



Workshop Manual

**Rolls-Royce Silver Shadow
(including Long Wheelbase Saloon)
Rolls-Royce Corniche
Bentley T Series
and Bentley Corniche**

Up to and including car serial number 30000

Volume 1

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INTRODUCTION

This Workshop Manual has been compiled to assist Service Personnel, responsible for maintenance and overhaul, in correctly maintaining the high standard of engineering achieved in the production of the Rolls-Royce Silver Shadow and Bentley T series cars.

The Manual is copiously illustrated and provides complete information on the dismantling procedure, inspection, assembly and special tools. Fault Diagnosis Sections have been included in some Chapters to enable obscure defects to be remedied speedily. Also included in the Manual at the end of most Chapters is a list of Dimensional Data which should be referred to when assessing wear or damage during overhaul.

Although all information contained in this Manual was correct when going to print, modifications which may subsequently develop will be kept up-to-date by amended pages.

Any information which cannot be dealt with satisfactorily by amended pages will, in the first instance, be issued in the form of a Service Bulletin.

Where a Service Bulletin is issued, it is advisable to endorse the relative page(s) in the Manual so that any subsequent reference to the Manual will reveal immediately that the page(s) content is affected by a Service Bulletin.

Service personnel at the appropriate address shown overleaf are always prepared to answer queries or give advice on individual servicing problems but it will assist them if enquiries are accompanied by the car serial numbers.

Every reasonable effort has been made to ensure that the information contained in this Publication is correct when going to print, however, as Rolls-Royce policy is one of continuous engineering improvement, the right is reserved to revise the contents without prior notice.

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Chapter A

GENERAL INFORMATION

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SECTION A1

SPECIFICATION

Type	Engine Over square 90° formation
Number of cylinders	Eight in two banks of four
Bore	10,41 cm. (4.1 in.)
Stroke	Cars prior to serial number 8742 - 9,14 cm. (3.6 in.) Cars from serial number 8742 - 9,91 cm. (3.9 in.)
Total capacity	Cars prior to serial number 8742 - 6,23 litres (380.5 cu.in.) Cars from serial number 8742 - 6,75 litres (411.9 cu.in.)
Compression ratio	9:1, 8:1 or 7.3:1 according to car's intended domicile.
Engine and transmission mounting points	The engine and transmission are flexibly mounted on rubber at three points; single mounting at the front, two at the rear
Material	Camshaft Alloy cast iron
Bearings	Surfaces machined in crankcase
Thrust taken	On front end
Drive	Through helical gears
Type	Connecting rods The connecting rods are 'H' section forgings and are balanced before fitting to the engine
Material	Chrome molybdenum steel
Big-end bearings	Split steel backed shells lined with 20% tin aluminium
Small-end bushes	Pressed into connecting rod small-end bosses
Material	Lead-bronze, steel backed
Description	Crankshaft Dynamically balanced two-plane crankshaft with four crankpins and integral balance weights; bolted on balance weights from car serial number 8742

Chapter A

Damping	Bonded rubber vibration damper
Direction of rotation	Clockwise (when viewed from front of engine)
Type	Cylinder block Monobloc casting
Material	Cast aluminium alloy
Description	Cylinder heads Two detachable heads, each having four separate inlet and exhaust ports
Material	Aluminium alloy, with phosphor bronze exhaust valve guides, cast iron inlet valve guides and valve seat inserts of alloy cast iron
Type	Cylinder liners Detachable wet liners
Material	Cast iron
Type	Main bearings Split steel backed shells lined with 20% aluminium
Type	Pistons The pistons are the full skirt type with off-set gudgeon pins. The crown of the pistons differ to give a compression ratio of 7.3:1, 8:1, or 9:1 dependent upon the car's intended domicile
Material	Aluminium alloy
Number of rings	Four. Three compression rings and one scraper ring or from car serial number 8742 Three. Two compression rings and one oil control ring
Inlet valves	Valve gear Overhead push rod operated. Single spring with steel collets, seals attached to collets control valve stem lubrication
Material	Alloy steel
Exhaust valves	Overhead push rod operated. Single spring with steel collets, seals attached to collets control valve stem lubrication
Material	Austenitic steel with stellite tip and valve seat
Tappets	The engine is fitted with self-adjusting hydraulic tappets. The base of each tappet has a spherical radius
Material	Alloy cast iron
Push rods	The push rods are hollow and have hardened spherical ends

Lubrication system

Type	Wet sump
High pressure supply	2,6 kgf/sq.cm. (37 lbf/sq.in.) at 1 000 r.p.m.
Relief valve	2,8 kgf/sq.cm. (40 lbf/sq.in.)
Oil pump	Helical gear type with fine mesh strainer pick-up
Oil filter	Full flow type with filter by-pass relief valve

Cooling system

Type	Solid coolant system
Pump type	Centrifugal
Pump drive	Adjustable twin 'Vee' belts
Radiator matrix type	Tube and fin construction
Fans	Located to the rear of the radiator
(a) cars prior to serial number 6300	(a) Five blades. 45,72 cm. (18.0 in.) diameter
(b) cars from serial number 6300	(b) Seven blades. Viscous drive coupling 50,8 cm. (20.0 in.) diameter
Electric booster fan	Located forward of the radiator. 30,5 cm. (12.0 in.) diameter plastic fan with seven blades
From car serial numbers	
Silver Shadow and Bentley T - 24482	
Corniche - 24431	
Coolant temperature controlled by thermostat opening temperature.	
Prior to car serial numbers	
Silver Shadow and Bentley T - 2832	
Corniche - 2986	79.5°C. to 83.5°C. (175°F. to 182°F.)
From car serial numbers	
Silver Shadow and Bentley T-2832	
Corniche - 2986	85°C. to 89°C. (185°F. to 192°F.)
System pressurised at	1,05 kgf/sq.cm. (15 lbf/sq.in.)
Coolant	Anti-freeze - 50% mixture
Cars destined for countries other than U.S.A. and Canada	Prestone anti-freeze and summer coolant UT184, renewed annually.
Cars destined for U.S.A. and Canada	Prestone II Winter/Summer concentrate, renewed annually. The two Prestone materials are miscible. Do not mix with different types of anti-freeze at any time

Make

Late cars destined for countries other than Australia, Canada, Japan and the U.S.A.
Late cars destined for Australia, Canada, Japan and the U.S.A.

Make and type

Cars from serial number 11188

Cars from serial number 22118

Rotation

Advance mechanism

Firing order

Drive

Make and type

Cars from serial number 22118

Gap setting

Cars prior to serial number 22118

Cars from serial number 22118

Cars destined for countries other than Australia, Canada, Japan and the U.S.A.

Cars destined for Australia, Canada, Japan and the U.S.A.

Make and type

Make and type

Make and type

Ignition coil

Lucas : HA 12 negative earth
 : BA 7 negative earth with ballast resistance
 : 16 C 6 negative earth with ballast resistance
 : 22 C 12 negative earth with ballast resistance
 : 23 C 12 negative earth with ballast resistance

Ignition distributor

Lucas : 20 D 8 - contact breakers Dwell angle 31° to 37°
 : 35 D 8 - contact breakers Dwell angle 26° to 28°
 : 35 DE 8 - Opus electronic Dwell angle 33° to 39° at 1 000 r.p.m.

Anti-clockwise, viewed from the top

Automatic centrifugal advance

A1, B1, A4, B4, B2, A3, B3, A2. 'A' bank is on the right when viewed from the driver's seat

Through camshaft skew gears

Sparking plugs

Champion : N 14 Y
 : RN 14 Y

0,58 mm. to 0,71 mm. (0.023 in. to 0.028 in.)

0,76 mm. (0.030 in.)

0,89 mm. (0.035 in.)

Generator

Lucas C 48

Generator control box

Lucas RB 340

Alternator

Lucas 11 AC
C.A.V. 512
C.A.V. AC 5B/12/53

	Alternator control
Make and type	Lucas 4 TR - fitted with Lucas 11 AC alternator C.A.V. 440 type 546 - fitted with C.A.V. alternators
	Starter motor
Make and type	Lucas M 45 G
	Refrigerant compressor
Make and type	Frigidaire 204,8 cu. cm. (12.5 cu. in.)
Drive	Twin 'Vee' belts
	Carburetters
Make and type	Twin S.U. HD8. Automatic choke
Choke size	5,08 cm. (2.00in.) diameter bore
Jet size	3,175 mm. (0.125 in.) Fixed needle type 2,44 mm. (0.100 in.) Spring loaded needle type
	Air filter/silencer
Make and type	Either an oil wetted wire mesh filter (early cars) or a Purolator paper type element
	Fuel pumps
Make and type	Twin S.U. electric type AUF 400
	Fuel tank
Capacity	107 litres (23.5 Imp. gal., 28 US. gal.)
	Fuel filter
Location	Main fuel filter in the fuel line between the fuel tank and carburetters. Small gauze filters at the carburetter inlets (early cars) disposable paper filter elements (late cars)
	Four Speed automatic gearbox
General	Fitted to right-hand drive cars prior to serial numbers SRH 4483 (excluding SRH 4486) and prior to SBH 4476
	Torque converter transmission (GM 400 - 3 speed)
General	Fitted to all left-hand drive cars. Also to right-hand drive cars after serial numbers SRH 4483 (excluding SRH 4487) and SBH 4475
	Propeller shaft
Description	Single piece shaft incorporating resonance dampers

Final drive unit and drive-shafts

Crown wheel teeth	40
Bevel pinion teeth	13
Final drive unit ratio	3.08:1
Top gear speed per 1 000 r.p.m.	42,3 k.p.h. (26.3 m.p.h.)

Braking system

Fluid	Castrol RR 363 brake fluid. This fluid exceeds current S.A.E. J1703 specifications in many respects and complies with D.O.T. 3 grade of FMVSS 116
Maximum operating pressure (pump cut-out pressure)	175,77 kgf/sq.cm. (2 500 lbf/sq.in.)
Pump cut-in pressure (2 settings)	(a) 130,06 kgf/sq.cm. to 133,58 kgf/sq.cm. (1 850 lbf/sq.in. to 1 900 lbf/sq.in.) early cars (b) 126,55 kgf/sq.cm. (1 800 lbf/sq.in.) late cars
Caliper type	
Front (2 types)	Four T16 calipers (cars prior to serial number 15950) Four M16 calipers (cars from serial number 15950)
Rear (2 types)	Two T11/14 calipers (cars prior to serial number 22118) Two T11/11 calipers (cars from serial number 22118)
Brake pads (four types)	Ferodo DC1, Mintex M69, Mintex M170 and Mintex V1431
Pad area (service brake)	
Front	304,5 sq.cm. (47.2 sq.in.)
Rear	237,3 sq.cm. (36.8 sq.in.)
Swept area	
Front	1459,35 sq.cm. (226.2 sq.in.)
Rear	1578,06 sq.cm. (244.6 sq.in.)
Total	3037,41 sq.cm. (470.8 sq.in.)
Disc diameter	27,94 cm. (11.0 in.) nominal
Disc width	
Front	1,60 cm. (0.630 in.)
Front (vented type)	3,18 cm. (1.250 in.)
Rear	1,27 cm. (0.500 in.)

Wheels and tyres

Wheels	
Rim (2 types)	(a) 6 JK x 15 in. (b) 6 JK x 15 in. flat ledge
Type	Disc - pressed steel
Fixing	5 stud - right-hand wheel nuts have right-hand threads, left-hand wheel nuts have left-hand threads

Tyres

- (a) Prior to car serial numbers
 Silver Shadow and Bentley T
 SRH 13485 (except SRH 13066, SRH 12853,
 SRX 12687 and SRH 12586)
 Long Wheelbase LRX 13201 (except LRH 13084)
 Corniche Convertible DRX 12734
 Corniche Saloon CRX 12735
- 8.15 15 cross-ply 205 15 radial-ply

Note

Prior to car serial numbers
 Silver Shadow SRX 6752
 Bentley T SBH 5572
 Coachbuilt CRH 6760
 Long Wheelbase LRX 6744
 (except LRX 6712, LRX 6714 and LRX 6720)

Only tubed radial tyre equipment should be fitted

- (b) Cars from and including the following car
 serial numbers up to those quoted in (c)
- 205 15 radial-ply

Silver Shadow and Bentley T
 SRH 13485 (including SRH 13066,
 SRH 12853, SRX 12687 and SRH 12587)
 Long Wheelbase LRX 13201 (including LRH 13084)
 Corniche Convertible DRX 12734
 Corniche Saloon CRH 12735

All cars from these car serial numbers **must** always
 be fitted with radial-ply tyre equipment.

- (c) All cars from and including the following car
 serial numbers

Silver Shadow SRC 18269
 Bentley T SBH 18265
 Long Wheelbase LRH 19577
 Corniche Convertible DRH 18563
 Corniche Saloon CRH 18564

HR 70 HR 15 (235/70 HR 15)

Recommended tyre inflation pressures cold

Refer to Chapter R - Wheels and tyres

Steering and suspension

Automatic height control system
 Maximum working pressure
 Pump cut-out pressure
 Pump cut-in pressure

See Braking System on Page A6

Minimum pressure for height control operation

80,85 kgf/sq.cm. (1 150 lbf/sq.in.)

Type

Steering

Recirculating ball

Turns of steering wheel lock-to-lock (3 changes)

4, 3.5, 3.25

Front and rear hubs

Taper roller bearings

Chapter A

	Front wheels steering geometry
Camber (in degrees)	0° to 1° negative
Kingpin inclination (in degrees)	11°
Caster (in degrees) Cars produced prior to serial numbers SBH 3349 and CRH 3449	1½° positive ±¼°
Cars produced after and including car serial numbers SBH 3349 and CRH 3449	3° positive ±¼°
Cars produced after and including car serial numbers Silver Shadow and Bentley T - 13485 Corniche - 12734	2° 30' to 3° 30' positive
Toe-in	1,58 mm. to 3, 58 mm. (0.062 in. to 0.141 in.) early cars 1,58 mm. to 3,17 mm. (0.062 in. to 0.125 in.) late cars
Diameter of steering wheel (all cars)	43,18 cm. (17.0 in.) prior to serial number 8222 40,64 cm. (16.0 in.) from serial number 8222 and onwards
Corniche	with the exception of, 38,10 cm. (15.0 in.) woodrim - from serial number 9770, limited period only, and 39,37 cm. (15.5 in.) from serial number 22583 and onwards
Turning circle (outside front) Wall to Wall	12,47 m. (L) 12,25 m. (R) [40 ft. 11 in. (L)] [40 ft. 2 in (R)]
Long Wheelbase	12,7 m. (L) 12,47 m. (R) [41 ft. 8 in. (L)] [40 ft. 11 in (R)]
Kerb to Kerb	11,81 m. (L) 11,58 m. (R) [38 ft. 9 in. (L)] [38 ft. 0 in. (R)]
Long Wheelbase	12,03 m. (L) 11,81 m. (R) [39 ft. 6 in. (L)] [38 ft. 9 in. (R)]
	Rear wheels geometry
Camber (in degrees)	¾° negative ±¼° early cars zero to -¼° late cars
Toe-in	Zero to 1,59 mm. (0.062 in.) early cars Zero to 12' (in degrees) late cars Both unsprung - non adjustable with car in show- room condition
	Dimensions
Wheelbase	3,05 m. (10 ft. 0¼ in.)
Track Cars prior to serial numbers SBH 5572, SRX 6752 and CRH 6760	1,46 m. (4 ft. 9½ in.) front and rear

Cars from serial numbers SBH 5572, SRX 6752 and CRH 6760	1,47 m. (4 ft. 9¾ in.) front and rear
Cars from serial number 18269	1,52 m. (5 ft.) front 1,51 m. (4 ft. 11⅝ in.) rear
Road clearance (all cars)	16,5 cm. (6½ in.)
Overall length	
Cars destined for countries other than U.S.A. and Canada	
Silver Shadow and Bentley T	5,196 m. (17 ft. 0 ⅞ in.)
Long Wheelbase	5,298 m. (17 ft. 4 ⅞ in.)
Corniche	5,196 m. (17 ft. 0 ⅞ in.)
Cars destined for U.S.A. and Canada	
Silver Shadow and Bentley T	5,270 m. (17 ft. 3½ in.)
Long Wheelbase	5,372 m. (17 ft. 7½ in.)
Corniche	5,270 m. (17 ft. 3½ in.)
Overall width	
Silver Shadow and Bentley T	1,827 m. (5 ft. 11 ⁵ / ₁₆ in.)
Long Wheelbase	1,827 m. (5 ft. 11 ⁵ / ₁₆ in.)
Corniche	1,836 m. (6 ft. 0 ⁵ / ₁₆ in.)
Overall height	
Silver Shadow and Bentley T	1,518 m. (4 ft. 11¼ in.)
Long Wheelbase	1,518 m. (4 ft. 11¼ in.)
Corniche Convertible	1,518 m. (4 ft. 11¼ in.)
Corniche Saloon	1,490 m. (4 ft. 10¼ in.)

Battery (negative earth)

Cars destined for countries other than U.S.A. and Canada	
Make and type	Chloride 369
Voltage	12V
Capacity	71 ampere hour at 20 hour rating
Cars destined for U.S.A. and Canada	
Make and type	Lucas Pacemaker CP 13/11
Voltage	12V
Capacity	68 ampere hour at 20 hour rating

SECTION A2

DATA

Identification of the two banks of the engine

Throughout this Manual, references are made to the 'A' and 'B' bank side of the engine. For easy identification, the two banks of the engine can be recognised as follows.

When viewing the engine from the driver's seat, the right-hand bank is 'A' bank and the left-hand bank is 'B' bank.

Air conditioning system

The air conditioning system (fitted as standard equipment from serial number 7500; offered as an option prior to 7500) provides unheated, heated or refrigerated air and is controlled by two switches on the centre console. Outlets are provided at the base of the windscreen, on the facia, under the facia and at the rear of the front seats. The air can be boosted in all these systems by two fan motors controlled from a five position switch on the centre console.

Automatic air conditioning system

Corniche cars from serial numbers:
 Convertible DRH 22583 (right-hand drive)
 DRX 22781 (left-hand drive)
 Saloon CRH 22648 (right-hand drive)
 CRX 22919 (left-hand drive)

Air temperature (blend) flaps form the basis of the automatic air conditioning system as they are operated by an electro-mechanical servo mechanism controlled by an electronic circuit. These circuits are fed with air temperature information from certain parts of the car and, acting on this information, drive the servos so that the air temperature (blend) flaps are moved into the correct positions to achieve the required in-car air temperature. The upper and lower systems operate independently, each system having its own set of air temperature sensors, air temperature selector, servo and servo electronics.

The system is operated by three switch controls situated on the facia.

The control marked AIR CONDITIONER has five positions and enables three automatic positions or a defrost position to be selected. The system can be switched off by turning the control to the OFF position.

The switch control marked UPPER TEMP controls the air temperature in the upper part of the car; the switch control marked LOWER TEMP controls the air temperature in the lower part of the car.

Automatic height control system

The system is a fully automatic hydraulic system and maintains the riding height of the car regardless of loading.

When the gear range selector lever is in any position except Neutral or Park the system is on slow levelling. When Neutral or Park is selected the system changes to fast levelling.

The system is operated by fluid, supplied under pressure from an engine driven pump and pressure accumulator and is controlled by one front and two rear height control valves and a front roll restrictor valve (cars prior to serial number 7404) or by two rear height control valves only (cars from serial number 7404 and onwards).

Automatic speed control system

Fitted as standard equipment on all cars from serial numbers.

Silver Shadow	SRH 17518
Long Wheelbase	LRH 16584, LRH 16609 and onwards
Corniche Convertible	DRH 16988
Corniche Saloon	CRH 16916

The automatic speed control system was fitted as standard equipment on all cars destined for U.S.A. and Canada from 1972. It was offered as an option from serial number 10325.

The controls for the automatic speed control system are either fitted to the end of the gear range selector

Chapter A

lever or mounted in the moulding adjacent to the lower roll between the steering column and the centre console. The regulator and bellows servo are mounted in the engine compartment.

Any cruising speed over 48 k.p.h. (30 m.p.h.) and up to 137 k.p.h. (85 m.p.h.) can be selected to give satisfactory operation of the automatic speed control system.

This system only operates when the vehicle is in top gear.

Body

The car body is steel and is of a monocoque construction. The doors, luggage compartment lid and bonnet are made of light alloy, combining lightness with strength and rigidity. The under-frame and body shell are welded together.

Braking system

Pressurised fluid is supplied from two camshaft driven pumps and two hydraulic accumulators. Power pressure is metered out to the brakes by two brake distribution valves actuated by brake pedal operation.

Braking units

Discs front and rear; two double cylinder calipers on each front wheel and one four cylinder caliper on each rear wheel.

Service brake

Three separate and independent hydraulic systems. Two are power brake systems and the third is a master cylinder system. Normally all the hydraulic circuits are in operation when the brake pedal is applied and the engine is running. The master cylinder system is fully operative irrespective of whether the engine is running or not.

All power brakes - Cars from serial number 22118

Two entirely independent hydraulic systems, each separately powered. Each system operates one of two individual disc brake caliper assemblies on each front wheel and one of two individual pairs of pistons and pads, housed in a single disc brake caliper assembly, on each rear wheel.

Parking brake

Separate mechanically controlled calipers are attached to service brake calipers at each rear wheel. Parking brake operation is by hand. On left-hand drive cars from serial number 16079 parking brake operation is by foot pedal application with a separate hand release.

Electrical system

Alternator control

The alternator control unit is located either in the engine compartment (early cars) or in the luggage compartment adjacent to the battery (late cars). It is a transistorised unit with a printed base circuit. It varies the alternator field current in order to maintain the stator output voltage within close limits. It is a sealed unit and cannot be adjusted.

Exterior lamps

Four headlamps are fitted and operate whenever the main lighting switch is turned to the HEAD position. The headlamps contain either sealed beam units or bulbs dependent upon the car's domicile. The two inner lamps provide long range illumination. The two outer lamps provide short range 'flood' illumination. When switched to main beam all four headlamps are illuminated. The two inner lamps are extinguished when the headlamps are dipped.

A small warning lamp situated in the speedometer illuminates when the headlamps are switched to main beam.

Twin front fog lamps (if fitted) contain a single filament quartz halogen bulb. The fog lamps operate whenever the main lighting switch is turned to the FOG position.

Fog lamps are not fitted to cars destined for certain countries.

The side, tail, side marker, and rear number plate lamps illuminate whenever the main lighting switch is moved from the OFF position.

Interior lamps

Interior roof lamps and floor illumination lamps are fitted and illuminate whenever the doors are opened. The roof lamps can also be operated with the appropriate switch.

The lamp mounted in the roof of the luggage compartment illuminates automatically whenever the luggage compartment lid is raised. Similarly, the bonnet lamp illuminates whenever the bonnet lid is raised.

A list of bulbs, headlamp bulbs and sealed beam units is shown in Chapter M.

Fuseboard

The fuseboard is situated in the lower facia, to the side of the steering column. On Corniche cars (from serial number 22583) the fuseboard is in the lower facia, below the stowage compartment. Access is gained by unscrewing the knurled screw, or on Corniche cars anti-clockwise rotation of the two quick release clips, then lowering the panel.

Windscreen washer

The reservoir is located in the engine compartment.

Operation of the washer is controlled by pressing either the wipers control switch on the facia, or the switch situated in the end of the direction indicator lever.

Windscreen wipers

Operation of the wipers is controlled by a switch on the facia marked WIPE. The switch has two clockwise positions, the first position is for normal speed wiping, and the second increases the speed (early cars only).

On later cars the switch has two clockwise positions and one anti-clockwise position. The anti-clockwise position provides intermittent operation, giving one complete wipe every seven seconds (approximately).

Engine**Lubrication system**

The engine oil from the sump is circulated by a gear type pump mounted on the front of the crankcase and driven by the crankshaft through skew gears.

High pressure oil is fed to the crankshaft, big-end bearings, camshaft bearings and timing gear, tappets, push rods and rocker ball end seatings. An intermittent feed supplies oil through the front cam-shaft bearing to the rocker shafts, rocker arms and valve tips. The connecting rod small-ends, gudgeon pins and cylinder walls are lubricated by a splash feed.

Cooling system

The engine cooling system comprises a matrix, a separate header (expansion) tank and a centrifugal pump. The pump is driven by the crankshaft through twin matched belts. The header tank is mounted separately above the radiator to reduce aeration in the system by separating the circulating coolant from the air space.

Cooling system corrosion and freeze protection

Prestone anti-freeze and summer coolant UT 184 or Prestone II winter/summer concentrate, 50% mixture with water giving frost protection down to a temperature of -36.5°C . (-33.7°F).

Coolant inhibitor

Approved inhibitor SQ36. 89 c.c. (3 fluid ounces) of

the concentrate should be added to each 4.5 litres (1 Imperial gallon, 1.2 U.S. gallons) of water.

Specific gravity of coolant

The coolant should be checked for 50% anti-freeze/water mixture with a hydrometer. To give a 50% mixture at room temperature the specific gravity should be between 1.060 and 1.070.

Emission control systems

Refer to the appropriate section within Chapter U.

Front and rear hubs

The front hubs are mounted onto the yoke stub axle. The rear hubs are mounted onto hollow stub axles connected to the final drive unit by universal couplings and drive-shafts.

Fuel filler door

To open the filler door depress the button on the facia. A manually operated release is situated in the luggage compartment.

Power assisted steering

Power assisted steering with collapsible steering column is fitted, the steering box is supplied with hydraulic fluid under pressure by an engine driven pump.

The steering idler box, fitted on the opposite side of the car to the steering box, incorporates an hydraulic damper; this damper gives protection against any violent reactions at the road wheels.

Sub-frames

The front sub-frame manufactured from welded sheet steel is either mounted on resilient metal mounts (early cars) or rubber mounts (late cars) to the car underframe.

The rear sub-frame manufactured from welded sheet steel is mounted to the car body underframe using resilient metal mounts.

Suspension**Cars from serial number 12734 (Corniche) and 13485 (Silver Shadow and Bentley T)**

The front suspension is an independent coil spring arrangement with double acting hydraulic shock dampers, an anti-roll stabiliser and a transverse locating rod, all of which are attached to the front sub-frame.

The rear suspension is an independent coil

Chapter A

spring arrangement with trailing arms and double acting hydraulic shock dampers; the trailing arms are pivoted on the rear sub-frame.

Cars prior to serial number 12734 (Corniche) and 13485 (Silver Shadow and Bentley T)

The compliant front suspension is an independent coil spring arrangement with double acting hydraulic shock dampers, an anti-roll stabiliser bar and a compliance rod, all of which are attached to the front sub-frame.

The rear suspension is an independent coil spring arrangement with trailing arms, double acting hydraulic shock dampers and an anti-roll stabiliser bar; the trailing arms are pivoted on the rear sub-frame.

Transmission

Final drive unit and drive-shafts

The final drive unit is rigidly mounted on a cross-member which is attached to the body underframe by two rubber mounts. A torque arm flexibly mounted between the rear crossmember and the rear sub-frame absorbs the torque reaction at the crownwheel in the final drive unit.

The final drive unit casing contains hypoid bevel gears. Drive is transmitted to the rear wheels by two drive-shafts; the inner end of each shaft is connected by a ball and trunnion joint and the outer end by a universal coupling.

Propeller shaft

The single piece propeller shaft incorporates resonance dampers. The shaft is connected to the torque converter transmission output shaft flange and to the final drive input flange by universal joints.

The propeller shaft assembly is dynamically balanced to fine limits.

Four speed automatic gearbox

The four speed automatic gearbox transmits drive in four forward ranges and reverse. Gear changes are made automatically through a fluid coupling and three epicyclic gear trains. A parking lock is incorporated when reverse is selected and the ignition is switched off.

Torque converter transmission

The torque converter transmission transmits the drive automatically in three forward ranges and reverse. Gear changes are made automatically and are obtained through a three element hydraulic torque

converter and a compound planetary gear train. A parking lock incorporated in the torque converter transmission operates when the gear range selector lever is moved to the Park position or when the ignition key is removed from the switchbox.

SECTION A3

HELI-COIL INSERTS

Heli-coil inserts

Heli-coil inserts are used on various aluminium parts of the engine. They offer a far greater resistance to wear, stripping, seizing and corrosion than direct type threads.

Heli-coils have been used only where the parts are secured by setscrews, not where studs are fitted.

The Heli-coil inserts are made of stainless steel wire and can therefore be easily identified when fitted into their aluminium components.

Heli-coil insert - To remove (see Fig. A1)

1. Fit the blade of the Heli-coil insert extraction tool into the top of the threaded insert.
2. Press downwards onto the insert and then turn the blade anti-clockwise; the insert should then wind out of the hole.

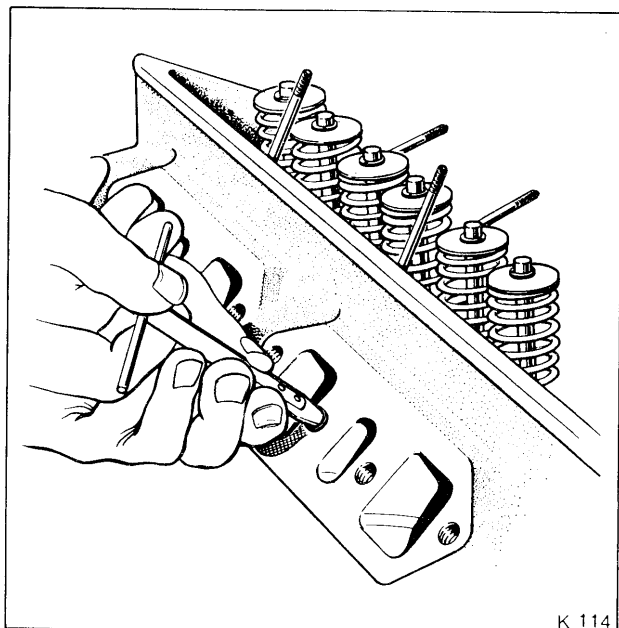


FIG. A1 HELI-COIL EXTRACTION TOOL

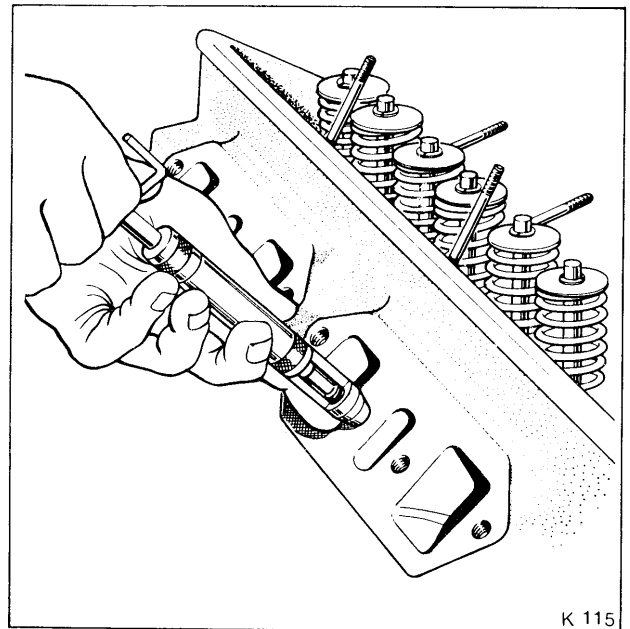


FIG. A2 HELI-COIL INSERTION TOOL

3. Examine the condition of the threads in the hole from which the Heli-coil was removed. If necessary rectify any damage by using a special Heli-coil insert tap.

Heli-coil insert - To fit

As it is necessary to remove the tang from the end of the Heli-coil insert after fitting, it is important to ensure that the insert tang is notched.

Using the Heli-coil insertion tool shown in Figure A2 proceed as follows.

1. Withdraw the mandrel from the threaded nozzle and loading chamber.
2. Fit the insert into the chamber with the tang end positioned towards the nozzle.
3. Slide the mandrel through the insert and engage the tang into the slot.
4. Turn the handle clockwise, applying gentle pressure on the insert until it is located into the nozzle.

Chapter A

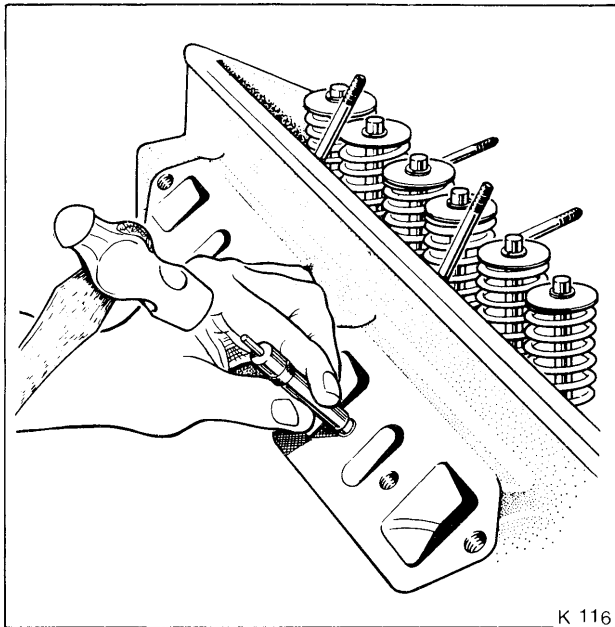


Fig. A3 HELI-COIL TANG 'BREAK-OFF' TOOL

5. Continue turning until the first coil of the insert just emerges from the nozzle.
6. Fit the insertion tool over the tapped hole ensuring that it is square to the work face.
7. Commence winding until the insert is transferred from the nozzle to the tapped hole. Do not apply any pressure during this operation.
8. The Heli-coil insert is finally fitted when the coil is between $\frac{1}{4}$ and $\frac{1}{2}$ pitch below the surface of the work face.
9. Fit the special tang break off tool (punch) into the insert as shown in Figure A3.
10. Allow the innerpiece of the punch to slide downward to locate onto the tang.
11. Apply a sharp tap to the end of the punch so that the tang breaks off at the notch.
12. Ensure that the tang does not fall into any part of the engine etc. where it could cause damage.

Chapter B

SPECIAL PROCESSES

SECTION	PAGE
B1 Storage and Recommissioning	B1
B2 Shipping Precautions	B5

Section B1

STORAGE AND RECOMMISSIONING

Introduction

The success of the following recommended storage procedures depends upon correct initial preparation, regular inspection and maintenance.

Storage

The storage building should be dry and well ventilated. If the building is heated, the temperature must remain constant twenty four hours a day.

Corniche Convertible cars should be stored with the hood raised and the hood clips securely fastened.

Storage recommendations

Prior to storage, thoroughly clean the carpets, rugs and upholstery. Treat all leather upholstery with Connolly's Hide Food.

Thoroughly wash the exterior bodywork of the car.

Any damaged paintwork discovered during this operation should be reported to the owner.

Apply a good quality cleaner /polish followed by a good quality silicone wax polish.

Throughout the storage period the following procedures should be carried out every two weeks.

1. Remove, clean and fully charge the battery and if necessary top-up with distilled water.
2. Check the coolant level in the radiator and top-up if necessary.
3. Ensure that the fluid levels in the engine sump, torque converter transmission, steering pump, final drive unit, brake and height control reservoirs and the power operated hood reservoir on Corniche Convertible cars are to the maximum level marks.
4. Check the tyre pressures including the spare tyre and adjust if necessary (see Chapter R).
5. Ensure that all controls, instruments, warning panels and lamps are operating satisfactorily.
6. Run the car for a minimum of 16 kilometres (10 miles) to ensure complete lubrication of internal components.

7. Allow the car to cool, then wash the exterior bodywork.

When the car has thoroughly dried, cover it with a light cotton or muslin dust sheet.

If it is not possible to carry out the above recommended storage procedures, the following storage procedures may be adopted though they will not provide the same degree of protection

Storage periods between one and three months

1. Remove, clean and fully charge the battery. If necessary top-up with distilled water. Once a month, re-charge the battery until the specific gravity of the electrolyte has remained constant for between ten and twelve hours.
2. Check the coolant level in the radiator and top-up if necessary.
3. Ensure that the fluid levels in the engine sump, torque converter transmission, steering pump, final drive unit, brake and height control reservoirs and the power operated hood reservoir on Corniche Convertible cars are to the maximum level marks.
4. Wash the exterior bodywork of the car. Any damaged paintwork discovered during this operation should be reported to the owner.
5. Apply a good quality cleaner /polish followed by a good quality silicone wax polish.
6. Increase the tyre pressures to 2,8 kgf/sq.cm. (40 lbf/sq.in.). The pressure of the spare wheel tyre does not need increasing.
7. Cover the car with a light cotton or muslin dust sheet, ensuring that the tyres are covered if sunlight is able to penetrate into the storage area.

Storage periods between three and six months

1. Drive the car for approximately 16 kilometres (10 miles) to warm the engine oil, torque converter transmission and final drive unit. This will ensure

Chapter B

complete lubrication of the internal components.

2. Check the coolant level in the radiator and top-up if necessary. Under no circumstances leave the cooling system dry.

3. Remove the sparking plugs and inject two tablespoonsful of a corrosion preventive oil into each cylinder. Suitable oils are BP Energol Protective Oil 20 and Castrol Storage Oil 20. Using the starter motor, turn the engine to distribute the oil over the cylinder walls. Fit the sparking plugs.

4. Ensure that the fluid levels in the engine sump, torque converter transmission, steering pump, final drive unit, brake and height control reservoirs and the power operated hood reservoir on Corniche Convertible cars are to the maximum level marks.

5. Thoroughly clean the carpets, upholstery and cushions.

6. Treat all leather upholstery with an application of Connolly's Hide Food.

7. Wash the exterior bodywork of the car.

Any damaged paintwork discovered during this operation should be reported to the owner.

8. Apply a good quality cleaner /polish followed by a good quality silicone wax polish.

9. Clean all chromium plating and stainless steel then lightly smear with petroleum jelly.

10. Remove, clean and fully charge the battery. Once a month, re-charge the battery until the specific gravity of the electrolyte has remained constant for between ten and twelve hours.

11. Jack up the car and place supports under the rear trailing arms and the outer side of the front lower triangle levers. Do not deflate the tyres but cover them with light cotton or muslin to ensure against the possibility of sunlight penetrating into the storage area.

Storage periods exceeding six months

With the exception of Operation 4 the following additional measures to those listed for storage periods between three and six months are recommended.

1. Ensure that the fluid levels in the torque converter transmission, steering pump, brake and height control reservoirs and the power operated hood reservoir on Corniche Convertible cars are to the maximum level marks.

2. Drain the final drive unit and the engine sump, then fill them to the normal levels with a corrosion preventive oil. Run the engine for one minute to distribute the oil.

3. On cars other than those fitted with a catalytic converter, to prevent the formation of deposits of gum in the fuel system, drain or syphon the fuel tank and then run the engine until the fuel system is empty.

On cars fitted with a catalytic converter drain or syphon the fuel tank, but **do not** run the engine to completely drain the system.

Position a note on the fascia panel stating that the fuel tank is empty and that no attempt must be made to start the engine until the tank contains fuel.

4. On cars other than those fitted with a catalytic converter, remove the fuel pump and carefully drain or syphon any fuel into a closed container, then refit the unit.

5. Check the hoses of the cooling system. If any are found to be defective, report to the owner.

6. Dust the carpets and rugs with anti-moth powder and store them in a dry place.

7. If the storage building is dry, leave the car windows slightly open.

If there is any tendency towards dampness, close the doors and windows and place an anti-moisture compound such as silica-gel or calcium chloride in an open metal container inside the car.

Recommissioning procedure

If the car has been stored in accordance with the stated procedures the following points are all that should require attention before the car is roadworthy.

1. Lower the car onto its tyres. Check the tyre pressures and adjust if necessary.

2. Fully charge and fit the battery.

3. Drain any corrosion preventive oil from the engine sump and final drive unit. Fit a new engine oil filter element and then fill the engine sump and final drive unit with the approved oils (see Chapter D).

4. Check the coolant level in the radiator and top-up if necessary.

5. Remove the sparking plugs and prime the cylinders with engine oil. Using the starter motor, turn the engine over to distribute the oil and to prevent a hydraulic lock.

If the car has been run every two weeks during the storage period, it will not be necessary to prime the cylinders.

6. Clean the sparking plugs and if necessary set the gaps; fit the plugs.

7. Lubricate the distributor advance mechanism by removing the rotor and applying two or three drops of engine oil to the top of the spindle and through a convenient aperture in the distributor baseplate.

8. Ensure that the fluid levels in the engine sump, torque converter transmission, steering pump, final drive unit, brake and height control reservoirs and the power operated hood reservoir on Corniche Convertible cars are to the maximum level marks.

9. Lubricate all grease points.

10. If the fuel tank has been drained, fill the tank and start the engine. Check that the engine oil pressure and ignition warning lamps are not illuminated. Also, check for coolant, oil or fuel leaks.

Note

If the brake pressure warning panels illuminate refer to Chapter G immediately.

11. Check the operation of all controls, instruments, warning panels, lamps and accessories.

Section B2

SHIPPING PRECAUTIONS

Introduction

When transporting a Rolls-Royce or Bentley motor car overseas, always contact a reputable shipping agent to obtain the correct advice and service. However, the following points should be brought to the notice of the shipping agent.

Precautions

1. On cars other than those fitted with a catalytic converter, drain or syphon the fuel from the tank and run the engine until the fuel system is empty.
2. On cars fitted with a catalytic converter, damage to the converter could occur if the engine is allowed to run until the fuel system is completely empty. Therefore, before completely draining or syphoning the fuel system the catalytic converter must be removed and a conventional front silencer fitted.
3. It should be noted that cars fitted with a catalytic converter must only be operated on unleaded fuel. Therefore, if unleaded fuel is not available the catalytic converter must be replaced with a conventional front silencer.
4. It is of the utmost importance that service personnel should fully appreciate that the hydraulic systems of the car operate at **high pressures** and that personnel are fully conversant with the precautions which must be taken to ensure correct operation of the systems. Special attention should therefore be given to the section on Special Precautions in Chapter G.
5. Ensure that the battery is disconnected and the terminals taped up.
6. Cover the radiator, bumpers and all outer chromed parts with masking tape.
7. When the car is shipped in a container, place a bag of silica-gel adjacent to each wheel trim and one inside the engine compartment.

Chapter C

AIR CONDITIONING

SECTION PAGE

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HEATING, DEMISTING AND VENTILATION SYSTEM

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PART 2

REFRIGERATION SYSTEM

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Chapter C

PART 1

HEATING, DEMISTING AND VENTILATION SYSTEM

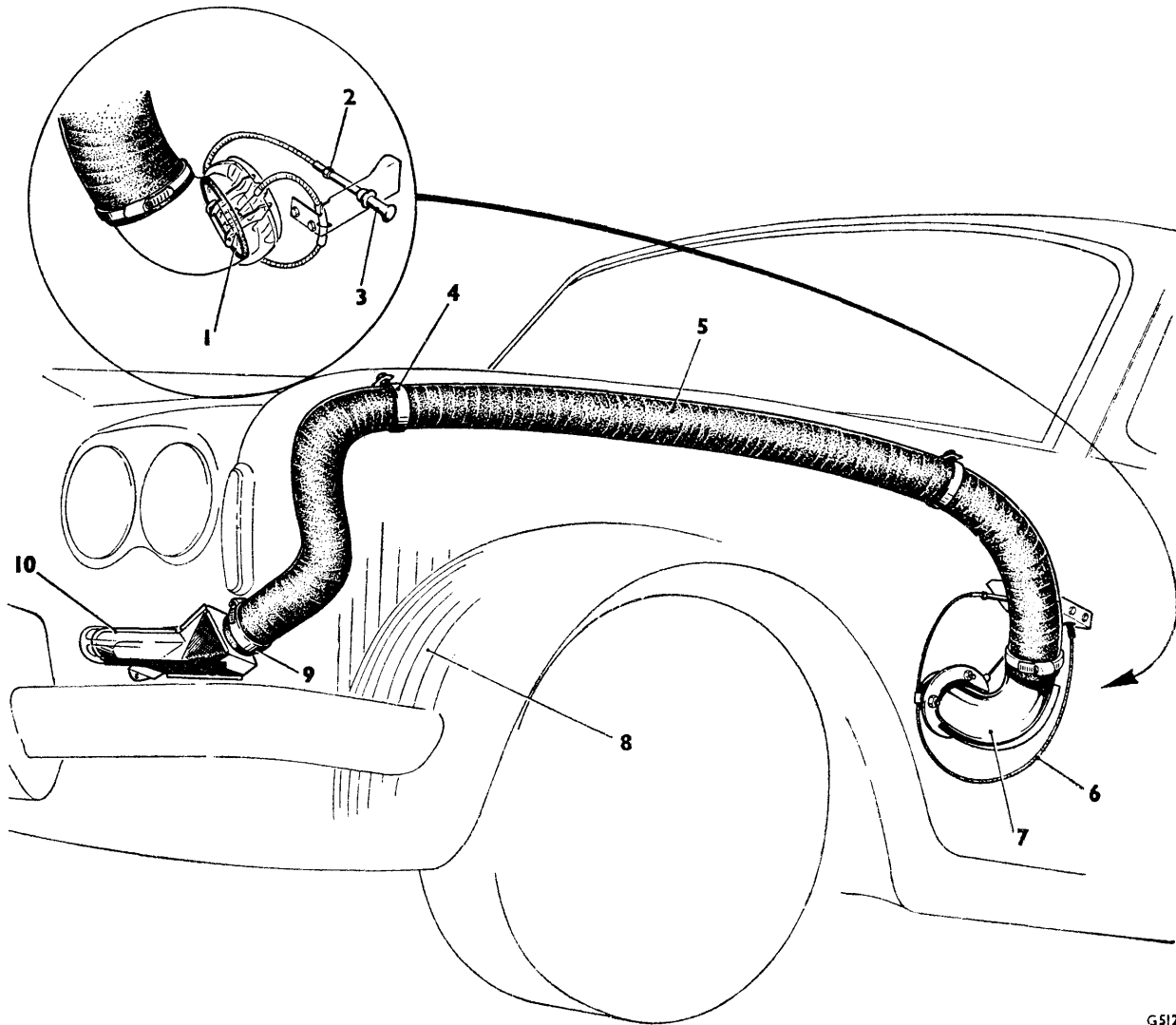
Section C1 OVERHAUL

Underwing ducting—To remove (see Fig. C1)

1. On early cars, the underwing ducting is fitted to both sides of the car, on late cars it is fitted to the driver's side only. In the operations that follow, the procedure is given for the removal of the ducting from both sides of the car.
2. Apply the hand brake and chock the rear wheels of the car.
3. Using the lever specially provided in the tool kit, carefully remove the embellishers from the front wheels.
4. Slacken the front wheel nuts; note that from the driver's seat, the nuts on the right-hand side of the car have right-hand threads and conversely, the nuts on the left-hand side of the car have left-hand threads.
5. Position a jack underneath the front lower triangle levers pivot points. Jack up the car so that the front wheels are clear of the ground. As a precaution against the jack failing, support the front of the car on two sets of wooden blocks placed underneath the extremities of the lower triangle levers adjacent to the ball joints.
6. Remove the wheel securing nuts and remove the front wheels.
7. Remove the caps and screws securing the undersheets to the under-side of each front wing; remove the undersheets. The caps are fitted to the threaded end of the screws which protrude through the body into the engine compartment.

8. Slacken the worm drive clips securing the large air transfer tube between the carburetter and the air silencer/cleaner.
9. Remove the two clamp bracket screws securing the tube at a point midway between the ends of the tube; remove the tube.
10. Withdraw the air silencer/cleaner intake tower from the air silencer/cleaner.
11. Remove the centre knurled screw securing the end cover and cleaner components to the air silencer/cleaner box. For further information on the air silencer/cleaner, refer to Chapter K—Section K3.
12. Remove the six setscrews securing the air silencer/cleaner, then remove the air silencer/cleaner from underneath the wing.
13. Remove the long ram air transfer tubes which are fitted beneath each front wing. Each transfer tube is secured in position by two worm drive clips and two clips with a nut and bolt fixing.
14. Remove the three setscrews securing the inlet scoop which is secured underneath each wing at the front of the car; remove the two scoops.
15. Using a wedge shaped tool, lift back the trim surrounding the ram air outlet ducts; the trim is secured in position by small tacks.
16. With the help of an assistant, support the outlet ducting situated underneath each wing then, remove the four screws securing each circular outlet duct to the side scuttle wall; remove the ducting.

Chapter C



GS12

FIG. C1 RAM AIR DUCTING

- | | | | | |
|-------------------------|-----------------------|------------------------|---------------------|--------------------------|
| 1 Flap valve | 3 Control knob | 5 Transfer tube | 7 Duct | 9 Worm drive clip |
| 2 Cable adjuster | 4 Clip | 6 Cable | 8 Undersheet | 10 Intake duct |

17. Remove the setscrews securing the circular outlet fixing brackets to the side scuttle then remove the brackets together with the outlet assemblies from the car.

Underwing ducting—To inspect

1. Examine the condition of the underwing ducting, particularly the long transfer tubes and the flap seal fitted to the outlet duct.

Underwing ducting—To fit

Fit the underwing ducting by reversing the procedure given for removal, noting the following point.

1. The circular outlet duct flap should be set so that it makes a perfect seal when the control knob is

pushed fully forward, i.e. the closed position; adjustment is possible by a conventional type of threaded adjuster interposed in the cable length.

Heater matrix—To remove

1. Drain the coolant from the radiator and heater matrix into a clean container as follows.

2. Remove the filler cap from the radiator header tank and open the three drain taps positioned one at the bottom of the radiator, and one at each side of the crankcase. On late cars, the crankcase drain taps are superseded by drain plugs.

3. To assist draining the heater matrix, switch on the ignition but do not start the engine, then turn clockwise either the 'UPPER' or 'LOWER' system heating switch.

4. Disconnect the battery leads.

5. Scribe the profile of the bonnet catch mounting brackets onto their adjacent cadmium plated catch parts (see Fig. C2).

6. Remove the bonnet catch springs.

7. Remove the screws securing the catch to the mounting bracket then move the catch to one side; it is not necessary to disconnect the operating cable from the bonnet catch.

8. Detach the strap securing the ducting between each blower motor and the heater box.

9. Peel back the rubber sleeve connecting the ducting to the heater box then remove the ducting.

10. Remove the three nuts and washers securing the wiper motor mounting bracket to the body, also unscrew the union nut securing the wiper drive cable into position; move the motor to one side to facilitate removal of the adjacent blower motor.

11. Disconnect the leads to each blower motor.

12. Remove the three 2 B.A. nuts securing each blower motor to its housing.

13. Remove the three nuts inside each blower motor housing and remove the housing from the bulkhead.

14. Remove the self-tapping screws securing the upper flap actuator cover plate to the heater box.

15. Release the lock-nuts then disconnect the upper flap control rods from the actuator levers. To facilitate re-assembly, retain the washers, spring and nuts with their respective control rods.

16. Disconnect the electrical connectors from each of the upper flap actuators.

17. Remove the ten nuts and washers and the four small self-tapping screws securing the heater box into position. The self-tapping screws are situated at the two outer bottom sides of the heater box and are partially hidden, but can be removed by using a long screwdriver.

18. Slacken the worm drive clips then disconnect the rubber pipes from the heater matrix. Withdraw the heater box and heater matrix from the bulkhead aperture (see Fig. C3).

19. Remove the setscrews securing the heater matrix to the heater box.

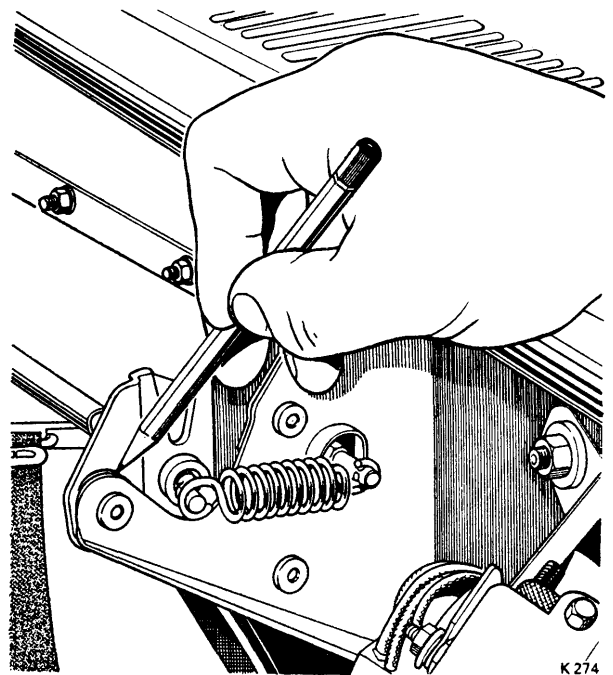


FIG. C2 SCRIBING A LINE ON THE BONNET CATCH MECHANISM TO FACILITATE ASSEMBLY

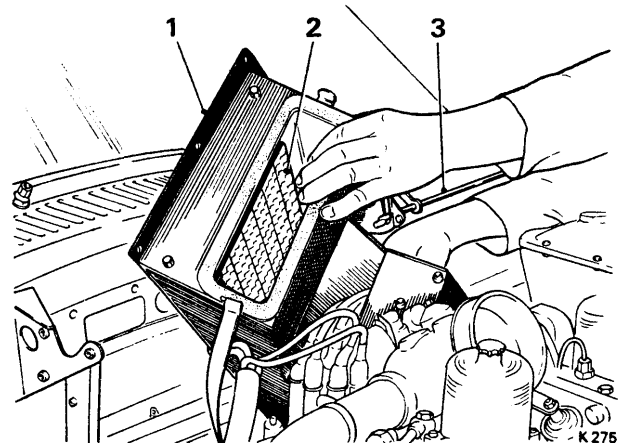


FIG. C3 REMOVING THE HEATER BOX AND MATRIX

- 1 Heater box
- 2 Heater matrix
- 3 Bonnet catch mechanism

Heater matrix—To fit

Fit the heater box by reversing the procedure described for its removal, noting the following points.

1. Check the condition of the various seals and ensure that they are fitting perfectly to their respective faces.

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2. To renew a seal, remove the old seal and remove the old 'Bostik' from the face with 'Bostik' cleaner 6001. Allow approximately one hour for the cleaner to dry then apply a liberal amount of 'Bostik' adhesive 1261 (or its equivalent) to the surface of the new seal and its mating surface then fit the new seal into position. After approximately half-an-hour when the 'Bostik' has had time to dry, check that the seal is secure. Examine the heater matrix for signs of leakage.

3. If the heater matrix has been repaired or, if a leak under pressure is suspected, blank off the outlet connection and connect an air supply to the inlet connection. Immerse the matrix in water and test at an air pressure of 30 lb./sq. in. (2,11 kg./sq. cm.).

4. Examine the upper flap control rods to ensure that they are not bent.

5. Examine the rubber hoses for signs of deterioration and renew if necessary.

6. Care should be taken when fitting the heater box to ensure that the upper flap control rods are not bent.

7. Seal the joint between the control box and the demister duct with 2 in. (5,08 cm.) wide 'Gosherous' tape or its equivalent.

8. Set the upper temperature flap and upper quantity flap actuators as described under the appropriate headings.

Control box—To remove

1. Remove the heater box matrix (see Heater matrix—To remove).

2. Disconnect the lower temperature flap control rod at its lower connection (see Fig. C11). On late cars, remove the connecting pin.

3. Withdraw the control box through the bulkhead aperture.

Control box flaps—To set

(see Fig. C4)

1. Before attempting to set the flaps, check the condition of the seals and renew them if necessary (see Heater matrix—To fit, Operation 3).

2. Hold the flaps firmly in the positions shown in Figure C4, i.e. temperature flaps in the hot position and the upper quantity flap in the closed position.

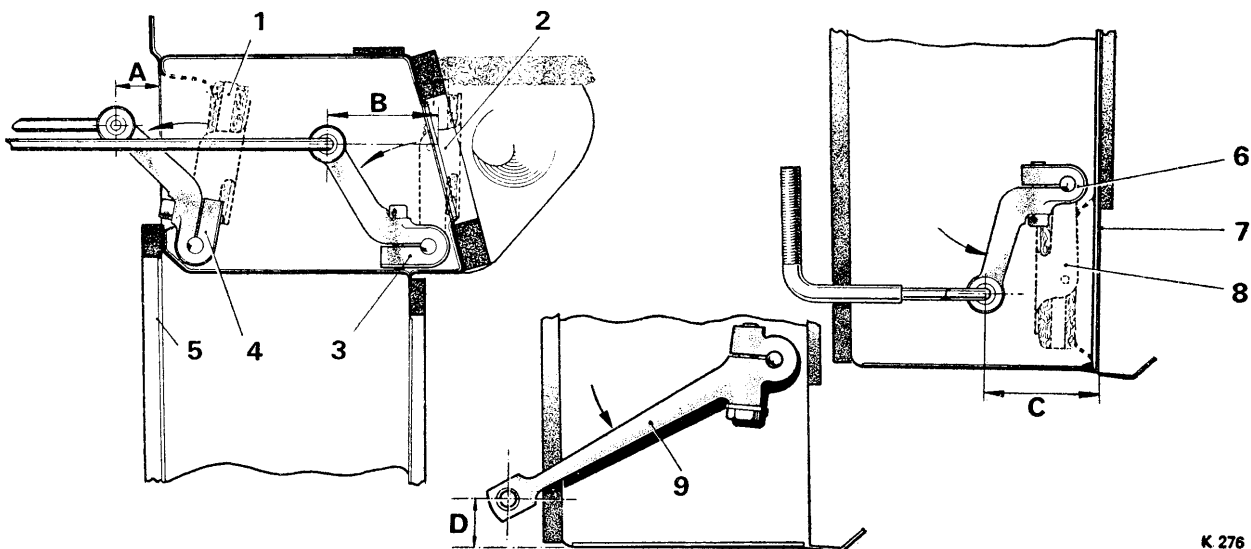


FIG. C4 CONTROL BOX SETTINGS

- | | |
|--|---|
| 1 Upper temperature flap | 5 Control box (forward face) |
| 2 Upper quantity flap | 6 Lower temperature flap lever (early type) |
| 3 Upper quantity flap lever | 7 Control box (forward face) |
| 4 Upper temperature flap lever | 8 Lower temperature flap |
| 9 Lower temperature flap lever (late type) | |

A $\frac{7}{16}$ in. (11,11 mm.)

B $\frac{1}{8}$ in. (22,22 mm.)

C $1\frac{3}{16}$ in. (3,02 cm.)

D $\frac{5}{8}$ in. (15,87 mm.)

3. Check the position of the levers to the dimensions given in the illustration and adjust if necessary.

Note The control box temperature flap lever should be set to either dimension C or dimension D depending whether the early type or late type of lever arrangement is fitted. Dimension C is early and dimension D is late.

4. Examine the joints of the control box, any holes should be sealed with 'Prestik' or other similar sealing compound.

Control box—To fit

1. Using a rubber lubricant on the seals inside the bulkhead aperture (e.g. 'Hellerine' grade M) fit the control box into the aperture, locating it on the studs.

2. Using a sealing compound such as 'Glasticon' or its equivalent, seal the lower joint between the control box and the bulkhead (see Fig. C5).

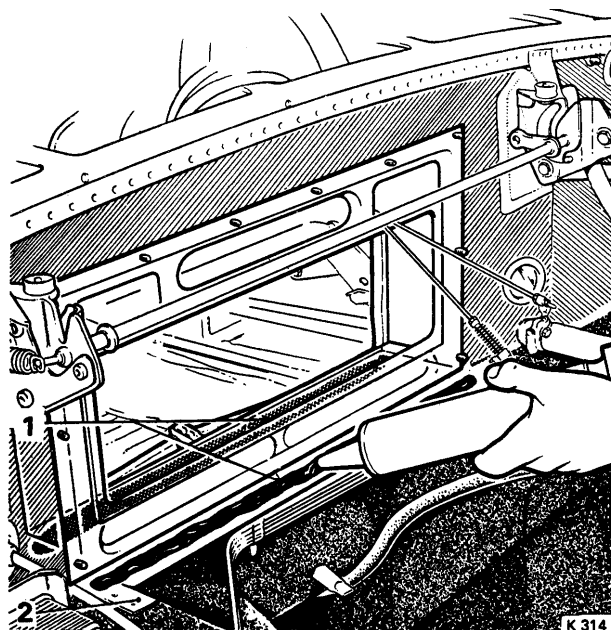


FIG. C5 CONTROL BOX FITTED INTO BULKHEAD APERTURE

- 1 Sealing compound
- 2 Rubber sealing strips

Upper flap actuators—To remove

1. Disconnect the battery.

2. Disconnect the electrical leads from the actuator terminals.

3. Remove the self-tapping screws securing the upper flap actuators cover plate to the heater box.

4. Release the lock-nuts then disconnect the upper flap control rods from the actuator levers. To facilitate re-assembly, retain the washers, spring and nuts with their respective control rods.

5. Unscrew (approximately three turns) the screws securing each actuator to the heater box, then push the special nylon inserts out of the locations in the heater box and remove the actuators; retain the two felt washers.

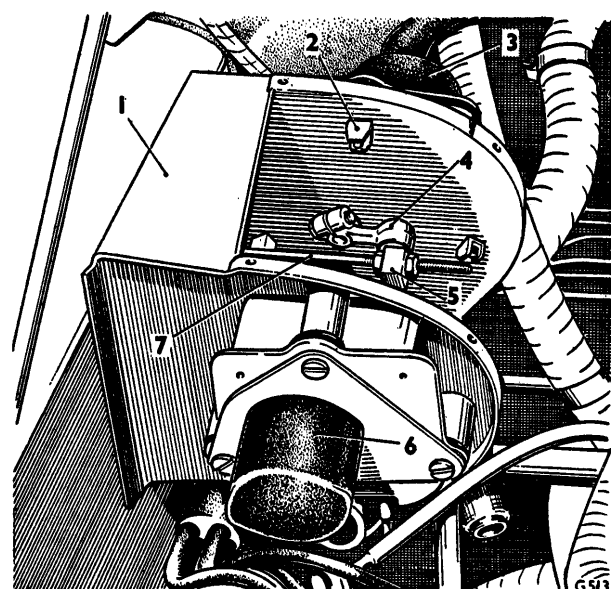


FIG. C6 UPPER QUANTITY FLAP ACTUATOR SETTING

- 1 Heater box
- 2 Nylon insert
- 3 Quantity flap actuator
- 4 Lever
- 5 Swivel pin
- 6 Temperature flap actuator
- 7 Control rod

Upper flap actuators—To fit

Fit the upper flap actuators by reversing the procedure described for their removal bearing in mind that they should be set as follows.

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Upper quantity flap—To set
(see Fig. C6)

1. Secure the actuator to the heater box and connect the electrical wiring.
2. Switch on the ignition and select the closed position on the upper quantity flap control knob. Allow the spindle to rotate to the closed position.
3. Fit and tighten the actuator lever onto the spindle in the position shown in Figure C6.
4. Fit the control rod through the hole in the swivel pin.
5. Pull the control rod forward so that the quantity flap is felt to reach its seating (i.e. closed position): refer to Figure C4.
6. With the flap held firmly in its closed position, tighten the nuts at either side of the swivel pin to secure the control rod in position.
7. Select the three open positions in turn and check that the actuator lever stops at 45°, 90° and 180° from the closed position. Ensure that the sealing is adequate by switching on the blower motors with the flap in the closed position and checking for air leaks.

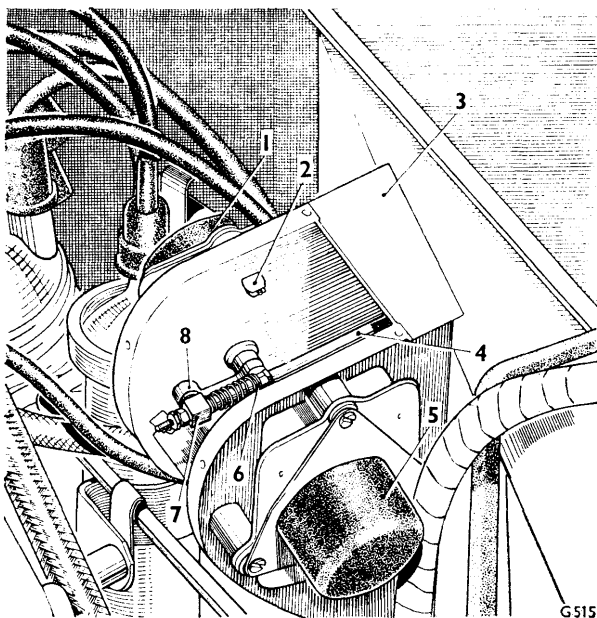


FIG. C7 UPPER TEMPERATURE FLAP ACTUATOR SETTING

- 1 Upper temperature flap actuator
- 2 Nylon insert
- 3 Heater box
- 4 Control box
- 5 Upper quantity flap
- 6 Spring
- 7 Swivel pin
- 8 Lever

8. Check that the actuator will move from the open position to closed and back to open without stalling. If the actuator stalls when approaching the closed position the flap is set too tightly and should be moved slightly toward the open position.

9. Fit the upper flap actuator cover to the heater box then fit the two clips over the lower flange of the box; secure the cover with four screws.

Upper temperature flap—To set
(see Fig. C7)

1. Secure the actuator to the heater box and connect the electrical wiring.
2. Switch on the ignition and select the hottest position on the upper temperature flap control knob. Allow the spindle to rotate to the hot position.
3. Fit and tighten the actuator lever onto the spindle in the position shown in Figure C7.
4. Fit the control rod through the hole in the swivel pin.
5. Pull the control rod forward so that the temperature flap is felt to reach its seating (i.e. hot position): refer to Figure C4.
6. With the flap held firmly in its hot position, adjust the nut adjacent to the swivel pin so that the control rod is holding the flap against its seat; tighten the lock-nut.
7. Select in turn, the four hot positions on the control knob and check that the lever stops at 45°, 90°, 135° and 180°.
8. Check that the actuator will move from the cold position to the hot without stalling. If the actuator stalls when approaching the hot position, the flap is set too tightly and should be moved slightly toward the cold position.
9. Fit the upper flap actuator cover to the heater box then fit the two clips over the lower flange of the box; secure the cover with four screws.

Lower quantity flap actuator—To remove
(see Fig. C8)

1. Switch on the ignition.
2. Push the lower quantity flap switch control to the closed position (i.e. fully in). This is done to facilitate assembly should the same actuator be refitted.
3. Disconnect the battery.
- 4(a) **Right-hand drive cars only.**
Remove the glove compartment from underneath the fascia.

The glove compartment is held into position by three screws; two inside the compartment (one head

is covered by a plastic plug), the head of the third screw is situated underneath the bottom left-hand corner of the compartment.

4(b) Left-hand drive cars only.

Unscrew the knurled screw holding the fuse box then lower the fuse box. The knurled screw is situated adjacent to the hand brake handle.

5. Disconnect the control rod from the lower flap lever 9 (see Fig. C9).

6. Remove the three setscrews securing the mounting bracket supporting the actuator.

7. Lower the mounting bracket until the electrical leads can be disconnected then disconnect the leads.

8. Lower and remove the actuator together with the control rod.

9. If the actuator requires renewal, remove the lever together with the control rod from the actuator.

Lower quantity actuator flap—To fit and set
(see Fig. C9)

1. Connect the negative lead of a 12 volt battery to the negative tag of the actuator (i.e. the tag adjacent to the number 1 tag).

2. Connect the positive lead of the battery to the number 5 tag and allow the actuator spindle to rotate to the closed position.

3. Fit and tighten the actuator lever onto the spindle in the position shown in Figure C9.

4. Fit the control rod to the lever.

5. Fit the actuator to its mounting bracket.

6. Fit the electrical leads to the actuator.

7. Fit the mounting bracket together with the actuator into position (see Fig. C8).

8. Pull downward, the flap lever 9 until the flap is felt to rest firmly on its seat i.e. closed position.

9. Adjust the length of the control rod and fit it to the flap lever; tighten the lock-nuts. The inset (see Fig. C9) shows the latest control rod.

10. Connect the battery.

11. Switch on the ignition but do not start the engine.

12. Select the three open positions in turn and check that the actuator lever stops at 45°, 90° and 180° from the closed position.

13. Fit the remaining components by reversing the procedure described for their removal.

**Lower temperature flap actuator—
To remove**
(see Fig. C10)

1. Turn the lower temperature flap switch to the hot position (i.e. fully clockwise). This is done to facilitate assembly should the same actuator be refitted.

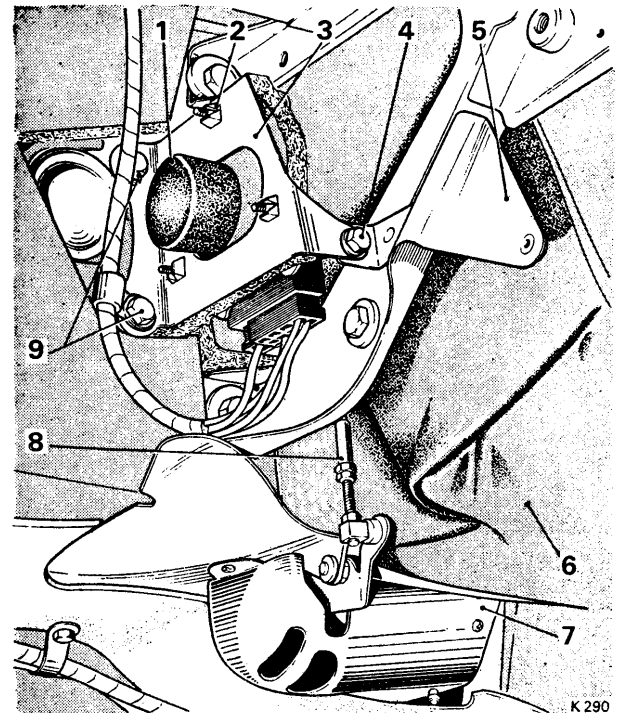


FIG. C8 POSITION OF LOWER QUANTITY FLAP ACTUATOR

- 1 Electrical actuator
- 2 Nylon insert
- 3 Actuator mounting bracket
- 4 Setscrew—Actuator mounting bracket
- 5 Instrument board mounting bracket
- 6 Evaporator box
- 7 Air deflector—Lower system
- 8 Control rod
- 9 Setscrews—Actuator mounting bracket

2. Disconnect the battery.

3. Disconnect the upper control rod from its lower control rod 8 or lever 1 (whichever is fitted); refer to Figure C11.

4(a) Right-hand drive cars.

Unscrew the knurled screw securing the fuse box into position; the knurled screw is situated adjacent to the hand brake handle.

4(b) Left-hand drive cars.

Remove the glove compartment from underneath the fascia.

The glove compartment is held into position by three screws; two inside the compartment (one head is covered by a plastic plug) the head of the third screw is situated underneath the bottom left-hand corner of the compartment.

5. Remove the three setscrews securing the actuator mounting bracket into position.

6. Lower the mounting bracket until the electrical leads can be disconnected then disconnect the leads.

Chapter C

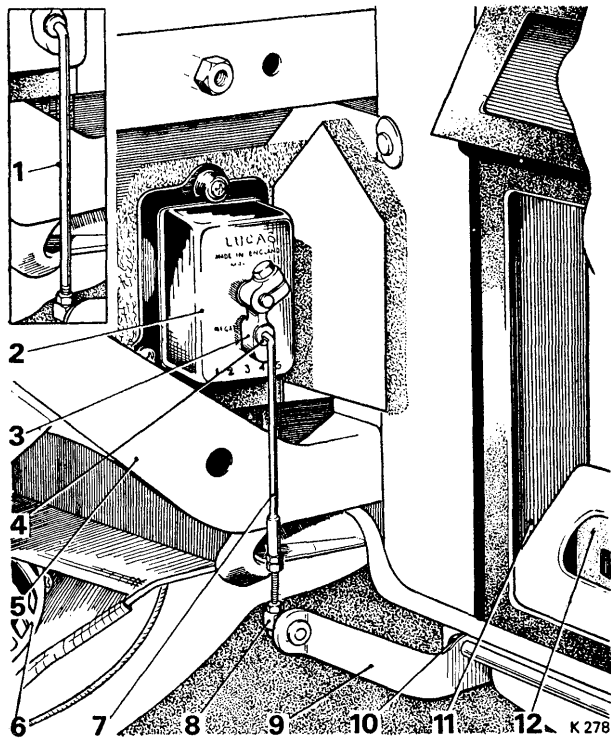


FIG. C9 LOWER QUANTITY FLAP ACTUATOR SETTING

- 1 Control rod (late type)
- 2 Electrical actuator
- 3 Lever
- 4 Bush
- 5 Instrument board mounting bracket
- 6 Outlet duct—Ram air
- 7 Control rod
- 8 Swivel pin
- 9 Lever—Lower quantity flap
- 10 Bush
- 11 Control box
- 12 Lower temperature flap

7. Lower and remove the actuator together with the control rod.

8. If the actuator requires renewal, remove the lever together with the control rod from the actuator.

**Lower temperature flap actuator—
To fit and set
(see Fig. C11)**

1. Connect the negative lead of a 12 volt battery to the negative tag of the actuator (i.e. the tag adjacent to number 1 tag).
2. Connect the positive lead of the battery to the number 5 tag and allow the actuator spindle to rotate; this will give the hot position.

3. Fit and tighten the actuator onto the spindle noting that the inset (see Fig. C12) shows the linkage arrangement for late cars.

4. Fit the control rod to the lever.
5. Fit the actuator to its mounting bracket.
6. Fit the electrical leads to the actuator.
7. Fit the mounting bracket together with the actuator into position (see Fig. C10).
8. Push the lower control rod or lever (whichever is fitted) downward until the flap can be felt to be seating firmly.
9. Adjust the length of the control rod, then with the flap held firmly on its seat, fit the lower control rod 8 or lever 1 to the upper control rod ; tighten the lock-nuts.
10. Connect the battery.
11. Switch on the ignition.
12. Select in turn the four hot positions on the control knob and check that the lever stops at 45°, 90°, 135° and 180°.
13. Check that the actuator will move from the cold position to the hot position without stalling. If the actuator stalls when approaching the hot position, the flap is set too tightly and should be moved slightly toward the cold position.
14. Switch off the ignition.
15. Fit the remaining components by reversing the procedure described for their removal.

**Lower quantity flap—To remove
(see Fig. C12)**

1. Operate the control switch to move the flap to the open position, i.e. maximum air.
2. Remove the small screws securing the two deflectors; the deflectors are situated at each end of the quantity flap. Remove the deflectors.
3. Remove the special spring which is fitted to the right-hand end of the flap (as viewed from the driver's seat).
4. Remove the two retaining washers which are fitted to each pin located at either end of the quantity flap.
5. Withdraw the flap from the bulkhead, noting that it is more convenient to remove it from the side adjacent to the front passenger seat.

Lower quantity flap—To fit

Fit the flap by reversing the procedure described for its removal noting the following point.

1. If the original seal is in poor condition, it should be removed and a new one fitted in its place (see Heater matrix—To fit—Operation 2).

Coolant tap and actuator—To remove (see Fig. C13)

1. Disconnect the battery.
2. Disconnect the 'Lucar' connector from the coolant tap actuator.
3. Remove the heater matrix and cylinder head hoses from the coolant tap by slackening the worm drive clips.
4. Remove the small grub screw securing the operating rod to the coolant tap lever; push the lever toward the open position (i.e. towards the engine) then withdraw the rod.
5. Slacken the pinch bolt securing the lever to the coolant tap actuator spindle; remove the lever.
6. Remove the three screws securing the coolant tap actuator to the mounting bracket; remove the actuator together with the felt washer.
7. Remove the two small nuts and bolts securing the tap to its mounting bracket; remove the tap.

Coolant tap and actuator—To fit and set

Fit the coolant tap and actuator by reversing the procedure described for its removal then set them as follows.

1. Fit the actuator to its mounting bracket.
2. Connect the electrical leads to the actuator.
3. Switch on the ignition.
4. Turn the upper and lower temperature control knobs to the closed position to allow the coolant tap actuator spindle to rotate to its closed position.
5. Fit the actuator lever onto the spindle in the position shown in Figure C13; tighten the lever onto the spindle.
6. Move the tap lever to the closed position simultaneously fitting the operating rod to the lever; the closed position is shown in Figure C13.
7. Turn the temperature control knobs to the open and closed positions and check that the coolant tap responds accordingly.

Fresh air duct flaps—To remove (see Fig. C14)

1. Remove the glove compartment from underneath the fascia.

The glove compartment is held in position by three screws; two inside the compartment (one head is covered by a plastic plug) the head of the third screw is situated underneath the bottom left-hand corner of the compartment.

2. Remove the trim pad surrounding the hand brake handle.

Cars prior to car number SRX 6001.

3. Remove the trim panel surrounding the radio (see Chapter M) and the two under fascia trim pads adjacent to the radio.

Cars after and including car number SRX 6001.

4. Remove the two side trim pads from the centre console and the two under fascia trim pads adjacent to the console.

All cars.

5. Remove the trim pad surrounding the steering column.
6. Remove the grub screw from each fresh air duct control knob and remove the knob; note that this grub screw is spring-loaded.

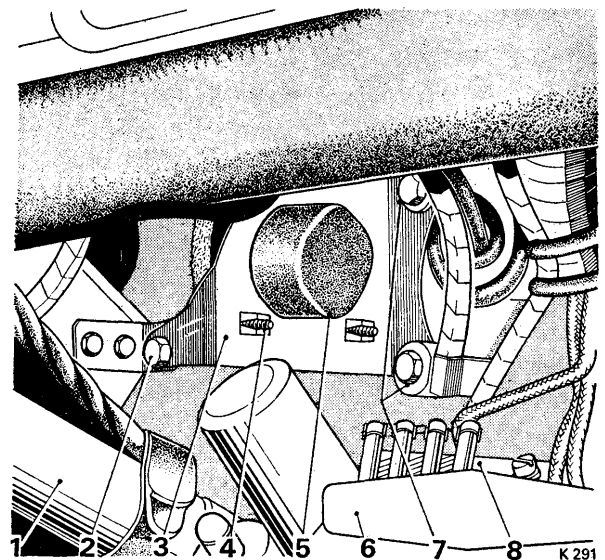


FIG. C10 POSITION OF LOWER TEMPERATURE FLAP ACTUATOR

- 1 Steering column
- 2 Setscrew—Actuator mounting bracket
- 3 Actuator mounting bracket
- 4 Nylon insert
- 5 Actuator
- 6 Handbrake handle
- 7 Setscrews—Actuator mounting bracket
- 8 Fusebox

Chapter C

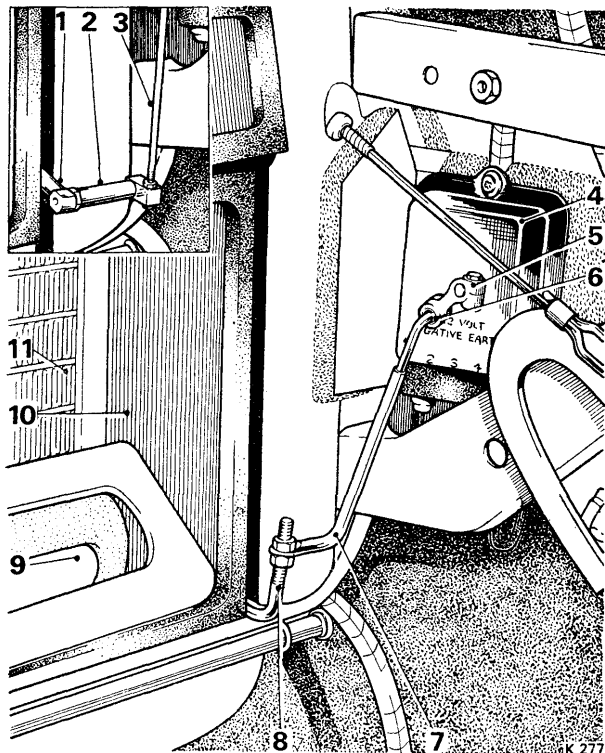


FIG. C11 LOWER TEMPERATURE FLAP ACTUATOR SETTING

- | | |
|---------------|--------------------------|
| 1 Lever | 7 Upper control rod |
| 2 Extension | 8 Lower control rod |
| 3 Control rod | 9 Lower temperature flap |
| 4 Actuator | 10 Control box |
| 5 Lever | 11 Heater matrix |
| 6 Bush | |

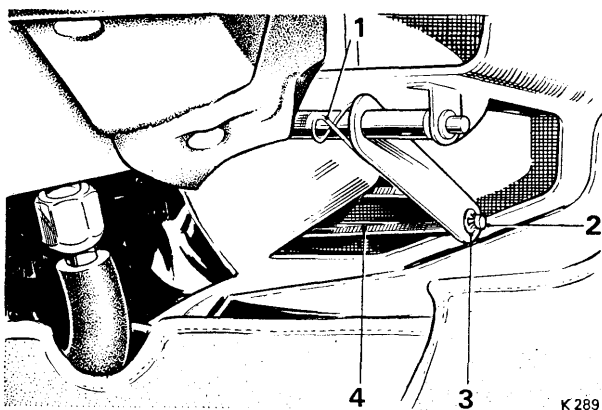


FIG. C12 POSITION OF LOWER QUANTITY FLAPS (Deflector removed)

- | | |
|----------|--------------------|
| 1 Spring | 3 Retaining washer |
| 2 Pin | 4 Flap |

7. Remove the chrome headed screws and two setscrews securing the fascia to the instrument panel; the heads of the setscrews are situated inside the fascia compartment.

8. Remove the screws securing the top roll to the instrument panel. The screws are situated underneath the protruding edge of the top roll also at each end of the top roll.

9. The remaining Operations describe the method of removing the left-hand (as viewed from the driver's seat) fresh air flap; the method for removing the right-hand flap is basically the same.

Cars after and including car serial number 6001.

10. Remove the 3 spring loaded screws securing the chrome plated deflectors to the instrument panel; remove the deflectors.

11. Move the operating mechanism so that the flap is in the fully open position.

12. Carefully remove the retaining washer from the swivel pin; remove the pin together with the two flat washers (see Fig. C14).

13. Slacken the two small grub screws securing the flap to the operating spindle.

14. Place an inspection lamp underneath the instrument panel so that the lower end of the operating spindle can be seen.

15. Carefully remove the retaining ring from the lower end of the spindle.

16. Using a long thin bar, locate the end of the spindle and push the spindle upward until it is felt to clear the holes in the two flap bosses. An assistant will be required at this stage to withdraw the spindle from the duct and through the space between the instrument panel and the windscreen. Remove the flap.

Cars prior to car number SRX 6001.

17. The procedure for removing the flap on these cars is basically the same as described in Operations 10 to 16 inclusive. One difference is that the operating linkage is attached to the lower end of the spindle instead of the top end. This necessitates removal of the spindle from below the instrument panel instead of from above.

One other difference is that the two flat washers mentioned in Operation 12 are not fitted.

Fresh air flap—To fit

Fit the fresh air flap by reversing the procedure described for its removal noting the following points.

1. Fit new retaining washers.
2. When fitting a retaining washer to the lower spindle connection, a long thin tube will be required.
3. Ensure that the retaining washers locate in their groove.
4. Ensure that when the flap is in the open position, the grub screws in the two bosses are toward the radio.
5. Adjust the 3 spring loaded screws so that equal tension is applied to the chrome deflectors and the deflectors swivel smoothly.
6. Adjust the control linkage so that when the control knob is fully withdrawn, the flap is in the open position.
7. Check that the flaps are sealing satisfactorily when the blower motors are switched on and the other flaps are in their closed position.

**Heating and demisting switches—
To remove and fit**

1. Refer to Chapter M.

Blower motor switch—To remove and fit

1. Refer to Chapter M.

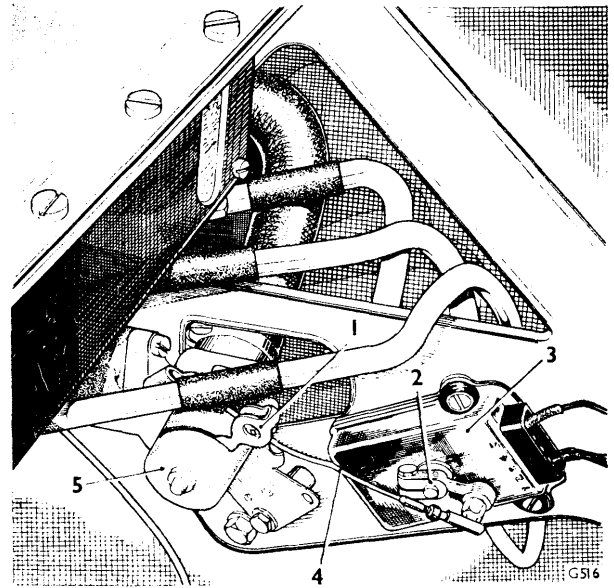
Air intake filter—To remove

1. The air intake filter is situated just forward of the car windscreen, to remove the foam filter proceed as follows.
2. Remove the five setscrews securing the grille to the car body.
3. Lift the grille clear of the car body so that the windscreen washer tube can be detached from its jet connection; remove the grille together with the filter.
4. Remove the filter from the grille and remove any surplus 'Bostik' using 'Bostik' cleaner 6001.

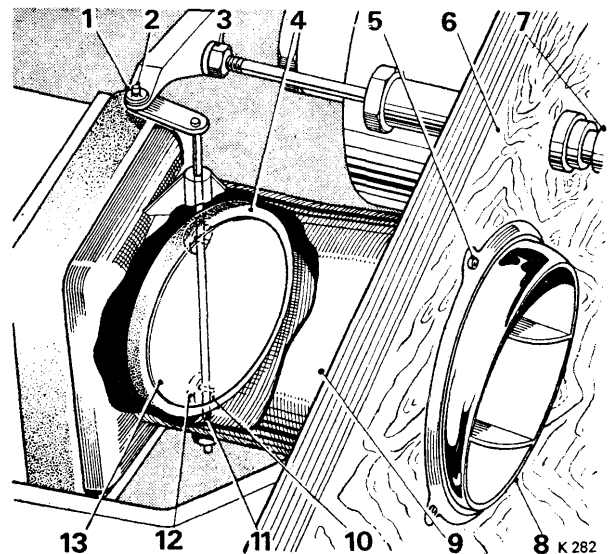
Air intake filter—To fit

Fit the filter by reversing the procedure described for its removal noting the following point.

1. The new foam filter should be stuck to the intake grille using 'Bostik 1261'.

**FIG. C13 COOLANT TAP ACTUATOR SETTING**

- 1 Lever (closed position)
- 2 Lever
- 3 Actuator
- 4 Operating rod
- 5 Water tap

**FIG. C14 VIEW OF FRESH AIR OUTLET DUCT**

- | | |
|---------------------------------|----------------------|
| 1 Retaining washer | 7 Control knob |
| 2 Swivel pin | 8 Deflector |
| 3 Control linkage adjusting nut | 9 Duct |
| 4 Seal | 10 Grub screw |
| 5 Spring-loaded screw | 11 Operating spindle |
| 6 Instrument panel | 12 Boss |
| | 13 Flap |

Section C2

FAULT DIAGNOSIS

SYMPTOM	POSSIBLE CAUSE	ACTION
1. Ambient air only (all switch positions on both upper and lower systems)	1. (a) Faulty coolant tap (b) Faulty coolant tap relay (c) Faulty coolant tap actuator (d) Break in circuit (e) Obstruction in heater matrix (f) Temperature flaps remaining in cold position	1. (a) Fit new coolant tap (see Section C1) (b) Fit new relay (see Chapter M) (c) Fit new coolant tap actuator (see Section C1) (d) Check for circuit continuity including earth connections (see wiring diagram in Chapter M) (e) Flush matrix to clear blockage or fit new matrix (see Section C1) (f) Dismantle flaps and linkage, lubricate and reset and check actuator for correct operation (see Section C1)
2. Ambient air only, upper system	2. (a) Faulty switch (b) Break in upper system circuit (c) Temperature flap remains in cold position (d) Faulty temperature flap actuator	2. (a) Fit new switch (see Chapter M) (b) Check circuit for continuity including earth connections (see wiring diagram in Chapter M) (c) Dismantle flap and linkage, lubricate and reset (see Section C1) (d) Fit new temperature flap actuator (see Section C1)
3. Ambient air only, lower system	3. (a) Faulty switch (b) Break in lower system circuit (c) Temperature flap remains in cold position (d) Faulty temperature flap actuator	3. (a) Fit new switch (see Chapter M) (b) Check for circuit continuity including earth connections (see wiring diagram in Chapter M) (c) Dismantle flap and linkage, lubricate and reset (see Section C1) (d) Fit new temperature flap actuator (see Section C1)
4. Constant temperature at different switch positions, upper and lower systems	4. (a) Faulty switch (b) Faulty upper temperature actuator (c) Break in wiring circuit (d) Seized or loose temperature flap linkage (e) Faulty coolant tap actuator (f) Faulty lower temperature flap actuator	4. (a) Fit new switch (see Chapter M) (b) Fit new actuator (see Section C1) (c) Check for circuit continuity including earth connections (see wiring diagram in Chapter M) (d) Dismantle, clean and adjust linkage (see Section C1) (e) Fit new coolant tap actuator (see Section C1) (f) Fit new lower quantity flap actuator (see Section C1)

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INTRODUCTION

Part 2 of this Chapter has been written to provide the refrigeration engineer with the necessary information to enable the Rolls-Royce Refrigeration System to be maintained and serviced in the correct manner.

December 1968

T.S.D. 2476

PART 2

REFRIGERATION SYSTEM

Section C3

SPECIAL INFORMATION

AND PRECAUTIONS

Exposure to refrigerant

Large quantities of refrigerant gas discharged into a confined space will displace air and could cause suffocation.

Liquid refrigerant which may accidentally escape is at least 12°F. (−11°C.) and if allowed to come into contact with the skin can cause a burn by the rapid transference of heat from the skin to the liquid as it

evaporates. Serious damage to the eyes will result from contact with liquid refrigerant. **For this reason, goggles should always be worn when contact might be possible.**

Should liquid refrigerant come into contact with the eye, **immediate first-aid treatment is necessary** and a doctor or eye specialist should be consulted as soon as possible.

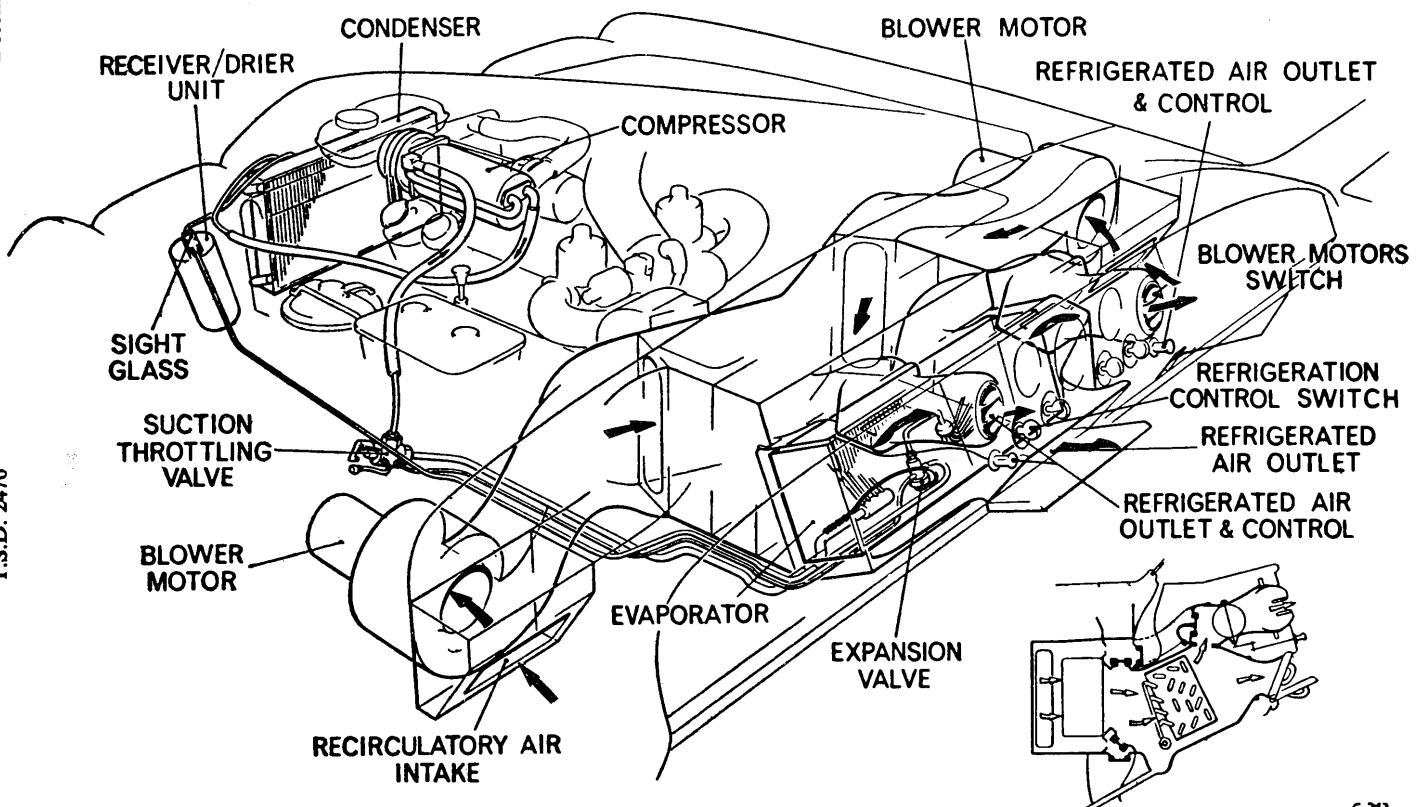


FIG. C15 REFRIGERATED AIR CIRCULATION DIAGRAM

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First aid treatment

Medicated liquid paraffin from the first-aid kit should be applied to the eye from an eye dropper to wash away the refrigerant. The eye should not be rubbed, as this will increase the area of the injury. If, however, the eye remains painful after a few minutes, the wash should be repeated, using a sterile salt solution containing not more than 2% sodium chloride.

Importance of chemical stability

The efficient operation of the system is dependent upon the pressure-saturation temperature relationship of the refrigerant. As long as the system contains only pure refrigerant (plus a certain amount of compressor lubricant which mixes with the refrigerant), it is considered to be chemically stable.

When foreign materials such as dirt, air or moisture are allowed to enter the system, the chemical stability will be affected resulting in a change in the pressure-saturation temperature relationship of the refrigerant. Thus, the system will no longer operate at the correct

pressures and temperatures, with a consequent decrease in efficiency.

Accident damage

It is very important that the refrigeration system should be inspected as soon as possible whenever a car has been involved in an accident. If the refrigeration system has been opened as a result of the accident, dirt, air and moisture will enter the system and cause internal damage. As the length of time the refrigeration system has been open and the extent of the damage to the components will govern the replacement of parts, a definite procedure cannot be recommended which will cover all cases.

Refrigeration components—To seal

Whenever it becomes necessary to open the refrigeration system to the atmosphere all open connections must be immediately capped. Air entering the system will carry moisture, which collects quickly on the exposed surface, causing deterioration, owing to the acidic properties of a moisture/refrigerant solution.

Section C4 SERVICING

Refrigeration system—To discharge

1. The refrigerant must be discharged from the system prior to breaking any joint.
2. Refrigerant discharged in the presence of an open flame will not burn, but decompose to form a poisonous gas.
3. Remove the protective cap from the suction throttling valve (*see Fig. C16*). Secure a length of pipe to the 'Schrader' valve adaptor (RH 7937) in such a manner that the free end of the pipe clears the car and rests at a level below the suction throttling valve. Place a clean container under the end of the pipe.
4. Tighten the adaptor to depress the valve core until a hissing sound is heard, indicating that the refrigeration gas is escaping to atmosphere.
5. When all the refrigerant gas appears to have escaped to atmosphere, slacken the adaptor to close the valve and allow approximately 2 minutes for any build-up of pressure in the system to develop, then repeat the discharge procedure. This operation should be repeated until there is no sign of refrigerant gas being issued through the adaptor after the 2 minute build-up period.
6. Care must be taken not to release the refrigerant too quickly as this will result in oil being drawn from the system. If any trace of oil is detected loosen the adaptor. The operation should require at least fifteen minutes to ensure complete discharge.

Note Any oil which is discharged into the container should be measured and a corresponding amount added to the system.

Refrigeration system—To evacuate

1. Fit the 'Schrader' valve adaptor to the vacuum pump connection.
2. Remove the protective cap from the suction throttling valve extension.
3. Fit the 'Schrader' valve adaptor together with the vacuum pump connection to the suction throttling valve extension.
4. Switch on the vacuum pump and observe the vacuum gauge. When a reading of 28 in. Hg. is reached or when the maximum possible vacuum that can be obtained from the prevalent barometric conditions is reached, allow the vacuum pump to continue drawing a vacuum for a further 15 minutes.
5. Switch off the vacuum pump. If the system loses vacuum quickly, a leak is prevalent. If the system loses vacuum extremely slowly a leak is possible.
6. In these conditions, it is advisable to further evacuate for 45 minutes to eliminate the possibility of residual liquid 'Freon' in the compressor oil vapourising and creating a pressure rise in the system. The final vacuum reading obtained should be held for 30 minutes to ascertain that leaks are not present.

Refrigeration system—To sweep

1. Evacuate the system and charge with 1 lb. (0.45 kg.) of refrigerant. In some cases when the ambient temperature is low, it may be necessary to start the engine and switch on the system in order to draw in the refrigerant. Run the engine for a further ten minutes with the blower motors at full speed.
2. Switch off the system and stop the engine.

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3. Allow 5–10 minutes for the refrigerant pressure to equalise.

4. If loss of refrigerant pressure is apparent the system should be checked for leaks using an electrical leak detector. If the system maintains its pressure it is ready for charging upon completion of the sweeping operation.

Refrigeration system—To charge

1. Before charging the system, it is necessary to repeat the evacuation process and pull a vacuum of 28 in. Hg. for 30 minutes.

2. Attach a cylinder of refrigerant to the appropriate connection on the vacuum pump apparatus. Open the valve on the cylinder and purge the line between the cylinder and the vacuum pump apparatus. Suspend the cylinder on a spring balance and note its weight. Open the tap on the vacuum pump apparatus to enable the refrigerant to flow into the system.

3. Start the engine, and run at 1,000 r.p.m. to 1,250 r.p.m. Open the refrigeration outlet ducts, select 4th position on the refrigeration control knob and select $\frac{1}{2}$ blower speed. When 1 lb. (0,45 kg.) of refrigerant has passed into the system, close the tap on the vacuum pump apparatus and switch off the engine. Check all joints in the system for leaks with an electrical leak detector. If the system is leak free, repeat the charging operation to increase the weight of the refrigerant in the system to 3.5 lb. (1,59 kg.). If a leak or leaks are detected they must be rectified and the whole evacuation and charging operation repeated.

Note The presence of bubbles or foam passing through the receiver/drier sight glass is

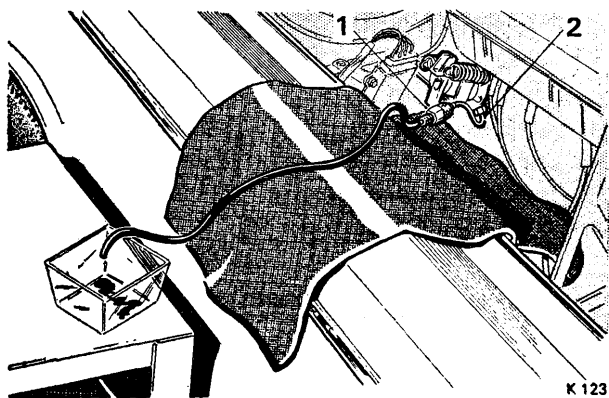


FIG. C16 DISCHARGING THE REFRIGERATION SYSTEM

- 1 'Schrader' valve adaptor (RH 7937)
- 2 Service pipe

not a reliable indication of refrigerant deficiency if the ambient temperature is below 23.9°C. (75°F).

4. Refit the 'Schrader' valve cap on the suction throttling valve when the charging operation is completed.

5. Again check the system for leaks using an electrical leak detector.

*** Oil level—To check**

The compressor sump was originally filled with 10.5 fluid ounces U.S. (310 c.c.) of 'Frigidaire' 525 Viscosity Oil. During normal system operation an affinity of the refrigerant for oil causes a certain amount of oil to circulate through the system with the refrigerant.

If a major loss of oil has occurred due to a severe compressor seal leak, line breakage or component failure, proceed as follows after making the necessary repairs.

Remove the compressor (see Section C5).

Drain the compressor oil into a clean measuring flask; record reading and discard the oil.

Pour into a clean measuring flask a quantity of new refrigerant oil, the amount being determined by the following.

If the oil drained from the compressor is more than 4.0 fluid ounces U.S. (125 ml) top-up the compressor with an equivalent amount of new compressor oil.

If the oil drained from the compressor is less than 4.0 fluid ounces U.S. (125 ml) and a major oil loss has occurred, fill the compressor with 6.0 fluid ounces U.S. (185 ml) of compressor oil.

If the compressor has been overhauled, increase the quantities given in the two previous paragraphs by 1.0 fluid ounce U.S. (29.5 c.c.).

If there is no indication of oil leakage in the system or from the compressor and the compressor is to be overhauled, drain and measure the oil as already described, then pour the equivalent quantity of clean oil into the compressor after overhaul.

If the compressor is to be renewed instead of overhauled, the oil contained in the new compressor should be drained into a clean measuring flask. This quantity should then be adjusted until the amount is 6 fluid ounces U.S. (185 ml.).

The resultant quantity of clean oil in the flask should then be poured into the new compressor.

Section C5

COMPRESSOR

Compressor—To remove

1. Discharge the refrigerant (see Section C4).
2. Disconnect the battery.
3. Disconnect the two 'Lucar' terminals from the compressor clutch.
4. Disconnect the flexible high pressure feed hose from the rear of the compressor.
5. Disconnect the flexible low pressure return hose from the front of the compressor.
6. Remove the two $\frac{9}{16}$ in. A/F setscrews securing the metal low pressure return pipe to the compressor body.
7. Slacken the alternator mounting bolts and the Vee belt tensioner and swing the unit toward the centre of the engine.
8. Remove the two compressor drive Vee belts.
9. Remove the setscrews and bolts securing the compressor to the engine.
10. Lift the compressor from the engine and lay it, with the sump downward, on a bench.

Compressor—To fit

1. To fit the compressor, reverse the procedure given for its removal, noting that the full procedure of evacuation and sweeping must be carried out before charging the system.

Overhaul

(see Figs. C17 and C18)

List of parts required for compressor overhaul

Whenever a major overhaul or rebuild is carried out it is recommended that an adequate stock of service parts be made available which should include the following:

- (a) Standard size piston drive balls.
- (b) Shoe discs—total of eleven sizes, including the ZERO shoe.

- (c) Thrust races—total of sixteen sizes, including the ZERO race.
- (d) Piston and rings.
- (e) Main shaft needle bearings.
- (f) Thrust bearings.
- (g) Compressor shaft, swash plate and Woodruff key assembly.
- (h) Suction reed valve, front, rear.
- (i) Gasket service kit—containing all gaskets, seals, 'O' rings, etc.
- (j) Discharge valve assembly, front, rear.
- (k) Shaft seal kit.
- (l) Nuts, head to shell and shaft.
- (m) Retainer rings.
- (n) Cylinder locating dowels.
- (o) Valve and head locating dowels.
- (p) Service discharge cross-over tube kit.

All service parts are protected by a preservation process and packed in a manner that will eliminate the necessity of cleaning or washing of the parts to be fitted.

Hub and drive assembly—To remove

1. Using the special clutch hub and holding tool RH 7798 (J-9403), remove and discard the compressor shaft lock-nut.
2. Withdraw the hub and drive-plate assembly using the special puller RH 7800 (J-9401); retain the key.

Note The puller must be screwed into its seat to prevent the hub and drive-plate assembly threads being damaged.

3. Remove the circlip and hub spacer washer.
4. Examine the clutch friction face for signs of wear or overheating, and check further for the underlying cause of the damage, e.g. low coil voltage or binding of the compressor internal mechanism.

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Hub and drive assembly—To fit

1. When the hub is ready for installation, clean its frictional face with a suitable solvent cleaner. Locate the key in the compressor shaft key-way allowing it to project approximately $\frac{3}{16}$ in. (4,76 mm.) from the end of the key-way. Locate the hub assembly on the key-way and, using the special hub and drive-plate fitting tool RH 7799 (J-9480) and a suitable distance piece, draw the hub and drive assembly onto the shaft

until there is approximately $\frac{3}{32}$ in. (2,38 mm.) space between the frictional surfaces of the drive-plate and pulley.

Remove tool RH 7799 (J-9480) and distance piece.

Note Do not hammer or force the assembly onto the shaft. Always use the correct tools when removing or replacing clutch parts or serious damage may result to the internal components of the compressor.

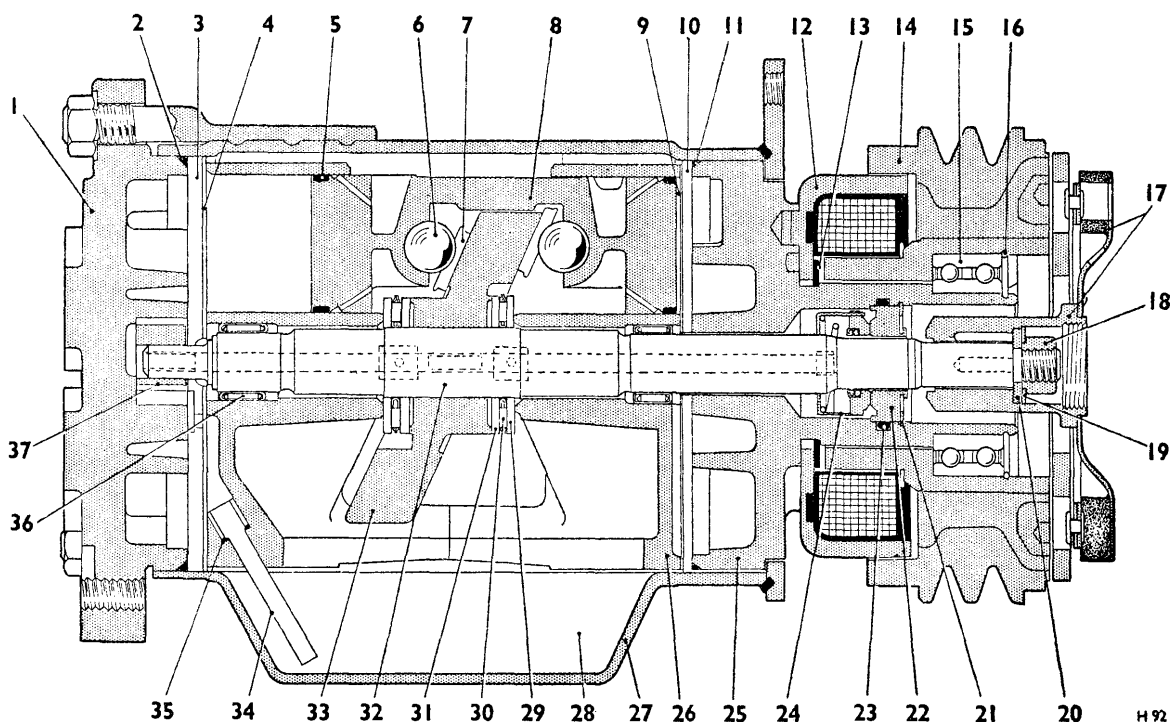


FIG. C17 SECTION VIEW OF REFRIGERANT COMPRESSOR

- | | | |
|---------------------------------|--|------------------------------|
| 1 Rear head | 13 Coil housing retainer ring | 25 Front head |
| 2 Rear head to shell 'O'-ring | 14 Pulley | 26 Cylinder assembly |
| 3 Rear discharge valve plate | 15 Pulley bearing | 27 Compressor shell |
| 4 Rear suction reed plate | 16 Pulley bearing retainer circlip | 28 Oil sump |
| 5 Piston ring | 17 Clutch hub and drive-plate assembly | 29 Thrust race |
| 6 Piston drive ball | 18 Shaft nut | 30 Thrust bearing |
| 7 Shoe disc | 19 Clutch hub retainer ring | 31 Thrust race |
| 8 Piston | 20 Spacer | 32 Mainshaft |
| 9 Suction reed plate | 21 Shaft seal seat retainer ring | 33 Swash plate |
| 10 Front discharge valve plate | 22 Shaft seal seat | 34 Oil pick-up tube |
| 11 Front head to shell 'O'-ring | 23 Shaft seal seat 'O'-ring | 35 Oil pick-up tube 'O'-ring |
| 12 Coil and housing assembly | 24 Shaft seal | 36 Mainshaft bearing |
| | | 37 Oil pump gears |

2. Fit the hub spacer washer and circlip with the convex side of the clip facing the washer.

3. Fit a new lock-nut and torque tighten to 15 lb.ft. (2,07 kg.m.). The air gap between the frictional faces should now be between 0.022 in. and 0.057 in. (0,558 mm. and 1,447 mm.).

Note The shoulder or circular projection on the lock-nut must face toward the circlip.

4. To 'bed-in' the clutch parts, run the engine and, by switching the refrigeration system off and on 20 times at approximately 1 second intervals, cycle the clutch assembly.

Pulley and bearing assembly—To remove

1. Remove the hub and drive assembly.
2. Remove the circlip retaining the pulley bearing and centre shaft key.
3. Fit the special puller pilot RH 7792 (J-9395) over the compressor shaft and using special puller RH 7791 (J-8433) withdraw the pulley assembly.
4. Check for excessive grooving in the clutch hub and drive-plate; renew parts if necessary.

Bearing—To remove

1. With the pulley and bearing assembly removed from the compressor, use a sharp pointed instrument to remove the wire retainer ring.
2. Press the bearing out of the pulley housing using special bearing puller RH 7795 (J-9398) with handle RH 7794 (J-8092).

Bearing—To fit

- ★ 1. Using the special puller RH 7796 (J-9481) and handle RH 7794 (J-8092), press the new bearing into the pulley.
- 2. Fit the bearing retainer ring.

Pulley and bearing assembly—To fit

- ★ 1. Using special tool RH 7796 (J-9481) press the pulley and bearing assembly onto the compressor shaft. Ensure that the pulley will rotate freely.
- 2. Fit the pulley retainer ring, the hub and drive-plate assembly and the retainer ring.

Coil housing—To remove

1. Following the removal of the hub and drive-plate assembly and the pulley bearing assembly, disconnect the two 'Lucar' terminals.
2. Scribe a mark on the coil housing and a corresponding mark on the compressor body.
3. Remove the circlip securing the coil to the compressor body.

Coil housing—To inspect

1. Examine the coil for loose terminals or cracked insulation.

Coil housing—To fit

1. Fit the coil housing in its correct position as indicated by the scribed marks.
2. Fit the circlip (flat face to coil housing).
3. Fit the hub and drive-plate assembly and the pulley bearing assembly.
4. Connect the 'Lucar' terminals and check the clutch for correct operation.

Compressor shaft seal assembly—To remove

1. Discharge the refrigerant.
2. Remove the clutch plate and hub assembly.
3. Remove the seal seat retainer ring.
4. Locate the flanges of seal seat remover RH 7802 (J-9393) in the groove of the seal seat; withdraw the seal seat.
5. Place the seal seat remover RH 7793 (J-9392) over the compressor shaft and by pressing downward (to overcome seal spring pressure) turn the seal seat remover clockwise to engage the tabs on the seal assembly; withdraw the seal.
6. Remove the 'O' ring from the interior of the front head casting bore.

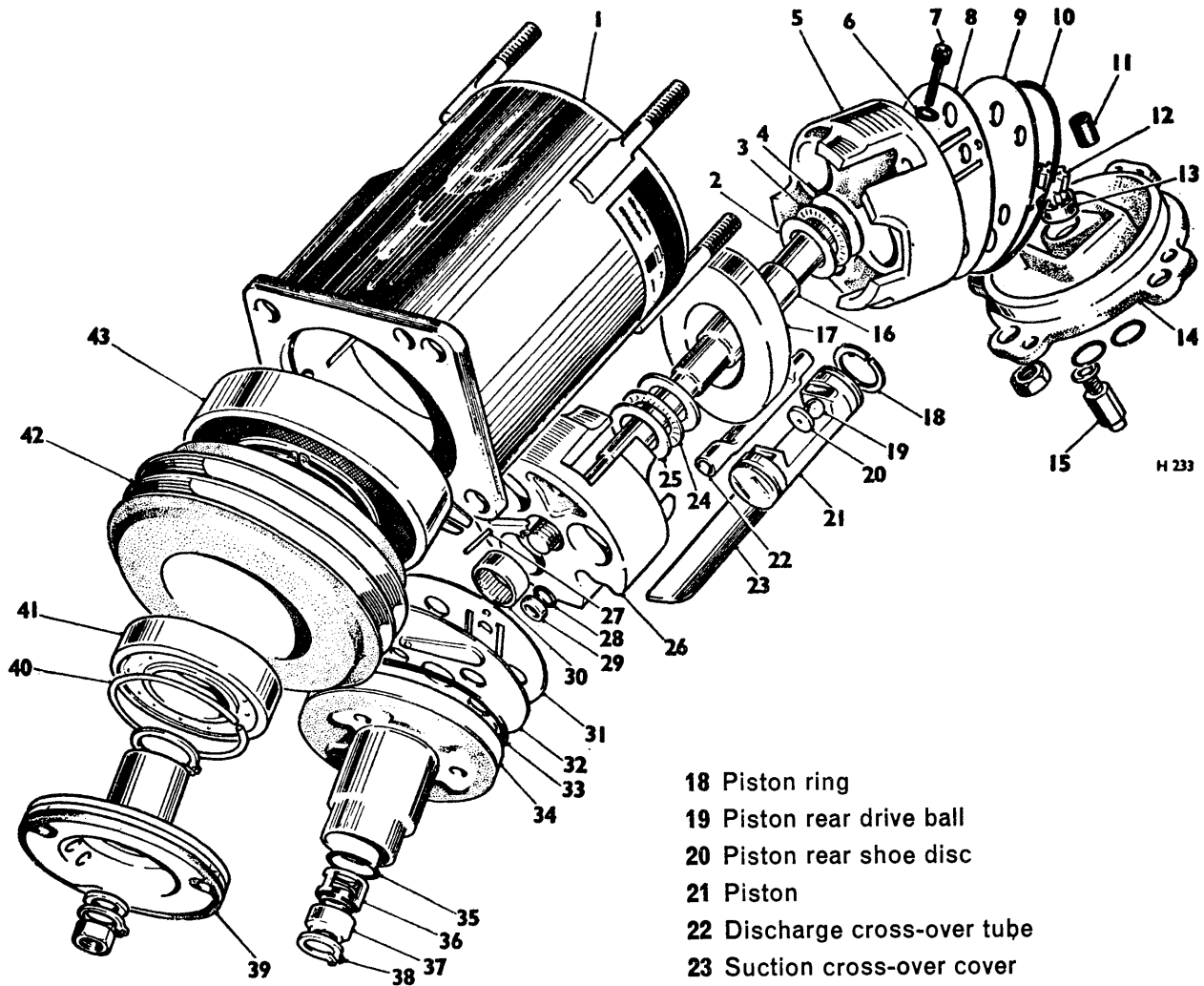
Compressor shaft seal assembly—To fit

1. Thoroughly clean the front head bore and fit a new 'O' ring in the bottom groove.
2. Immerse the shaft seal in clean compressor oil before fitting to prevent the shoulder from damaging the 'O' ring.
3. Using special seal installer RH 7793 (J-9392) fit the shaft seal over the flats on the compressor shaft with the carbon seal facing upwards; turn the seal installer anti-clockwise to release the seal.
4. Insert the seal seat into the front head bore taking care not to dislodge the 'O' ring; use tool RH 7802 (J-9393).

Note The contact surface of the seal must be protected against any damage, such as scratches and nicks. Finger marks may cause surface damage.

5. Insert the retainer ring (flat side down) until the retainer rests on the seal seat. Using seal seat installer RH 7802 (J-9393), press the retainer ring until the spring pressure of the shaft seal is overcome and the retainer ring snaps into the groove in the casting bore.

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FIG. C18 EXPLODED VIEW OF REFRIGERANT COMPRESSOR

- | | |
|--|---|
| <ul style="list-style-type: none"> 1 Compressor shell 2 Thrust race 3 Bearing 4 Thrust race 5 Rear cylinder half 6 Oil pick-up tube 'O'-ring 7 Oil pick-up tube 8 Rear suction reed plate 9 Rear discharge valve plate 10 Rear head to shell 'O'-ring 11 Strainer screen 12 Oil pump drive gear 13 Oil pump driven gear 14 Compressor rear head 15 High pressure relief valve 16 Mainshaft 17 Swash plate | <ul style="list-style-type: none"> 18 Piston ring 19 Piston rear drive ball 20 Piston rear shoe disc 21 Piston 22 Discharge cross-over tube 23 Suction cross-over cover 24 Bearing 25 Thrust race 26 Front cylinder half 27 Drive key 28 Discharge cross-over tube front 'O'-ring 29 Discharge cross-over tube spacer 30 Mainshaft front bearing 31 Front suction reed plate 32 Front discharge valve plate 33 Front head to shell 'O'-ring 34 Compressor front head 35 Shaft seal seat 'O'-ring 36 Shaft seal 37 Shaft seal seat 38 Shaft seal seat retainer ring 39 Clutch hub and drive-plate assembly 40 Pulley bearing retaining circlip 41 Pulley bearing 42 Pulley 43 Coil housing |
|--|---|

Internal mechanism—To remove

1. Remove the clutch, the pulley assembly, the clutch coil and the shaft seal as previously instructed in this Section.

2. Invert the compressor and drain the oil into a measuring cup. This operation is necessary to ensure that, on assembly, the compressor is filled with the correct amount of oil.

3. Remove the four lock-nuts securing the rear head to the compressor shell then remove the compressor head.

4. Wipe any excess oil from the teflon gasket surfaces on the rear head casting webs and examine for damage (see Fig. C19); renew the rear head if necessary.

5. Remove the suction filter and examine it for damage or obstruction; clean or renew if necessary.

6. Paint or etch suitable marks on the oil pump gears; this is to ensure that the gears, if used for assembly, will be fitted in their identical positions.

7. Remove and discard the rear head 'O' ring.

8. Carefully lift the rear discharge valve plate assembly by using two small screwdrivers under the valve reed retainers. Do not position the screwdrivers between the reeds and the reed seats.

9. Examine the valve reeds and seats for damage; renew if necessary.

10. Withdraw the oil pick-up tube using a stiff piece of hooked wire (see Fig. C20); discard the 'O' ring.

11. Invert and rest the compressor assembly on support block RH 7803 (J-9521).

12. Lift off the compressor shell and front head assembly leaving the internal mechanism resting on the support block.

Note If the internal mechanism will not separate from the compressor case, tap the compressor head and not on the end of the compressor shaft.

13. Wipe any excess oil from the teflon gasket surfaces on the front head casting webs and examine for damage; renew the front head if necessary.

14. Carefully lift the front discharge valve plate assembly by using two small screwdrivers under the valve reed retainers. Do not position the screwdrivers between the reeds and the reed seats.

15. Examine the valve reeds and seats for damage; renew if necessary.

16. Remove the suction cross-over cover from the cylinder casting.

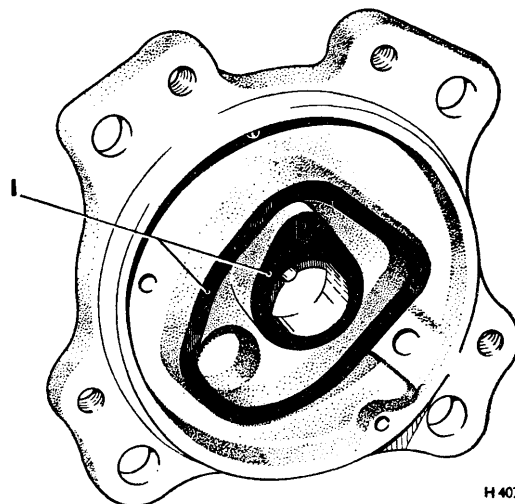


FIG. C19 COMPRESSOR REAR HEAD

1 Teflon gasket surfaces

Cylinder assembly—To dismantle

1. Etch or mark by some suitable means, each piston and its respective bore to ensure correct assembly.

2. Using a wooden block and mallet separate the cylinder halves (see Fig. C21), taking care that the discharge cross-over tube does not foul the swash plate.

Important Under no circumstances should the compressor shaft be hit at either end in an effort to separate the cylinder halves.

3. Place the complete internal mechanism rear cylinder downwards on support block RH 7803 (J-9521); remove the front cylinder half.

4. Turn the compressor shaft until the piston marked 1 is fully raised; remove the piston.

5. Discard the piston shoe discs. Examine the piston drive balls for signs of pitting or surface cracking; renew if necessary.

6. Remove and discard the piston rings. Place the piston with the drive balls in the parts tray RH 7801 (J-9402).

7. Repeat Operations 4 to 6 inclusive for No. 2 and 3 pistons ensuring that all parts are kept with their respective pistons.

8. Remove and discard the front combination of thrust races and thrust bearings.

9. Remove the swash plate and shaft assembly from the rear cylinder half. It may be necessary to bend the discharge cross-over tube slightly to facilitate shaft removal.

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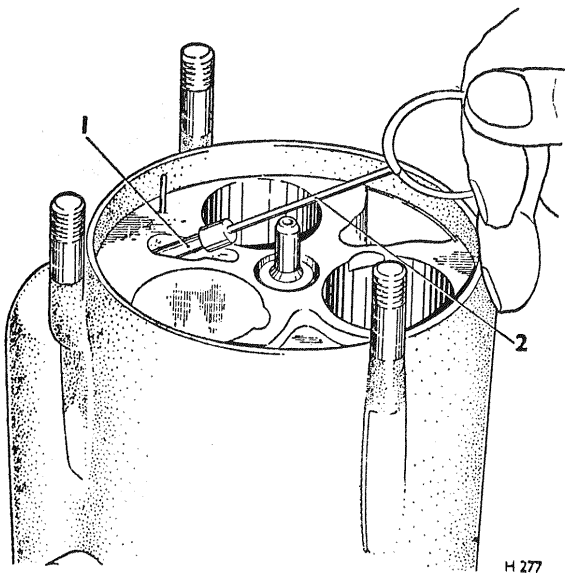


FIG. C20 REMOVING THE OIL PICK-UP TUBE

- 1 Oil pick-up tube
- 2 Wire hook

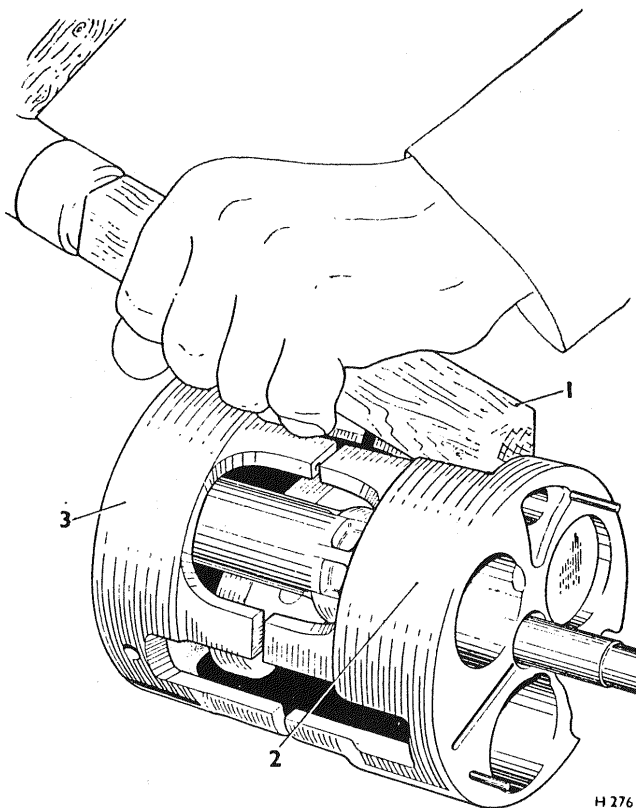


FIG. C21 SEPARATING THE CYLINDER HALVES

- 1 Wooden block
- 2 Front cylinder half
- 3 Rear cylinder half

10. Remove and discard the rear combination of thrust races and thrust bearings.

11. Examine the swash plate surface and shaft; renew as an assembly if necessary.

Note A certain amount of shoe disc wear on the swash plate together with marks indicating needle bearing load on the shaft are normal.

12. Remove the discharge cross-over tube from the cylinder half; use vice grip pliers.

Note Operation 12 is necessary on original factory equipment as the ends of the tube are swaged into the cylinder halves. The discharge cross-over tube, in previously overhauled units has an 'O' ring and bush at each end of the tube and can easily be removed by hand.

13. Examine the piston bores and needle bearings in the front and rear cylinder halves. Renew the front or rear cylinders if any cylinder bore is deeply scored or damaged.

14. Needle bearings may be removed if necessary by the use of a suitable punch. Fit the punch in the inner side of the cylinder head and drive the bearing out.

15. To fit the needle bearing, place the cylinder half on support block RH 7803 (J-9521).

16. Insert the bearing into the cylinder head with the bearing identification marks upward. Use the special needle bearing installer RH 7790 (J-9432) to drive the bearing into the cylinder head until the installer bottoms on the cylinder face.

Important All parts which are to be used again should be washed in 'Genklene', alcohol, or a similar solvent. Remove excess moisture with dry compressed air.

Compressor running clearances—To set

Before assembling the compressor, it is necessary to set the running clearances of the bearing surfaces in the following manner.

1. Place the compressing fixture RH 7789 (J-9397) on the bench (studs uppermost).
2. Place the front cylinder half in the compressing fixture. face downwards.
3. Fit a zero thrust race, thrust bearing and a second zero thrust race onto the front end of the compressor shaft. Lubricate the thrust races and thrust bearing with petroleum jelly.

4. Fit the threaded end of the shaft through the needle bearing in the front cylinder half and rest the shaft on the cylinder hub.

5. Fit a zero thrust race onto the rear end of the compressor shaft so that it rests on the hub of the swash plate then fit a thrust bearing and a second zero thrust race. Lubricate the thrust races and thrust bearing with petroleum jelly.

6. Lubricate the ball pockets of No. 1 piston with compressor oil and place a ball in each socket. Use the balls previously removed if they are in suitable condition.

7. Lubricate the cavity of a zero shoe disc with compressor oil and place the shoe disc over the ball in the front end of the piston.

Note The front end of the piston has an identification mark on the casting web.

8. Rotate the compressor shaft and swash plate until the high point of the swash plate is above No. 1 cylinder bore.

9. Lift the shaft assembly to enable the piston (identification mark downwards) to be fitted over the swash plate above No. 1 cylinder bore.

Note Piston rings should not be fitted for this operation.

10. Repeat Operations 6 to 9 inclusive for No. 2 and No. 3 pistons.

11. Fit the rear cylinder half over the pistons, aligning the discharge cross-over tube hole with that of the front cylinder. Tap the cylinder into place with a soft-headed mallet.

12. Position the compressor internal mechanism so that the discharge cross-over tube holes are mid-way between a pair of compressing fixture bolts.

13. Fit the top cover on the compressing fixture and torque tighten the four bolts to 15 lb.ft. (2,07 kg.m.).

Shoe disc—To select

1. Measure the clearance between the rear ball of No. 1 piston and the swash plate in the following manner.

2. Select a suitable combination of oiled feeler gauge leaves to fit neatly between the ball and swash plate.

3. Attach a spring scale reading in one ounce (one gramme) increments, to the feeler gauge.

4. Adjust the thickness of the feeler gauge until a reading of 4 to 8 ounces (113,4 to 226,8 grammes) on the spring scale is necessary to withdraw the feeler

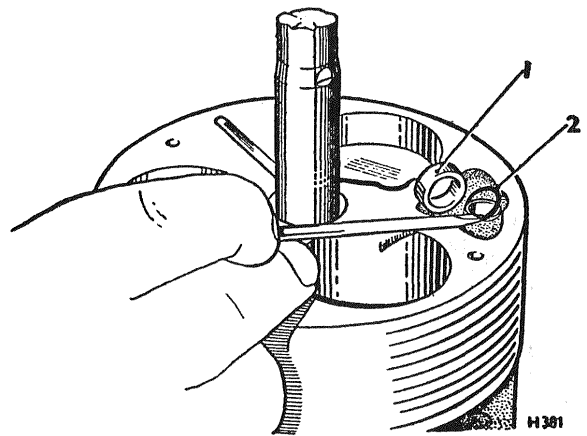


FIG. C22 FITTING THE CROSS-OVER TUBE 'O' RING

- 1 Spacer
- 2 'O'-ring

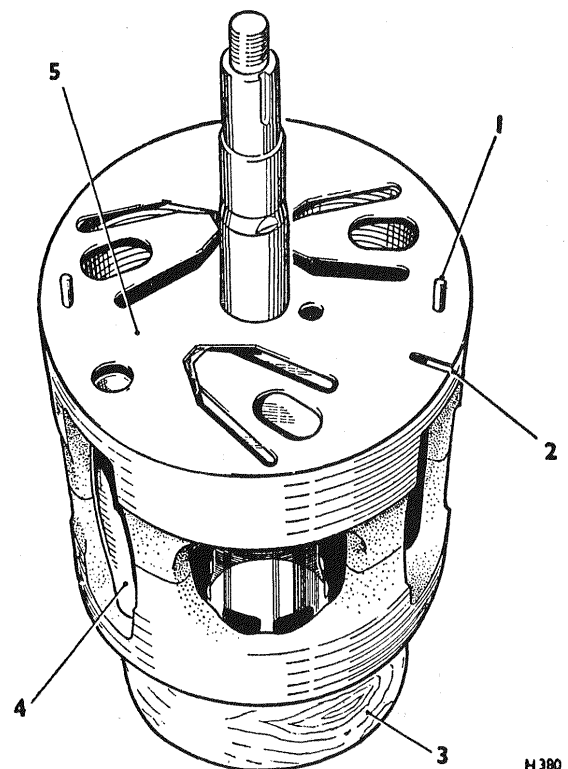


FIG. C23 FRONT SUCTION REED PLATE

- 1 Dowel pin
- 2 Oil return slot
- 3 Support block
- 4 Discharge cross-over tube
- 5 Front suction reed plate

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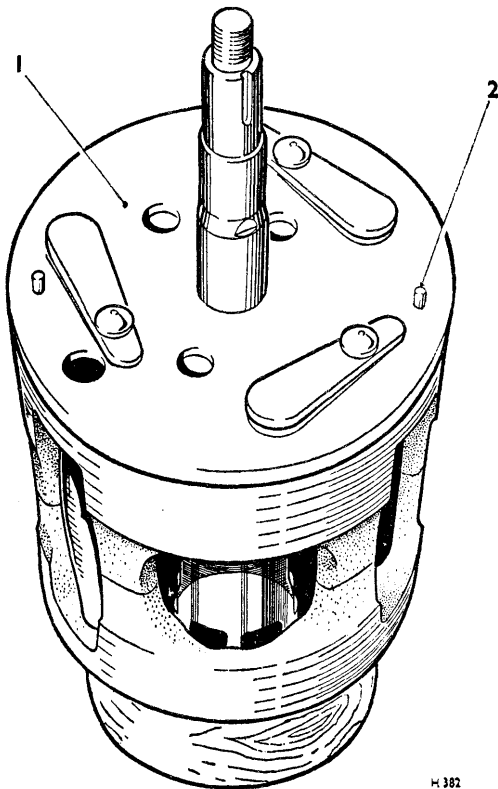


FIG. C24 FRONT DISCHARGE VALVE PLATE

- 1 Front discharge valve plate
- 2 Dowel pin

gauge from between the swash plate and piston ball; record the thickness of the feeler gauges.

5. Rotate the compressor shaft through 120° and repeat Operations 2 to 4 inclusive on same parts. Rotate the compressor shaft through a further 120 and again repeat Operations 2 to 4 inclusive on same parts.

6. Select a shoe disc corresponding to the minimum feeler gauge thickness recorded for the three checks on No. 1 piston.

7. Repeat Operations 1 to 6 inclusive for No. 2 and No. 3 pistons.

Compressor shaft thrust race—To select

1. Position a dial indicator on the rear end of the compressor shaft and adjust to zero. Push the shaft upwards and record the dial reading.

Note Dial indicator increments are 0.001 in. (0,025 mm.), therefore the reading must be estimated to the nearest 0.0005 in. (0,013 mm.).

2. Select an oversize thrust race equivalent to the dial gauge reading.

Note Fifteen thrust races are provided in increments of 0.0005 in. (0,013 mm.) above the zero washer size each with a tolerance of 0.0005 in. (0,013 mm.) to 0.0015 in. (0,038 mm.) to provide a running clearance between the hub surfaces of the swash plate and the front and rear hubs of the cylinder.

3. Dismantle the compressing fixture and remove the rear cylinder half, leaving the front cylinder half resting upon the compressing fixture.

4. Remove one piston at a time taking care not to lose the relationship of the front ball and shoe disc and the rear ball.

5. Remove the rear outer thrust race from the compressor shaft and replace it with the thrust race previously selected.

**Compressor internal mechanism—
To assemble**

1. Fit a piston ring to each of No. 1 piston with the scraper groove toward the swash plate.

2. Lubricate the piston ball pockets, the corresponding piston drive balls, the piston shoe discs and assemble them, place the zero shoe disc over the drive ball of the front piston.

3. Rotate the compressor shaft and swash plate until the high point of the swash plate is over No. 1 piston cylinder bore.

4. Lift the compressor shaft and place the piston over the swash plate with the identification mark toward the front cylinder head.

5. Position the piston ring with the gap toward the compressor shaft.

6. Repeat the procedure for pistons No. 2 and No. 3 taking care not to damage the piston rings.

7. Fit a new discharge cross-over tube in the front cylinder half with the flat surface facing the compressor shaft.

Note The service discharge cross-over tube is of similar design to that used on production except that an 'O' ring and bush are used at each end.

8. Position the rings on each piston so that the ring gaps are facing the compressor shaft, then push the rings outward.

9. Place the rear cylinder half over the compressor shaft and enter the pistons into their respective bores taking care not to break the piston rings.

10. When all the pistons and rings are located in their respective bores, align the end of the discharge cross-over tube with the hole in the rear cylinder half.

11. Ensure that the flat face of the discharge cross-over tube faces the compressor shaft and gently tap the rear cylinder half until it is seated on the front cylinder half.

12. Fit the suction cross-over cover into the grooves in the cylinder halves. Align the cover with the ends of the cylinder faces by gently tapping the end of the cover with a soft-headed mallet.

Compressor—To assemble

1. Place the internal assembly on to the support block RH 7803 (J-9521) with the oil pump drive in the block hole.

2. Fit a new 'O' ring and bush on to the front end of the discharge cross-over tube (*see Fig. C22*).

3. Fit new dowel pins to the cylinder head.

4. Fit the front suction reed plate and discharge valve plate assembly aligning the holes with the dowel pins and the correct openings (*see Figs. C23 and C24*).

Note The front discharge plate has a large diameter hole in the centre.

5. Coat the teflon gasket surfaces with the approved compressor oil.

6. Determine the exact position of the front head casting in relation to the dowel pins of the internal mechanism and mark the positions of the dowel pins on the sides of the front head assembly with a soft pencil. Carefully lower the front head casting into position.

7. Ensure that the teflon gasket around the cylinder head centre does not come into contact with the compressor shaft.

8. **Do not** rotate the head assembly to align it with the dowel pins as the teflon gasket may contact the reed retainers.

9. Lubricate the angled groove at the lower edge of the front head casting with compressor oil.

10. Position the compressor shell over the front head and with the aid of a small screwdriver gently press in the 'O' ring around the circumference of the internal mechanism until the compressor shell will slide over the internal mechanism without damage to the 'O' ring.

11. Invert the compressor and fit new dowels and the oil pick-up 'O' ring in the cylinder head.

12. Lubricate the oil pick-up tube and fit it in the cylinder head passage; if necessary, rotate the internal mechanism to align the oil pick-up tube with the hole in the sump baffle.

13. Fit a new 'O' ring and bush on the discharge cross-over tube.

14. Fit the suction reed with the oil drain slot adjacent to the sump.

15. Fit the rear discharge plate.

16. Place the inner and outer oil pump gears over the compressor shaft (identification marks together).

17. Position the gears as shown in Figure C25.

18. Lubricate around the outer edge of the rear discharge valve plate, the valve reeds, pump gears and the area which the teflon sealing surface will contact on the rear discharge valve plate.

19. Lubricate the new head to shell 'O' ring and place on the discharge valve plate.

20. Fit the suction filter in the rear head casting and coat the teflon sealing surface with compressor oil.

21. Place the rear head assembly over the studs on the compressor shell. The two lower, threaded, compressor mounting holes should be in alignment with the compressor sump. Ensure that the suction filter does not drop out of place when lowering the cylinder head into position.

22. Fit nuts and torque tighten evenly to 20 lb.ft. (1,41 kg.m.).

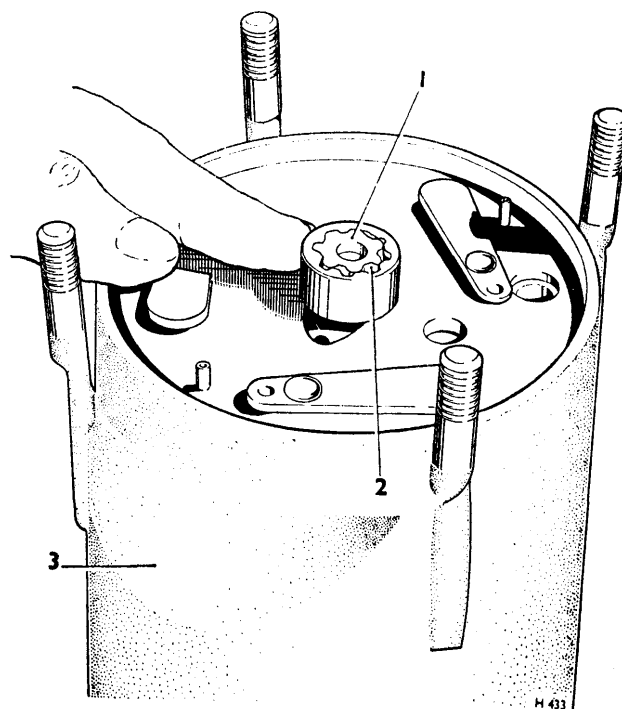


FIG. C25 POSITIONING THE OIL PUMP GEARS

1 Inner gear

2 Cavity between gear teeth

3 Compressor body

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23. Fit the shaft seal, clutch coil, compressor pulley and bearing assembly and compressor clutch plate and hub assembly as described earlier in this Section.

24. Add the approved compressor oil to the compressor—refer to Compressor oil level—To check (see Page C20).

25. Before operating the compressor, rotate the clutch hub (clockwise) several times to circulate compressor oil to the piston rings and oil seals.

26. Upon assembly of the refrigeration system, the full process of evacuation and sweeping must be carried out before charging the system.

Section C6

SUCTION THROTTLING VALVE AND EXPANSION VALVE

Suction throttling valve—To remove (see Fig. C27)

1. Discharge the refrigerant (see Section C4).
2. Disconnect the suction hose fitted between the compressor and the suction throttling valve.
3. Slacken the outlet and inlet pipes to the suction throttling valve.
4. Disconnect the suction hose from the suction throttling valve.
5. Remove the suction throttling valve extension pipe.
6. Disconnect the equalising pipe from the expansion valve.
7. Slacken the pinch bolt securing the actuator crank lever to the actuator spindle.
8. Remove the bolts securing the suction throttling valve to its mounting bracket.
9. Disconnect the clip securing the suction hose to the hydraulic reservoir mounting bracket.
10. Remove the suction throttling valve.

Suction throttling valve—To fit

Fit the suction throttling valve by reversing the procedure given for its removal, noting the following points.

1. The inlet pipe from the toeboard should be connected to the suction throttling valve before any other connections are fitted and before the suction throttling valve is mounted.
2. Fit and set the actuator lever to its spindle as described in Section C6.
3. Fit new 'O' rings and lubricate all threads and connections with the approved compressor oil.

★ Suction throttling valve—To dismantle (see Fig. C26)

1. Remove the two springs from the operating arm.
2. Remove the charging pipe.
3. Scribe correlation marks on the valve body and cover to ensure correct positioning on assembly.
4. With the valve cover held firmly down on the valve body, remove the five cover securing screws then, slowly allow the cover to separate from the body and collect the three springs, spring seats and spacing washer.

Care must be taken during this operation due to the strong compression force of the valve spring.

5. Withdraw the diaphragm and piston assembly from the body; care should be taken when handling the diaphragm to avoid damaging the rubber and fabric surfaces.

Note The filter screen and retainer in the base of the piston should not be removed.

Suction throttling valve—To inspect

1. Examine the valve body bore and also the piston surfaces for any imperfections, foreign material and any obvious damage that would cause the piston not to operate freely. Renew any parts which are damaged; do not attempt to scrape, stone or dress out any damage. Examine the diaphragm for cuts and tears and if necessary renew the diaphragm and piston assembly.
2. Check that the springs are not broken, particularly the ends and renew as necessary.

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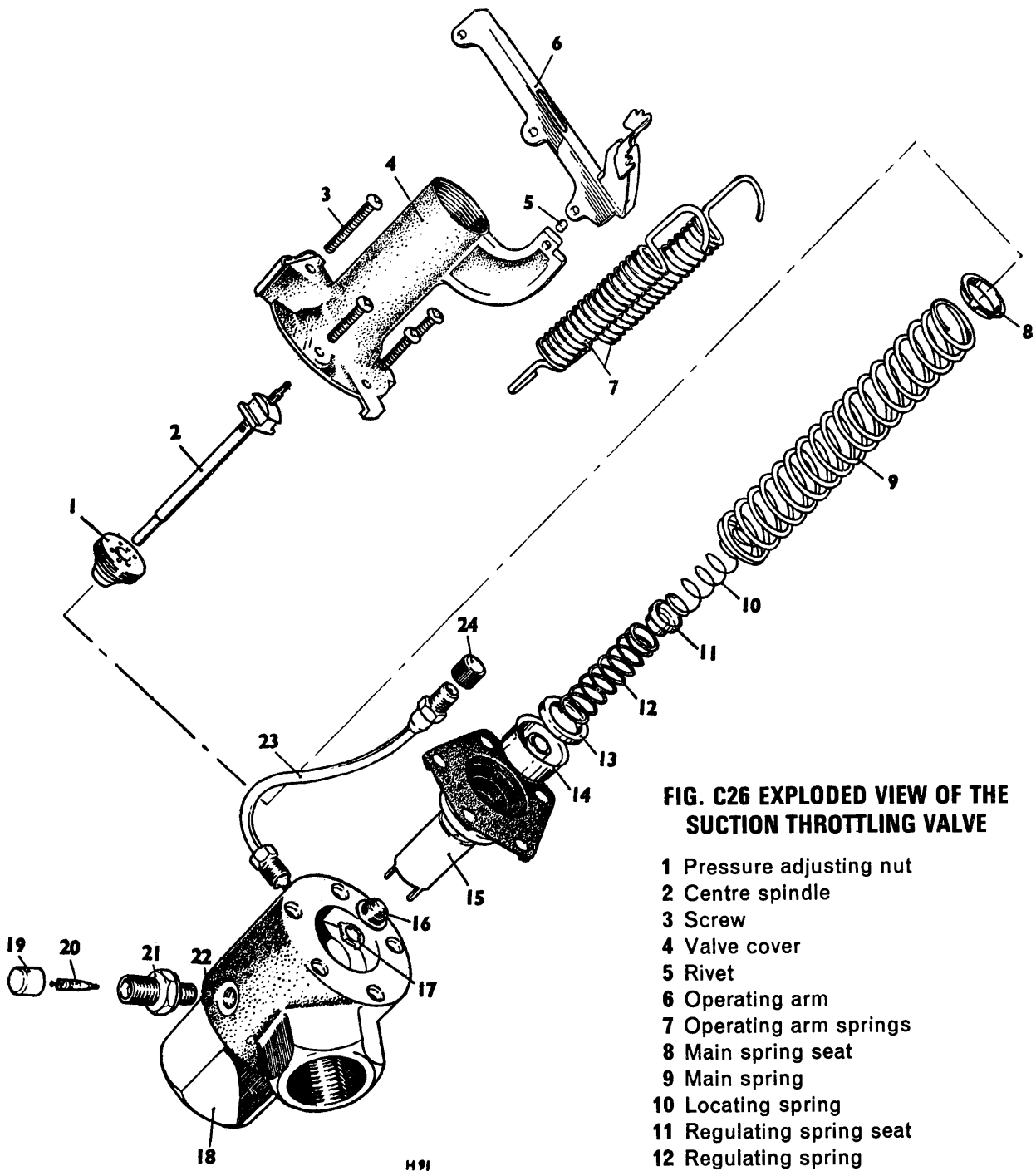


FIG. C26 EXPLODED VIEW OF THE SUCTION THROTTLING VALVE

- 1 Pressure adjusting nut
- 2 Centre spindle
- 3 Screw
- 4 Valve cover
- 5 Rivet
- 6 Operating arm
- 7 Operating arm springs
- 8 Main spring seat
- 9 Main spring
- 10 Locating spring
- 11 Regulating spring seat
- 12 Regulating spring
- 13 Spacing washer
- 14 Main spring seat
- 15 Piston and diaphragm assembly
- 16 Filter screen
- 17 Filter screen retainer
- 18 Valve body
- 19 Valve cap (if fitted)
- 20 'Schrader' valve (if fitted)
- 21 'Schrader' valve adaptor (if fitted)
- 22 Sealing ring
- 23 Charging pipe
- 24 Cap

★ Suction throttling valve—To assemble

(see Fig. C26)

1. Using Genklene or alcohol, thoroughly clean all the valve components including the screen in the base of the piston then dry with a compressed air line; note that the screen should not be removed from the piston.

2. Lightly coat the diaphragm and piston assembly with refrigerant oil then fit the assembly into the valve body; press the centre of the diaphragm until the piston seats against the inner shoulder in the valve body.

3. Assemble the main spring upper seat, main spring, locating spring, regulating spring seat, regulating spring, spacing washer and main spring lower seat into the valve cover in this sequence (see Fig. C26), holding the assembled parts together; ensure that the spindle in the cover passes through the centre of the springs and seats.

4. Fit the assembled cover, springs and seats to the valve body ensuring that the main spring lower seat locates into the centre of the diaphragm and that the correlation marks on the valve body and cover are aligned.

Guide rods approximately 4 in. (10.2 cm.) long, placed temporarily in three of the screw holes in the valve body will greatly assist in aligning the body and cover.

5. Press down on the top cover until it contacts the diaphragm then fit two of the cover securing screws; do not fully tighten the screws at this stage.

Firm pressure will be required when pressing down the cover to overcome the pressure of the valve spring.

6. Remove the temporary locating rods then fit the three remaining cover securing screws; ensure that the diaphragm is positioned correctly between the body and cover then tighten the five screws evenly and firmly.

7. Move the operating arm up and down and ensure that the centre spindle is not binding.

8. Fit the charging pipe.

9. Fit the suction throttling valve to the car as previously described then adjust the valve as follows.

Note that after fitting and adjusting the suction throttling valve it will be necessary to check the valve pressure and adjust if necessary (see Suction throttling valve pressure — To adjust, in this Section).

Suction throttling valve—To adjust

1. The system should be evacuated, swept and charged prior to adjusting the suction throttling valve.

2. Adjust the positions of the 5 B.A. nuts on either side of the swivel pin so that it is possible to rotate the crank (with the pinch bolt slack) for a full turn about the actuator spindle without binding or distortion taking place. Lock the 5 B.A. nuts against the swivel pin.

3. Remove the two springs from the suction throttling valve operating arm and by turning the spindle, which is screwed through a plastic bush located in the centre of the operating arm, reduce the free play of the operating arm.

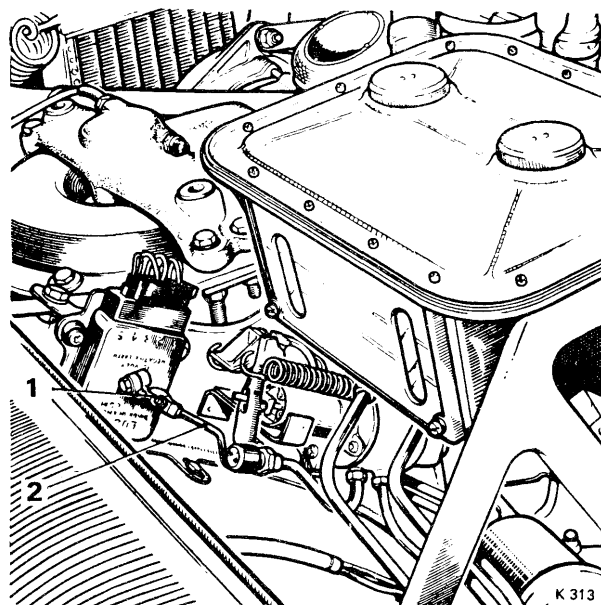


FIG. C27 SUCTION THROTTLING VALVE ACTUATOR SETTING

- 1 Actuator crank lever
- 2 Link rod

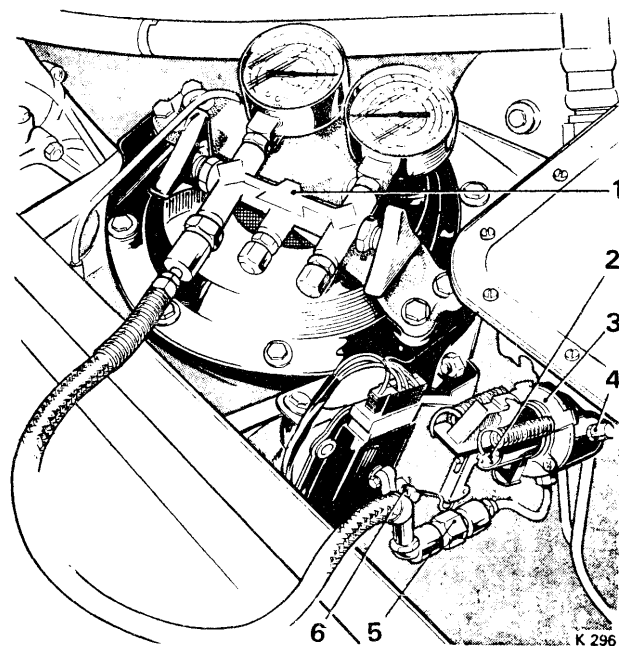


FIG. C28 SUCTION THROTTLING VALVE WITH PRESSURE GAUGE

- 1 Pressure gauges
- 2 Pressure adjusting nut
- 3 Suction throttling valve
- 4 Blanking plug
- 5 Charging pipe
- 6 Actuator linkage

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4. Check to ensure that the spindle does not bottom within the valve by turning the crank through a complete revolution every $\frac{1}{2}$ turn clockwise of the spindle.
5. When bottoming does occur, turn the spindle one turn anti-clockwise and fit the springs.
6. Secure the lever to the actuator spindle (see Section C6—Suction throttling valve actuator linkage—To adjust).

**Suction throttling valve pressure—
To adjust
(see Fig. C28)**

1. Remove the 'Schrader' valve cap from the suction throttling valve gauge connection.
2. Fit the 'Schrader' valve adaptor to a flexible hose and gauge, which in turn should be connected to the suction throttling valve.
3. Purge the air from the hose by loosening the connection on the pressure gauge for a few seconds.

4. Start and run the engine at a speed of between approximately 1,000 r.p.m. and 1,250 r.p.m.; select maximum blower speed with all refrigerant outlets open.

5. Turn the 'UPPER' fascia switch fully anti-clockwise then back to the 'off' position so that the actuator crank makes a full turn. Repeat this operation ten times to normalise the suction throttling valve diaphragm.

6. Allow the system to operate for a further 5 minutes until pressure in the system becomes stable.

7. Slowly increase the engine speed until the gauge pressure ceases to fall and the suction throttling valve can be seen to control the pressure by the slight hunting of the gauge needle.

The stabilised suction throttling valve pressure should be between 29 lb./sq. in. and 30 lb./sq. in. (2.03 kg./sq. cm. and 2.11 kg./sq. cm.) gauge reading.

★ If it is necessary to adjust the suction throttling valve, rotate the pressure adjusting nut (see Fig. C28) using the special adjusting tool (RH 7934). Clockwise rotation increases the pressure, anti-clockwise rotation decreases the pressure.

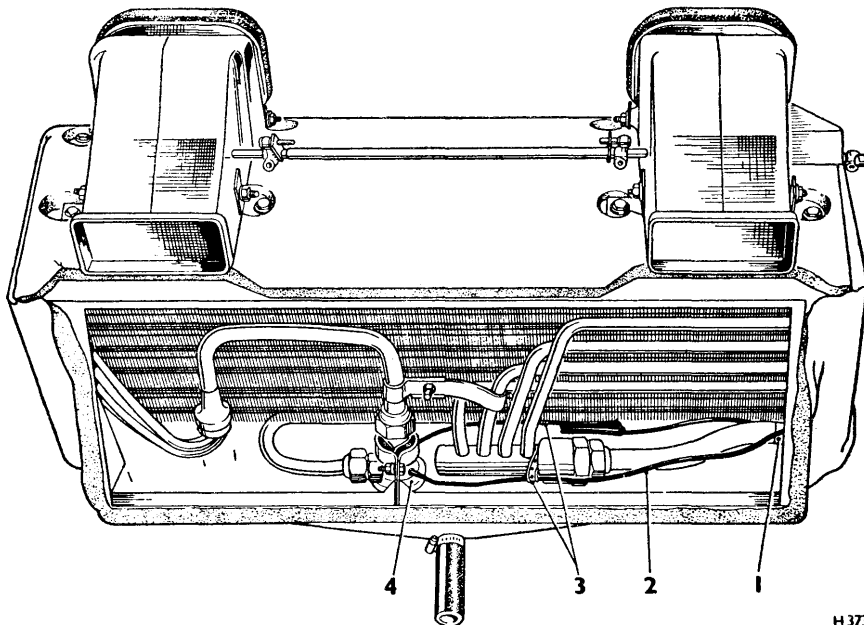


FIG. C29 POSITION OF EXPANSION VALVE IN EVAPORATOR BOX (Early cars)

- 1 Cup 2 Equalising pipe 3 Clips 4 Expansion valve

Suction throttling valve pressures

Switch Position	Approximate Gauge Pressure
1st	52 lb./sq. in. to 54 lb./sq. in. (3,66 kg./sq. cm. to 3,79 kg./sq. cm.)
2nd	46 lb./sq. in. to 48 lb./sq. in. (3,23 kg./sq. cm. to 3,37 kg./sq. cm.)
3rd	34 lb./sq. in. to 36 lb./sq. in. (2,39 kg./sq. cm. to 2,53 kg./sq. cm.)
4th	29 lb./sq. in. to 30 lb./sq. in. (2,03 kg./sq. cm. to 2,11 kg./sq. cm.)

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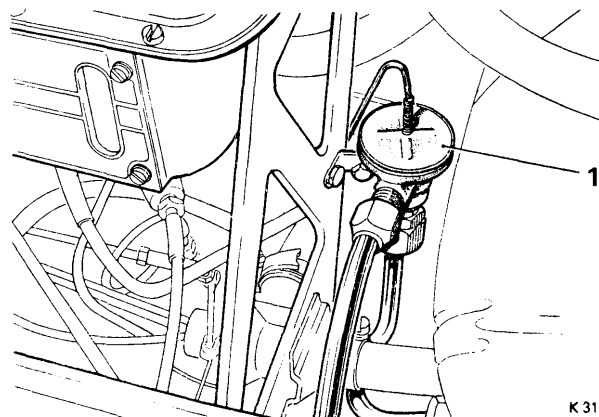
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Expansion valve—To remove**Early cars.**

(Refer to Figure C29)

1. Discharge the refrigeration system (see Section C4).
2. Remove the radio and the small trim panels fitted to either side of the radio; refer to Chapter M.
3. Remove the drain tube from the underside of the evaporator box.
4. Using a sharp razor knife, cut the stitching along the bottom corners of the evaporator box; fold back the insulating material. On later cars the insulating material is kept into place with press studs, it is therefore only necessary to undo the press studs.
5. Remove the self tapping screws securing the bottom tray to the evaporator box; remove the tray.
6. Lower the steering column (right-hand drive cars only); refer to Chapter N and unwrap the insulating material covering the refrigerant circulation pipes.
7. Disconnect the expansion valve balance pipe at the engine bulkhead.
8. Disconnect the two refrigerant pipes at the expansion valve body.
9. Remove the metal clip securing the expansion valve thermal bulb to the low pressure outlet pipe.
10. Remove the plastic strap securing the capillary tube to the four pass manifold.
11. Remove the bolt securing the expansion valve body clamp to the evaporator box.



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**FIG. C30 POSITION OF EXPANSION VALVE
(Late cars)**

1 Expansion valve

12. Withdraw the expansion valve and at the same time feed the capillary balance pipe through the evaporator case.

Late cars.

(Refer to Figure C30)

1. Discharge the refrigerant (see Section C4).
2. Disconnect the equaliser pipe at the suction throttling valve.
3. Remove the putty insulation, surrounding the thermal bulb at the suction throttling valve inlet pipe.
Slacken the clip securing the thermal bulb to the pipe then slide the bulb clear of the pipe.
4. Disconnect the clip securing the expansion valve to the hydraulic reservoir bracket.
5. Disconnect the inlet and outlet pipes to the suction throttling valve then remove the valve.

Expansion valve—To fit

Fit the expansion valve by reversing the procedure given for its removal noting the following points.

1. Renew 'O' rings where fitted, lubricate all threads and connections with the approved compressor oil.
2. **On early cars**, where the expansion valve is fitted inside the evaporator box, care should be taken not to kink or damage the balance pipe when feeding it through the evaporator box casing. Also, the expansion valve thermal bulb must be strapped tightly to the low pressure outlet pipe.

Section C7

EVAPORATOR, CONDENSER, RECEIVER/DRIER UNIT AND 'FAST-IDLE' SOLENOID

Evaporator box—To remove (see Fig. C31)

1. Discharge the refrigerant (see Section C4).
2. Disconnect the battery.
3. Remove the front seats (see Chapter S).
4. **On standard cars fitted with a centre console**, proceed as described in Operations 5 and 8.
5. Lift back the carpet surrounding the tidy box and console.
6. Remove the three screws securing the tidy box to the transmission tunnel.
7. Remove the six setscrews securing the centre console to the transmission tunnel then withdraw the console sufficiently for the electrical connections to be disconnected then disconnect them.
8. Remove the console.
9. **On cars not fitted with a centre console**, remove the radio as described in Chapter M.
10. Remove the under facia trim panels (see Chapter S).
11. Remove the screws securing the top roll to the instrument board. The screws are situated underneath the protruding edge of the top roll also at each end of the top roll.
12. Remove the screws securing the facia to the instrument board.
13. Remove the setscrews securing the instrument board to its inner and outer mounting brackets.
14. Withdraw the instrument board sufficiently for the wiring to be disconnected then disconnect the wiring and remove the board together with the instruments (see Chapter M).

15. Disconnect the drain pipe at the bottom of the evaporator box.

16. **On early cars**, where the expansion valve is fitted inside the evaporator box (see Fig. C29), disconnect the three pipes leading to the evaporator box. The connections for two of these pipes are situated adjacent to the heater coolant tap, the third connection is situated adjacent to the rubber grommets fitted into the toeboard.

17. **On late cars**, where the expansion valve is fitted inside the engine compartment (see Fig. C30), disconnect the two pipes fitted to the bottom of the evaporator box (see Fig. C31).

18. Remove the screws securing the evaporator box to its two mounting brackets then remove the box.

On early cars, it will be necessary when removing the box, to manoeuvre the refrigeration pipes through the rubber grommets fitted into the toeboard.

Evaporator box—To fit

Fit the evaporator box by reversing the procedure given for its removal.

Evaporator matrix—To remove (see Fig. C29)

1. If the expansion valve is fitted inside the evaporator box, it should be removed as described earlier in this Section.
2. Remove the setscrews securing the evaporator matrix to the evaporator box; remove the matrix.

Chapter C

Evaporator matrix—To fit

Fit the evaporator matrix by reversing the procedure given for its removal noting the following point.

1. If a new evaporator matrix is to be fitted, add sufficient compressor oil to compensate for the amount lost in the old matrix.

Condenser—To remove

(see Fig. C15)

1. Remove the radiator grille, refer to Chapter S.
2. Discharge the refrigerant (see Section C4).
3. Disconnect the two high pressure pipes located at the top of the condenser.
4. Remove the four setscrews securing the condenser to the coachwork; remove the condenser.

Condenser—To fit

Fit the condenser by reversing the procedure given for its removal noting the following point.

1. If a new condenser is to be fitted add sufficient compressor oil to compensate for the amount lost in the old condenser.

Receiver/drier unit—To remove

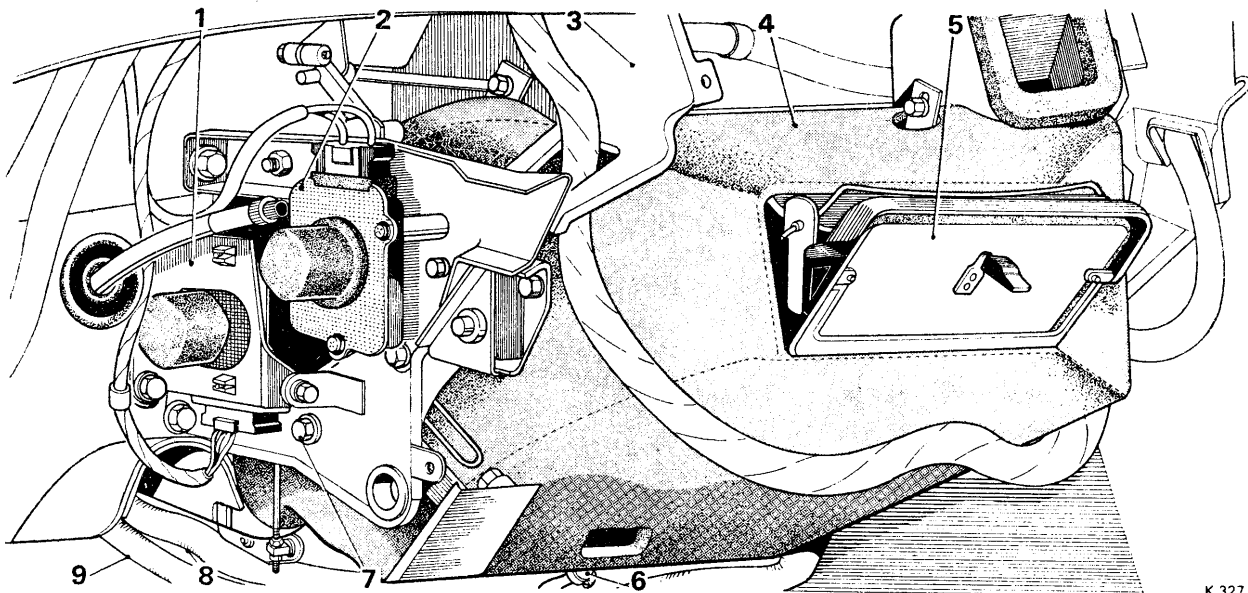
(see Fig. C15)

1. Discharge the refrigerant (see Section C4).
2. Disconnect the high pressure inlet and outlet pipes and slacken the clip securing the receiver/drier; remove the unit.

Receiver/drier unit—To fit

Fit a new unit by reversing the procedure given for its removal, noting the following point.

1. Use new rubber 'O' rings.
2. Add sufficient compressor oil to compensate for the amount lost in the old receiver/drier unit.



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FIG. C31 POSITION OF THE EVAPORATOR BOX

- | | |
|--|---|
| 1 Lower quantity flap actuator | 6 Evaporator box drain tube |
| 2 Evaporator box change-over flap actuator | 7 Evaporator box mounting screws (4 off) |
| 3 Instrument board mounting bracket | 8 Low pressure pipe (fitted between evaporator box and S.T.V.) |
| 4 Evaporator box | 9 Low pressure pipe (fitted between evaporator box and expansion valve) |
| 5 Outlet flap—Refrigerated/fresh air | |

Fitting of new units

1. Whenever a new unit is fitted a measured quantity of compressor oil should be added to that component to ensure that the oil charge is correct before operating the system.

2. These quantities are as follows.

Evaporator	3 fluid oz. (84 c.c.)
Condenser	1 fluid oz. (28 c.c.)
Receiver	1 fluid oz. (28 c.c.)

3. Compressor oil should be poured into the replacement unit. If a new evaporator is to be fitted, pour the compressor oil into the inlet pipe with the pipe held vertically. This will ensure that the oil drains into the evaporator core.

4. Upon assembly of the refrigeration system, the full process of evacuation and sweeping must be carried out before charging the system.

'Fast-idle' solenoid—To remove

(see Fig. C32)

1. Disconnect the battery.
2. Disconnect the two feed wires at the 'Lucar' terminals.
3. Remove the two bolts securing the solenoid to the baseplate and remove the solenoid.

'Fast-idle' solenoid—To fit

Fit the solenoid by reversing the procedure given for its removal, taking care to connect the solenoid leads to their respective main 'Lucar' connectors.

Vacuum operated actuator—To remove

1. Carefully remove the two flexible pipes from the underside of the actuator unit.
2. Remove the bolts securing the actuator unit to the underside of the baseplate; remove the actuator unit.

Vacuum operated actuator—To fit

Fit the vacuum actuator by reversing the procedure given for its removal.

Note The vacuum actuator is a factory built unit and should not require adjustment.

Vacuum unit—To remove

1. Carefully remove the flexible pipe from the underside of the vacuum unit.
2. Remove the three half nuts from the underside of the bracket.
3. Do not slacken the screws as this may cause a diaphragm leak.

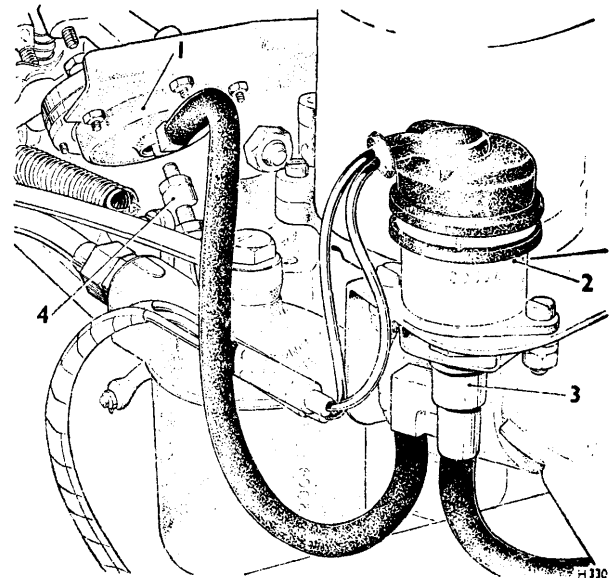


FIG. C32 VACUUM OPERATED FAST-IDLE ARRANGEMENT

- 1 Vacuum unit
- 2 Solenoid
- 3 Vacuum pipe to induction manifold
- 4 Fast-idle adjustment screw

Vacuum unit—To fit

Fit the vacuum unit by reversing the procedure given for its removal.

'Fast-idle'—To set

(see Fig. C32)

1. Prior to setting the 'fast-idle' screw ensure that the carburettor linkage is correctly adjusted (see Chapter K) i.e. the lost motion slots in the twin connecting links must allow the carburettor to move to the 'fast-idle' position without moving the remainder of the throttle linkage.

2. To obtain the correct 'fast-idle' position, run the engine with the gear lever in 'P' or 'N' position to obtain the normal operating temperature and switch on the refrigeration system. 'P' position should be used in preference to 'N' position on cars fitted with a torque converter transmission.

3. Slacken the lock-nut and adjust the screw to give an engine speed of 900 r.p.m. The screw should then be locked in this position.

Section C8

ELECTRICAL ACTUATORS AND FLAPS

Recirculation actuator—To remove

(see Fig. C33)

1. Disconnect the battery.
2. Carefully remove the side trim panel by prising the carpet tacks from behind the piping along the door pillar; the panel can then be removed.
3. Disconnect the 'Lucar' connector from the actuator.
4. Slacken the pinch bolt securing the actuator crank lever to the actuator spindle; remove the lever from the spindle.
5. Unscrew the three 'Phillips' screws securing the actuator to the support bracket; remove the actuator.

Recirculation actuator—To fit

Fit the actuator to its support by reversing the procedure given for its removal.

Recirculation actuator—To adjust

(see Fig. C33)

1. To allow the recirculation actuator to rotate to the closed position, move the upper heating and demister switch to the off position.
2. Slide the actuator lever onto the spindle; do not tighten the pinch bolt.
3. Rotate the actuator lever until the lever and the link rods lie parallel to each other; tighten the pinch bolt.
4. The two nuts on the end of the link rod should then be tightened against the swivel pin until the flap is seated on the lower aperture; the nuts can then be locked together.

5. The upper nuts should be set and locked together so that the spring is compressed to a length of between $\frac{7}{8}$ in. and 1 in. (22,2 mm. and 25,4 mm.).

6. To check for correct operation select the recirculation position.

7. If the flap is seating correctly, the spring should be further compressed by $\frac{1}{8}$ in. to $\frac{1}{4}$ in. (3,17 mm. to 6,35 mm.) as seen by the distance from the swivel pin to the lower locking nuts.

Evaporator box change-over flap actuator— To remove

1. Disconnect the battery.
2. Remove the screws securing the facia into position and remove the facia.
3. Remove the screws securing the top roll to the instrument board. The screws are situated underneath the protruding edge of the top roll also at each end of the top roll.
4. Remove the top roll to reveal the change-over flap actuator.

On left-hand drive cars, this actuator is fitted adjacent to the lower quantity flap actuator (see Fig. C34).

On right-hand drive cars, it is fitted adjacent to the lower temperature flap actuator (see Fig. C11).

5. Disconnect the electrical connections to the actuator.

6. Slacken the pinch bolt securing the actuator crank lever to the actuator spindle. Remove the actuator lever from the spindle.

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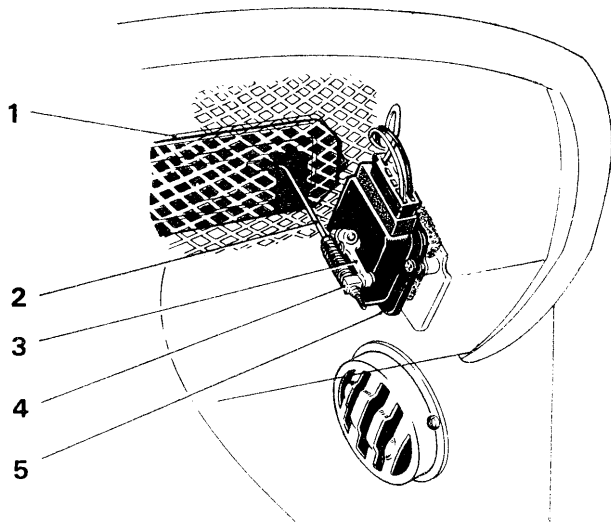


FIG. C33 POSITION OF RECIRCULATION ACTUATOR

- 1 Recirculation flap
- 2 Control rod
- 3 Lever
- 4 Swivel pin
- 5 Actuator

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7. Remove the two 2 B.A. setscrews holding the actuator frame to the main facia panel frame; withdraw the assembly.

8. Unscrew the three 'Phillips' screws securing the actuator to the support bracket; remove the actuator.

**Evaporator box change-over flap actuator—
To fit**

Fit the actuator by reversing the procedure given for its removal.

**Evaporator box change-over flap linkage—
To adjust
(see Fig. C34)**

1. To allow the recirculation actuator to rotate to the closed position, move the upper heating and demister switch to the off position.

2. Rotate the actuator crank lever until the flaps are pressing on their horizontal seats; the flaps are visible through the outlet ducts on the facia. Tighten the pinch bolt.

3. Select a refrigeration position then a heating and demisting position to ensure that the actuator does not stall in either position.

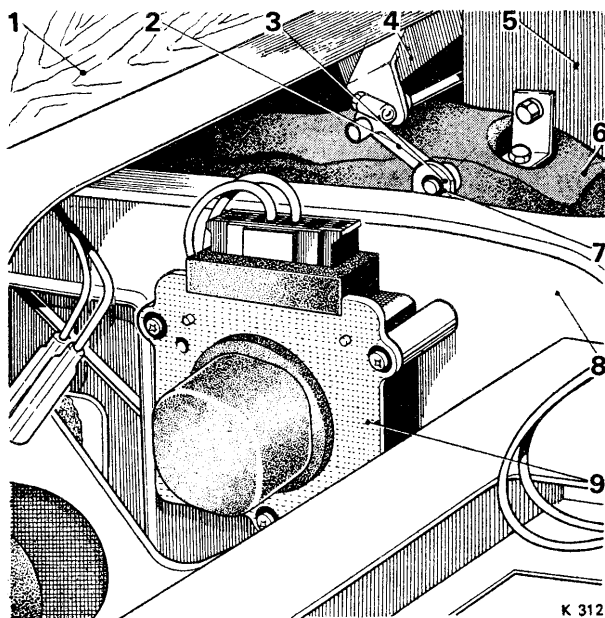


FIG. C34 POSITION OF CHANGE-OVER FLAP ACTUATOR (Left-hand drive cars)

- 1 Wood finisher
- 2 Lever
- 3 Lever
- 4 Bracket
- 5 Duct
- 6 Evaporator
- 7 Retaining ring
- 8 Instrument board mounting bracket
- 9 Actuator

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**Suction throttling valve actuator—
To remove**

1. Slacken the pinch bolt securing the actuator crank lever to the actuator spindle; remove the lever.

2. Unscrew the three 'Phillips' screws securing the actuator to the support bracket; remove the actuator.

Suction throttling valve actuator—To fit

Fit the actuator to its support bracket by reversing the procedure given for its removal.

**Suction throttling valve actuator linkage—
To adjust
(see Fig. C27)**

1. Rotate the actuator crank lever on the actuator spindle one full turn to ensure that binding of the linkage does not take place.

2. With the 'UPPER' switch in the fully anti-clockwise position (maximum cooling), rotate the actuator crank lever until the lever and the link rod lie parallel to each other; tighten the pinch bolt.

3. Select a refrigeration position then a heating and demisting position to ensure that the actuator does not stall in either position.

Section C9

REAR REFRIGERATION UNIT

Introduction

On Long Wheelbase cars fitted with a centre division, the refrigeration system detailed in the previous sections is supplemented, by an additional rear refrigeration unit which is dealt with in this Section.

The rear refrigeration unit is supplied with refrigerant by the same compressor and condenser that supplies the front system but employs its own evaporator assembly. This assembly, which is situated in the luggage compartment behind a trim panel, consists of the evaporator, suction throttling valve, expansion valve, twin blower motors and two electrical actuators housed in a metal box (*see Fig. C38*).

Unlike the front system, the air flow through the rear unit is not fully recirculatory, as a small proportion of fresh air is admitted to the evaporator assembly when the rear system is operating. Interior air, drawn into the evaporator box through recirculation intakes in the rear parcel shelf, mixes with the fresh air before passing through the evaporator. The cooled air is delivered into the rear compartment through outlet ducts in the quarter panels.

Servicing

The Servicing procedure detailed in Section C4 is applicable to refrigeration systems incorporating the rear refrigeration unit, except for the following.

Under the heading Refrigeration system – To charge, Operation 3, the weight of refrigerant in the system should be increased to a final weight of between 4.25 lb. and 4.75 lb. (1.93 kg. and 2.15 kg.), after the system has been checked and found to be leak free.

OVERHAUL

Evaporator box assembly—To remove (*see Fig. C35*)

1. Discharge the refrigeration system (*see Section C4*).

2. Disconnect the battery.

3. Remove the rear seat, back rest, cheek pads and the cold air outlet ducts as described later in this Section (*see Outlet ducts – To remove*).

4. Remove the parcel shelf trim panel complete with the rear radio speaker grille and the recirculated air intake grilles.

The parcel shelf trim panel is secured by upholstery clips; a wedge shaped tool will be required for inserting under the clips to prise the panel from the parcel shelf.

5. Remove the six self-tapping screws securing the trim panel in the forward section of the luggage compartment; remove the panel.

6. Slacken the worm drive clips securing the transparent drain tubes and the lower drain hoses to the evaporator box; disconnect the drain tubes and hoses from the box.

7. Disconnect the electrical loom emerging from the left-hand side of the evaporator box.

8. Disconnect the refrigerant inlet and outlet pipes to the evaporator assembly.

9. Peel back the rubber sleeve connections on each side of the evaporator box and disconnect the flexible air delivery tubes from the evaporator outlet ducts.

10. **On early cars**, remove the two $\frac{7}{16}$ in. A/F nuts securing each of the two hinge rod support brackets of the luggage compartment cover; remove the brackets from the bolts.

11. Remove the fresh air intake filter as described later in this Section (*see Fresh air intake filter – To remove*).

12. Remove the remaining twelve self-tapping screws securing the clamping plate and the upper flange of the fresh air transfer duct to the car body. Remove the clamping plate and tuck the upper flange of the duct down into the intake so that it is below the lip of the body intake aperture.

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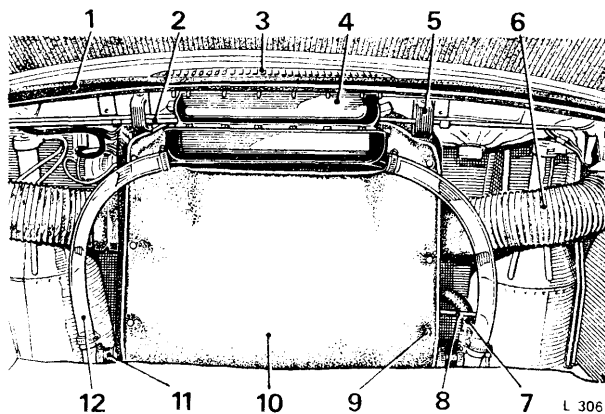


FIG. C35 POSITION OF THE EVAPORATOR BOX ASSEMBLY

- 1 Luggage compartment rubber seal
- 2 Hinge torque rods
- 3 Fresh air intake grille
- 4 Fresh air transfer duct
- 5 Hinge rods support bracket (2 off—if fitted)
- 6 Flexible delivery duct (2 off)
- 7 Suction line (outlet)
- 8 Liquid line (inlet)
- 9 Press-stud fastener (8 off)
- 10 Evaporator box assembly
- 11 Lower drain hose (2 off)
- 12 Transparent drain tube (2 off)

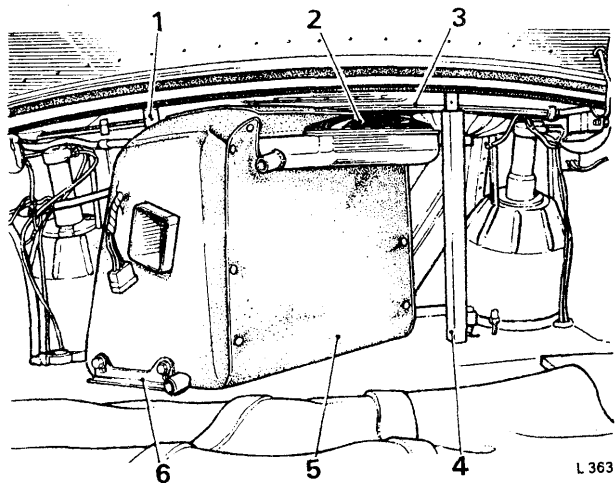


FIG. C36 SHOWING THE WOODEN BLOCK IN POSITION

- 1 Trim panel upper attachment bracket
- 2 Fresh air transfer duct (upper flange of duct shown tucked down into intake)
- 3 Luggage compartment lid hinge rods
- 4 Wooden block
- 5 Evaporator box assembly
- 6 Angled mounting bracket

13. Remove the six self-tapping screws from around each recirculated air intake aperture in the parcel shelf.

14. Remove the three self-tapping screws securing the angled mounting bracket on each side of the evaporator box to the floor of the luggage compartment. Slacken the two $\frac{1}{2}$ in. A/F setscrews securing each mounting bracket to the evaporator box and remove the wooden packing strip from under each bracket.

15. Insert a block of wood, approximately 19 in. (48 cm.) long and 3 in. \times 2 in. (8 cm. \times 5 cm.) thick, between the floor of the luggage compartment and the lid hinge rods; position the block as shown in Figure C36.

16. Carefully remove the evaporator box assembly from the luggage compartment, turning it side-ways slightly during removal to avoid fouling the trim panel upper attachment brackets.

Evaporator box assembly—To fit

To fit the evaporator box reverse the procedure given for removal noting the following points.

1. Before fitting the evaporator box assembly into the luggage compartment, check the condition of the recirculated air intake seals on the underside of the rear parcel shelf; renew if necessary (*see Section C1, Heater matrix - To fit, Operation 2*).

2. Secure the evaporator box assembly into position in the following sequence.

3. Fit the six self-tapping screws around each recirculated air intake aperture sufficiently to just locate them in their holes in the evaporator box.

4. With the setscrews securing the angled mounting brackets to the evaporator box slackened off, fit the wooden packing strip under each mounting bracket and secure them to the floor of the luggage compartment with the self-tapping screws.

5. Lever the evaporator box assembly upward until the top of the box contacts the recirculated air intake seals. With the box still in this position, tighten the six self-tapping screws around each recirculated air intake in the rear parcel shelf.

6. Finally tighten the two $\frac{1}{2}$ in. A/F setscrews securing each angled mounting bracket to the evaporator box assembly.

Evaporator matrix—To remove (*see Fig. C38*)

1. Discharge the refrigeration system (*see Section C4*).

2. Disconnect the battery.

3. Remove the evaporator box as described earlier in this Section (*see Evaporator box assembly - To remove*).

4. Remove the two $\frac{1}{2}$ in. A/F setscrews securing each mounting bracket to the evaporator box.

5. Unclip the press studs securing the rear cover flap on the evaporator box insulating jacket; starting at the upper rear edge, carefully remove the insulating jacket from the evaporator box.

6. Remove the evaporator box rear cover as described later in this Section (see *Suction throttling valve - To remove, Operations 8 and 9*).

7. Remove the six self-tapping screws securing each side patch plate to the evaporator box. Also, remove the upper rear setscrew securing the evaporator and blower motor mounting assembly to each side of the evaporator box; remove the side patch plates.

8. Remove the expansion valve as described later in this Section (see *Expansion valve - To remove, Operations 4 to 7 inclusive*).

9. Disconnect the outlet pipe from the suction throttling valve.

10. Press the square grommet from its aperture in the right-hand side of evaporator box; remove the pipe grommet and the two refrigerant circulation pipes.

11. Disconnect the electrical leads to the suction throttling valve actuator and the leads to the blower motors.

12. Remove the remaining three setscrews on each side of the evaporator box securing the evaporator and blower motor mounting assembly; remove the assembly from the evaporator box.

13. Disconnect the evaporator outlet pipe.

14. Remove the eight $\frac{7}{16}$ in. A/F setscrews securing the evaporator matrix to the mounting assembly; slide the matrix out of the mounting assembly.

Evaporator matrix—To fit

To fit the evaporator matrix reverse the procedure given for removal noting the following points.

1. Ensure that the blower duct to evaporator box seals are positioned correctly.

2. Ensure that the anti-vibration strips are in position between the front and rear lower edges of the evaporator matrix and the evaporator mounting assembly, particularly if a new matrix is to be fitted.

3. If a new matrix is to be fitted, before connecting the refrigerant inlet and outlet pipes, pour sufficient fresh compressor oil into the new matrix to compensate for the amount lost in the old matrix. To determine this amount drain all the oil from the old matrix and measure carefully, then add an equivalent amount of fresh oil to the new matrix.

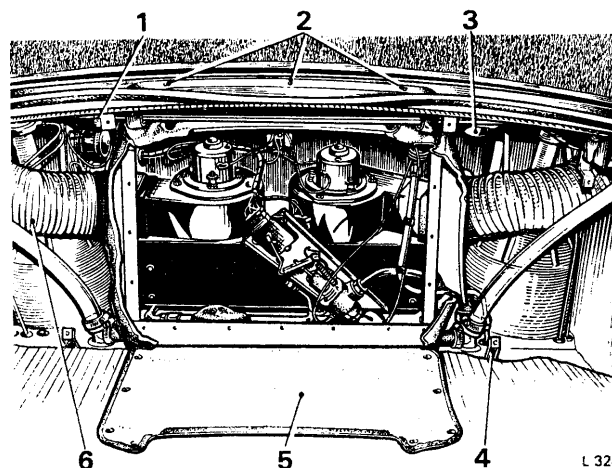


FIG. C37 EVAPORATOR BOX WITH REAR COVER REMOVED

- 1 Rear seat backrest securing screw (2 off)
- 2 Locating pegs for fresh air intake grille
- 3 Radio speaker
- 4 Trim panel attachment bracket
- 5 Insulating jacket flap
- 6 Flexible delivery duct (2 off)

Note. The quantities of compressor oil shown on Page C39 - Fitting of new units - Operation 2, are for guidance only and the amount of fresh oil to be added to the new component should be equal to the amount of oil which can be drained from the old unit.

Suction throttling valve—To remove (see Fig. C38)

1. Discharge the refrigeration system (see Section C4).
2. Disconnect the battery.
3. Remove the six 'Philips' screws securing the carpeted trim panel in the forward section of the luggage compartment; remove the panel.
4. Slacken the worm drive clips securing the upper ends of the transparent drain tubes to the evaporator box rear cover; detach both drain tubes from the cover (see Fig. C35).
5. Remove the fresh air intake grille and filter as described later in this Section (see *Fresh air intake filter - To remove*).
6. Remove the remaining twelve self-tapping screws securing the clamp and upper flange of the fresh air transfer duct to the car body (see Fig. C43); remove the clamp and tuck the upper flange of the transfer duct down, so that it is below the lip of the intake aperture.

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7. Unfasten the eight press studs securing the rear flap of the evaporator box insulating jacket.

8. Remove the fifteen self-tapping screws securing the evaporator box rear cover; note that the upper edge of the cover is still secured to the evaporator box by three clips on the inside of the cover (see Fig. C40, item 2).

9. Pull the evaporator box rear cover downwards to detach the three clips and withdraw the cover sufficiently to enable the electrical leads to the fresh air flap actuator to be disconnected; disconnect the leads and remove the cover together with the fresh air transfer duct.

10. Disconnect the inlet and outlet pipes from the suction throttling valve.

11. Disconnect the equalising pipe from the suction throttling valve.

12. Disconnect the electrical leads to the suction throttling valve actuator.

13. Remove the three 2 B.A. setscrews securing the suction throttling valve and actuator mounting bracket to the evaporator and blower mounting assembly; remove the mounting bracket.

Note. It is necessary to remove the actuator mounting bracket in order to gain access to the suction throttling valve securing bolts.

14. Slacken the pinch bolt securing the actuator crank lever to the actuator spindle.

15. Remove the two special setscrews securing the suction throttling valve to its mounting bracket; remove the valve.

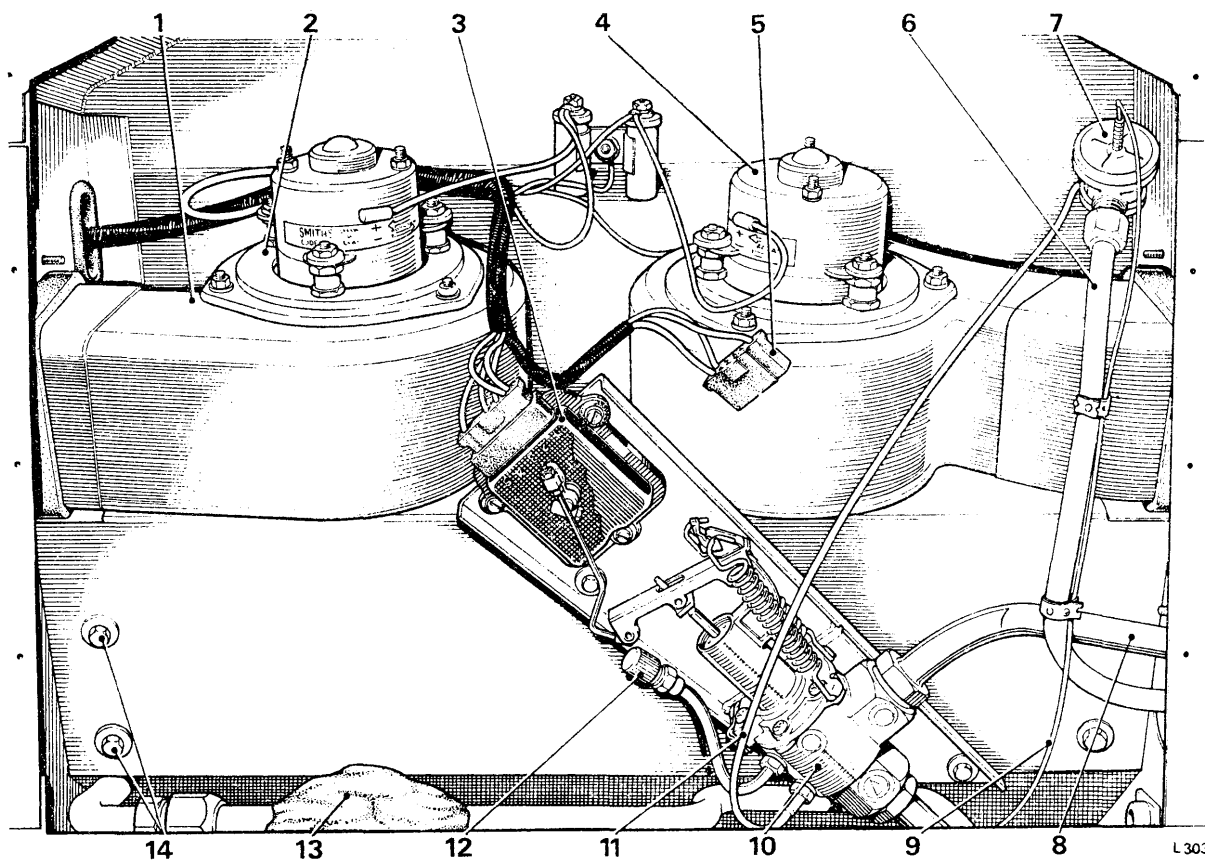


FIG. C38 EVAPORATOR BOX COMPONENTS

- | | |
|---|---|
| 1 Blower housing/outlet duct assembly (2 off) | 8 Suction line (outlet) |
| 2 Blower motor mounting plate (2 off) | 9 Capillary tube |
| 3 Suction throttling valve actuator | 10 Suction throttling valve |
| 4 Blower motor (2 off) | 11 Equaliser pipe |
| 5 Fresh air flap actuator connector block | 12 Charging pipe cap |
| 6 Liquid line (inlet) | 13 Thermal bulb insulation |
| 7 Expansion valve | 14 Evaporator matrix securing setscrews (8 off) |

Suction throttling valve—To dismantle (see Fig. C26)

Dismantle the suction throttling valve as described in Section C6.

Suction throttling valve—To inspect

Inspect the suction throttling valve as described in Section C6.

Suction throttling valve—To assemble

Assemble the valve as described in Section C6 (see *Suction throttling valve – To assemble, Operations 1 to 10 inclusive*), noting that the valve must be adjusted after it is fitted to the car.

Suction throttling valve—To fit

To fit the suction throttling valve reverse the procedure given for removal noting the following points.

1. The inlet and outlet pipes should be loosely connected to the suction throttling valve before the mounting bracket is secured to the evaporator: tighten the pipe connections after securing the mounting bracket.
2. Fit new sealing rings and lubricate all threads and connections with the approved compressor oil.
3. Check the condition of the cover seal and renew if necessary (see *Section C1, Heater matrix – To fit, Operation 2*).
4. Before the evaporator box rear cover is fitted the S.T. valve and valve linkage must be adjusted and the valve pressure checked and adjusted as necessary.

Suction throttling valve—To adjust

1. Evacuate, sweep and charge the system as described in Section C4, noting also the point mentioned under Servicing earlier in this Section.
2. Adjust the suction throttling valve as described in Section C6. Suction throttling valve – To adjust, Operations 2 to 5 inclusive.
3. Secure the crank lever to the actuator spindle as described later in this Section (see *Suction throttling valve actuator linkage – To adjust, Operations 4 to 11 inclusive*).
4. After adjusting the valve linkage, adjust the valve pressure as follows.

Suction throttling valve pressure—To adjust

1. Remove the 'Schrader' valve cap from the charging pipe on the suction throttling valve (see *Fig. C38, item 2*).
2. Fit the 'Schrader' valve adaptor (RH 7937) to a flexible hose and gauge, then connect the adaptor to the suction throttling valve charging pipe.

3. Purge the air from the hose by slackening the connection on the pressure gauge for a few seconds.

4. Start and run the engine at a speed of between approximately 1 000 r.p.m. and 1 250 r.p.m.: select maximum speed on the rear refrigeration blower switch.

5. Turn the rear refrigeration temperature switch fully anti-clockwise and then back to the 'off' position (so that the actuator crank makes a full turn). Repeat this operation ten times to normalise the suction throttling valve diaphragm.

6. Allow the system to operate for a further five minutes until pressure in the system becomes stable.

7. Slowly increase the engine speed until the gauge pressure ceases to fall and the suction throttling valve can be seen to control the pressure by the slight hunting of the gauge needle.

The stabilised suction throttling valve pressure should be between 29 lb/sq. in. and 30 lb/sq. in. (2.03 kg/sq. cm. to 2.11 kg/sq. cm.) gauge reading.

8. If it is necessary to adjust the suction throttling valve pressure, rotate the pressure adjusting nut (see *Fig. C28*), using the adjusting tool (RH 7934); clockwise rotation increases the pressure, anti-clockwise rotation decreases the pressure.

9. Remove the 'Schrader' valve adaptor (RH 7937) from the suction throttling valve charging pipe.

10. Fit the 'Schrader' valve cap to the suction throttling valve charging pipe.

11. Fit the evaporator box rear cover, trim panel etc. by reversing the procedure given for removal.

Note. Ensure that the electrical leads to the actuators are not inadvertently disconnected while fitting the evaporator box rear cover.

Suction throttling valve pressures

Switch Position	Approximate Gauge Pressures
1st	52lb/sq. in. to 54lb/sq. in. (3.66 kg/sq. cm. to 3.79 kg/sq. cm.)
2nd	44lb/sq. in. to 46lb/sq. in. (3.09 kg/sq. cm. to 3.23 kg/sq. cm.)
3rd	33lb/sq. in. to 35lb/sq. in. (2.32 kg/sq. cm. to 2.46 kg/sq. cm.)
4th	29lb/sq. in. to 30lb/sq. in. (2.03 kg/sq. cm. to 2.11 kg/sq. cm.)

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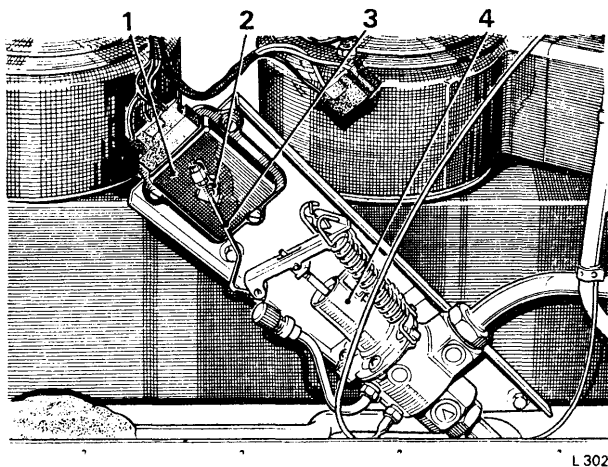


FIG. C39 SUCTION THROTTLING VALVE ACTUATOR SETTING

- 1 Actuator
- 2 Crank lever
- 3 Link rod
- 4 Suction throttling valve

Expansion valve—To remove (see Fig. C38)

1. Discharge the refrigeration system (see Section C4).
2. Disconnect the battery.
3. Remove the carpeted trim panel in the forward section of the luggage compartment and the rear cover of the evaporator box as described earlier in this Section (see Suction throttling valve - To remove, Operations 3 to 9 inclusive).
4. Disconnect the equaliser pipe from the suction throttling valve.
5. Remove the two nylon straps securing the capillary tube to the inlet pipe.
6. Remove the putty insulation surrounding the thermal bulb on the suction throttling valve inlet pipe (see Fig. C38); slacken the clip securing the thermal bulb to the inlet pipe, then slide the bulb clear of the pipe.
7. Disconnect the inlet and outlet pipes to the expansion valve; remove the valve.

IMPORTANT. Do not attempt to alter the factory setting of the expansion valve. If the valve is faulty fit a new unit.

Expansion valve—To fit

To fit the expansion valve reverse the procedure given for removal noting the following points.

1. Before fitting the expansion valve, check the gauze filter in the inlet bore and clean if necessary.
2. Fit new sealing rings, lubricate all threads and connections with the approved compressor oil.

3. Ensure that the thermal bulb on the capillary tube is firmly secured to the suction throttling valve inlet pipe.

Suction throttling valve actuator—To remove

1. Disconnect the battery.
2. Remove the carpeted trim panel in the forward section of the luggage compartment and the rear cover of the evaporator box as described earlier in this Section (see Suction throttling valve - To remove, Operations 3 to 9 inclusive).
3. Disconnect the electrical leads from the actuator terminals.
4. Slacken the pinch bolt securing the actuator crank lever to the actuator spindle; remove the lever.
5. Remove the three cheeseheaded screws securing the actuator to the support bracket; remove the actuator noting the spacing washers between the actuator and the support bracket.

Suction throttling valve actuator—To fit

To fit the actuator reverse the procedure given for removal noting that before the rear cover of the evaporator box is fitted, the actuator linkage must be adjusted as follows.

Suction throttling valve actuator linkage—To adjust (see Fig. C39)

1. With the actuator crank lever loosely mounted on the actuator spindle, rotate the lever about the spindle to ensure that the linkage does not bind.
2. With the throttling valve fully open, adjust the 5 B.A. lock-nuts on the link rod until the link rod and the crank lever lie parallel to each other as shown in Figure C39; tighten the 5 B.A. lock-nuts on the link rod.
3. Rotate the crank lever a full turn about the actuator spindle to ensure that the S. T. V. spindle does not bottom in the valve and that binding or distortion does not take place.

If bottoming does occur, check that the suction throttling valve is set correctly and adjust as necessary (see Suction throttling valve - To adjust).

4. Connect the negative lead of a 12 volt battery to the negative tag on the actuator (i.e. the tag adjacent to number 1 tag).
5. Connect the positive lead of the same battery to the number 1 tag and allow the actuator spindle to rotate; this will give the maximum cooling position.
6. Disconnect the temporary battery leads from the actuator.

7. With the actuator lever and the link rod parallel and the suction throttling valve fully open, tighten the actuator lever pinch bolt (see Fig. C39).

8. Connect the electrical leads to the S. T. V. actuator.

9. Position the electrical connections to the fresh air flap actuator (see Fig. C38, item 5) such that they cannot cause an electrical 'short' when the battery leads are connected and the refrigeration switch operated.

10. Connect the battery leads.

11. Switch on the ignition.

12. Select in turn, each position on the rear refrigeration temperature switch and check that the actuator operates and does not stall.

Fresh air flap—To remove (see Fig. C40)

The fresh air flap is mounted on the inner face of the evaporator box rear cover; to remove the flap proceed as follows.

1. Disconnect the battery.
2. Remove the trim panel in the luggage compartment and the rear cover of the evaporator box as described earlier in this Section (see *Suction throttling valve - To remove, Operations 3 to 9 inclusive*).

3. (a) **Cars prior to Car Serial Number LRX 8146** - Release the 5 B.A. lock-nuts on the flap control rod and disconnect the rod from the actuator crank lever (see Fig. C41).

- (b) **Cars after and including Car Serial Number LRX 8146** - Remove the 2 B.A. lock-nut securing the two-stud 'Metalastik' adjuster to the crank lever swivel block; disconnect the adjuster from the block (see Fig. C42).

4. Remove the two 3 B.A. setscrews securing each of the flap hinge brackets to the rear cover; remove the flap complete with the hinge brackets and distance pieces.

Fresh air flap—To fit

To fit the flap reverse the procedure given for removal noting the following points.

1. If the flap seal is in poor condition, renew the seal (see *Section C1 Heater matrix - To fit, Operation 2*).

2. Before fitting the rear cover to the evaporator box set the flap control rod as described later in this Section (see *Fresh air flap actuator - To fit and set*).

Fresh air flap actuator—To remove (see Figs. C41 and C42)

The fresh air flap actuator is mounted on the inner face of the evaporator box rear cover; to remove the actuator proceed as follows.

1. Disconnect the battery.

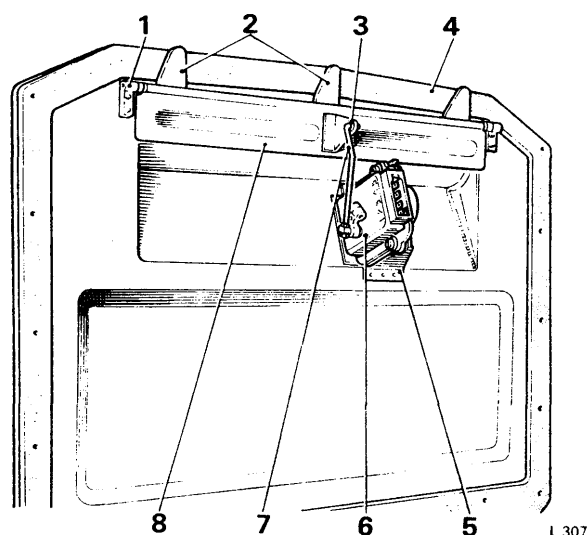


FIG. C40 POSITION OF FRESH AIR FLAP AND ACTUATOR ON THE REAR COVER

- 1 Flap hinge bracket (2 off)
- 2 Cover retaining lugs (3 off)
- 3 Nylon bush
- 4 Rubber seal
- 5 Actuator mounting bracket
- 6 Actuator
- 7 Link rod
- 8 Fresh air flap

2. Remove the trim panel in the luggage compartment and the rear cover of the evaporator box as described earlier in this Section (see *Suction throttling valve - To remove, Operations 3 to 9 inclusive*).

3. Slacken the pinch bolt securing the actuator crank lever to the actuator spindle; remove the crank lever and the spacing washer from the spindle.

4. (a) **Cars prior to Car Serial Number LRX 8146** - Remove the three screws, nuts and washers securing the actuator to the support bracket (see Fig. C41); remove the actuator noting the spacing washers between the actuator and the support bracket.

- (b) **Cars after and including Car Serial Number LRX 8146** - Remove the 2 B.A. nuts and washers securing the actuator to the three 'Metalastik' mounts (see Fig. C42); remove the actuator.

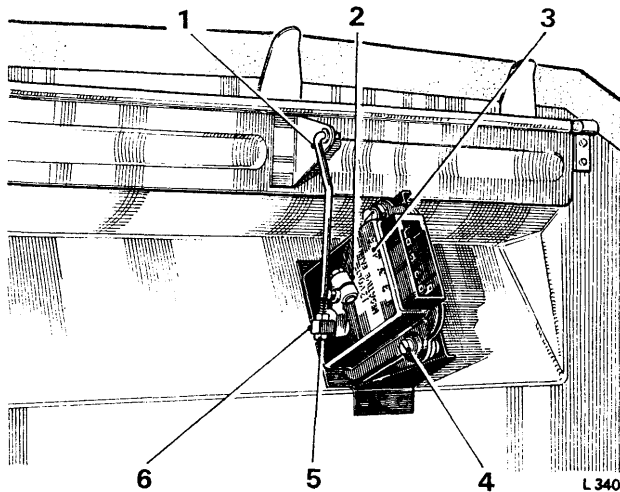
Fresh air flap actuator—To fit and set

To fit the fresh air flap actuator reverse the procedure given for removal noting that before the evaporator box rear cover is fitted, the actuator linkage must be set as follows.

1. Connect the negative lead of a 12 volt battery to the negative tag of the actuator (*i.e. the tag adjacent to the number 1 tag*).

2. Connect the positive lead of the same battery to the number 5 tag and allow the actuator spindle to rotate to the closed position.

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**FIG. C41 FRESH AIR FLAP ACTUATOR SETTING
—EARLY CARS**

- 1 Link rod
- 2 Crank lever
- 3 Actuator
- 4 Actuator securing screw (3 off)
- 5 Lock-nut (2 off)
- 6 Swivel block

3. With the actuator crank lever mounted loosely on the actuator spindle, rotate the lever to ensure that the linkage does not bind.

4. (a) **Cars prior to Car Serial Number LRX 8146** – Hold the fresh air flap firmly onto its seat then adjust the 5 B.A. lock-nuts on the link rod until the link rod and the crank lever lie parallel to each other as shown in Figure C41; tighten the 5 B.A. lock-nuts.

(b) **Cars after and including Car Serial Number LRX 8146** – Slacken the 2 B.A. lock-nuts on the two-stud ‘Metalastik’ adjuster attached to the link rod. Hold the fresh air flap firmly onto its seat then screw the adjuster in or out of the link rod hexagonal extension, as required, until the link rod and the ‘Metalastik’ adjuster lie parallel to the crank lever as shown in Figure C42; tighten the 2 B.A. lock-nuts.

5. Rotate the crank lever a full turn on the actuator spindle to ensure that there is no binding or distortion.

6. With the fresh air flap held firmly onto its seat, tighten the crank lever pinch bolt.

7. Energise in turn the number 1 tag (flap open) and then the number 5 tag (flap closed) of the actuator with the positive lead of the 12 volt battery. Check that the flap opens and closes correctly when the appropriate tag is energised and that the actuator does not stall in either position.

8. Disconnect the temporary battery leads from the actuator.

**Fresh air intake filter—To remove
(see Fig. C43)**

The fresh air intake filter is situated below the intake grille in the rear decking panel (see Fig. C43); to remove the foam filter element proceed as follows.

- 1. Raise the luggage compartment lid.
- 2. Detach the luggage lid rubber seal from the rear flange of the fresh air intake grille.

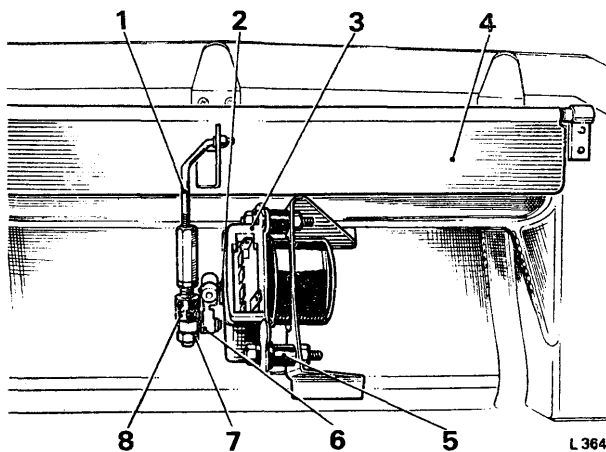
Note. Care must be taken when carrying out this operation to avoid damage to the rubber seal and surrounding paintwork.

3. Remove the three 2 B.A. setscrews securing the intake grille to the car body.

4. Raise the rear flange of the intake grille sufficiently to just clear the luggage lid rubber seal then remove the intake grille from the three locating pegs securing the forward edge of the grille to the car body (see Fig. C37).

5. Raise the outer ends of the foam filter element and remove the two screws securing the lower filter mesh to which the foam element is attached by adhesive; remove the filter mesh and foam element.

6. Detach the foam filter element from the filter mesh and remove any surplus adhesive from the mesh using ‘Bostik’ cleaner 6001.



**FIG. C42 FRESH AIR FLAP ACTUATOR SETTING
—LATE CARS**

- 1 Link rod
- 2 Spacing washer
- 3 Actuator
- 4 Fresh air flap
- 5 Metalastic mount (3 off)
- 6 Crank lever and swivel block assembly
- 7 Lock-nut
- 8 Metalastic adjuster

Fresh air intake filter—To fit

To fit the foam filter element reverse the procedure given for removal noting the following points.

1. The new foam element should be fixed to the lower intake mesh using 'Bostik' adhesive 1261.
2. Before fitting the intake grille onto the three locating pegs ensure that the three rubber grommets are in position in the front flange of the grille.
3. To fix the luggage lid rubber seal, first clean the bonding area of the seal and its mating metal surface with 'Bostik' cleaner 6001. Allow the cleaner to dry for one hour then apply 'Boscolite' primer 9252 to the metal surface only. Allow the primer to dry for one hour then apply 'Boscoprene' cement 2402 parts 1 and 2, to the rubber seal and its mating metal surface. Allow the cement to partially dry for between five and fifteen minutes then fix the rubber seal firmly into its original position. Do not close the lid of the luggage compartment for twelve hours.

If the rubber seal is damaged a new seal must be fitted.

Fresh air transfer duct—To remove
(see Fig. C43)

1. Disconnect the battery.
2. Remove the carpeted trim panel in the forward section of the luggage compartment and the evaporator box rear cover as described earlier in this Section (see *Suction throttling valve - To remove, Operations 3 to 9 inclusive*).
3. Slacken the screws on the evaporator box rear cover securing the two latches to the forward edge of the transfer duct lower clamp; rotate the latches clear of the clamp and transfer duct.
4. Remove the ten 2 B.A. setscrews securing the lower clamp and the transfer duct to the rear cover (see Fig. C43); remove the transfer duct and clamp.

Fresh air transfer duct—To fit

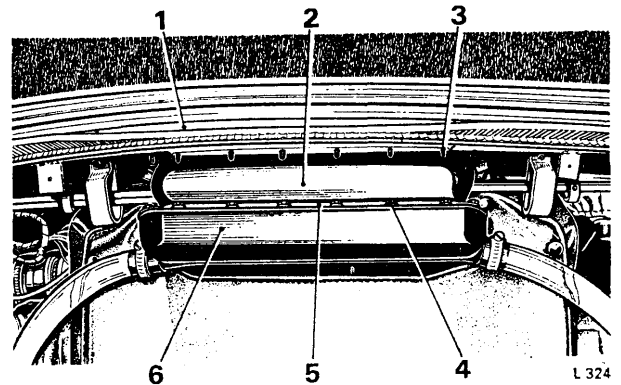
To fit the transfer duct reverse the procedure given for removal noting the following point.

1. Check the condition of the transfer duct before fitting and renew if necessary.

Flexible delivery ducts—To remove
(see Fig. C38)

To remove a delivery duct proceed as follows, noting that the removal procedure is the same for both ducts.

1. Remove the six screws securing the trim panel in the forward section of the luggage compartment; remove the panel.
2. Peel back the rubber sleeve connections on the evaporator end of the delivery duct and detach the duct from the evaporator outlet duct.

**FIG. C43 FRESH AIR INTAKE AND TRANSFER DUCT**

- 1 Recess for intake filter (grille removed)
- 2 Transfer duct
- 3 Screw securing duct to car body (14 off)
- 4 Screw securing duct to cover (10 off)
- 5 Duct lower clamping plate
- 6 Rear cover intake flange

3. Slacken the worm-drive clip securing the outlet end of the delivery duct to the car body duct: remove the delivery duct.

Flexible delivery ducts—To fit

To fit the delivery ducts reverse the procedure given for removal noting the following points.

1. Check the condition of each duct before fitting and renew if necessary. Minor damage to a duct could be temporary repaired using 'Gosherous' tape.
2. The rubber sleeve connections are attached to the delivery ducts with 'Bostik' adhesive 772. Adhesive should not be used when fitting the rubber sleeve connections onto the evaporator box outlet ducts.

Outlet ducts—To remove

To remove an outlet duct proceed as follows noting that the removal procedure is the same for both ducts.

1. Remove the rear seat cushion (refer to *Chapter S - Body*).
2. Remove the six screws securing the forward trim panel in the luggage compartment; remove the trim panel.
3. Remove the two 'Philips' screws securing the upper corners of the rear seat back rest to the car body.

The screws are located in the front wall of the luggage compartment one each side of the evaporator assembly. The position of the left-hand screw is shown in Figure C37; the right-hand screw is hidden by the radio speaker.

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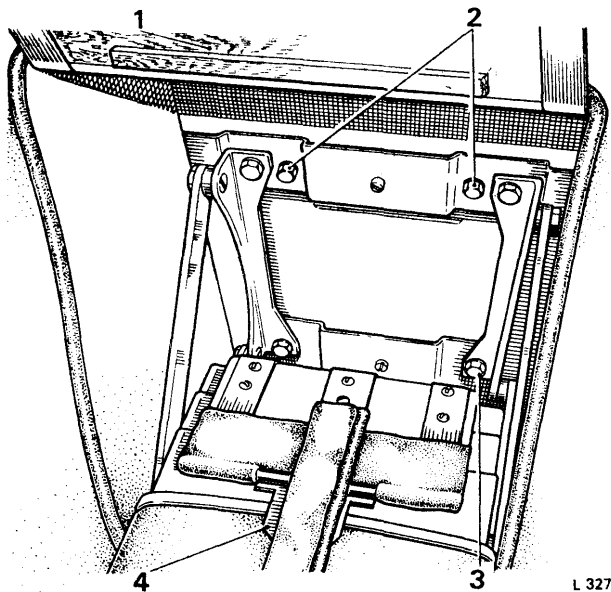


FIG. C44 POSITION OF THE REAR SEAT BACKREST SECURING SETSCREWS

- 1 Trim pad
- 2 Backrest securing setscrews
- 3 Armrest mechanism securing setscrews (4 off)
- 4 Spring flap

4. Remove the two screws situated one in each lower corner of the rear seat back rest in the rear compartment.

5. Lower the rear seat centre arm rest then push the top of the arm rest trim pad inwards as far as possible. Manipulate the lower part of the trim pad until the arm rest mechanism flap is felt to clear the bracket attached to the back of the trim pad. Lift the trim pad upwards to expose the arm rest mechanism.

6. Remove the two $\frac{7}{16}$ in. A/F setscrews and washers securing the rear seat back rest to the car body (see Fig. C44).

7. Remove the rear seat back rest from the car.

8. Carefully detach the rear edge of the rear cheek pad trim from the car body. Fold the trim forward to expose the three screws securing the lower part of the cheek pad to the body; remove the screws. Slide the cheek pad forward until the slotted upper bracket attached to the back of the cheek pad can be detached from the locating screw secured in the body quarter panel. Remove the cheek pad noting that the rear edge of the pad is slotted to accommodate the rear parcel shelf trim panel.

9. Remove the screw securing the lower fixing bracket on the outlet duct to the car body.

10. Grasp the front end of the outlet duct and pull firmly downwards until the slotted upper fixing bracket attached to the back of the duct is felt to clear the locating screw secured to the car body; remove the duct noting that the rear end of the duct is a close fit on the flanged outlet in the rear parcel shelf.

Outlet ducts—To fit

To fit the outlet ducts reverse the procedure given for removal noting the following points.

1. The cheek pad trim should be fixed to the car body using 'Dunlop' upholstery solution L107 or its equivalent.

2. When fitting the rear seat back rest do not tighten the two $\frac{7}{16}$ in. A/F setscrews until the self-tapping screws securing the upper and lower corners are located in their original holes, then tighten all the screws.

Blower motors—To remove (see Fig. C38)

To remove a blower motor proceed as follows, noting that the removal procedure is the same for both motors.

1. Disconnect the battery.

2. Remove the forward trim panel in the luggage compartment and the evaporator box rear cover as described earlier in this Section (see *Suction throttling valve - To remove, Operations 3 to 9 inclusive*).

3. Disconnect the electrical leads to the blower motor.

4. Remove the three 2 B.A. nuts and washers securing the blower motor and mounting bracket to its blower housing; lift the blower motor, complete with fan and mounting bracket, out of its housing and out of the evaporator box.

5. Slacken the 'Allen' grub screw securing the fan to the blower motor output shaft; remove the fan.

6. Remove the rubber seal from the blower motor mounting bracket.

7. Separate the blower motor from its mounting bracket by removing the $\frac{7}{16}$ in. A/F nuts and washers from each end of the three 'Metalastik' mounts.

Blower motors—To fit

To fit the blower motors reverse the procedure given for removal noting the following points.

1. Ensure that the three bonded rubber mounts on each blower motor are in good condition; renew if necessary.

2. Fit new rubber seals to the blower motor mounting plate.

3. When fitting the fan to the blower motor, position the fan on the output shaft so that there is approximately $\frac{3}{8}$ in. (9.25 mm.) between the fan and the lower edge of the mounting plate, then tighten the 'Allen' grub screw.

4. Ensure that the electrical leads to the blower motors are fitted correctly; the yellow/green lead should be connected to the terminal marked \pm on the blower motor casing (*see Fig. C38*), i.e. the blower fan should rotate anti-clockwise when viewed on the end of the motor output shaft.

Blower motor switch—To remove and fit

Refer to Chapter M – The Electrical Section.

Refrigeration control switch—To remove and fit

Refer to Chapter M – The Electrical Section.

MAINTENANCE

Every 12 months the following maintenance should be carried out.

1. Clean any debris (i.e. leaves, dead insects, etc.) from the surfaces of the condenser matrix by reverse flushing with a hose.

2. Check that the fresh air intake filter is free from obstruction; renew the foam element if necessary (*see Section C9, Fresh air intake filter – To remove*).

The following operations should only be carried out by an experienced refrigeration engineer.

3. Check the functioning of the system; if necessary charge with refrigerant.

4. Check for leaks if loss of refrigerant is apparent.

5. Visually check the compressor for oil leakage; if oil leakage is apparent, check the compressor oil level and top-up if necessary (*see Section C4, Oil level – To check*).

In the event of a major oil loss check and repair before topping-up.

Section C10

FAULT DIAGNOSIS

SYMPTOM	POSSIBLE CAUSE	ACTION
1. Insufficient air flow from air conditioning outlets	1. (a) *Fault in blower motors	1. (a) *Check blower motors for correct operation (see Chapter M)
2. Refrigeration system inoperative	2. (a) System low or empty of refrigerant (b) Compressor clutch slipping (c) Compressor clutch inoperative. No voltage at clutch coil (d) Compressor belt slipping (e) Blockage in system	2. (a) Leak test, repair, evacuate and charge the system (see Section C4 and also C9 if rear unit is fitted) (b) Fit new clutch plate and hub assembly (see Section C5) (c) Check circuit for continuity and repair if necessary (see wiring diagram in Chapter M) (d) Adjust or renew belts (see Section C5) (e) Check filters on compressor, *expansion valve and *suction throttling valve (see Sections C5, C6 and C9)
3. Insufficient cooling of air flowing from air conditioning outlets	3. (a) *Suction throttling valve incorrectly adjusted, evaporator pressure higher than 30 lb/sq. in. (2,11 kg/sq. cm.) maximum cooling setting (b) *Suction throttling valve stuck in closed position, evaporator pressure will not pull down to 30lb/sq. in. (2,11 kg/sq. cm.) (c) *Suction throttling valve actuator sticking or seized and not adjusting valve positions (d) *Expansion valve thermal bulb and capillary discharged, causing valve to close (e) *Expansion valve stuck fully open allowing too much refrigerant through to evaporator (f) *Expansion valve inlet filter clogged restricting flow of refrigerant to evaporator (g) Restriction in receiver/drier unit (h) Condenser air flow reduced by insects, leaves, etc. This is indicated by high head pressure causing safety valve on compressor to blow off	3. (a) Adjust suction throttling valve (see Section C6 – front valve or Section C9 – rear valve). (b) Repair or renew suction throttling valve (see Section C6 – front valve or Section C9 – rear valve) (c) Fit new actuator (see Section C8 – front actuator or Section C9 – rear actuator) (d) Renew expansion valve (see Section C6 – front valve or Section C9 – rear valve) (e) Renew expansion valve (see Section C6 – front valve or Section C9 – rear valve) (f) Clean expansion valve filter (see Section C6 – front valve or Section C9 – rear valve) and compressor filter (see Section C5) (g) Renew unit (see Section C7) (h) Clean condenser matrix surfaces (see Section C9 – Maintenance)

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SYMPTOM	POSSIBLE CAUSE	ACTION
<p>3. Insufficient cooling of air flowing from air conditioning outlets—<i>continued</i></p>	<p>(i) Refrigerant hose and piping collapsed, kinked, or otherwise damaged, restricting flow of refrigerant</p> <p>(j) Compressor inlet filter at suction fitting clogged</p> <p>(k) Compressor not pumping sufficiently</p> <p>(l) Compressor inoperative – seized</p> <p>Front System Only</p> <p>(m) System uses outside air only and will not switch to recirculated air to give maximum cooling capacity</p> <p>(n) Coolant tap remains open in maximum heating position</p> <p>(o) Fault in coolant tap actuator</p>	<p>(i) Renew damaged hose or piping</p> <p>(j) Clean compressor and *expansion valve filters (see Sections C5, C6 and C9)</p> <p>(k) Dismantle compressor and renew parts if necessary (see Section C5)</p> <p>(l) Repair or renew compressor (see Section C5)</p> <p>(m) Dismantle recirculating flap linkage, clean, lubricate and adjust. Check actuator for correct operation (see Section C8)</p> <p>(n) Fit new coolant tap or actuator (see Section C1)</p> <p>(o) Fit new coolant tap actuator (see Section C1)</p>
<p>4. Excessive cooling of too little air</p>	<p>4. (a) *Suction throttling valve incorrectly adjusted, evaporator pressure lower than 30lb/sq. in. (2,11 kg/sq. cm.) at maximum cooling setting resulting in icing of evaporator and loss of cooling air flow</p> <p>(b) *Suction throttling valve stuck in fully open position, evaporator pressure pulls down below 30lb/sq. in. (2,11 kg/sq. cm.) resulting in icing of evaporator and loss of cooling air flow</p>	<p>4. (a) Adjust suction throttling valve (see Section C6 – front valve or Section C9 – rear valve)</p> <p>(b) Adjust suction throttling valve. If valve does not respond to adjustment, repair or if necessary renew (see Section C6 – front valve or Section C9 – rear valve)</p>
<p>5. Noise or vibration</p>	<p>5. (a) Loose compressor belt</p> <p>(b) Loose compressor mountings</p> <p>(c) Damaged compressor shell or worn internal parts</p> <p>(d) *Defective expansion valve</p>	<p>5. (a) Adjust belt tension (see Section C5)</p> <p>(b) Tighten compressor mountings (see Section C5)</p> <p>(c) Repair or renew compressor (see Section C5)</p> <p>(d) Renew expansion valve (see Section C6 – front valve or Section C9 – rear valve)</p>
<p>Front System Only 6. Upper quantity actuator operates in refrigeration position</p>	<p>6. (a) Fault in diode</p>	<p>6. (a) Fit new diode (see Chapter M - Distributon Board)</p>

*On Long Wheelbase cars fitted with a centre division, check the front or rear component, whichever is suspect e.g. if there is insufficient air flow from the air conditioning outlets in the front compartment check the front blower motors and if there is insufficient air flowing from the outlets in the rear compartment quarter panels check the rear refrigeration unit blower motors.

Section C11

WORKSHOP TOOLS

<i>Tool Number</i>	<i>Description</i>
RH 529	Spring Balance – 0 to 25 lb.
RH 530	Thermometer
RH 7789 (J-9397)	Compressing Fixture – Compressor
RH 7790 (J-9432)	Bearing Installer – Compressor
RH 7791 (J-8433)	Extractor – Compressor Pulley
RH 7792 (J-9395)	Pilot – Compressor Pulley
RH 7793 (J-9392)	Seal Fitting and Extracting Tool – Compressor Shaft (Carbon type seal)
RH 7794 (J-8092)	Universal Handle – Compressor (For use with Tools RH 7791 and RH 7795)
RH 7795 (J-9398)	Pulley Bearing Remover – Compressor
RH 7796 (J-9481)	Pulley and Bearing Installer – Compressor
RH 7797 (J-21303)	Seal Protector – Compressor
RH 7798 (J-9403)	Clutch Holding Tool – Compressor
RH 7799 (J-9480)	Fitting Tool – Clutch Plate and Hub – Compressor
RH 7800 (J-9401)	Extractor – Clutch Plate and Hub – Compressor
RH 7801 (J-9402)	Parts Tray – Compressor
RH 7802 (J-9393)	Extraction and Fitting Tool – Seal Seat – Compressor

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<i>Tool Number</i>	<i>Description</i>
RH 7803 (J-9521)	Support Block – Internal Mechanism – Compressor
RH 7934	Adjuster – Suction Throttling Valve
RH 7937	Adaptor – Schrader Valve
RH 8342 (J-23128)	Seal Fitting and Extracting Tool – Compressor Shaft (Ceramic type seal)

Chapter D

LUBRICATION AND MAINTENANCE

SECTION	PAGE
D1 Approved Lubricants	D1
D2 Periodic Lubrication and Maintenance	D3
D3 Lubrication of the Steering Linkage Joints	D4

Section D1

APPROVED LUBRICANTS

Countries other than U.S.A. and Canada

	BP	CASTROL	DUCKHAMS	ESSO	MOBIL	SHELL	TEXACO
†Engine †SU Carburetter Dampers, Hand Oiling Points	BP Super Visco-static 20W/50 10W/50 10W/40 10W/30	Castrol GTX Castrox GTX-2 Castrolite	Duckhams 'Q' Motor Oil	UNIFLO	Mobilol Super 20W/50 15W/50 10W/50	Shell Super Motor Oil (20W/50) Shell Super Motor Oil (10W/50)	
*Torque Converter Transmission, *Steering Pump *Steering Idler Box Damper	BP Autran DX (Dexron)	Castrol TQ Dexron ®		Esso Automatic Transmission Fluid (Dexron)	Mobil ATF 220 (Dexron)	Shell Auto- matic Transmission Fluid Dexron	Texamatic Fluid 9226
Final Drive Unit, Drive-shaft Ball and Trunnion Joints,	BP Gear Oil SAE 90 EP	Castrol Hypoy 90 or Castrol Hypoy B		Esso Gear Oil GX 85/140 or GX 90	Mobilube HD 90	Shell Spirax 90 EP	
Front and Rear Hubs, Steering Idler Box Housing, Drive shaft Outer Universal Joints	BP Energrease L2	Castrol LM Grease		Esso Multi-purpose Grease H	Mobilgrease MP	‡Shell Retinax A	
Distributor Cam (Prior to OPUS ignition)	Midlands Silicones No. 4 Grease						
Height Control Valve Operating Rod Ball Joints, Steering Joints, Parking Brake Linkage Clevis and Fulcrum Pins	Rocol MTS 1000 Grease						
Fuel Tank Drain Plug	Rocol MV3 or Rocol A.S. Spray						
Parking Brake Inner Cable and Pulley Grooves	Midlands Silicones MS44 Grease						
Refrigeration Compressor	Frigidaire 525						
Hydraulic Brakes and Automatic Height Control System	Castrol RR 363 Brake Fluid. This fluid exceeds current S.A.E. J1703 specifications in many respects and complies with D.O.T. 3 grade of FMVSS 116.						
Power Operated Hood Reservoir	‡Lorco 6659, Gargoyle Artic Oil Light, Shell Clavus 27 or Castrol Icematic 66						

†Recommended engine oil grades for cars operating in low temperatures:

For constant outside temperatures of between 0°C and -23°C. (32°F. and -10°F.) use a 10W/30 grade oil.


For constant outside temperatures of -23°C. (-10°F.) and below, use a 5W/20 grade oil.

*Also approved any Dexron Transmission Fluid.

‡First preference.

Chapter D

U.S.A. and Canada

	BP	CASTROL	DUCKHAMS	EXXON/ IMPERIAL	MOBIL	SHELL	TEXACO
Engine, Carburetter Dampers, Hand Oiling Points	BP Super Visco-static 10W/40	Castrol GTX Castrol Super GTX	Duckhams 'Q' Motor Oil	UNIFLO	Mobiloil 10W/50	Super Shell Motor Oil	
Final Drive Unit, Drive-shaft Ball and Trunnion Joints	BP Extra duty Gear Oil SAE 90EP or BP Gear Oil MP 80/90	Castrol Hypoy B 90 or Castrol Hypoy 90		Esso Gear Oil GX 85W/140 or GX 90	Mobilube HD 90	Shell Spirax 90 EP	
Front and Rear Hubs, Steering Idler Box Housing, Drive-shaft Outer Universal Joints	BP Ener-grease MP	Castrol MP Grease or Castrol LM Grease		Ronex MP Grease or Unitol	Mobilgrease MP	Shell Darina AX	
*Torque Converter Transmission, *Steering Pump *Steering Idler Box Damper	BP Aufran-Dexron or BP ATF Dexron	Castrol TQ Dexron 		Esso Automatic Transmission Fluid (Dexron II)	Mobil ATF 220 Dexron	Shell Donax T6 or ATF Dexron	Texamatic Fluid 9226
Distributor Cam (Prior to OPUS ignition)	Midlands Silicones No. 4 grease						
Height Control Valve Operating Rod Ball Joints, Steering Joints, Parking Brake Linkage Clevis and Fulcrum Pins	Rocol MTS 1000 Grease						
Fuel Tank Drain Plug	Rocol MV3 or Rocol A.S. Spray						
Parking Brake Inner Cable and Pulley Grooves	Midlands Silicones MS44 grease						
Refrigeration Compressor	Frigidaire 525						
Hydraulic Brakes and Automatic Height Control Systems	Castrol RR363 Brake Fluid. This fluid exceeds current S.A.E. J1703 specifications in many respects and complies with D.O.T. 3 grade of FMVSS 116.						
Power Operated Hood Reservoir	Lorco 6659						

* Also approved any Dexron Transmission Fluid

Section D2

PERIODIC LUBRICATION AND MAINTENANCE

When carrying out service schedules reference should be made to the Service Schedule Manual publication number T.S.D. 4117.

Section D3

LUBRICATION OF THE STEERING
LINKAGE JOINTS

Suspension

The suspension requires no lubrication as all joints are pre-packed sealed units, although it is possible to renew the seals if damaged (see Chapter H - Sub frames and Suspension).

Steering

Lubrication of the steering linkage joints is accomplished through six grease nipples (see Fig. D1).

The grease nipples should be lubricated with the approved grease every 12,000 miles (20000 km.) or 12 months.

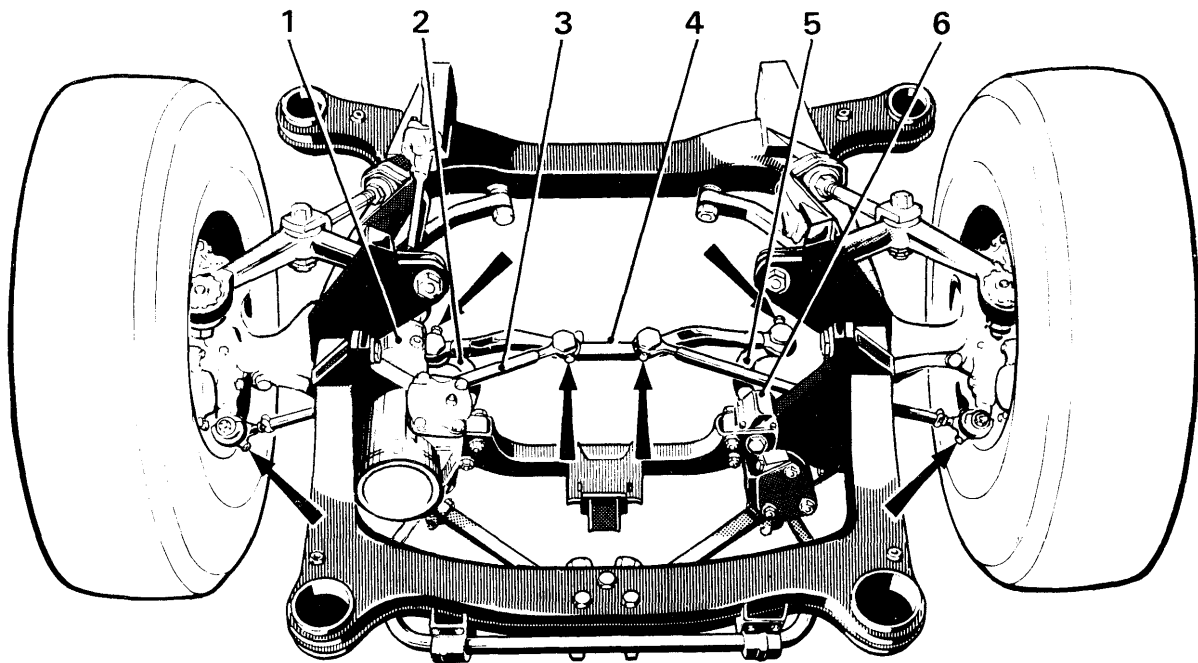


FIG. D1 STEERING JOINT LUBRICATION

- 1 Steering box
- 2 Steering lever
- 3 Track rod
- 4 Cross-beam
- 5 Idler lever
- 6 Steering idler box dampener

← Grease points

Chapter E

ENGINE

SECTION	PAGE
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E1 Engine Removal and Fitting	E5
E2 Cylinder Heads	E11
E3 Crankcase and Cylinder Liners	E17
E4 Crankcase and Main Bearings	E19
E5 Connecting Rods and Pistons	E25
E6 Valve Gear and Hydraulic Tappets	E31
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Chapter E

ENGINE

Introduction

The engine (*see Figs. E1 and E2*) is an eight - cylinder over square 90°Vee form, four stroke, cooled by an approved anti-freeze mixture.

The engine is mounted onto the front sub-frame by rubber mounts. The aluminium crankcase incorporates detachable wet cylinder liners of centrifugally spun cast iron. The aluminium alloy pistons have three compression rings and one oil control ring on the 9,14 cm. (3.600 in.) stroke engine and two compression rings and one oil control ring on the 9,90 cm. (3.900 in.) stroke engine.

All piston rings are fitted above the gudgeon pin which is offset to the vertical axis of the piston.

The engine has two aluminium alloy cylinder heads each having four separate inlet and exhaust ports. The cylinder heads are fitted with phosphor bronze exhaust valve guides, cast iron inlet valve guides and austenitic steel valve seat inserts. The valves are austenitic steel with a stellite tip and valve seat face. The overhead valve mechanism is operated from a single camshaft by push rods and self adjusting hydraulic tappets.

The five journal crankshaft is forged from chrome molybdenum steel, nitride hardened and dynamically balanced. Location is by steel backed, lead bronze thrust washers at the centre bearing. The crankshaft is drilled for pressure lubrication of all bearings and the crankpins incorporate sludge traps with removable sealing plugs.

The main and big end bearing shells are lined with reticular aluminium-tin.

The engine is lubricated by oil from the sump, circulated by a gear driven pump mounted on the front of the crankcase. High pressure oil from the full flow filter is delivered to the crankshaft, connecting rods, camshaft bearings, timing gears, tappets, push rods and rocker ball end seatings. Low pressure oil is fed intermittently through the front camshaft bearing to the rocker shafts, rocker arms and valve tips. The connecting rod small ends, gudgeon pins and cylinder walls are splash fed with oil from the crankcase.

Identification

The cylinder banks are referred to as the 'A' and

'B' bank sides of the engine.

Viewed from the driving position 'A' bank is on the right and 'B' bank on the left-hand side of the engine compartment.

Long and short stroke engines

There are two basic engine types, a short stroke engine and a long stroke engine. Identification can be made by reference to either the car serial number or the engine serial number.

Car serial number

Cars produced prior to serial number SRH 8742 have engines fitted with cylinder dimensions of 10,41 cm. x 9,14 cm. (4.100 in. x 3.600 in.).

Cars produced from serial number SRH 8742 and onwards have engines fitted with cylinder dimensions of 10,41 cm. x 9,90 cm. (4.100 in. x 3.900 in.).

Engine number

Engines can be identified by the prefix of the engine serial number. This number is stamped on a small crankcase boss situated directly under the thermostat housing.

The prefix letters 'SY' refer to the short stroke engine; the prefix letters 'SYL' refer to the long stroke engine.

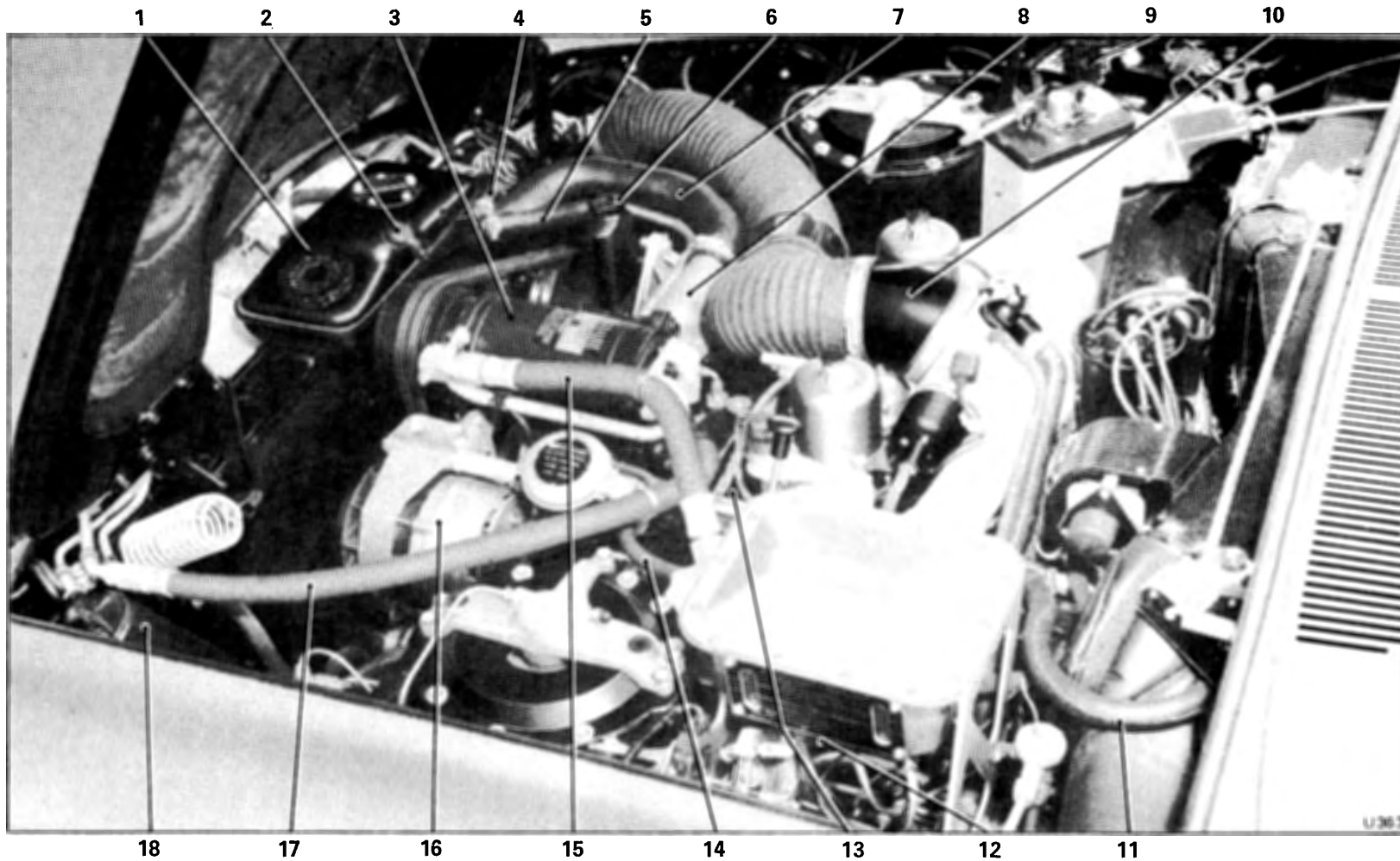


Fig. E1 General view of engine compartment - Early cars

- | | | |
|--------------------------------------|-----------------------------------|--------------------------------------|
| 1 Radiator header tank | 7 Coolant hose | 13 Brake pump (hidden) |
| 2 Coolant level probe | 8 Thermostat elbow | 14 Low pressure hose |
| 3 Refrigeration compressor | 9 Engine wiring loom connections | 15 Low pressure refrigeration pipe |
| 4 Coolant overflow hose | 10 Air intake | 16 Alternator |
| 5 Coolant hose | 11 Heating system hose | 17 High pressure refrigeration |
| 6 Steering pump reservoir filler cap | 12 Wiring loom connector (hidden) | 18 Refrigeration receiver/drier unit |

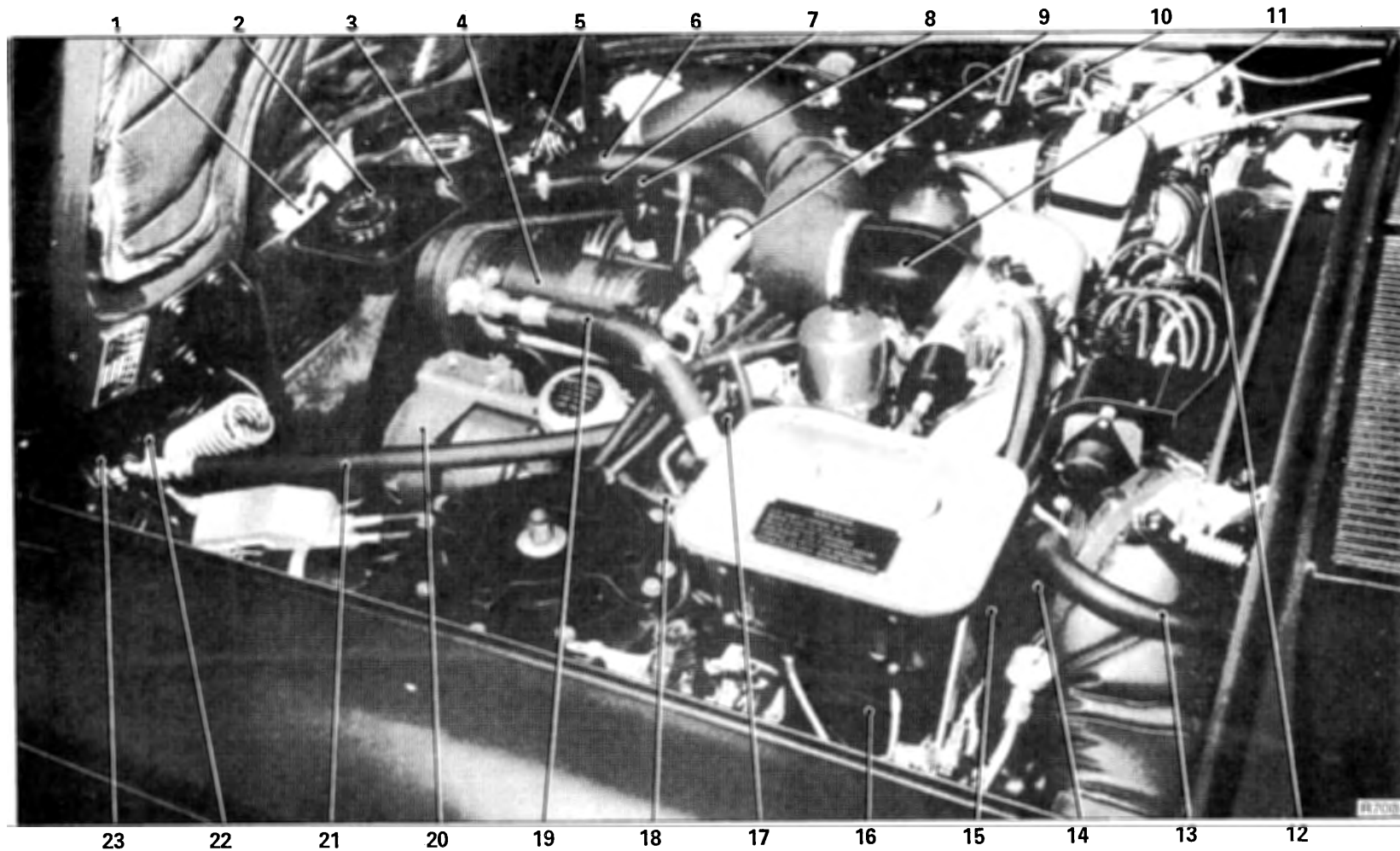


Fig. E2 General view of engine compartment - Late cars

- | | | |
|--------------------------------------|---|-------------------------------------|
| 1 Bonding strip | 9 Thermostat elbow | 17 Front brake pump (hidden) |
| 2 Radiator header tank | 10 Engine wiring loom connections | 18 Low pressure hose |
| 3 Coolant level probe leads | 11 Air intake | 19 Low pressure refrigeration pipe |
| 4 Refrigeration compressor | 12 Wiring loom connector block (hidden) | 20 Alternator |
| 5 Coolant overflow hose | 13 Heating system hose | 21 High pressure refrigeration pipe |
| 6 Coolant hose | 14 Heating system hose (hidden) | 22 Pipe - Refrigeration condenser |
| 7 Coolant hose | 15 Low pressure hose | 23 Pipe - Refrigeration condenser |
| 8 Steering pump reservoir filler cap | 16 Wiring loom connector (hidden) | |

Section E1

ENGINE REMOVAL AND FITTING

Information

Before attempting engine removal reference should be made to Chapter G - Special Precautions. This section should be read and fully understood so that depressurising the hydraulic systems and disconnecting the hydraulic pipe work affecting the engine are carried out correctly.

Dependent upon the specification of a particular car, it is suggested that the operator also familiarises himself with the details contained in the chapter listed below, before commencing any work on the engine.

Air Conditioning - Chapter C
 Fuel System and Carburettors - Chapter K
 Exhaust Emission Control System - Chapter U
 Transmission - Chapter T Parts 1 and 2

The following pages describe the best method of engine removal, which is by lifting the engine out through the bonnet aperture. However, should it be necessary to remove the sub-frame, the engine may be removed complete with gearbox (transmission) and sub-frame from underneath the car. This method of engine removal is fully described in Chapter H.

To remove the engine through the bonnet aperture, proceed as follows.

Engine - To remove

1. Drive the car onto a ramp or over a pit.
2. Chock both front wheels and one of the rear wheels to prevent the car from moving. To protect the paintwork on the wings from accidental damage while working in the engine compartment, it is recommended to fit a wing cover set RH 2684 and liners RH 2685.
3. Drain the cooling system as described in Chapter L.
4. Depressurise the hydraulic systems as described in Chapter G.
5. Disconnect the battery leads.
6. Remove any dirt surrounding the engine oil drain plug then remove the plug together with the aluminium sealing washer. Drain the oil into a container of suitable capacity (*see Fig. E5*).

Inspect the aluminium sealing washer; renew if necessary and then fit the sealing washer and the drain plug.

7. If refrigeration is fitted, discharge the system as described in Chapter C - Part 2.

8. If the exhaust emission control and evaporative emission control systems are fitted, refer to Chapter U for information relating to the removal of the various components.

9. Scribe location lines around the profile of the engine mounting brackets (*see Fig E4*); this is necessary to ensure correct engine alignment when the engine is replaced.

10. Remove the torque converter transmission or four speed automatic gearbox as applicable.

Chapter T Part 1 gives the correct procedure for removal of the four speed automatic gearbox.

Chapter T Part 2 gives the correct procedure for removal of the torque converter transmission.

A plate attached to the right-hand side of each transmission (as viewed from the driver's seat) serves to determine the type of transmission fitted; the plate for the torque converter transmission is rectangular and the plate for the four speed automatic gearbox is oval.

11. After removal of the transmission, the jack taking the weight of the engine (*see Fig. E5*) should be left in position and the following work carried out (*refer to Fig. E1 and E2*).

12. Disconnect the bonnet lamp leads at the switch snap connectors and connector block; these are situated just below the right-hand bonnet hinge (*see Fig. E6*). Detach the leads and clips from the body.

13. Disconnect the bonding strip from the front of the bonnet (*see Figs. E1 and E2 item 1*).

14. Remove the eight setscrews securing the bonnet to its two hinges. Remove the bonnet.

15. Slacken the worm drive clips securing the air silencer tube to the carburettor air intake; detach the tube from the intake together with the bonding strip (if fitted).

16. Slacken the worm drive clip at the intake end of the air silencer tube then detach the tube.

17. Slacken the two screws from the air silencer clamp, then withdraw the tube through the clamp and

Chapter E

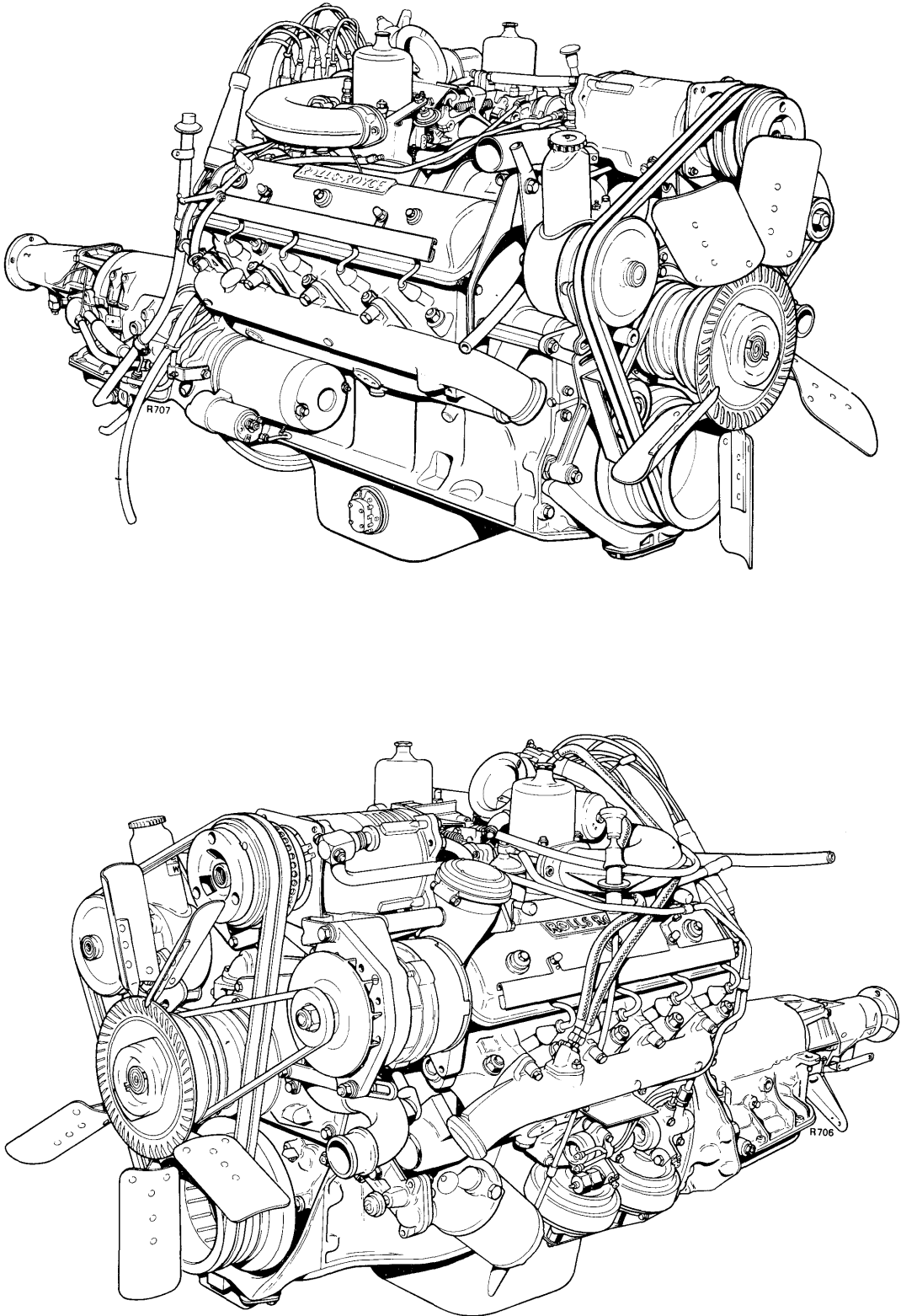


FIG. E3 GENERAL VIEWS OF 6,75 LITRE ENGINE UNIT

remove from the engine compartment.

18. To prevent the ingress of dirt, blank off both the carburettor air intake and the air silencer outlet apertures.

19. Disconnect the coolant level probe leads from the header tank (see Figs. E1 and E2 item 3); detach the leads from the header tank.

20. Slacken the worm drive clips securing the coolant hose and coolant overflow hose to the rear of the header tank; detach the hoses.

21. Slacken the worm drive clip securing the coolant hose to the radiator upper connection; detach the hose.

22. Slacken the worm drive clip securing the coolant hose to the radiator lower connection; detach the hose.

23. On cars fitted with a fan cowl of either metal or plastic, the procedure for removing the radiator assembly is as follows:

- a. Place a piece of sheet foam rubber inside the cowl, ensure that it covers the radiator matrix, thus providing protection against accidental damage during removal.
- b. Unscrew the four setscrews securing the fan extension to the coolant pump pulley.
- c. Carefully ease the fan assembly from the pulley and place inside the cowl onto the sheet of foam rubber.
- d. By using a metal support strap or similar arrangement, secure the fan assembly so that it cannot move during removal of the radiator, as illustrated on Figure E11.

24. Remove the four setscrews securing the radiator in position, two of these setscrews are shown on Figure E6 the other two are located on the opposite side of the radiator; remove the radiator together with the header tank.

25. Remove the four setscrews securing the fan in position then remove the fan together with its extension.

26. Disconnect the two pipes to the refrigeration compressor (if fitted); refer to Figures E1 and E3, items 19 and 21.

27. To prevent the ingress of dirt, fit blanks to the ends of the pipes.

28. Remove the steering pump reservoir filler cap.

29. Using a syringe, transfer as much fluid as possible from the steering pump reservoir into a container and discard the fluid; approximately 0,5 litre (0.75 pint) of fluid can be removed in this way (see Fig. E7).

30. Disconnect the two steering pump hoses from the pump, simultaneously placing a container beneath the exposed tubes to prevent any fluid spilling onto the floor. To prevent ingress of dirt and further oil spillage, fit blanks to the open ends of the tubes and hoses and leave them supported in a vertical position.

31. Slacken the worm drive clips from the two heating system hoses then detach the hoses. These

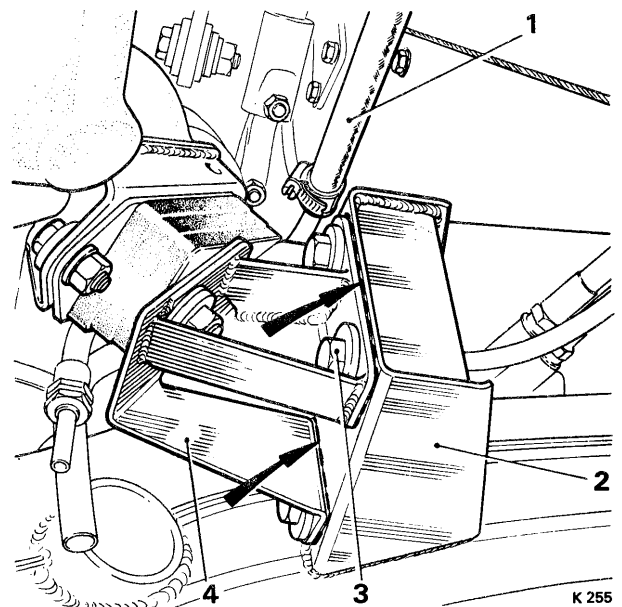


FIG. E4 POSITIONS FOR SCRIBING ENGINE MOUNTING PROFILE

- | | |
|-------------------|---------------------|
| 1 Petrol pipe | 3 Mounting setscrew |
| 2 Front sub-frame | 4 Mounting bracket |

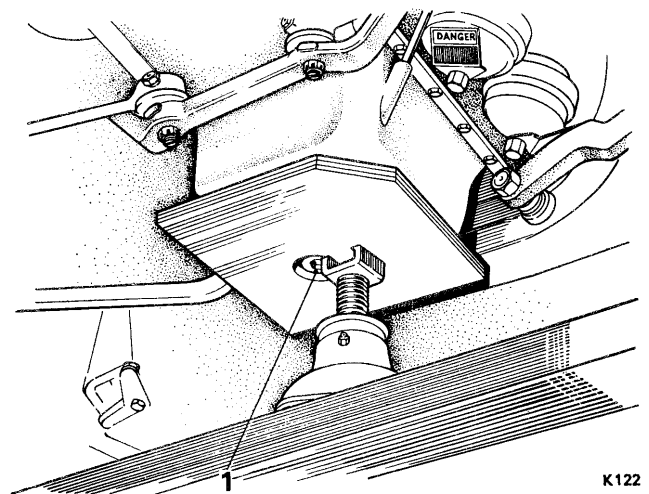


FIG. E5 JACK IN POSITION

- 1 Sump drain plug

hoses are situated immediately below the upper heating system actuators (see Figs. E1 and E2 items 13 and 14).

32. Slacken the worm drive clips securing the two low pressure hydraulic brake pump hoses. One of the clips is situated below the upper heating system actuators (see Figs. E1 and E2 item 15) and the other clip is situated adjacent to the engine oil filler cap (see Figs. E1 and E2 item 18). Blank off the ends of the hoses to prevent ingress of dirt and fluid drainage from the reservoir.

33. Slacken the two worm drive clips securing the

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accumulator to reservoir low pressure return hoses, then disconnect the hoses (*see Fig. E8 item 1*). Blank off the hose ends to prevent ingress of dirt also drainage from the reservoir. On some later cars the accumulators are situated one on each side of

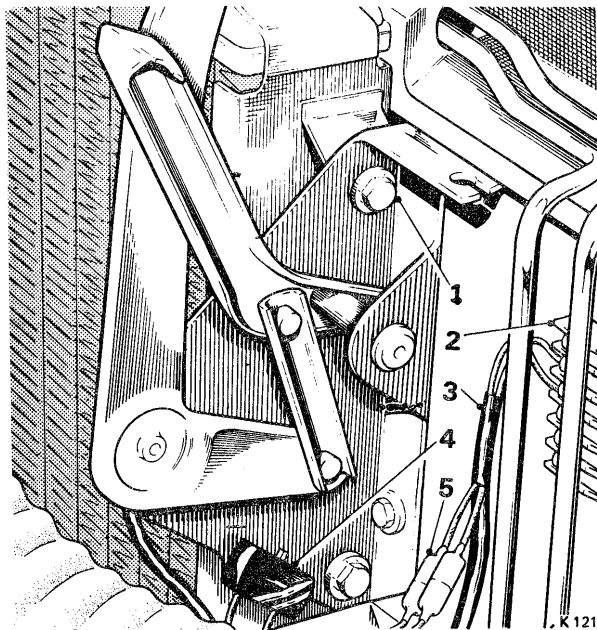


FIG. E6 RADIATOR MOUNTING

- 1 Setscrew - radiator (4 off)
- 2 Connector block
- 3 Wiring loom
- 4 Bonnet lamp switch
- 5 Snap connectors

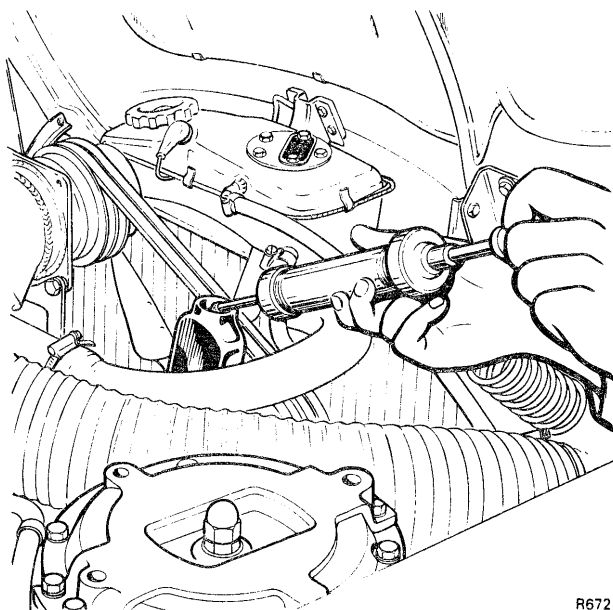


FIG. E7 REMOVING FLUID FROM STEERING PUMP RESERVOIR

the engine.

34. Disconnect the two high pressure hoses which run between the accumulator and body connection (*see Fig. E8 item 2*). Blank off the pipe ends to prevent the ingress of dirt.

35. Slacken the worm drive clip fitted to the petrol supply pipe then disconnect the pipe. The worm drive clip is situated just above the combined engine and gearbox (transmission) flexible mounting on the 'A' bank side of the car refer to Figure E4.

36. Disconnect the oil filter electrical leads (*see Fig. E8*).

37. Remove the three exhaust downtake pipe clamps adjacent to the engine then detach the 'A' bank pipe from the engine and remove the short 'B' bank downtake pipe.

38. Disconnect the engine wiring looms at their socket and blade connections, there are three blocks of these connections which are situated as follows.

Block 1 Immediately below the right-hand blower motor (when viewed from the driver's seat). (*see Fig. E10 item 2*).

Two connections only of this block pertain to the engine, however for practical reasons it is better to disconnect all the connections. When the windscreen wiper motor is fitted adjacent to the blower motor, access to these connections will be simplified if the windscreen wiper motor and the blower motor are removed.

Block 2 On the cast arm of the oil filter (*see Fig. E9 item 1*).

Block 3 Adjacent to the heating system water tap (*see Figs. E1 and E2 item 16*).

39. Disconnect the leads to the remote starter switch (*see Fig. E11*).

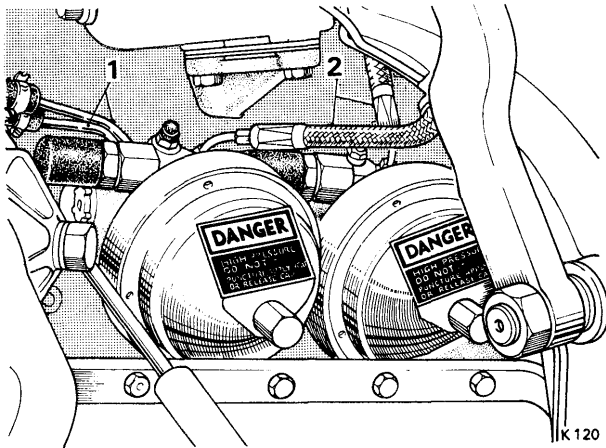
40. Disconnect the control rod which is fitted between the pedal linkage and compensator linkage (*see Fig. E11 item 2*).

41. Remove the long bolt and nut securing the compensator linkage to the mounting bracket adjacent to the rear end of the 'A' bank cylinder head (*see Fig. E11 item 1*); attach the compensator linkage to the engine.

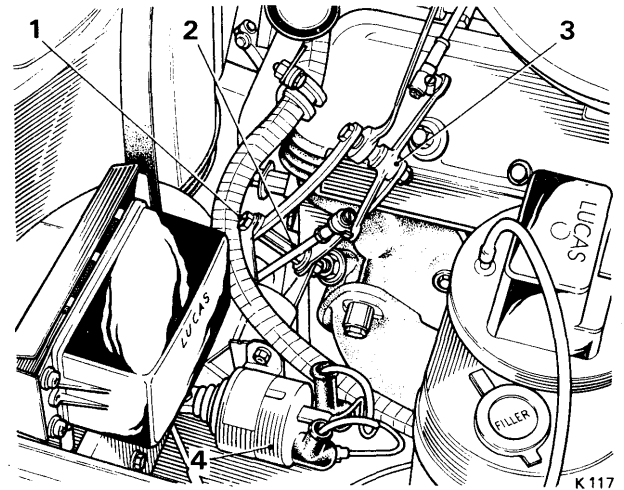
42. Remove the starter motor if it has not been removed previously.

43. Disconnect the leads to the ignition coil then remove the two setscrews securing the coil clamping bracket to the induction manifold; remove the coil.

Note The coil must be removed from the engine before engine removal, otherwise it will foul the upper heating actuator mounting as the engine is lifted clear of the engine compartment.

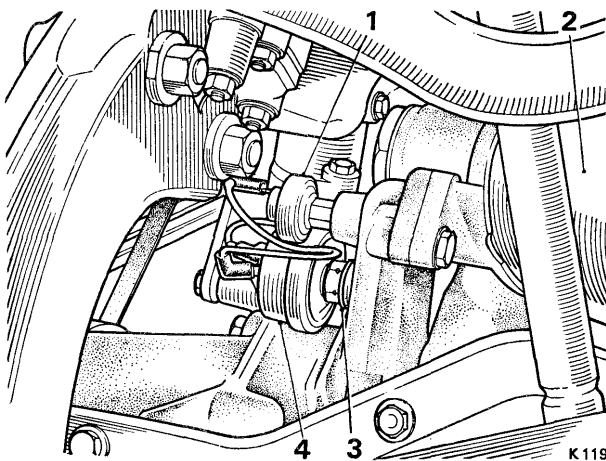
**FIG. E8 POSITION OF HYDRAULIC ACCUMULATOR**

- 1 Low pressure hoses 2 High pressure hoses

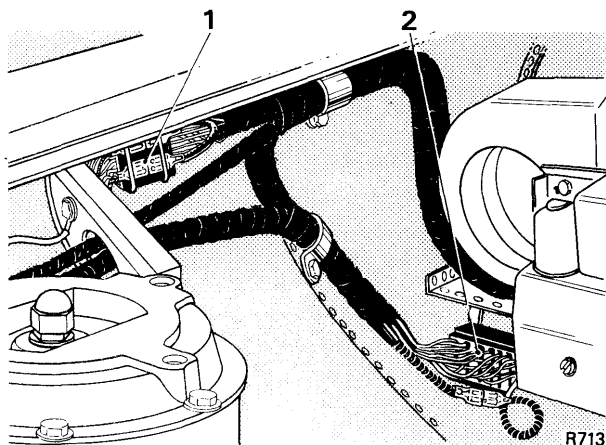
**FIG. E11 COMPENSATOR LINKAGE AND REMOTE STARTER MOTOR SWITCH (Early Cars)**

- 1 Long bolt and nut
2 Control rod
3 Compensator linkage
4 Remote starter switch

44. Using a crane and slings capable of lifting 10 cwt. take the weight of the engine.
45. Disconnect the engine front mounting.
46. Check to ensure that the engine is completely disconnected from any pipes, wiring etc.
47. Carefully lift the engine out of the engine compartment simultaneously checking to ensure that the engine does not foul any point of the engine compartment.

**FIG. E9 OIL PRESSURE TRANSMITTER LEADS**

- 1 Oil pressure warning lamp switch
2 Filter Bowl
3 Copper washer
4 Oil pressure transmitter (if fitted)

**FIG. E10 POSITION OF ENGINE LOOM SOCKET**

- 1 Connector block 2 Connector block

Engine - To replace

To fit the engine into position reverse the procedure given for its removal noting the following points.

- When lowering the engine into position, ensure that the flywheel and rear of the engine do not get trapped against the rear crossmember of the front sub-frame, otherwise damage to these parts will result.
- Position the engine on its rear mounts, so that the scribed lines on the sub-frame align with the profile of the mounts (see Fig. E4).
- With the engine front mounting setscrews slack, adjust the position of the engine mounting stop plate so that there is a 1,27 mm. (0.050 in.) gap between the bonded rubber strip on the stop plate and the crossmember stop bracket (see Fig. E13). The engine stop plate has elongated holes to allow it to be moved fore and aft as required.

After the 1,27 mm. (0.050 in.) gap has been set, tighten the engine front mounting setscrews.

- To avoid damage to the conical seats (where fitted), care should be taken not to overtighten the pipes at the unions on the power assisted steering pump reservoir.

Chapter E

5. Any hoses showing signs of deterioration should be renewed.
6. Fill the engine with fresh approved oil to the level marked on the dipstick.
7. Fill the coolant system with the approved anti-freeze.
8. Fill the power steering reservoir with fresh approved fluid.
9. Fill the hydraulic fluid reservoir.

10. Connect the battery leads.
11. Fill the transmission with fresh approved fluid as described in Chapter T.
12. Bleed the hydraulic systems as described in Chapter G.
13. Bleed the power steering system as described in Chapter N.
14. Charge the refrigeration system as described in Chapter C.
15. Tighten all nuts, bolts, setscrews etc., to the torque figures specified in Chapter P.
16. With the engine running, check all pipes, hoses and joints for leaks.
17. After a short period of engine operation, check all oil and fluid levels and top-up to the correct levels if necessary.

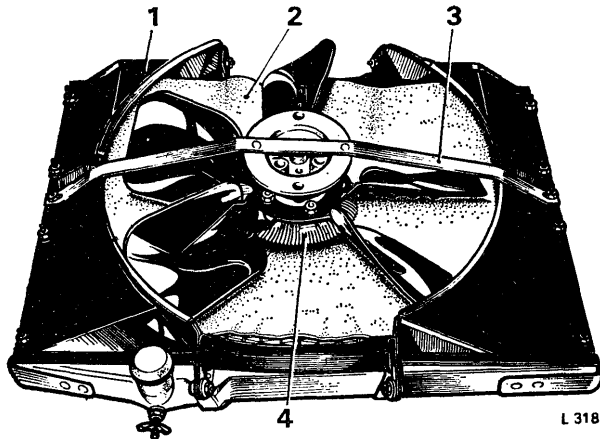


FIG. E12 METHOD OF RETAINING FAN ASSEMBLY FOR RADIATOR/ENGINE REMOVAL

- | | |
|-------------------|------------------------|
| 1 Fan cowl | 3 Support strap |
| 2 Sheet of rubber | 4 Viscous fan assembly |

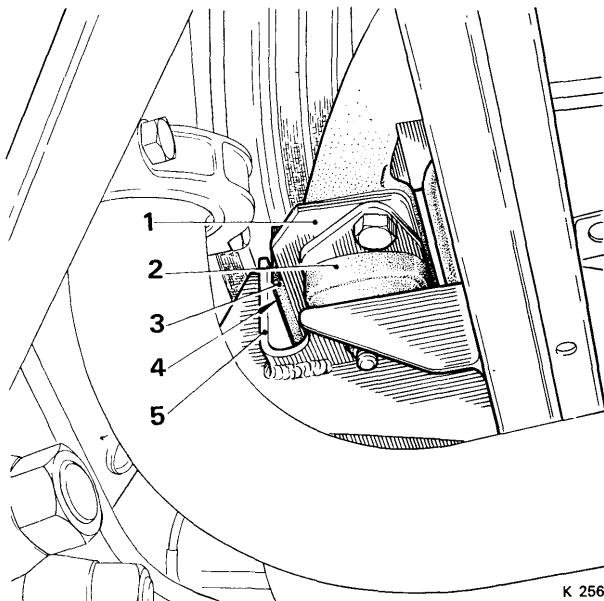


FIG. E13 ENGINE MOUNTING - Front Stop Plate Gap

- 1 Engine stop plate
- 2 Front engine mounting
- 3 Rubber strip
- 4 Gap 1,27 mm. (0.150 in.)
- 5 Front crossmember stop bracket

Section E2

CYLINDER HEADS

Cylinder heads - To remove

1. To remove the heads with the engine in the car, fit front wing cover sets number (RH 2684) and cover liner set number (RH 2685) over each wing to protect paintwork.

2. Disconnect the battery.

3. Depressurise the hydraulic systems (*see Chapter G - Special Precautions*).

4. Drain the cooling system as described in Chapter L.

5. If refrigeration is fitted, discharge the system (*see Chapter C - Part 2*).

6. Remove the engine oil dipstick.

7. Disconnect the vacuum advance pipe (if fitted) between the distributor and 'B' bank carburetter.

8. Remove the carburetters and air horns assembly (*see Chapter K or Chapter U*).

9. Remove the refrigeration compressor (if fitted) (*see Chapter C - Part 2*); blank off all open ended pipes to prevent the ingress of dirt.

10. Detach the alternator (if fitted) from the cylinder head (*see Chapter M*).

11. Remove the generator (*see Chapter M*).

12. Disconnect the hydraulic pipes from the brake pumps; blank off the open ends of the pipes to prevent the ingress of dirt.

13. Detach the gearbox (transmission) dipstick tube from the 'A' bank cylinder head.

14. Remove the long control rod fitted between the compensator linkage and the pedal linkage (*see Fig. E11*).

15. Remove the long bolt securing the compensator linkage to the mounting bracket (*see Fig. E11*).

16. If a four speed automatic gearbox is fitted, disconnect the throttle valve control rod from the manifold shaft lever. This rod is situated adjacent to the distributor.

17. Disconnect the engine wiring looms (*see Section E1 - Engine - To remove - Operation 38*).

18. Remove as much fluid as possible from the steering pump then disconnect the hoses (*see Section E1 - Engine - To remove - Operations 28, 29 and 30*).

19. Remove the steering pump.

20. Remove the rubber coolant hose from the thermostat elbow.

21. Detach the clip from the thermostat housing.

22. Disconnect the heating system hoses, these hoses are situated adjacent to the upper heating system actuators (*see Figs. E1 and E2*).

23. Remove the two rigid heater pipes from their connections at the front of the engine.

24. Remove the ignition coil.

25. Remove the distributor head together with the ignition harness.

26. Remove the rocker covers.

27. Remove the induction manifold.

28. Remove the exhaust pipes from the exhaust manifolds; remove the manifolds (*see Chapter Q - Exhaust System*).

29. Remove the sparking plugs.

30. Progressively unscrew the five setscrews securing the rocker pedestals to the cylinder head and remove the rocker shaft assembly. Withdraw the push rods.

31. Using box spanner RH 7126 progressively unscrew the 20 cylinder head retaining nuts for each cylinder head. Commencing with those at each end and working inwards.

32. Lift off the cylinder heads and gaskets taking care that the cylinder head studs do not damage the face of the heads, check also, that the stud threads are not damaged.

Valve removal

1. To remove the valves, special tool number RH 7094 and the wooden base RH 7200 are required.

2. Fit a valve tool pedestal at each end of the cylinder head. The pedestals locate in the recesses used for the rocker pedestals and are secured by two nuts and bolts.

3. Place the head on the wooden base (RH 7200) ensuring that the four raised blocks fit into the combustion chambers to support the valves whilst the springs are being compressed.

4. Insert the fulcrum bar through the holes in the pedestals.

5. Fit the hook of the valve spring compression tool under the fulcrum bar and fit the stirrup over the valve top washers (*see Fig. E14*). Compress the valve spring and remove the two collets, followed by the valve spring top washer, valve spring, grommet

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housing, grommet, grommet spring and bottom washer.

6. The cylinder head may then be turned over and the valves removed.

Valve replacement

To fit the valves reverse the procedure given for their removal, noting the following points.

1. Ensure that each valve is fitted to the guide from which it was removed.

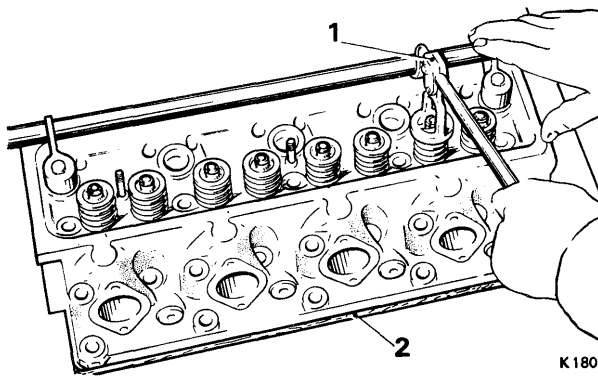


FIG. E14 REMOVAL OF VALVE COLLETS

- 1 Valve compressing tool (RH 7094)
- 2 Block of wood (RH 7200)

2. Check that the valves operate smoothly in their respective guides and that they are seating correctly.

3. Thinly coat the valve stems with 'Molykote G Rapid' grease or its equivalent and liberally lubricate the valve guide bores with engine oil before fitting the valves.

Assemble the valve collets in pairs on a clean dry surface. Apply a coat of 'Silastic' 732 sealant along one edge of each collet so that when assembled a coated edge opposes an un-coated edge. Allow approximately ten minutes before assembly. After assembly wipe off the excess sealant. Allow a period of at least 12 hours from applying the sealant before running the engine.

4. To fit collets that do not have a rubber strip bonded to one edge proceed as follows.

Ensure that the top washer and collets are degreased and the valve stem taper is wiped clean.

5. When fitting the valve springs, it should be noted that engines with the 9,14 cm. (3.600 in.) stroke (i.e. those with an engine number prefix of 'SY'), have interchangeable exhaust and inlet valve springs. The engines with the longer 9,90 cm. (3.900 in.) stroke (i.e. those with an engine number prefix of 'SYL'), have a stronger exhaust valve spring and therefore, inlet and exhaust valve springs from these later engines *must not be interchanged*.

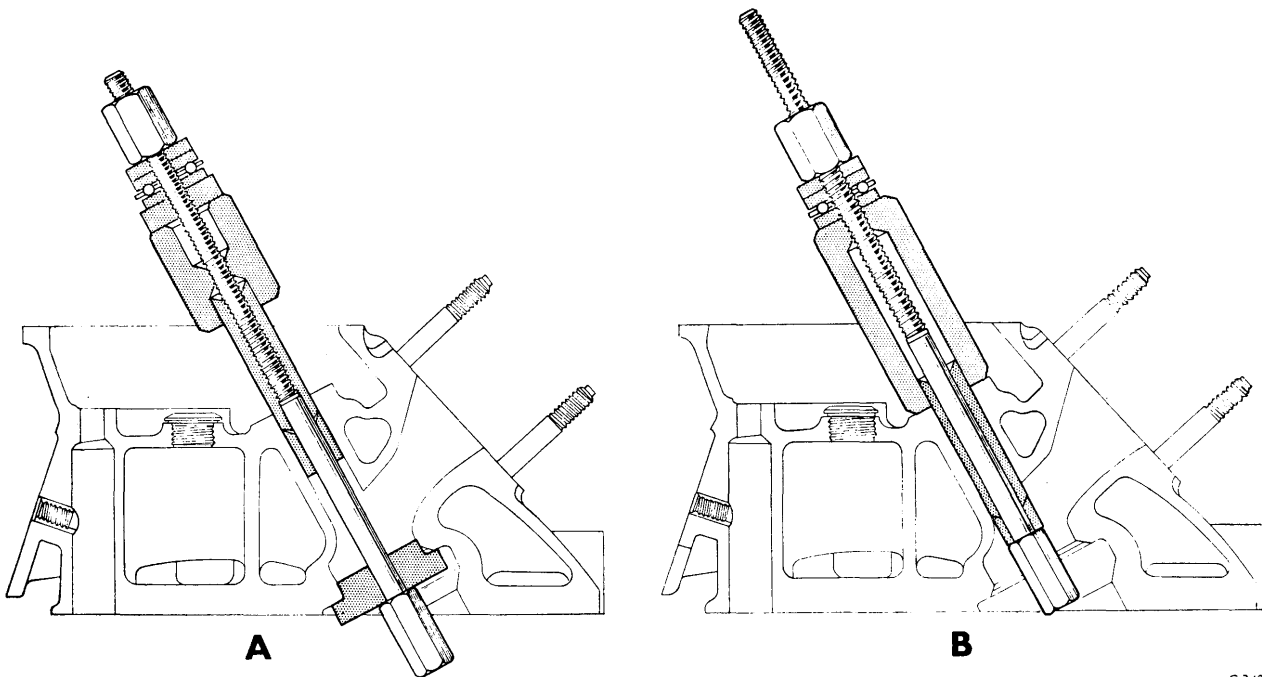


FIG. E15 VALVE GUIDE RENEWAL

- A Insertion
- B Extraction

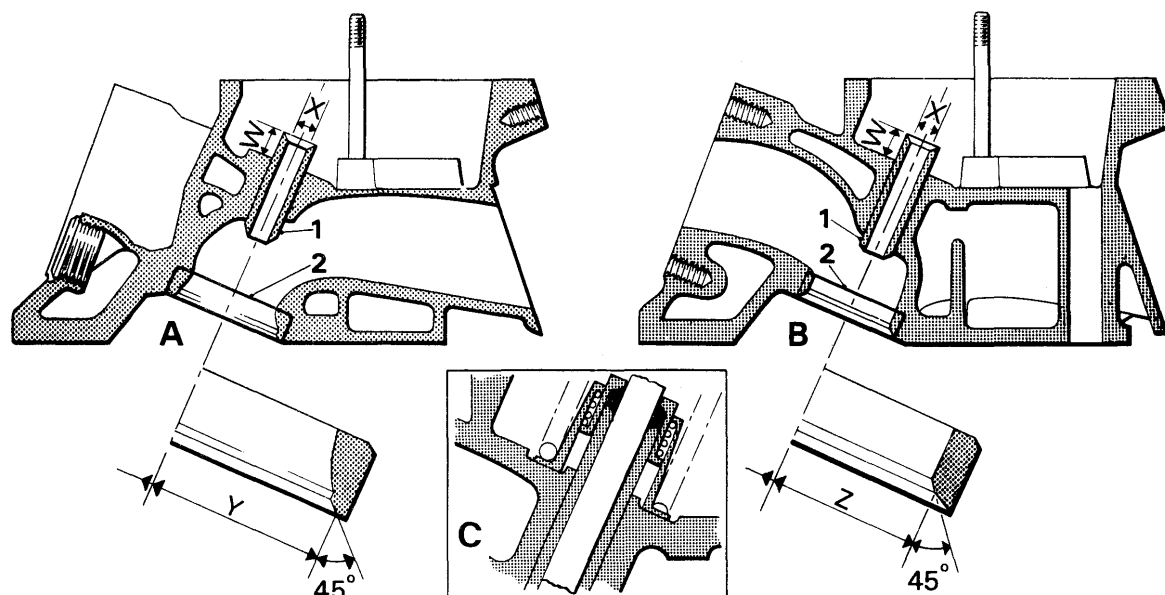


FIG. E16 INLET AND EXHAUST VALVE GUIDE AND SEAT DIMENSIONS

1 Valve guide	2 Valve seat insert	A Inlet	B Exhaust
		C Long stroke engine exhaust boss	
W = 18,796 mm. to 19,050 mm. (0.740 in. to 0.750 in.)		Y = 4,826 cm. to 4,851 cm. (1.900 in. to 1.910 in. dia.)	
X = 9,525 mm. to 9,5377 mm. (0.375 in. to 0.3755 in.)		Z = 3,899 cm. to 3,924 cm. (1.535 in. to 1.545 in. dia.)	

Valve guides - To remove

Remove the valve guides from the cylinder head using tools RH 7207 and RH 7272; draw the guides out from the rocker side of the head (see Fig. E15B).

Note Inset shows the narrow type of exhaust valve guide boss, fitted to the 'long stroke' type of engines.

Valve guides - To fit

1. Thoroughly clean the valve guide bores in the cylinder heads and measure the diameters of the bores.
2. Select a new set of oversize guides that will give the correct interference fit when fitted in the heads (see Section E11 - Dimensional Data).
3. Using the special tools RH 7207 and RH 7272 draw the valve guides into the heads from the rocker side until they stand the correct distance proud of the cylinder head face (see Fig. E16 - Dimension W).

4. Using special reamer RH 7825 or the tungsten carbide tipped version RH 7827, ream the inlet and exhaust valve guides to finished size.

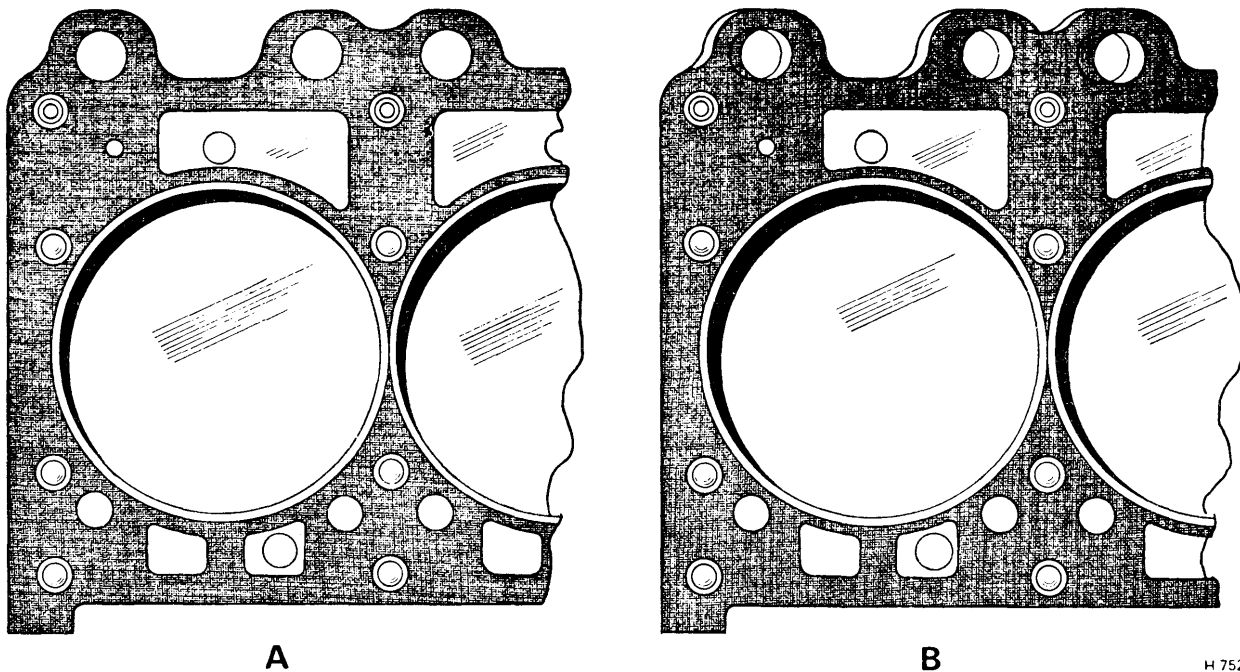
Valve seat inserts - To remove

1. Remove the inserts from the head by machining leaving a thin skin of metal of approximately 0,25 mm. (0.010 in.) thick.
2. After machining, carefully lift the insert shell from the bore in the head.

Valve seat inserts - To fit

1. Compare the sizes of the bore in the head from which the valve seat inserts have been removed with the standard figures given in Section E11 - Dimensional Data.
2. If the bores do not conform to these sizes, it will be necessary to machine them to a larger diameter and to fit oversize seat inserts (see Parts List).
3. Ensure that when new inserts are fitted into the head, the correct interference is maintained (see Section E11 - Dimensional Data).

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A

B

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FIG. E17 POSITIONING THE CYLINDER HEAD GASKET (Early Cars)

A Correct

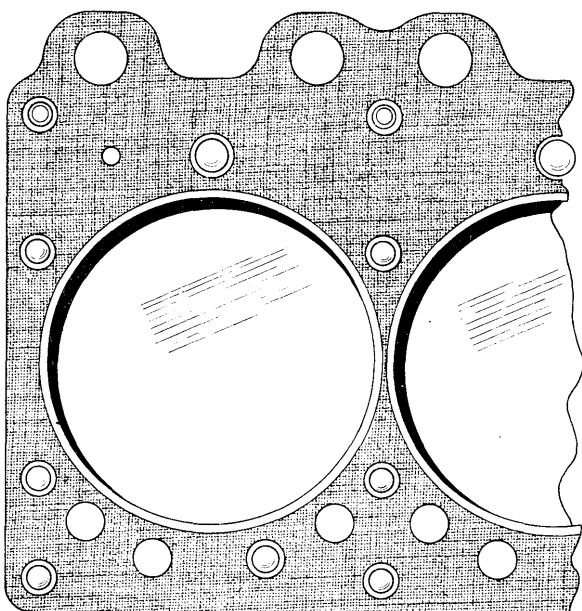
B Incorrect

4. To fit the seats it is necessary to heat the head in an oven to a temperature of 151.5°C (305°F) for a period of one hour. The head should then be quickly removed and the inserts driven into their bores in the head using a soft drift. Do not finish machine the valve seats until after the valve guides have been reamed (see Fig. E16 for machining dimensions).

5. If the necessary service facilities are not available it is recommended that the cylinder heads be returned to the Rolls-Royce Service Stations, at Pym's Lane, Crewe, or Hythe Road, London.

Cylinder heads - To fit

Fit the cylinder heads by reversing the procedure given for removal, noting the following points.



R710

FIG. E18 CYLINDER HEAD GASKET (Late Cars)

1. Fit the cylinder head gasket so that the face marked 'TOP' is uppermost. If the gasket is not marked 'TOP' it should be fitted so that the holes line up with the coolant holes in the crankcase. If incorrect alignment occurs the gasket should be turned over end to end. (see Figs. E17 and E18).

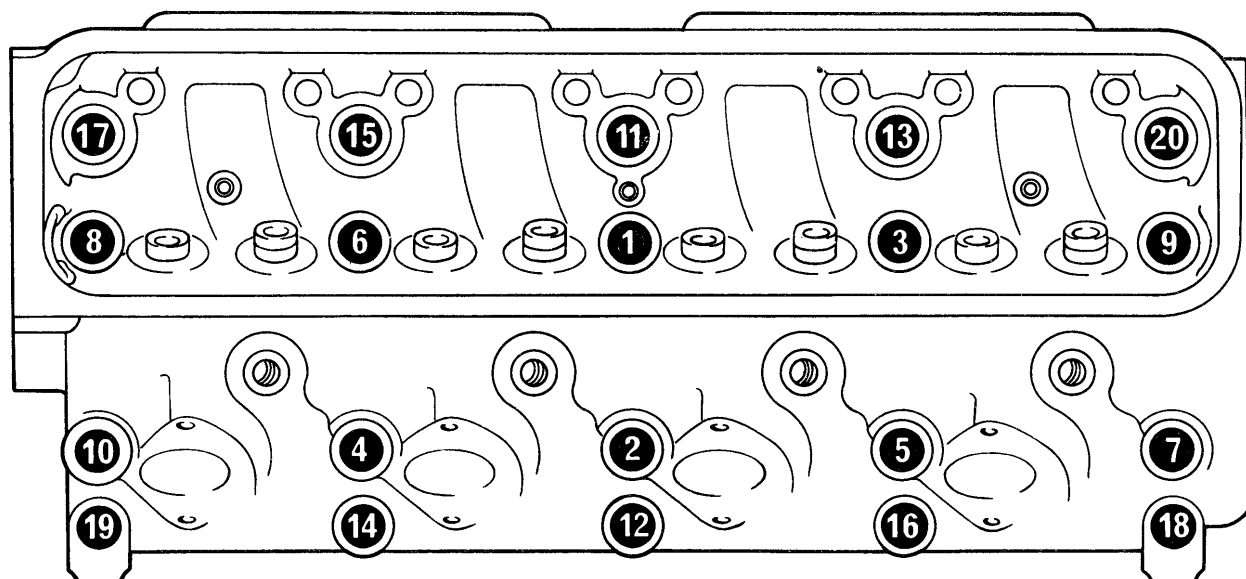
2. Progressively torque tighten the cylinder head nuts in two stages, to the figures given in Chapter P. The correct tightening sequence is shown in Figure E19. Ensure that the remainder of the setscrews, nuts and bolts are torque tightened to the figures quoted in Chapter P.

3. Clean the flame traps in the crankcase breather tube by washing them in petrol and drying them with a high pressure air line (see Section E9).

4. Ensure that brake and steering pump pipes are not overtightened otherwise damage to conical seatings may occur.

5. All hoses showing signs of deterioration should be renewed.

6. Renew all joints and rubber 'O' rings.



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FIG. E19 CYLINDER HEAD UNIT TIGHTENING SEQUENCES

7. When replacing the compressor on cars fitted with a refrigeration unit the air must be purged from the system (*see Chapter C - Part 2*).

8. Ensure that the driving belts are adjusted to the correct tension (*see Chapter L*).

9. Fill the power-assisted steering pump reservoir to the correct level (*see Chapter N*).

10. Ensure that the cooling system is replenished with the correct anti-freeze mixture (*see Chapter L*).

11. Connect the battery leads.

12. Bleed the hydraulic systems (*see Chapter G*).

Section E3

CRANKCASE AND CYLINDER LINERS

Introduction

The cylinder bore dimensions should be checked only when all the liners from any one bank are in position, any deviation from this rule could result in false readings.

If the readings taken show that the bore is worn in excess of 0,1016 mm. (0.004 in.) or ovality exceeds 0,076 mm. (0.003) (see Section E11 *Dimensional Data*) the liner should be withdrawn and a new liner, sealing rings and piston fitted.

Cylinder liner seal leakage can be detected by 'tell-tale' holes in the side of the crankcase. Coolant or oil will issue from these holes depending upon which of the two bottom sealing rings is leaking. The upper of the two bottom rings leaks coolant and the lower one leaks oil, in either case the appropriate liner should be removed and new seals fitted to the crankcase (see Fig. E20).

When renewing liners, it is important that as one liner is removed it is replaced by a new liner, before any other liners are removed.

If this procedure is not adopted and a liner is extracted from a bore adjacent to bores without liners, it is possible for the crankcase bridge piece to sustain damage. This is caused by a hard crust of corrosion which forms on the liner immediately below the upper of the two lower sealing rings (see Fig. E20). As the liner is withdrawn, the deposit has to pass under the sealing ring thus exerting an abnormally high bursting pressure which, if the crust of corrosion is thick enough will cause the rubber ring to twist and the bridge piece to fracture.

Cylinder liner - To remove

1. Using extraction tool (RH 7095) as shown in Figure E21, remove the liner from the crankcase; note that the liners can be removed from the top face only.

Cylinder liner - To fit

1. Ensure that the coolant drain hole in the crankcase wall is clean and unobstructed.
2. Ensure that the seal leakage 'tell-tale' holes in the crankcase wall are clean and unobstructed.
3. Remove any burrs then clean the crankcase cylinder liner, crankcase liner location bore and seating face in the crankcase counterbore with

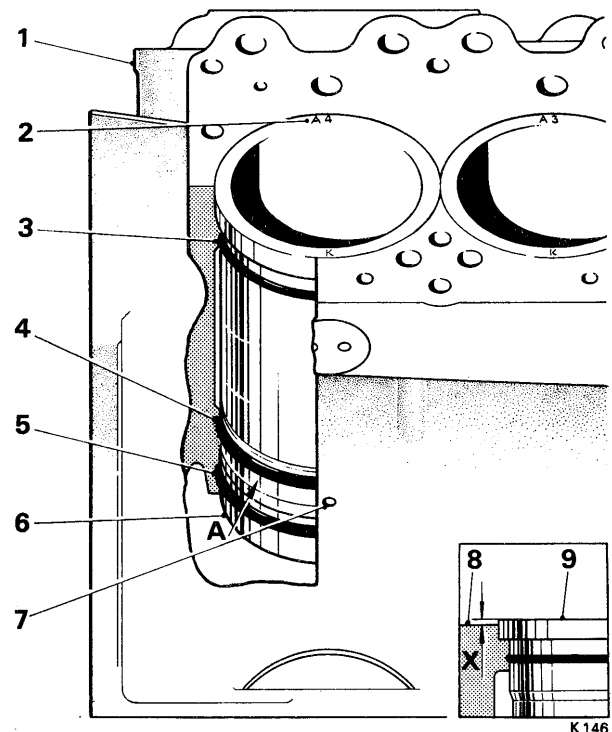


FIG. E20 CYLINDER LINER IN CRANKCASE

A Position of corrosion build up on cylinder liner and crankcase

X 0,051 mm. to 0,076 mm. (0.002 in. to 0.003 in.)

- | | |
|-------------------------|--------------------------|
| 1 Crankcase | 6 Cylinder liner |
| 2 Bore reference number | 7 Tell tale hole (8 off) |
| 3 Rubber 'O' ring | 8 Crankcase |
| 4 Upper sealing ring | 9 Cylinder liner |
| 5 Lower sealing ring | |

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'Genklene' or a similar alternative.

Note Meticulous care should be exercised when carrying out these operations as any dirt or burrs allowed to remain will have an adverse affect on the fit of the liner in the crankcase and may in fact distort the liner bore.

4. A liner when fitted into the crankcase should stand between 0,051 mm. and 0,076 mm. (0.002 in. and 0.003 in.) proud of the crankcase top face, this is to provide a 'nip' when the cylinder head and gasket are fitted. To obtain the correct amount of 'nip' proceed as described in operations 5 and 6 (see Fig. E20).

5. Measure the width of the liner collar and the depth of the counterbore in the crankcase.

Subtract the measurement taken for the depth of the counterbore from the width of the collar. Compare this figure with the 'nip' required (see Operation 4).

6. If the amount of 'nip' does not correspond with the amount required, either another liner should be tried or if the figure allows more than 0,076 mm. (0.003 in.) 'nip', the excess should be ground off the top face of the liner: after grinding, again thoroughly clean the liner.

7. A liner is identified with the corresponding bore reference etched onto its top face. Any new liner which is being fitted should also have the appropriate bore reference etched onto its top face before being fitted (e.g. No. 1 bore 'A' bank to be etched A1. Certain cars fitted with service reconditioned engines have oversize liners (outside diameter). These engines are identified by an SR number suffixed by the letters O/L stamped on a

small boss situated at the front of the crankcase

The liner is identified by the marking of the letter O/L on the top face of the liner adjacent to the piston grade information.

A liner is also graded and if not already done so, the grade should be etched onto the top face of the liner so that the grade can be seen when the liner is fitted into the crankcase.

8. Fit three new rubber sealing rings to the crankcase, then thinly smear the rings and location diameters with Palmolive grease or its equivalent.

9. To enable a liner to be fitted which can be up to 0,032 mm. (0.00125 in.) interference fit in the crankcase bore, the crankcase should be placed in an oven which has controlled heat of approximately 150°C (302°F). The crankcase should be allowed to remain in the oven until it has reached oven temperature.

Important Do not attempt to fit a liner into a cold crankcase.

10. Remove the crankcase from the oven then quickly push the liner into the crankcase bore until it is felt to seat on the seating face of the counterbore. Bear in mind that the bore reference etched onto the top face of the liner should be positioned at its nearest point to the camshaft location i.e. innermost part of the engine.

11. Allow the crankcase to return to its cold condition.

12. Using a depth micrometer, measure the amount that the liner stands proud above the crankcase face. As stated previously this figure should be between 0,051 mm. and 0,076 mm. (0.002 in. and 0.003 in.).

13. If the liner stands more than 0,076 mm. (0.003 in.) proud, an even tap with a plastic-headed mallet about the top face of the liner is permissible. If this does not move the liner below the 0,076 mm. (0.003 in.) limit or if the liner is below the 0,051 mm. (0.002 in.) limit, the liner should be withdrawn and the cause of the trouble investigated.

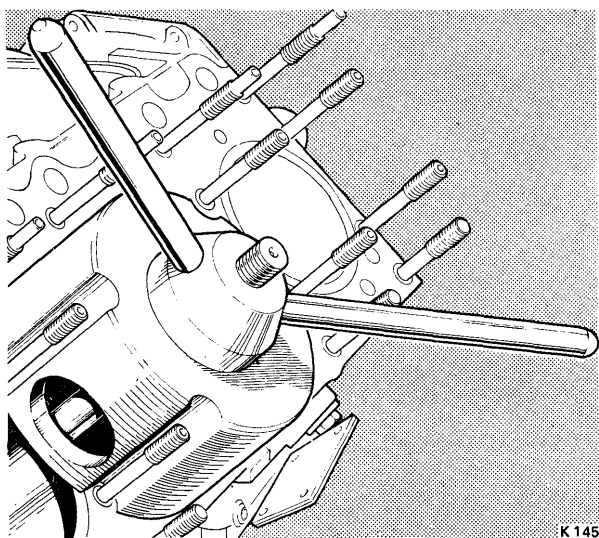


FIG. E21 METHOD OF REMOVING CYLINDER LINERS

Section E4

CRANKSHAFT AND MAIN BEARINGS

Crankshaft - To remove

1. Remove the engine from the car (*see Section E1*).
2. Fit the engine into a turnover stand.
3. Remove the sump.
4. Remove the oil pedestal and strainer.
5. Remove the front cover, oil pump etc. (*see Section E10 - Oil Pump - To remove*).
6. Remove the flywheel.
7. Withdraw the rear adapter, incorporating the balance weight (if fitted).
8. Remove the engine backplate, this component is dowelled to the crankcase.
9. Unscrew the nuts from the connecting rod bolts, remove the connecting rod caps and the shell bearings from both the caps and the rods.
10. Fit a piece of rubber tubing over the connecting rod bolts to prevent damage to the shaft, then push the pistons to the top of their bores.
11. Remove the main bearing caps and bearings using extractor tool RH 7208 and attachment RH 7498 (*see Fig. E22*).
12. Remove the thrust washers from the centre main bearing.
13. Fit a piece of rubber tubing over the main bearing cap studs to prevent damage to the crankshaft.
14. Carefully lift the crankshaft from the crankcase.

Crankshaft - To dismantle

1. Using spanner RH 7110, remove the serrated nut and washer from the crankshaft.
2. Remove the oil flingers.
3. Remove the oil pump gear.
4. Using a soft thin punch, remove the Woodruff key.
5. Remove the spacer.
6. Remove the timing gear.
7. To dismantle the sludge traps, remove the circlips and withdraw the oil sealing plugs. These plugs can be removed with the aid of a setscrew or stud screwed into the tapped extraction holes; discard the rubber sealing rings.

Bolted on crankshaft balance weights are fitted to long stroke engines

It is not envisaged that these weights will require attention in service but if the crankshaft requires a regrind they will have to be removed to allow access to the various crankshaft journals and pins.

It is essential that if the balance weights are removed, they be returned to their original positions, otherwise, not only will the balance of the crankshaft be severely impaired but there will also be a danger of the balance weights striking the pistons when the engine is running.

The crankshaft web number is stamped on each balance weight together with the word 'Front' which must be facing the front of the engine when that particular weight is fitted.

It is also necessary to ensure that all sludge deposits be removed from the threads of the bolts and tapped holes in the crankshaft, so that when the bolts securing the balance weights are tightened to the torque figures quoted in Chapter P, a false reading is not registered on the torque spanner.

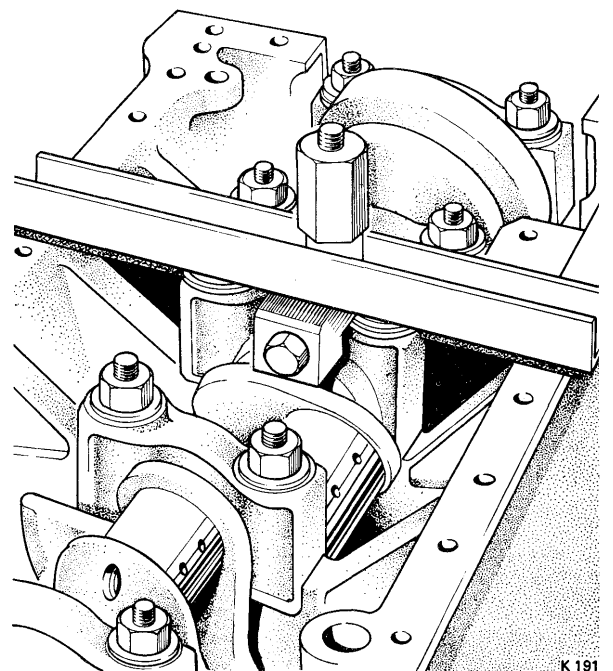


FIG. E22 REMOVAL OF MAIN BEARING CAP

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Main bearings

1. Shell bearings removed from an engine during maintenance or overhaul must always be fitted back into their original positions. On initial assembly each pair of shell bearings are marked with their appropriate position in the crankcase. They are not however, marked top and bottom and care should be taken that they are not interchanged. When fitting the shells check that the locating tangs are correctly located in their recesses.

On short stroke 9,14 cm. (3.600 in.) engines it is necessary to remove the oil pump assembly before the front main bearing cap can be withdrawn. On the long stroke 9,90 cm. (3.900 in.) engines the outer surface of the oil pump casing has been machined to allow the front main bearing cap to be withdrawn with the oil pump in position.

Crankshaft - To inspect

1. Mount the crankshaft in a pair of Vee-blocks on an inspection table.
2. Using a micrometer check the journals and crankpins for wear and ovality; regrind the shaft if

wear exceeds the figure quoted in Section E11 - Dimensional Data.

3. Remove the crankshaft then position the Vee-blocks so that the crankshaft when fitted will rest on journals Nos. 1 and 5.

4. Fit a test bar onto the Vee-blocks and check that the Vee-blocks are parallel to the table. If necessary, correct any errors by fitting packing pieces under the feet of the Vee-blocks.

5. Fit the crankshaft onto the Vee-blocks and ensure that it is free to rotate.

6. Place the arm of a dial test indicator onto the centre journal then set the indicator to zero.

7. Rotate the crankshaft until the difference between the maximum and minimum reading on the indicator is recorded. Halve this reading to give the amount of bow in the crankshaft (see Fig. E24); ensure that any ovality in the two end and centre journals is taken into account.

The maximum permissible bow is 0,25 mm. (0.010 in.), if this figure is exceeded, the crankshaft must be reground.

8. Turn the shaft so that the webs of each crankpin are first at 45° then at 135° to the table. Check the journals and crankpins in each position for parallelism; regrind the shaft if wear exceeds the figure given in Section E11 - Dimensional Data.

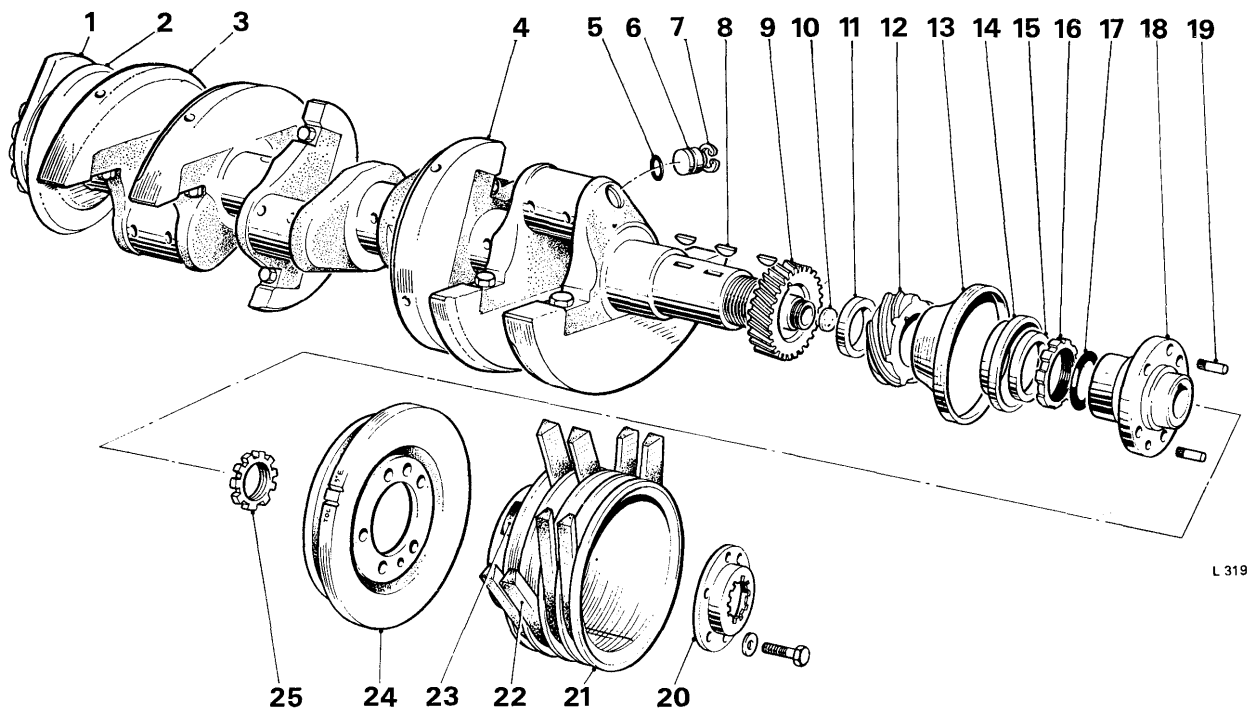


FIG E23 EXPLODED VIEW OF CRANKSHAFT 9,90 cm. (3.900 ins.) STROKE ENGINE

- | | | | | |
|----------------------------|----------------|--------------------------|--------------------|-------------------|
| 1 Rear adapter | 6 Plug | 11 Washer | 16 Nut | 21 Pulley |
| 2 Flinger | 7 Circlip | 12 Oil pump driving gear | 17 Rubber 'O' ring | 22 Belt |
| 3 Bolted-on balance weight | 8 Woodruff key | 13 Flinger | 18 Driving flange | 23 Balance weight |
| 4 Bolted-on balance weight | 9 Timing gear | 14 Flinger | 19 Dowel | 24 Damper |
| 5 'O' ring | 10 Disc | 15 Washer | 20 Lockplate | 25 Nut |

Crankshaft - To regrind

1. The crankshaft should be reground when wear or ovality exceeds 0,025 mm. (0.001 in.) or when the crankpins and journals are heavily scored or when the bow in the crankshaft exceeds 0,25 mm. (0.010 in.).

2. Replacement bearings are available in the following sizes, standard, minus 0,25 mm. (0.010 in.) and minus 0,50 mm. (0.020 in.).

3. The crankpins and journals should be ground and lapped to suit the nearest undersize bearing. (see Section E11 - Dimensional Data).

4. When grinding, use a stone having a grit and grade equivalent to a NORTON A 46 NV or one grade softer. **A harder stone must not be used.**

5. For 'plunge' grinding, the width of the stone must be 0,51 mm. (0.020 in.) less than the dimension between the journal or crankpin end faces and the machine must be fitted with hydraulic stops. For traverse grinding a suitable width of stone should be selected (see Fig. E25).

6. Care must be taken to ensure that no sharp ridges are left in the radii where the grinding wheel traverse ends and the radii of the grinding wheel must be carefully controlled to ensure that the grinding fades out not more than half way up the radius on the crankshaft.

On no account must the grinding wheel touch the side faces of the crankpin or journal.

7. Lubrication must be continuous during re-grinding and the lubricant should be fed liberally onto the ingoing side of the grinding wheel. The grinding wheel must not be allowed to contact the journal or crankpin until the shaft is thoroughly wet. Any approved lubricant can be used.

8. Grind the crankpins and journals until they are 0,025 mm. (0.001 in.) larger than the required finished size. This will allow for lapping and polishing.

9. Crankshafts must be re-hardened by the nitriding process after each re-grind.

10. After hardening, test the hardness of the journals and crankpins. The minimum acceptance figure for the hardened crankshaft is 570 VPN/30 kg. using a Vickers Diamond Pyramid Machine.

11. After grinding, and, if the necessary equipment is available, the shaft should be magnetically crack tested. It should then be lapped and polished to the finished size.

Crankshaft - To lap

1. The crankshaft journals and crankpins should be lapped to produce a perfectly smooth finish after grinding and hardening.

2. Cast iron laps should be used and the machine set to run at between 220 r.p.m. and 250 r.p.m.

3. The lapping compound should consist of a mixture of grade M.303½ grit and vegetable oil in proportion of 1,134 kg. (2.5 lb.) of grit to 4,546

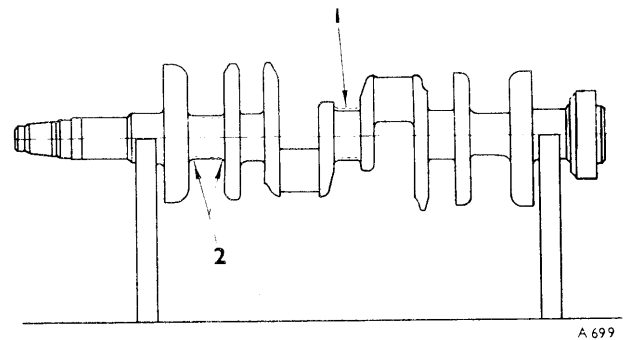


FIG. E24 CRANKSHAFT CHECKING

1 Bow check

2 Parallelism

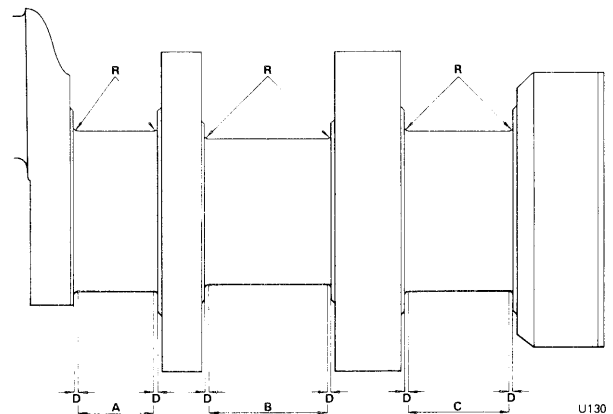


FIG. E25 CRANKPIN AND JOURNAL GRINDING DIMENSIONS

- A 3,297 mm. (1.298 in.) Grinding wheel travel - Journals 2,3 and 4.
- B 5,029 mm. (1.980 in.) Grinding wheel travel - Crankpins.
- C 4,267 mm. (1.680 in.) Grinding wheel travel - Journal 5.
- D 0,254 mm. (0.010 in.) Minimum distance - Side face to grinding wheel.
- R 2,362 mm. to 2,108 mm (0.093 in. to 0.083 in.) Radius.

litres (1 gallon) of the oil. The compound must be mixed to a smooth consistency and injected into the laps at frequent intervals.

4. The crankpins and journals must be lapped parallel to within 0,025 mm. (0.001 in.). Whilst lapping, the size of the crankpins and journals should be checked frequently; allowances must be made for the slight contraction which will take place as the shaft cools.

5. After lapping, wash the shaft thoroughly in a high pressure paraffin wash; blow off any surplus paraffin with compressed air and dry the shaft with a soft lint-free cloth.

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6. When the shaft is dry, polish the crankpins and journals with Corolite 320 grade abrasive tape 2,5 cm. 1 in.) wide liberally lubricated with vegetable oil.
7. After polishing, again wash the shaft and repeat the cleaning procedure.

Crankshaft - To assemble

1. On long stroke engines, fit the 'bolted on' balance weights, refer to the sub-section Crankshaft - To dismantle, for the procedure that should be adopted.
2. Fit the Woodruff key to the crankshaft then fit the timing gear; ensure that the timing gear locates correctly on the Woodruff key.
3. Fit the spacer.
4. Fit the Woodruff key to the crankshaft, then fit the oil pump drive gear, ensuring that the oil pump

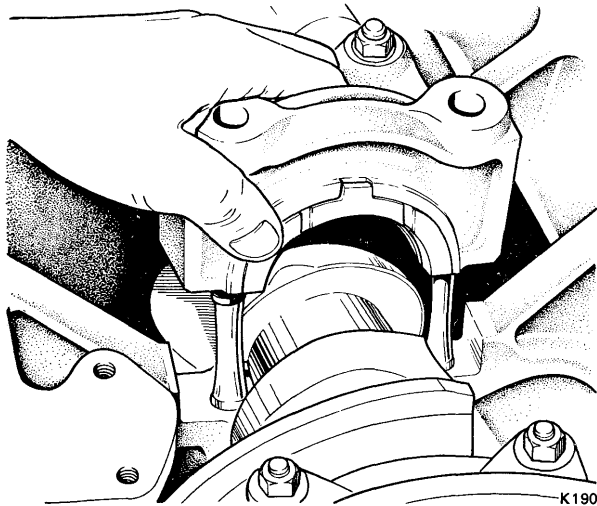


FIG. E26 FITTING THE CENTRE MAIN BEARING CAP

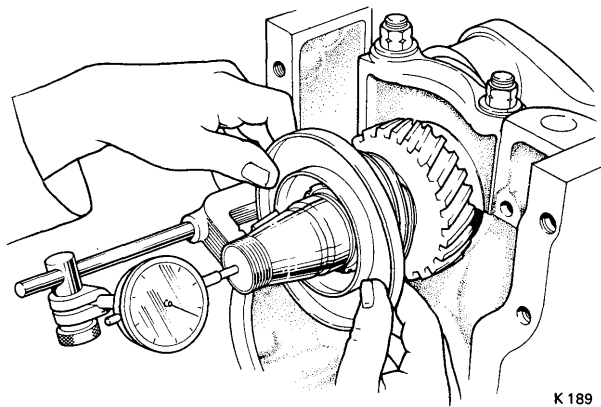


FIG. E27 CHECKING THE CRANKSHAFT END-FLOAT

- gear locates correctly on the Woodruff key.
5. Fit the oil flingers.
6. Fit the washer and serrated nut.

Note Always use a new serrated nut (*see item 16, Fig. E23*).

7. Using special box spanner RH 7110, torque tighten the serrated nut to the figures quoted in Chapter P.

The crankshaft should be held firm whilst tightening the serrated nut. This can be accomplished by fitting two long setscrews in the rear end of the crankshaft and inserting a bar between them, offset the force needed to tighten the serrated nut.

8. Fit new rubber sealing rings to the sludge trap plugs, then smear engine oil onto the rings.
9. Push the plug firmly home and fit the circlip into its groove; pull the plug outwards to meet the circlip face.

Before fitting a timing gear to the crankshaft, ensure that it is the correct component (*see Fig. E28*).

Crankshaft - To fit

1. Ensure that the bearing shells are the correct size for the journals and crankpins.
2. Ensure that all parts are clean. A lint-free cloth should be used for wiping all parts.
3. Position the upper bearing shells in the crankcase and slightly smear them with clean engine oil.
4. Place the crankshaft in position and fit the upper halves of the thrust washer to the centre main bearing.
5. Fit the main bearing caps and shells together with the two lower thrust washers for the centre main bearing (*see Fig. E26*). When fitting the bearing caps it may be necessary to tap them lightly into position. If this is done ensure that the bearing shells are not dislodged. The cap nuts should be torque tightened to the figure quoted in Chapter P.
6. Check that the crankshaft rotates freely.
7. Check the crankshaft end - float (*see Fig. E27 and Section E11 - Engine Dimensional Data*).
8. Fit the bearing shells to the connecting rods and caps, then lightly smear the shells with clean oil. Fit the caps to the rods and torque tighten the nuts to the figures quoted in Chapter P to give a bolt stretch of 0,152 to 0,203 mm. (0.006 to 0.008 in.) (*see Fig. E29*).
9. Re-set the valve timing as described in Section E7 and fit the camshaft timing wheel.
10. Fit the oil pump and oil filter delivery pipe using new rubber 'O' sealing rings. Fit the oil strainer pick-up and pedestal (*see Fig. E29*).
11. Connect a pressurised supply of clean oil to the oil supply hole in the crankcase and pump oil

into the crankcase at a pressure of 5,62 kg/sq.cm. (80 lb/sq.in.). Check the oil flow to the main and big-end bearings. Prime the oil pump by filling the strainer with clean oil and at the same time turning the crankshaft.

12. Assemble the front end of the engine, fitting the lower front cover, the damper, the driving pulley, the coolant pump, the generator or alternator, the refrigeration compressor (if fitted), and the belts. A new Neoprene seal must be fitted between the lower front cover and the coolant pump.

13. Fit new rubber 'O' rings then fit the driving flange.

14. Using special spanner RH 7131, torque tighten the serrated nut securing the driving flange to the crankshaft (see Chapter P).

15. Check that the lockplate aligns with the five

setscrew holes. If it does not, carefully tighten the serrated nut until the five setscrews can be inserted easily without binding.

16. Fit the engine back-plate, flywheel, and rear adapter (if fitted).

17. Using new joints, fit the sump and the dipstick assembly.

18. Fit the engine into the engine compartment by following the procedure given in Section E1.

Crankshaft damper - To remove

1. Disconnect the battery leads.
2. Remove the radiator intake grille and matrix.
3. Slacken off the generator or alternator, the power assisted steering pump and remove the driving belts.
4. Remove the five setscrews and the locking

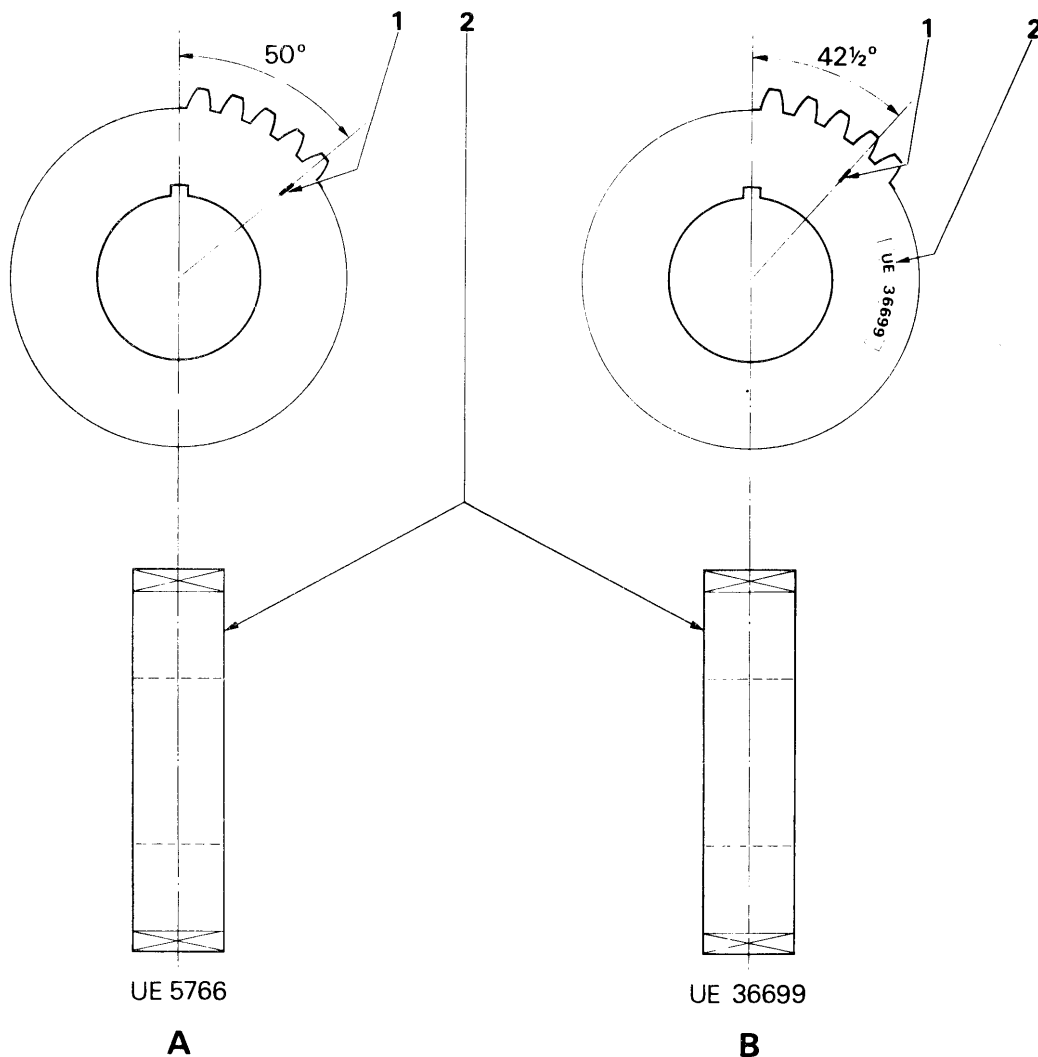


FIG. E28 IDENTIFICATION OF TIMING GEARS

- A Silver Shadow T Series
Corniche (U.S.A. and Canada)
B Corniche (other than U.S.A. and Canada)

- 1 Timing mark
2 Position of part number

M 634

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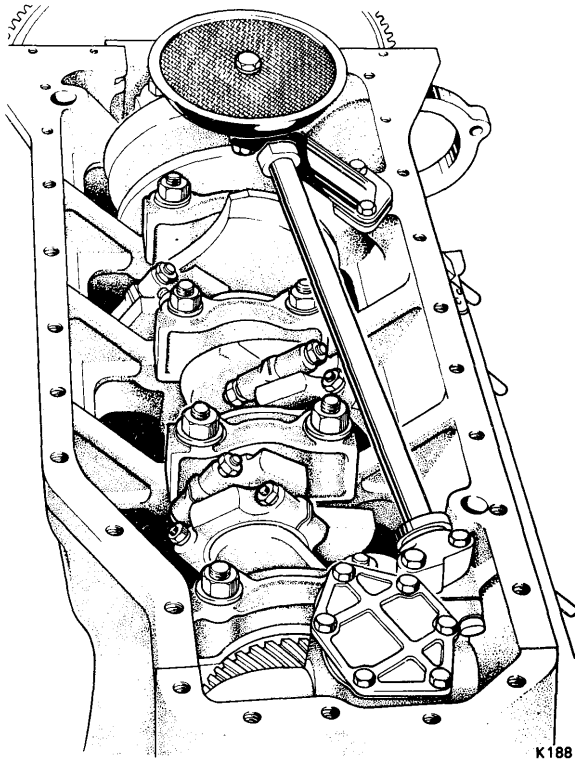


FIG. E29 VIEW OF MAIN BEARING CAPS

plate securing the crankshaft pulley and damper to the driving flange. Both the pulley and damper are located by dowel pins which are pressed into the driving flange.

5. It should be noted that the long stroke 9,90 cm. (3.900 in.) engines have a crankshaft pulley with an additional balance weight incorporated in the rear flange.

Crankshaft damper - To fit

To fit the damper, reverse the procedure given for its removal, noting the following points.

1. The damper and crankshaft pulley can only be fitted one way due to the positioning of the locating dowels.
2. Torque tighten the setscrews to the figures quoted in Chapter P.
3. Ensure that the generator or alternator (if fitted), and the power assisted steering pump driving belts are adjusted to the correct tension (see Chapter L).
4. Connect the battery leads.

Section E5

CONNECTING RODS AND PISTONS

Connecting rod bearings - To remove

1. The big-end bearings may be renewed whilst the engine is in position in the car by adopting the following procedure.
 2. Place the car on a ramp beneath an overhead pulley.
 3. Disconnect the battery leads.
 4. Drain the engine oil into a container.
 5. Remove the exhaust pipe section which fits adjacent to the sump.
 6. Place a sling beneath the crankshaft pulley, take the weight of the engine and detach the front engine mount; slightly raise the engine front end.
 7. Remove the four nuts and bolts securing the crossmember to the steering and idle boxes; remove the crossmember.
 8. Disconnect and remove the steering cross-beam at the ball joints (*see Chapter N*).
 9. Disconnect the lead to the sump oil level gauge.
 10. If necessary, dependent upon the type of transmission, remove the transmission front adapter cover to gain access to the setscrews at the rear of the sump.
 11. Remove the sump securing setscrews and remove the sump.
 12. Remove the oil pedestal and fine mesh strainer.
 13. To facilitate rotation of the crankshaft, remove the sparking plugs.
 14. The crankshaft can be rotated manually when the static timing inspection cover has been removed from the base of the flywheel ring (torus).
 15. Rotate the crankshaft until one pair of connecting rod caps are at bottom dead centre and then remove the nuts from the connecting rod caps. Ease off the caps and the bearing shells, then fit rubber tubing over the connecting rod bolts to prevent damage to the crankshaft. Push the rods up sufficiently to allow the bolts to clear the crankshaft; remove the shell from the rod.
- Repeat this operation with the remaining connecting rods ensuring that the bolts do not foul the crankshaft when it is being rotated.
- Do not remove the connecting rod bolts.

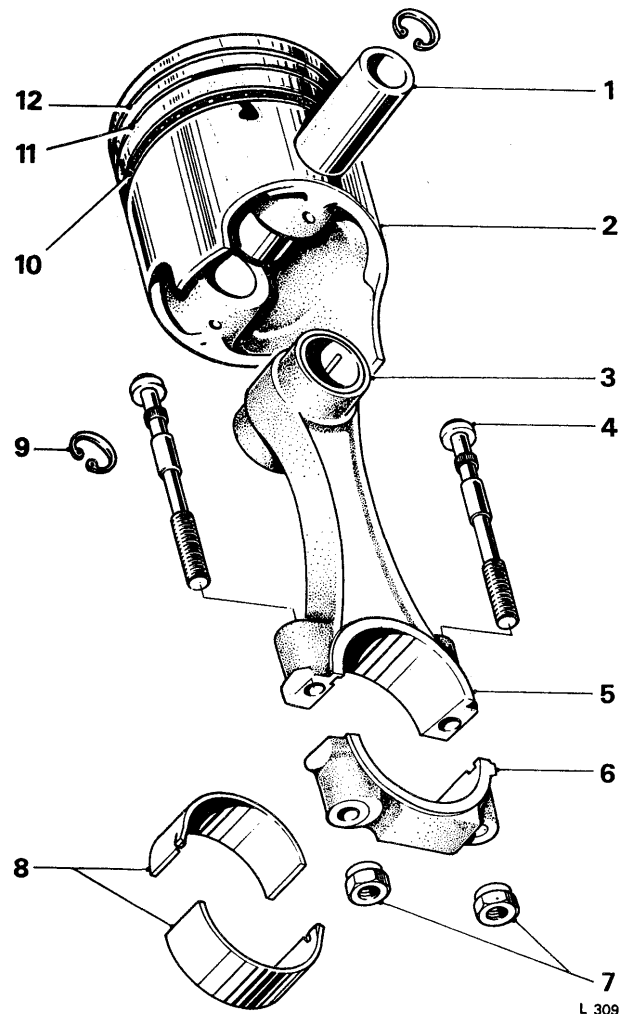


FIG. E30 EXPLODED VIEW OF PISTON AND CONNECTING ROD ASSEMBLY

- | | |
|--------------------------------|--------------------------|
| 1 Gudgeon pin | 7 Connecting rod nuts |
| 2 Piston | 8 Connecting rod bearing |
| 3 Connecting rod small-
end | 9 Circlip |
| 4 Connecting rod bolt | 10 Scraper ring |
| 5 Connecting rod | 11 2nd compression ring |
| 6 Connecting rod cap | 12 1st compression ring |

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Note It is important that, with the long stroke 9,90 cm. (3.900 in.) engine which has the 'bolted-on' crankshaft balance weights, only one pair of big-end bearings are dismantled at any one time. The big-end bearings must be assembled or the connecting rod assembly withdrawn from the top of the engine before the crankshaft is rotated, otherwise the crankshaft balance weights will foul the big-ends.

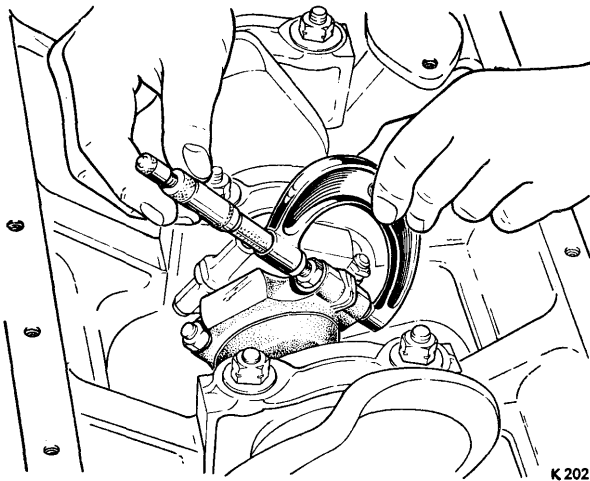


FIG. E31 CHECKING CONNECTING ROD BOLT STRETCH

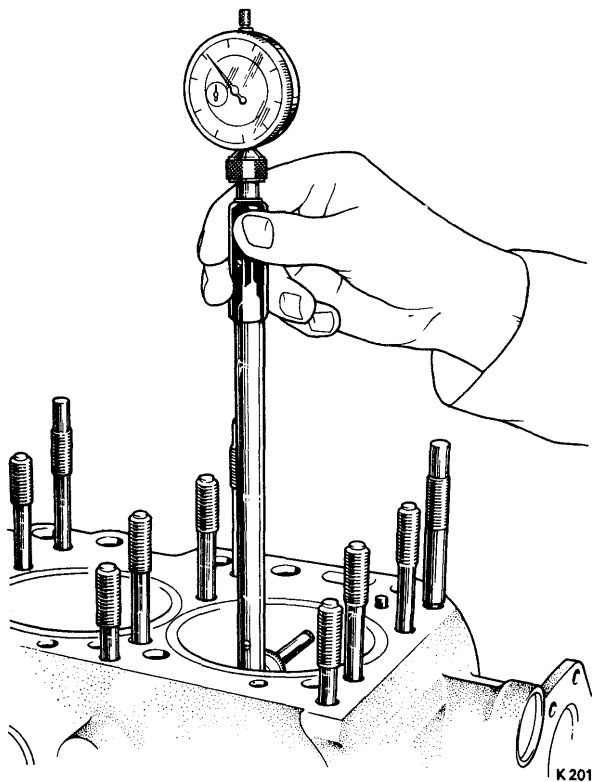


FIG. E32 CHECKING CYLINDER BORE DIAMETER

Crankpins and bearings - To inspect

1. Thoroughly clean each crankpin with a lint-free cloth and measure the diameters for wear and ovality (*see Section E4 - Crankshaft - To regrind*).
2. The running clearance between the connecting rod big-end bearing and the crankpin is 0,032 mm. to 0,076 mm. (0.0015 in. to 0.003 in.) measured in the plane of the rod centre line. The maximum permissible wear should not exceed 0,089 mm. (0.0035 in.).
3. The bearing shells used for the big-ends are of the conventional design, having a lead-tin, lead-indium or aluminium-tin lining and a steel back. New bearing shells should be fitted if the specified limits of the originals are exceeded or if they are scored.
4. The 'nip' between the bore of the rod and the outer diameter of the bearing shells, i.e. the amount by which the bearing shell is larger than the connecting rod bore, should be 0,038 mm. to 0,076 mm. (0.0015 in. to 0.003 in.). This 'nip' is necessary to ensure that the bearing shells are firmly located in the connecting rod and cap, and this prevents the bearing shells from rocking or fretting in the rod.

Connecting rod bearings - To fit

1. The upper and lower bearing shells are interchangeable but not with shells from another connecting rod. After inspection shells can be used again if they are considered serviceable.
 2. Before fitting new bearings to the connecting rods and caps, etch the number of the bore on the locating tang. Thoroughly clean the shells and the crankpin, checking that there is no sludge or dirt in the feed holes from the main bearings.
 3. Lightly smear the bearing with oil and fit it into the connecting rod.
 4. Pull the rod down onto the crankpin ensuring that the bolts do not damage the crankpin. Remove the protective rubber tubing from the bolts.
 5. Fit the second shell into the connecting rod cap and lightly smear it with clean oil.
 6. Place the cap on the rod ensuring that the two tangs are both on the same side of the crankpin. The cap may require a certain amount of gentle tapping before it is fully 'home' and care should be taken that the bearing shell is not dislodged. Fit the nuts to the bolts and torque tighten to the figure quoted in Chapter P. This torque figure should give a bolt stretch of approximately 0,152 mm. to 0,205 mm. (0.006 in. to 0.008 in.) (*see Fig. E31*). If necessary, further tighten the bolt until the correct extension is obtained.
- The connecting rod bolts are an interference fit in the rods and should not be removed unless absolutely necessary.

7. Repeat Operations 3 to 6 inclusive for the remaining bearings, taking care that when the crankshaft is rotated the connecting rod bolts do not damage the crankpins.
8. Fit the oil strainer and pedestal using new 'O' rings.
9. Fit the sump using a new joint and fill the engine with clean oil.
10. Fit the crossmember to the steering and idler boxes.
11. When fitting the steering cross-beam it should be noted that the cross-beam ends have a 29° 'set' and care should be taken to replace the cross-beam in its correct position, i.e. with the 'set' pointing towards the rear of the car (see Chapter N).
12. Before tightening the front engine mount ensure that the engine is lined up correctly. Set the front engine mount stop plate to a 1.27 mm. (0.050 in.) gap, this procedure is fully described in Section E1 - Engine - To fit.
13. Fit the sparking plugs, connect the battery leads and torque tighten all setscrews, nuts and bolts to the figures specified in Chapter P.

Connecting rods and pistons - To remove

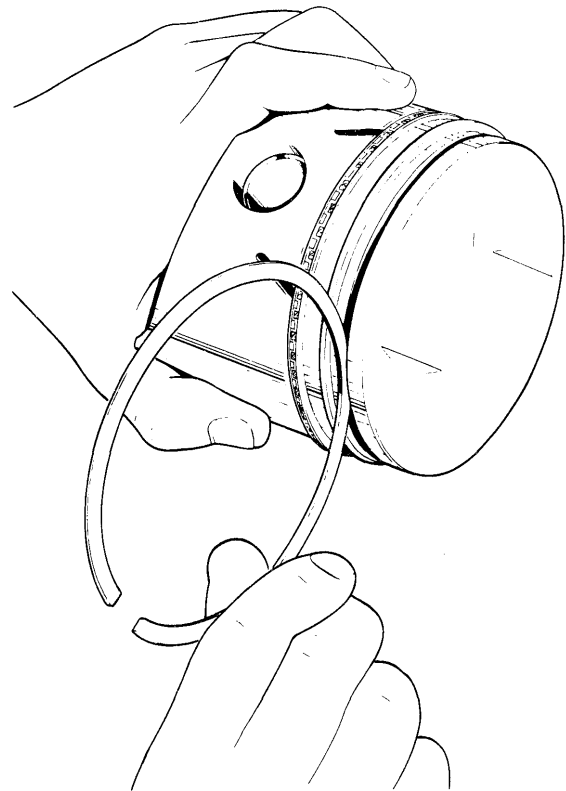
1. Remove the cylinder heads (see Section E2 - Cylinder Heads).
2. Remove the connecting rod caps and bearings as described previously in this Section.
3. Remove the pistons from the top face of the engine crankcase.
4. If a three ring piston is removed from an engine for any reason and is to be used again, a new second compression ring (centre piston ring) must be fitted.

Connecting rod and piston - To dismantle

1. Remove the circlip from each end of the gudgeon pin.
2. The four ring piston of the 9,14 cm. (3.600 in.) stroke engine, should be immersed in a hot bath of oil or placed on a hot plate until the piston is thoroughly warmed.
3. The gudgeon pin of the three ring piston which is fitted to the 9,90 cm. (3.900 in.) stroke engine is a clearance fit in the piston, therefore, heating the piston assembly is unnecessary.
4. Using a suitable guide push the gudgeon pin out of the piston bore.

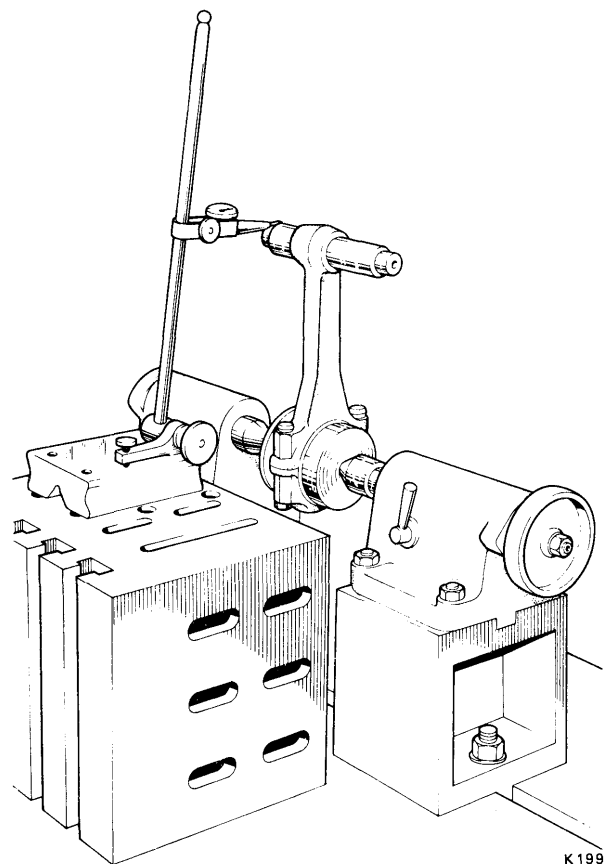
Piston and cylinder bores - To inspect

1. Before checking the cylinder bore dimensions it is essential to ensure that all the cylinder liners of a particular 'bank' are correctly in position. If one liner has been removed, do not check



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FIG. E33 CHECKING PISTON RING CLEARANCE



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FIG. E34 CHECKING CONNECTING ROD
ALIGNMENT

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the bore dimension of an adjacent liner until the first liner has been replaced. Otherwise false readings could be obtained.

2. Clean the cylinder bores.

3. Using a dial test indicator, check the diameters of each cylinder bore. If the liners are worn more than 0,1016 mm (0.004 in.) or if the ovality exceeds 0,076 mm (0.003 in.) it is necessary to fit new liners and pistons.

Do not fit new pistons to liners which are worn beyond the permissible limit.

4. Using a piston ring expander tool, remove the rings from the piston.

5. Remove the carbon from the rings, the grooves and pistons.

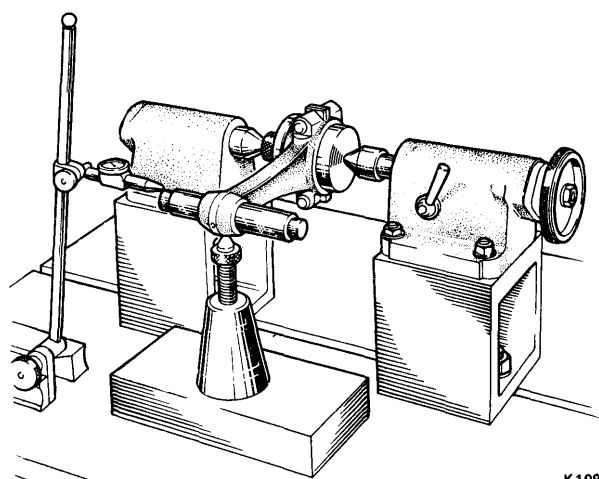
6. Check the clearance of the rings in the grooves (see Fig. E33 and Section E11 - Dimensional Data).

7. Check the compression rings in a 10,414 cm. (4.100 in.) diameter gauge; if the rings are in good condition there should be no light shown around the circumference of the rings.

8. Check the closed ring gap when fitted to the gauge; this should be between 0,38 mm. to 0,51 mm. (0.015 in. to 0.020 in.). The free gap should be 13,21 mm. (0.520 in.) nominal.

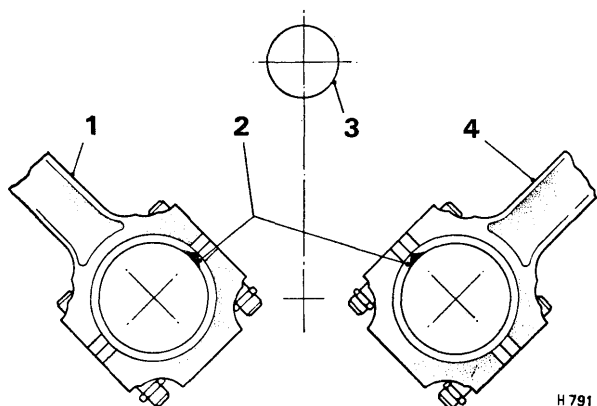
9. Check the dimensions of the pistons across the thrust axis. The measurements should be taken at the piston grading point which is 2,3 cm. (0.906 in.) above the bottom of the skirt.

The grading and the part number are stamped on the piston crown; the pistons are graded in five sizes (see Section E11 - Dimensional Data).



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FIG. E35 CHECKING CONNECTING ROD FOR TWIST



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FIG. E36 POSITION OF CONNECTING ROD TANGS

- 1 'A' bank connecting rod
- 2 Position of tangs
- 3 Camshaft
- 4 'B' bank connecting rod

Small end bush - To renew

1. Check the diameters of the gudgeon pin and the small-end bush and if the total clearance exceeds 0,013 mm. (0.0005 in.) renew the bush.

2. Using a suitable drift, remove the small-end bush. Before fitting the new bush, check that the interference between the bush and the connecting rod is 0,051 mm. to 0,089 mm. (0.002 in. to 0.0035 in.).

3. Press the bush into the connecting rod ensuring that the split in the bush is positioned so that it is 45° away from the central axis of the rod and on the same side of the rod as the locating recess for the big-end bearing shell. In this position the oil hole in the bush should line up with the oil hole in the small-end boss.

4. Check the grade of the piston gudgeon pin which is to be used, then bore or ream the bush to whichever of the finished bore sizes given below is appropriate, in order to match the grade of the gudgeon pin. The gudgeon pin has its grade etched onto one of its end faces. The corresponding grade is also stamped onto the inside of the piston.

Grade 'A' - 2,5407 cm. to 2,5409 cm.
(1.0003 in. to 1.00037 in.)

Grade 'B' - 2,54096 cm. to 2,54114 cm.
(1.00038 in. to 1.00048 in.)

Connecting rods - To check alignment and twist

1. Correct alignment of the connecting rods is of the utmost importance, and all connecting rods after rebushing and boring should be checked for alignment in a reliable alignment indicator.

2. Connecting rods that are bent will produce slight knocking noises when under acceleration or loading, and will also cause uneven or premature wear between the cylinder walls and pistons.

3. Alignment of the rods may be checked in the following manner if a suitable alignment fixture is not available.

4. Fit the gudgeon pin to the small-end of the rod and a mandrel in the big-end, then set up the connecting rod on a surface block, with the mandrel resting in either Vee-blocks or between centres and with the rod in a vertical plane (*see Fig. E34*).

5. Using a dial indicator gauge, take readings at both ends of the gudgeon pin. The difference between the two readings must not exceed 0,025 mm. (0.001 in.) per 25,4 mm. (1.00 in.) length of the gudgeon pin.

6. Check the connecting rod for 'twist' in a similar manner to the procedure adopted for checking the alignment but with the axis of the rod in a horizontal plane (*see Fig. E35*).

7. The difference in the readings at each end of the gudgeon pin should not exceed 0,076 mm. (0.003 in.) per 25,4 mm. (1.00 in.) length of gudgeon pin.

8. Connecting rods can be corrected when the inaccuracies are small, but where greater errors exist, new connecting rods must be fitted.

Connecting rod and piston - To assemble

1. Ensure that the piston grade matches the bore grade into which it is to be fitted and that the gudgeon pin grade suits the connecting rod small-end bush.

2. Pistons and gudgeon pins are supplied as an assembly, the gudgeon pin being grade 'A' or 'B' to provide a selective fit to suit the piston bore size. On no account must gudgeon pins and pistons be interchanged.

3. Check the size of the small-end bush, then select a piston having a gudgeon pin of the corresponding size. For graded bore sizes, refer to Small-end bush - To renew. The selected gudgeon pin should be a push fit into the small-end bush.

4. It is possible that service personnel will encounter three different types of piston assembly and therefore, if replacement of these items is contemplated it is essential that the car serial number and engine compression ratio be considered, when the appropriate section of the Parts Catalogue is consulted.

5. The pistons should be assembled as follows, noting that the piston rings are fitted from the piston crown to avoid damaging the skirt and that a new second compression ring must always be fitted when assembling the three ring piston.

Pistons - four rings

Scraper ring

- Fit the expander ring.
- Fit the bottom steel rail.
- Fit the spacer.
- Fit the top steel rail.

Two Intermediate taper rings

Fit the rings so that their side marked 'TOP' is uppermost.

Top ring

Fit the top chromium plated ring; this ring can be fitted either way up.

Pistons - three rings

Scraper ring

- Fit the expander ring.
- Fit the bottom steel rail.
- Fit the spacer.
- Fit the top steel rail.

Two Compression rings

Fit the two compression rings so that their side marked 'TOP' is uppermost. The top compression ring is chromium plated on the outside diameter and has the additional letters 'AE' adjacent to the word 'TOP'.

6. Pistons with four rings should be warmed in a hot oil bath or on a hot plate. This operation is not essential with the three ring piston as they can be assembled in the cold condition due to the gudgeon pin having clearance in the bore of the piston.

7. Fit the connecting rod to the piston as described under 'Connecting rods and pistons - To fit' noting that the word 'Front' which is stamped onto the piston crown should be towards the front of the engine and the tangs on the connecting rod and cap are adjacent to the camshaft (*see Fig. E36*).

8. Remove the four ring piston from the oil/hot plate.

9. To assemble either the three or four ring pistons to the connecting rods, hold the connecting rod in its correct position inside and fit a suitable guide through the piston and the small-end bush.

Using a hide mallet and a guide pin to facilitate connecting rod and piston small-end alignment, tap the gudgeon pin into position in the piston and connecting rod.

Fit the circlip to each end of the gudgeon pin, thus securing it in the piston.

Connecting rods and pistons - To fit

1. Liberally cover the pistons with 'Molykote G Rapid' grease or its equivalent and fit a ring compressor over the piston rings.

2. Fit the bearing shells to the connecting rod and cap. The shells should have the number of the bore etched on them and should be in pairs.

3. Place rubbers on the end of the connecting rod bolts to prevent damage to the crankpins when fitting the rods.

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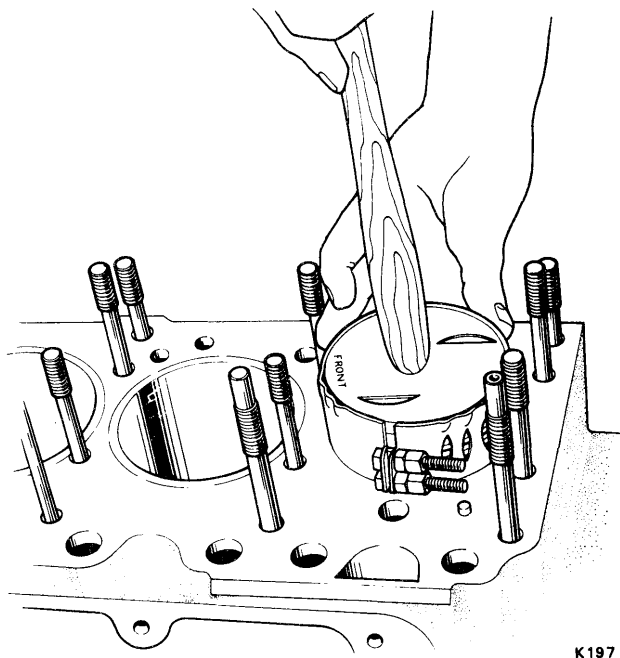


FIG. E37 METHOD OF FITTING PISTONS

4. Fit the piston into the bore from the top ensuring that the piston is in the right bore and that the 'FRONT' of the piston is to the front of the engine and the tang on the connecting rod is nearest to the camshaft.

5. Tighten the ring compressor and hold it against the liner, then push the piston into the bore (*see Fig. E37*).

6. Ensure that the connecting rod is correctly positioned around the crankshaft.

7. Remove the rubber from the connecting rod bolts and fit the connecting rod cap to the rod. The tang on the cap should be on the same side of the journal as the tang on the rod.

8. Fit the nuts to the bolts and torque tighten them to the figure quoted in Chapter P. This reading should give a 0,152 mm. to 0,205 mm. (0.006 in. to 0.008 in.) bolt stretch (*see Fig. E31*). If necessary, further tighten the bolt until the correct extension is obtained.

9. Fit the sump by reversing the procedure adopted for removal noting the following points.

10. Fit a new sump joint.

11. The steering cross-beam ends have a 29° 'set' and care should be taken to replace the cross-beam in its correct position, i.e. with the 'set' pointing towards the rear of the car (*see Chapter N*).

12. Ensure that the engine front mount stop plate is set correctly with a gap of 1,27 mm. (0.050 in.); this procedure is fully described in Section E1 - Engine - To replace - Operation 3.

13. Remove the sling from beneath the crankshaft pulley.

Section E6

VALVE GEAR AND HYDRAULIC TAPPETS

Hydraulic tappets

A tappet which is found to be defective in service should be replaced by a complete assembly and not by renewing any individual components.

Where a tappet is noisy but otherwise appears to be serviceable and replacement tappets are not readily available, it may be worthwhile dismantling the tappet and thoroughly washing it in clean paraffin. After cleaning, the tappet should be assembled and fitted back into the engine and tested. If the noise still persists, the tappet should be renewed.

Tappet noise

A defective tappet makes a noise like a 'rifle crack' and is usually caused by one or more tappets collapsing, it can be heard with each revolution of the camshaft. This could be caused by dirt which has infiltrated into the tappet(s) in which case the tappet(s) should be dismantled and cleaned. If cleaning the tappet does not cure the fault, the tappet should be renewed.

The tappet can be isolated by the fact that the noise changes as the rocker arm is depressed manually to take up any 'sponge' while the engine is running.

If the noise is not caused by a collapsed tappet(s) one of the following causes should be suspected.

- (i) Sometimes air is drawn into the tappets after standing overnight and one of the tappets may be reluctant to clear itself even after 30 minutes hot running.
- (ii) Very occasionally a tappet leaks down too quickly at high temperatures causing a knock. This tappet is really a milder case of the 'rifle crack failure' and should be renewed.
- (iii) Very occasionally a tappet will stick in the bore of the tappet block at high temperatures causing a knock. This will show itself by being consistently noisy when the engine is very hot and always quiet at other times. Should this situation be encountered and all other tappet rectification measures failed to effect a

cure, the suspect tappet block should be checked for incorrect crankcase bedding by lightly smearing the seating face with engineers blue and trying it in the crankcase. If the check proves conclusively that the tappet block bedding in the crankcase is faulty, the crankcase can be scraped to improve the situation.

Important Extreme care must be exercised when carrying out this operation and the minimum amount of metal removed from the crankcase.

Tappet wear

There is very seldom a just cause for rejecting tappets due to wear of the bottom face unless the cam peak on the camshaft is also badly worn. This type of excessive mutual wear would cause a loud noise at the valve and is termed a 'catastrophic' failure. It is very rare and has never been known after the first 10,000 miles. A badly worn tappet which would indicate camshaft wear is illustrated in Figure E38.



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FIG. E38 SEVERELY SCUFFED TAPPET BASE

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All other cases of seemingly bad surface wear on the tappet bottom e.g. pitting, scuffing, etc., are not yet known to be harmful (after many 100,000 miles experience with experimental engines). It is known however that it may be harmful to replace a mildly worn tappet with a new one unless the camshaft is also changed. For this reason, if not for economy, only the tappets which actually cause a noise should be changed. If it is found necessary to fit a new camshaft to an engine, (sixteen) one complete set of new tappets must also be fitted.

Hydraulic tappets - To remove

1. Remove the carburetters and induction manifold etc. (see Section E2 - Cylinder heads - To remove - Operations 1 to 27 inclusive).
2. Progressively unscrew the setscrews securing the tappet chest cover to the crankcase. The setscrews must be removed progressively. If the brake pump operating cam happens to be on its peak, distortion could occur to the tappet chest cover.
3. Remove the rocker covers.
4. Progressively unscrew the five setscrews securing the rocker pedestals to each cylinder head, then remove the rocker shaft assemblies.
5. Remove the push rods.
6. Withdraw the hydraulic tappets from the tappet blocks.

Hydraulic tappets - To dismantle

1. Press down the spherical cap situated in the top of the tappet and remove the circlip holding the

cap in place. After gradually releasing the pressure from the spherical cap the tappet can be dismantled (see Fig. E43).

2. Remove the plunger and valve from the tappet barrel. The tappet barrel should be examined for any signs of wear on the base.

Hydraulic tappets - To assemble and prime

In order to obtain the high degree of accuracy necessary for efficient operation of the hydraulic tappets, it is essential that extreme precautions are taken to ensure complete cleanliness on assembly.

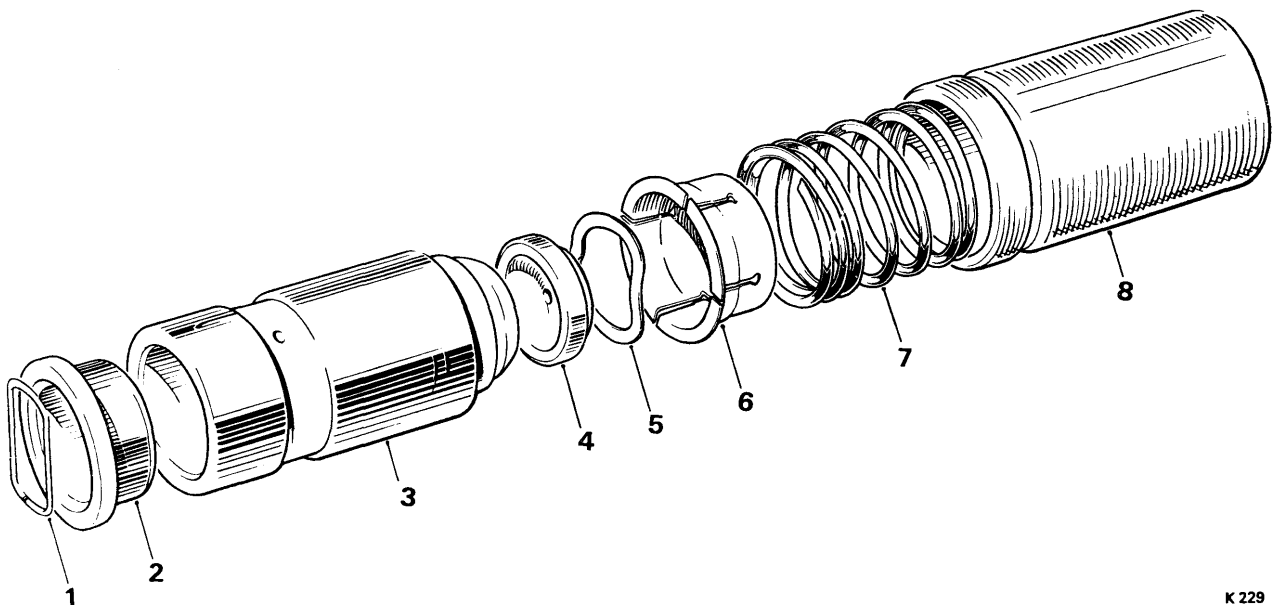
It is therefore most important that particular attention is given to the following points.

- (i) Due to the highly critical surfaces and dimensions of the hydraulic tappets, great care and cleanliness are of the utmost importance when handling tappet components.

If a cloth is to be used ensure that it is lint free.

- (ii) Ensure that the assembly tank is perfectly clean before adding paraffin; only clean fresh paraffin must be used.

- (iii) Wash all the tappet components in clean paraffin, taking care that the components of each tappet are retained as an assembly and are not interchanged with parts of another tappet.



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FIG. E39 EXPLODED VIEW OF HYDRAULIC TAPPET

- | | | | |
|-----------|-----------|---------------|-----------------|
| 1 Circlip | 3 Plunger | 5 Wave washer | 7 Spring |
| 2 Cap | 4 Valve | 6 Retainer | 8 Tappet barrel |

1. Commence assembly of the tappet by fitting the wave washer (see Fig. E39) and valve into the retainer.

2. Using 'finger' pressure, carefully press the retainer assembly onto the spigot of the plunger.

3. Fit the spring onto the retainer assembly.

4. Fit the valve assembly (plunger, valve, wave washer, retainer and spring), into the tappet barrel.

5. Fit the cap into the top of the plunger.

6. Using an old push rod press the cap downward until it is possible to fit the retaining circlip into the groove located inside the top of the tappet barrel.

7. Release the pressure.

8. Submerge the tappet assembly in clean Esso T.S.D. 1047 rust inhibiting paraffin.

9. Using a small probe push the valve off its seat; the probe should be carefully positioned through the small hole in the tappet cap and pushed down into the tappet until it contacts the valve. A slight increase in pressure will then be required to overcome the wave washer loading and open the valve.

10. Continue to hold the valve open and place a small screwdriver into the cap adjacent to the probe.

11. Apply pressure to both the probe and screwdriver. Press the cap downwards in the tappet barrel, compressing the spring. Note the air bubbles that are expelled from the tappet barrel oil inlet hole.

12. When the air bubbles cease, release the pressure from the cap and valve.

13. Repeat operations 9 to 12 continuously, until the air bubbles have ceased to appear throughout the cycle of operations.

14. Withdraw the probe from the small hole in the centre of the cap.

15. Again apply pressure to the cap with a small screwdriver. If the assembly feels solid it can be assumed that it is operating satisfactorily, therefore it can be removed from the paraffin and fitted to the engine.

Hydraulic tappets - To fit

1. Oil the bores of the tappet blocks.

2. Check that if new tappets are being fitted, the grade of each tappet corresponds with the bore of the tappet block into which it is to be fitted. The tappet barrel grading marks are etched onto the top lip of the barrel.

3. Fit the tappets.

4. Fit the push rods to the engine, into the same position from which they were removed.

5. Fit the rocker shafts then progressively tighten the securing nuts.

6. Rotate the camshaft until the brake pump eccentrics are at B.D.C.

7. To prevent the possibility of hydraulic lock, ensure that the brake pumps are drained of fluid.

8. To check that the position of the brake pump

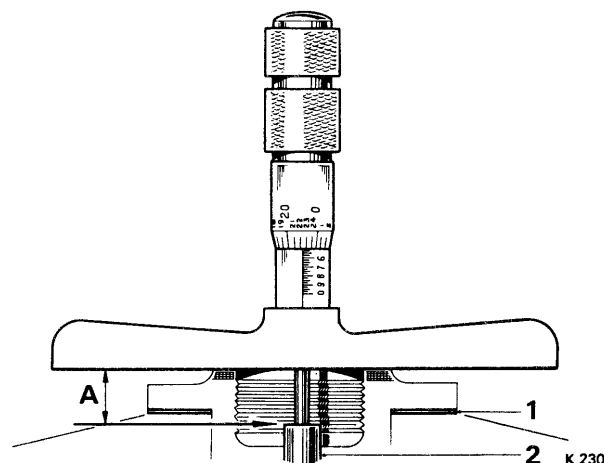


FIG. E40 CHECKING THE POSITION OF THE BRAKE PUMP PUSH ROD

1 Shims	A 13,26 mm. to 13,33 mm.
2 Push rod	(0.522 in. to 0.525 in.)

push rods are set correctly, carry out Operations 9 to 27 inclusive.

9. Temporarily fit the tappet cover together with the brake pumps; tighten the tappet cover setscrews.

10. Using spanner RH 7856, unscrew the serrated nut securing the front brake pump to its push rod housing.

11. Rotate the engine to find the lowest position of the front brake pump push rod, then using a depth micrometer, check the dimension (A) from the top face of the mounting flange to the top of the push rod (see Fig. E40).

12. If this dimension A is incorrect, the total thickness of the shim washers fitted between the brake pump and the tappet cover should be altered as necessary.

The shims are available in two sizes 0,076 mm. and 0,178 mm. (0.003 in. and 0.007 in.) and can be obtained from the Parts Department, Rolls-Royce Motors Limited.

13. To alter the number of shims carry out Operations 14 and 21 inclusive.

14. Remove the tappet cover together with the push rod housing.

15. Unscrew the two setscrews which secure the push rod housing to the mounting flange and remove the housing and flange together with the shim washers.

16. Care should be taken to ensure that dirt or any other foreign matter is not allowed to come into contact with the eccentrics or the cam face of the follower.

17. Either add or subtract the necessary shim washers.

18. Secure the push rod housing and mounting flange to the tappet cover, then fit the tappet cover to the engine and tighten the securing setscrews.

19. Again using a depth micrometer, check the

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dimension (A) in Figure E40 from the top face of the mounting flange to the tappet cover.

20. Fit the front brake pump to its push rod housing then rotate the pump casing so that the position of its inlet port is relative to the feed pipe run from the reservoir.

21. Using spanner RH 7856, torque tighten the serrated nut (*see Chapter P*).

22. Repeat Operations 11 to 21 inclusive for the rear brake pump.

23. Remove the tappet cover together with the brake pumps.

24. Wellseal the crankcase tappet cover joint face, then fit a new length of sealing thread to the face.

Fit the thread so that its two ends overlay and it surrounds all the tapped holes in the crankcase.

(*see Fig. E41*).

25. Wellseal the joint face of the tappet cover.

26. Check that the brake pump operating eccentrics are at B.D.C. and that all fluid is drained from the brake pumps.

27. Fit the tappet cover to the crankcase then fit and tighten the setscrews.

28. Complete the engine build by reversing the procedure given for its dismantling, noting the following points.

29. Fit new joints and sealing rings.

30. Refer to Chapter P for torque tightening figures.

31. Ensure that brake pipes are not over-tightened otherwise damage to the conical seating may occur.

32. Any hoses showing signs of deterioration should be renewed.

33. Ensure that the driving belts are adjusted to the correct tension.

34. Refill the cooling system with the correct anti-freeze mixture.

35. Connect the battery leads.

36. Bleed the hydraulic systems (*see Chapter G*).

37. Charge the refrigeration system (*see Chapter C - Part 2*).

Rocker shaft assembly - To remove

1. Remove the rocker assembly by unscrewing the pedestal setscrews and lifting the assembly away from the base but not above the rim of the rocker box.

2. Replace setscrews into the end pedestals otherwise the spacing springs will force the rocker arms and pedestals off the shaft.

3. Lift the rocker assembly to a bench and remove one of the restraining setscrews.

4. Withdraw the rocker arms, pedestals and springs to a clean container, keeping the components in their correct order for assembly.

Rocker arms - To inspect

1. Examine the pads on the rocker arms for wear and renew them if they are badly worn. Slight 'scuffing' or pitting on the pad may be removed with a smooth stone.

2. Rocker pads are case hardened to a depth of between 0,635 mm. and 0,762 mm. (0,025 in. and 0,030 in.) and the Rockwell hardness value should be between C57 and C65.

3. If, after refacing or stoning the rocker pads, the hardness value is below these figures, the rocker arms should be renewed.

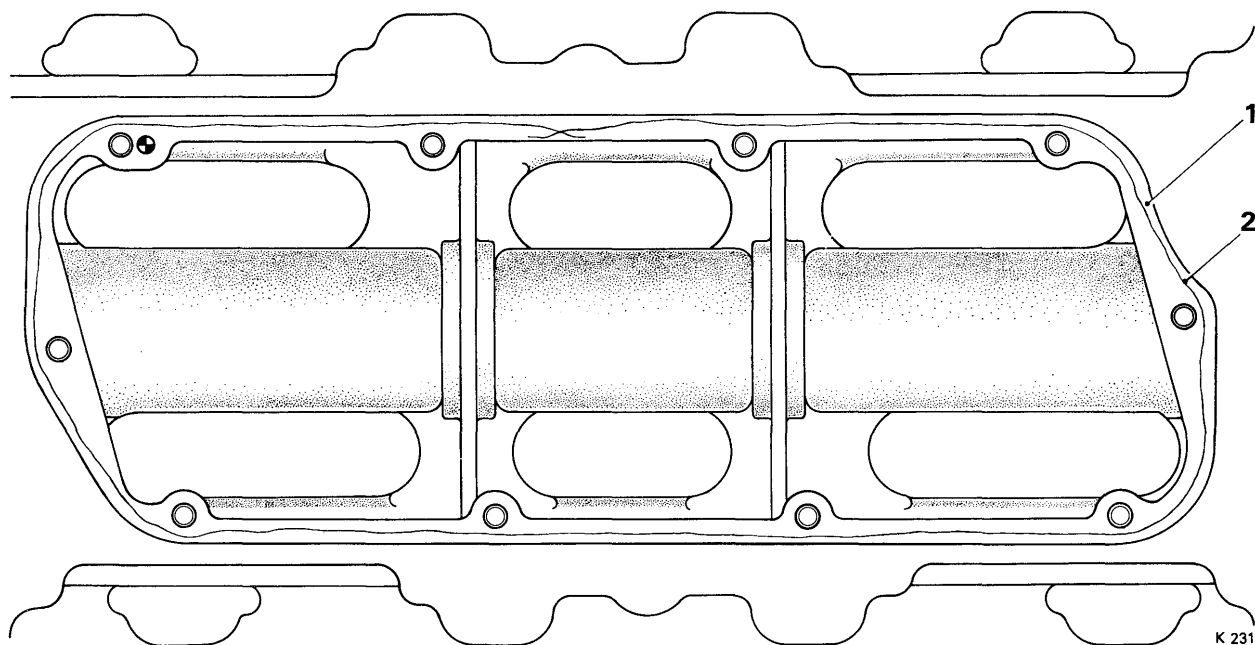


FIG. E41 SILK SEALING THREAD IN POSITION ON THE CRANKCASE FACE

1 Crankcase tappet cover face

2 Silk sealing thread

Rocker shaft - To assemble

1. Fit the rocker pedestals, spacing springs and rockers to the rocker shaft.
2. When building up the shaft fit a setscrew through the end pedestal and shaft before the remaining pedestals and springs are fitted. The rockers are handed and should be fitted in pairs so that the arms point inward over the cylinder bore when the rocker shaft is fitted to the rocker box. (see Fig. E42).

Rocker shaft assembly - To fit

Fit the rocker shafts to the cylinder heads, noting the following points.

1. The cylinder heads are fitted with dowel pins, these pins ensure that the rocker shaft is fitted correctly and the oil feed holes align.
2. When tightening the five setscrews and washers that hold the shaft, ensure that the ball-ends of the push rods are correctly seated in the tappet and rocker arms.
3. Tighten the shaft down progressively to the torque figure quoted in Chapter P.

Push rods

1. Check the push rods for bow, any that are bowed more than 0,51 mm. (0.020 in.) total indicator reading should be renewed.
2. Before fitting the push rods, check that the ball-ends are not blocked by dirt.

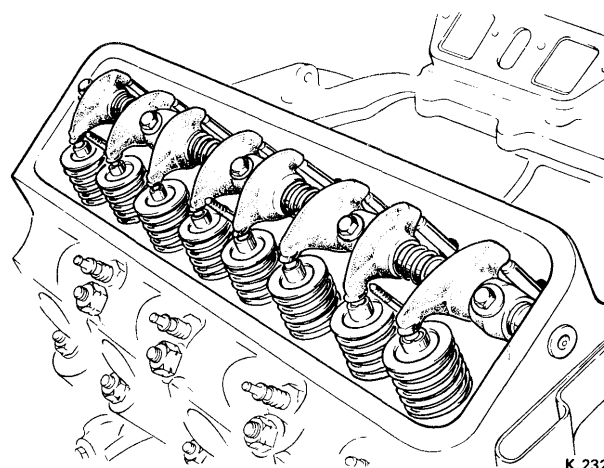
Valve spring - To renew (Cylinder head fitted)

1. Remove the rocker gear as already described then proceed as follows.
2. Using valve spring compressing tool RH 7094, press down the valve spring which is to be replaced (see Fig. E43).
3. Very carefully, rotate the engine crankshaft by hand until the corresponding piston is felt to touch the head of the valve.
4. Continue to carefully rotate the crankshaft, until the piston reaches T.D.C.

Whilst the piston is being moved toward T.D.C. with the valve head touching it, the pressure should be progressively released from the compressing tool so that a minimum amount of pressure is exerted onto the valve.

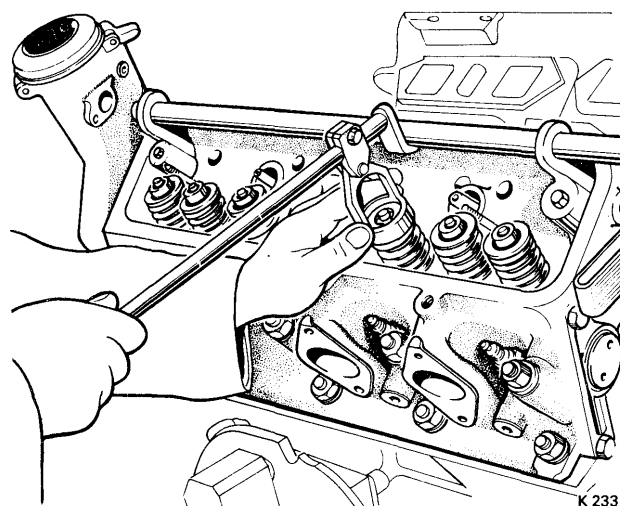
If the operation is not carried out in this manner, the valve could sustain damage.

5. Temporarily remove the valve spring compressing lever then using a soft headed mallet, tap the top washer until the collets are disturbed in their seat.
6. Compress the valve spring then remove the collets, top washer and spring.



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FIG. E42 ROCKER SHAFT ASSEMBLY IN POSITION



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FIG. E43 REMOVAL OF VALVE COLLETS -
CYLINDER HEADS MOUNTED ON ENGINE

7. Fit a new spring; then fit the top washer, collets and valve gear by reversing the procedure given for dismantling.

Section E7

CAMSHAFT

Camshaft - To remove

1. Remove the engine from the car (*see Section E1*), blanking off all pipes and ports immediately after being disconnected or uncovered.
2. Place the engine in a stand.
3. Remove the hydraulic tappets (*see Section E6*).
4. Remove the flywheel.
5. Remove the distributor together with its pedestal (*see Chapter M*).
6. Remove the pressed steel cover from the rear end of the crankcase to expose the distributor driving gears (*see Fig. E44*).
7. Withdraw the distributor driving shaft together with the locating plug and 'O' ring.
8. Withdraw the distributor driving spindle and integral gear together with the thrust washer.
9. Remove the skew gear from the rear end of the camshaft.
10. Remove the front cover from the front of the camshaft and withdraw the cam gear.
11. Remove the camshaft thrust plate together with the timing gear lubricating oil pipe assembly then withdraw the camshaft through the front end of the crankcase. Take care that the bearing bores are not damaged by the cam lobes.

Camshaft - To inspect

1. Inspect the cams for wear and pitting. The cam lift is 6,43 mm. (0.253 in.) but a minimum lift of 5,97 mm. (0.235 in.) is permissible.
2. If wear is in excess of this figure, the camshaft must be renewed.

Camshaft - To fit

1. Lightly smear the camshaft bearings with clean engine oil. Lubricate the camshaft lobes with EP (extreme pressure) oil such as Castrol Hipress SC 140. Fit the camshaft through the front end of the crankcase, taking care that the cam lobes do not damage the camshaft bearing bores.
2. Fit the timing gear lubricating jet to the thrust

plate and secure it with two setscrews and tab-washers.

3. Fit and secure the camshaft thrust plate to the crankcase; use new tabwashers. Torque tighten the setscrews to the figure quoted in Chapter P; lock the tab washers.

Camshaft end float - To check (*see Fig. E45*)

1. Fit a dial test indicator to the crankcase and set the scale to zero.
2. Fit the two setscrews to the end of the camshaft.
3. Grip the setscrews then move the camshaft backward and forward and note the reading on the dial test indicator.
4. The camshaft end-float should be between 0,05 mm. and 0,15 mm. (0.002 in. and 0.006 in.).

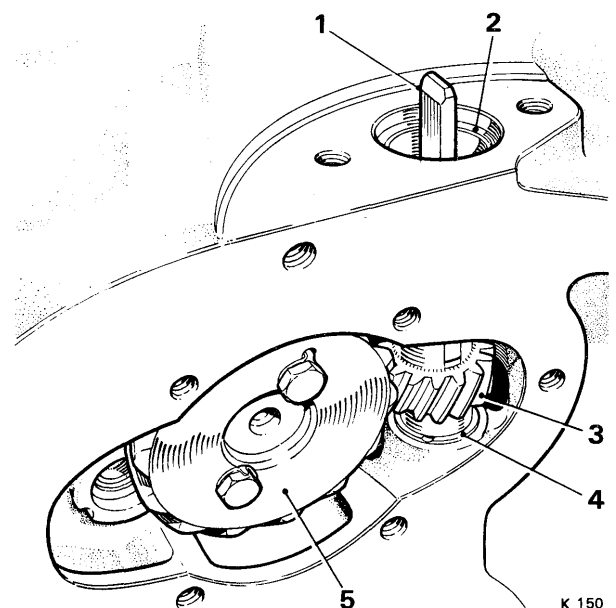


FIG. E44 VIEW OF DISTRIBUTOR DRIVING GEARS

- | | |
|-------------------------------------|-----------------|
| 1 Distributor driving shaft | 4 Thrust washer |
| 2 Locating plug | 5 Skew gear |
| 3 Driving spindle and integral gear | |

Chapter E

Valve gear - To time (see Fig. E46)

1. Rotate the crankshaft until the mark on the crankshaft timing gear is vertical and toward the top of the crankcase.

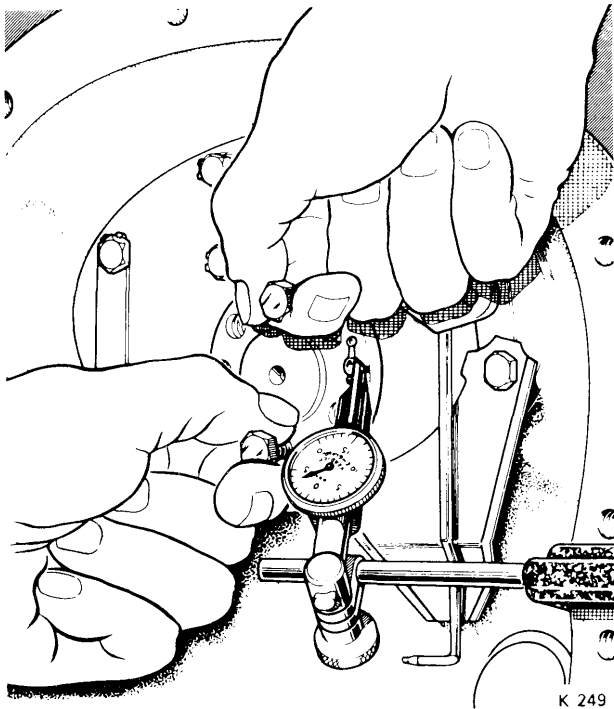


FIG. E45 CHECKING CAMSHAFT END FLOAT

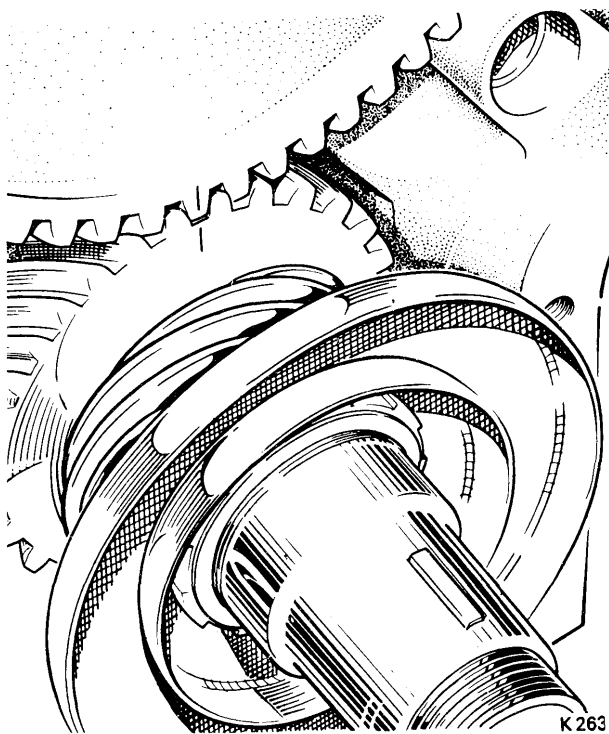


FIG. E46 VALVE TIMING MARKS

2. Fit the camshaft timing gear to the camshaft, so that the mark on the camshaft timing gear is aligned with the mark on the crankshaft timing gear; do not fit any setscrews at this stage.
3. Carefully rotate the camshaft until the holes in the camshaft timing gear align exactly with the threaded holes in the camshaft.
4. Fit the end plate cover and secure the timing gear and the cover to the camshaft with eight setscrews. Torque tighten the setscrews to the figure quoted in Chapter P.

Camshaft timing gear backlash and run-out - To check

1. Fit a dial test indicator to the crankcase and set the scale to zero as shown in Figure E47.
2. Rock the cam gear and check the backlash. The backlash should be between 0,025 mm. and 0,10 mm. (0,001 in. and 0,004 in.).
3. Check the backlash on various teeth around the circumference of the gear.
4. Check the timing gear run-out as follows (see Fig. E48).
5. Move the indicator pointer so that it touches the front face of the cam gear.
6. Rotate the crankshaft and check the run-out shown on the indicator dial. The run-out should not exceed 0,05 mm. (0,002 in.).

Distributor driving gear - To fit

1. Fit the camshaft distributor driving gear.
2. Rotate the crankshaft until the timing marks on the camshaft and crankshaft gears are in line.
3. Fit the thrust washer to the distributor driving gear spindle then fit the gear into the recess in the crankcase. It will help in fitting this gear if the washer is held to the gear with a light smear of grease.
4. When the gear is fitted, the slot in the top of the gear spindle should be in line with the camshaft (see Fig. E44).

On no account should the setting of crankshaft and camshaft be disturbed whilst fitting this gear.

5. Fit the distributor driving shaft to the driving spindle then fit the locating plug.
6. If necessary, renew the rubber 'O' ring on the locating plug.
7. Using a dial test indicator in a similar manner to that shown in Figure E47, check the backlash of the distributor driving gear. This should be between 0,05 mm. and 0,10 mm. (0,002 in. and 0,004 in.).
8. Fit the camshaft rear cover using a new paper joint.

Engine assembly - To complete

Complete the engine assembly by reversing the procedure given for camshaft removal, noting the following points.

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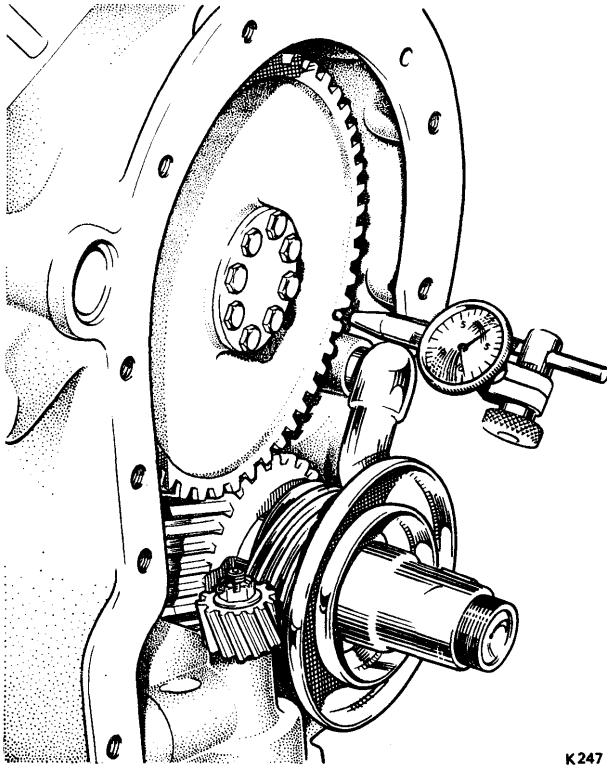
1. All setscrews, nuts and bolts must be torque tightened to the figures quoted in Chapter P.
2. Renew all joints.
3. Fit a new Neoprene oil seal between the lower

front casing and the coolant pump.

4. Ensure that the tappet cover is fitted correctly (see Section E6).

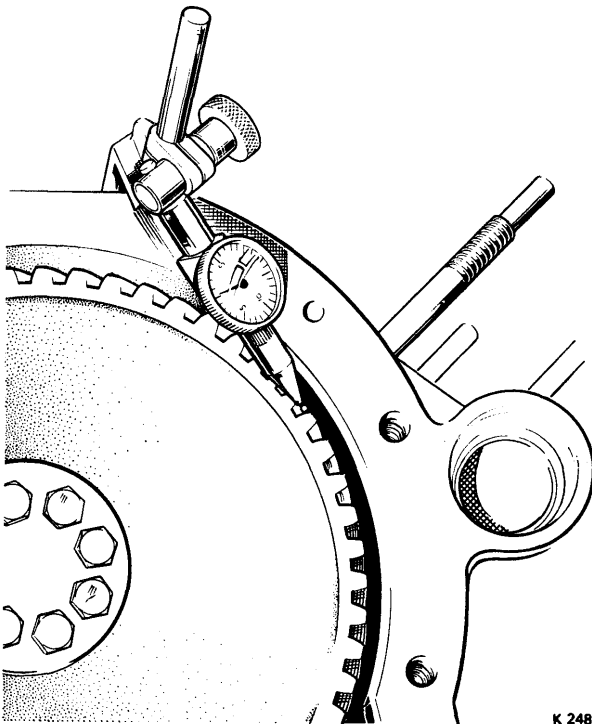
5. Fit the distributor and time the ignition as described in Chapter M.

6. If new camshaft is fitted to an engine, one complete set (sixteen) new tappets must also be fitted.



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FIG. E48 CHECKING TIMING GEAR RUN-OUT



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FIG. E47 CHECKING TIMING GEAR BACKLASH

Section E8

CRANKCASE BREATHER PIPE

Maintenance

1. Periodically clean the flame trap fitted to the breather pipe in the following manner.
2. Unscrew the setscrew securing the breather pipe connection to the oil filler pedestal; withdraw the connection from the pedestal (slight resistance may be felt due to the rubber 'O' ring connections).
3. Withdraw the connection from the pipe flange.
4. Wash the flame trap assembly in clean petrol, then dry with a high pressure air line. The flame trap assembly consists of either 6 separate gauzes or 3 gauzes crimped together as shown in Figure E49.
5. To clean the adapter fitted to the choke housing, remove the single setscrew from the breather pipe end connection and detach the pipe.
6. Clean the adapter fitted to the choke housing and ensure that the holes in the adapter are clear.
7. Assemble the flame trap and breather pipe in the reverse order, ensuring that the 'O' rings are in good condition.

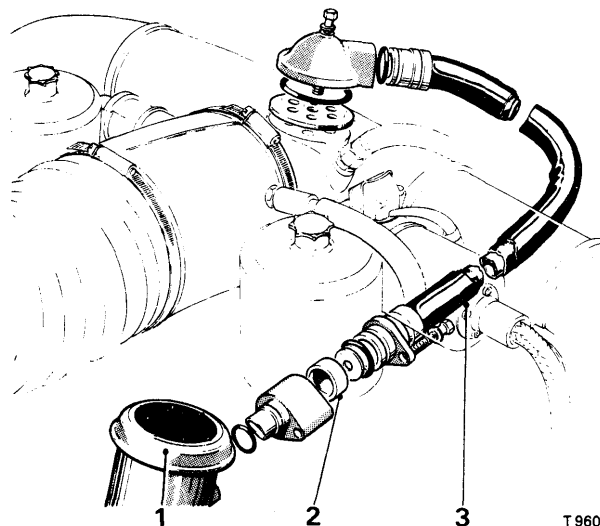


FIG. E49 EXPLODED VIEW OF CRANKCASE BREATHER PIPE

- 1 Oil filler housing
- 2 Flame trap
- 3 Breather tube

Section E9

DECARBONIZING

Engine - To decarbonize

1. Remove the cylinder heads and the valves (see Section E2 - Cylinder Heads).
2. The valve spring, washer, split collets, valve gland, housing and gland pressure spring from each valve assembly should be retained as a separate assembly in order that they can be readily assembled in the head in their original positions.
3. Using a blunt tool or wire brush, remove the carbon deposit from the cylinder heads, the piston crowns and the top faces of the cylinder liners; care should be taken not to damage the valve seats or to make heavy score marks in the piston crowns and cylinder heads. Heavy score marks will quickly accumulate carbon and seriously impair the performance of the engine.
4. Wash the cylinder heads in paraffin then blow off the surplus paraffin with compressed air.
5. Remove all traces of carbon from the cylinder bores and the crankcase top faces, ensuring that carbon does not get into the coolant or oil drain holes.
6. Clean all the carbon off the valves.

Valve guides - To inspect

1. Using a new valve as a gauge, examine the valve guides for wear.
2. The maximum permissible wear on both the inlet and exhaust guides is 0,051 mm. (0.002 in.). If this figure is exceeded, the guides should be renewed as described in Section E2. 'Bell mouching' at the lower ends of the valve guides is permissible up to 0,15 mm. (0.006 in.) for a depth of 9,52 mm. (0.375 in.).
3. The maximum permissible clearance in the bore between each valve and its bore is 0,132 mm. (0.0052 in.).

Valve and valve seat inserts - To reface

1. Reface the valve seats and seat inserts using valve reconditioning equipment to give a seat angle of 45°.

When refacing the valve seats, remove the minimum amount of material possible to give a 'clean' seating, whilst maintaining the two dimensions shown in Figure E50.

2. If necessary, the valve seat inserts may be crowned with a 30° cutter to prevent 'pocketing'.
3. Renew the valve seat inserts if they are badly worn (see Section E2).
4. Using a fine, good quality lapping paste, lightly lap each valve to its seating. Check the seating using Prussian blue.
5. Wash the head and the valves in paraffin to remove all grinding dust and lapping paste. Blow off the surplus paraffin with compressed air.
6. If new valve guides and valve seat inserts are fitted, the valve guides should be reamed before the valve seat inserts are faced.

Valve springs - To test

1. Visually examine the valve springs for defects and check the poundage of the springs on a valve spring tester.
2. Data for this test can be found in Section E11 - Engine dimensional data.
3. Engines with a 9,14 cm. (3.600 in.) stroke have identical inlet and exhaust valve springs.

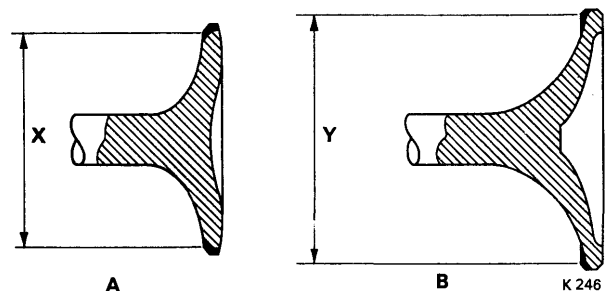


FIG. E50 VALVE SEAT DIMENSIONS

- A Exhaust
 B Inlet
 X 3,576 cm. to 3,58 cm.
 (1.408 in. to 1.412 in.)
 Y 4,56 cm. to 4,58 cm.
 (1.775 in. to 1.805 in.)

Chapter E

However, on later engines with the 9,90 cm. (3.900 in.) stroke, having an engine number prefix 'SYL', the inlet valve spring remains unchanged but both the dimensions and rating of the exhaust valve spring are increased. Assemble and fit the cylinder heads as described in Section E2, noting the following points.

Cylinder heads - To assemble

1. Ensure that the valves are fitted in their correct position and that the valve guide bores are perfectly clean.
2. Fit new cylinder head gaskets.
3. Tune the carburetters (*see Chapter K*).
4. Ensure all setscrews, nuts and bolts are torque tightened to the figures quoted in Chapter P.

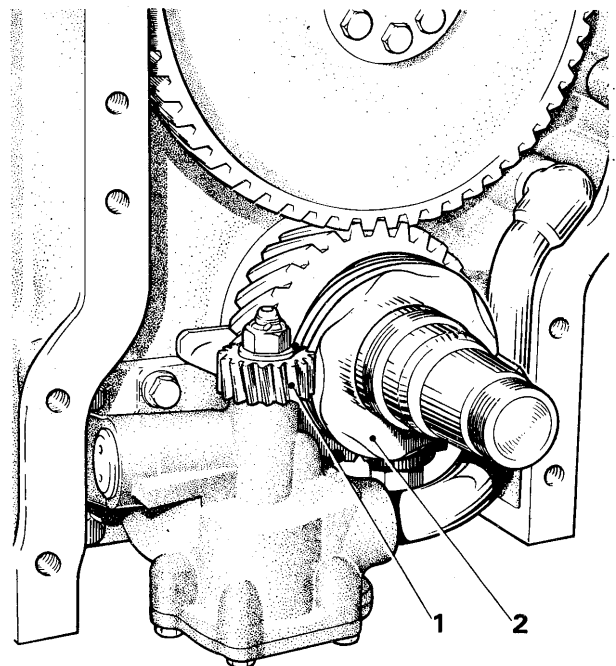
Section E10

ENGINE LUBRICATION

Oil pump - To remove

1. Drive the car onto a ramp then chock the road wheels to prevent the car from moving.
2. Drain the coolant as described in Chapter L.
3. Disconnect the battery leads.
4. Drain the engine oil as described in Section E1.
5. Remove the bonnet as described in Section E1.
6. Remove the eight nuts and bolts securing the radiator grille; remove the grille.
7. If refrigeration is fitted, discharge the system as described in Chapter C - Part 2.
8. Disconnect the two high pressure pipes located at the top of the condenser (*see Figs. E1 and E2 items 22 and 23*).
9. Remove the coolant fan, viscous coupling assembly (if fitted), radiator and header tank as described in Section E1.
10. Remove the four setscrews securing the condenser to the body; remove the condenser. The condenser is fitted between the radiator and the grille.
11. Remove the three exhaust downtake pipe clamps adjacent to the engine then detach the right-hand pipe from the engine and remove the short left-hand downtake pipe. (*Left-hand and right-hand description applies when viewed from the driver's seat*).
12. Using a jack, support the weight of the engine as shown in Figure E2.
13. Remove the nuts and washers securing the front engine mounting to the cross-member.
14. Remove the drive belts from the crankshaft pulley; refer to Chapter L.
15. Disconnect the electrical wiring to the generator or alternator, taking a careful note of the connections to ensure correct assembly.
16. Remove the nut, bolt and distance washer from the generator or alternator adjusting strap.
17. Detach the generator or alternator from its front and rear mounting points; remove the generator or alternator.
18. Remove the refrigerant compressor (if fitted) as described in Chapter C - Part 2; blank the ends of open pipes to prevent the ingress of dirt.
19. Disconnect the generator or alternator adjusting strut.

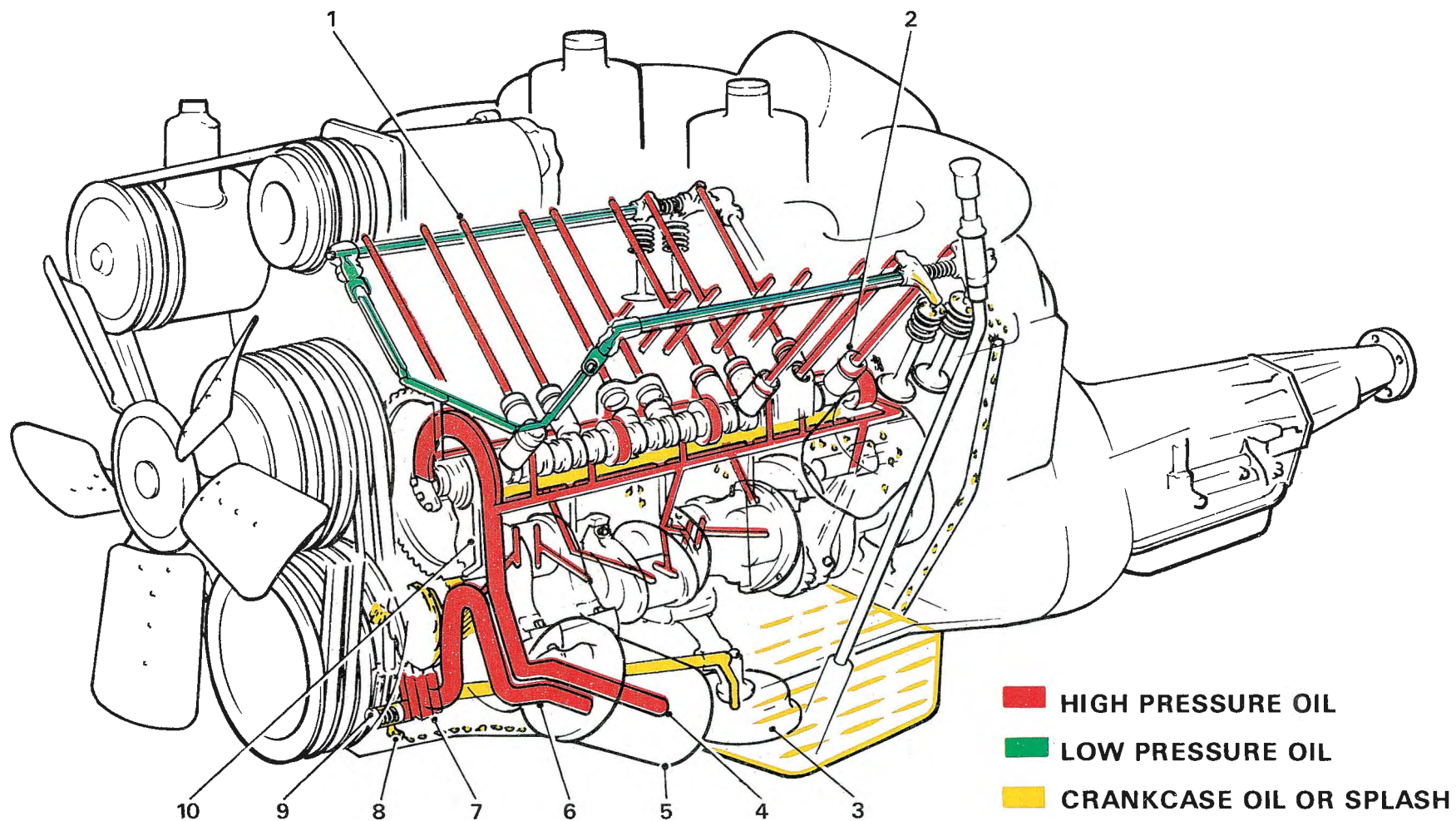
20. Disconnect the heater pipes from the coolant pump.
21. Disconnect the thermostat by-pass pipe at the coolant pump.
22. On cars fitted with an oil pressure gauge, remove the capacitor from the front lower casing.
23. Remove the setscrews securing the coolant pump to the crankcase; remove the coolant pump.
24. Discard the Neoprene seal which fits between the coolant pump and front lower casing.
25. Remove the lockplate and setscrews securing the pulley and Metalastik damper to the pulley drive flange; remove the pulley and Metalastik damper.
26. Using spanner RH 7131, remove the serrated nut from the crankshaft.
27. Using withdrawal tool RH 7097, remove the pulley driving flange (*see Fig. E53*).



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FIG. E51 VIEW OF OIL PUMP FITTED TO THE ENGINE

- 1 Oil pump gear
- 2 Oil pump gear drive



Q378

FIG. E52 ENGINE LUBRICATION DIAGRAM

- | | | | | |
|---------------------|----------------------------|-------------------------|---------------------------------|-----------------------------|
| 1 Push rods | 3 Oil pick-up and strainer | 5 Filter to oil gallery | 7 Oil pump | 9 Relief valve |
| 2 Hydraulic tappets | 4 Full flow oil filter | 6 Filter intake | 8 Return to intake side of sump | 10 Oil jet to camshaft gear |

28. Remove the setscrews securing the front lower casing to the crankcase then remove the casing; note that this casing is dowelled to the crankcase.

29. Detach the oil pipe connecting the pump to the filter intake ensuring that the rubber 'O' ring, fitted at the filter end of the pipe is also removed.

30. Remove the three setscrews securing the pump to the crankcase, then remove the pump together with the dowel inserts.

A little difficulty may be experienced when withdrawing the oil pump and it may be necessary to turn the unit from side to side as it is removed.

Crankshaft oil pump driving gear - To remove

1. With the front engine cover removed from the crankcase use special spanner RH 7110 to remove the serrated nut from the crankshaft.
2. Remove the washer and the two oil flingers.
3. The oil pump driving gear can now be withdrawn.

Oil pump - To test

The pump must be tested on a rig which has a variable orifice so that the oil delivery pressure from the pump can be restricted. The rig should also be able to drive the pump at a controlled speed and be capable of maintaining a constant temperature of 80° C (176° F) for the duration of the test. If these facilities are available, the pump should be tested as follows.

1. Drive the pump at 200 r.p.m. then adjust the variable orifice until the pump is delivering oil at 1,055 kg/sq.cm. (15 lb/sq.in.); with the orifice at this setting, the pump oil delivery should be 4,55 litres/min. (1 gal/min.).

2. Maintain the orifice at this setting then increase the pump speed to 1 500 r.p.m. At this speed, the pump oil delivery should be at least 9,00 litres/min. (2 gal/min.) at 2,95 kg/sq.cm. (42 lb/sq.in.). The oil pump relief valve should blow at approximately 2,95 kg/sq.cm. (42 lb/sq.in.).

If the performance of the pump does not conform to these figures, proceed as follows;

3. Examine the working face of the pump cover and if necessary, remove light wear marks by machining.

4. Compare the pump clearance with the figures given in Section E11 - Dimensional Data. If necessary renew the pump casing and fit a new matched set of gears.

5. If the condition of the pump is poor, the complete pump should be renewed.

Oil pump - To dismantle (see Fig. E54)

1. Hold the external driving gear in a suitable fixture, taking care that sufficient protection is provided to ensure that the teeth of the gear are not damaged.

2. Remove the split pin, nut and washer securing the driving gear to the driving shaft then carefully withdraw the gear; remove the Woodruff key from the shaft.

Unscrew the six setscrews from the end cover; remove the cover together with the two gears from the casing.

Oil pump - To assemble

Assemble the oil pump by reversing the procedure given for dismantling noting the following points.

1. Examine all working parts for wear and inspect the end cover and casing for distortion; renew if necessary. If the end cover is lightly scored by the pump gears, the score marks may be removed by machining.

2. Assemble the oil pump then check that the endfloat in the gears and backlash between the pump driving gear and the driven gear is correct (*see Section E11 - Dimensional Data*).

3. Torque tighten the setscrews, nuts and bolts to the figure specified in Chapter P.

Oil pump - To fit

Fit the oil pump by reversing the procedure given for removal, noting the following points.

1. Ensure that all setscrews, nuts and bolts are torque tightened to the figures specified in Chapter P.

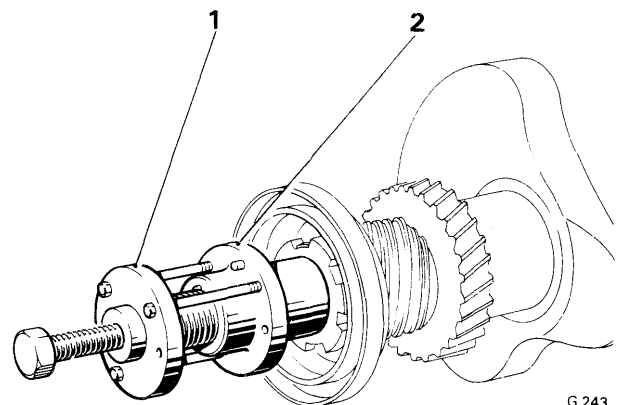


FIG. E53 WITHDRAWING THE CRANKSHAFT
FRONT FLANGE

- 1 Withdrawal tool
- 2 Driving flange

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2. Ensure that the backlash between the driving gear on the crankshaft and the gear on the pump is correct (see Section E11 - Dimensional Data: refer to Fig. E55).

3. When fitting the setscrews securing the pump to the engine, ensure that the dowel inserts are fitted to the holes from which they were removed.

4. The filter delivery pipe is held in position by

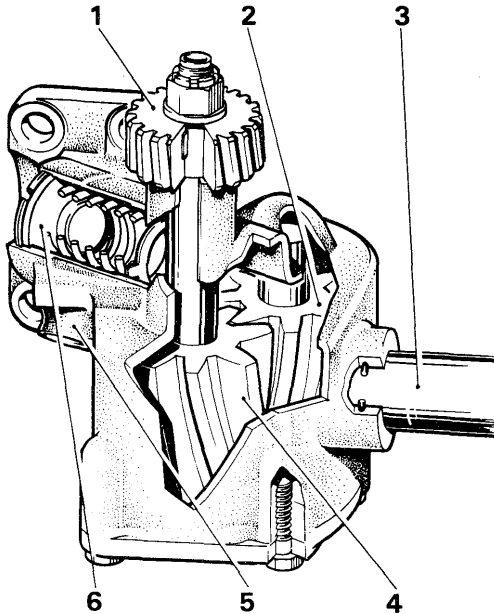


FIG. E54 CUT-AWAY VIEW OF OIL PUMP

- 1 Crankshaft driven gear
- 2 Oil pump driven gear
- 3 Oil filter delivery pipe
- 4 Oil pump driving gear
- 5 Relief valve
- 6 Oil pump body

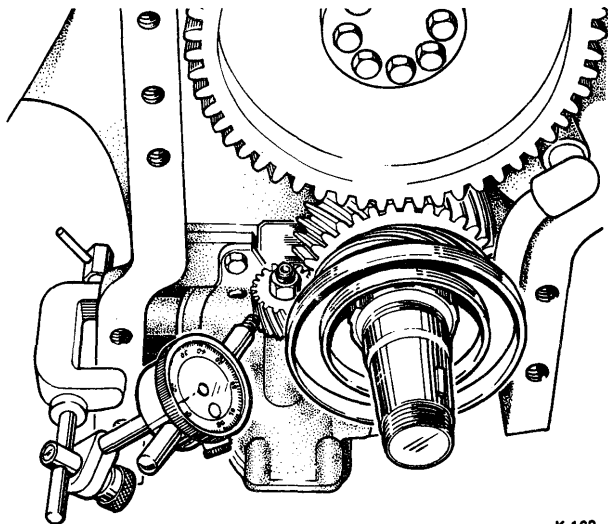


FIG. E55 CHECKING GEARING BACKLASH ON THE OIL PUMP

means of a rubber pad attached to the front cover; ensure that this pad is in position before fitting the cover. Renew the delivery pipe 'O' rings.

5. Fit new joints to the lower front cover and the oil pump facing. If the front cover to sump joint is damaged or in a poor condition it will be necessary to remove the sump to enable a new joint to be fitted (see Section E5 - Connecting rod bearings - To remove, Operations 6 to 11 inclusive).

6. Set the engine mounting stop plates to a 1,27 mm. (0.050 in.) gap; this procedure is fully described in Section E1 - Engine - To fit.

7. Renew the Neoprene seal between the coolant pump casing and the lower front cover and also the coolant pump 'O' rings.

8. Examine all coolant hoses for deterioration; replace any that are unserviceable.

9. Ensure that the driving belts are adjusted to the correct tension (see Chapter L).

10. Replenish the cooling system with the correct anti-freeze mixture.

11. If refrigeration is fitted, charge the system as described in Chapter C - Part 2.

12. Fill the engine with an approved oil to the 'Max.' level mark on the dipstick.

Oil filter element - To renew (see Fig. E56)

The sump should be drained when the oil is warm, preferably after the car has completed a run.

- 1. Place car on a ramp.
- 2. Position a container of suitable capacity beneath the sump plug.
- 3. Drain engine oil into container by unscrewing and removing, the drain plug and aluminium sealing washer.
- 4. Clean the drain plug, washer and small area of sump around the drain hole.
- 5. Inspect the condition of the aluminium sealing washer and renew if necessary.
- 6. Fit the sealing washer and drain plug to the sump and tighten.
- 7. Position the container beneath the oil filter.
- 8. Support the filter bowl and unscrew the retaining bolt. Remove the bowl and pour away the old oil.
- 9. Remove the rubber ring from the filter head.
- 10. Remove and discard the filter element.
- 11. Remove the conical cork washer, the spring and the rubber washer from inside the bowl and withdraw the retaining bolt and Dowty seal.
- 12. Thoroughly wash the bowl in clean paraffin and wipe it dry with a clean cloth ensuring that the rim and the bottom of the bowl are free from any foreign matter.
- 13. Inspect the Dowty seal, the conical cork washer and the rubber sealing washer for signs of deterioration or damage, and renew them if necessary.
- 14. Fit a new element, together with the retaining

bolt, sealing washers and spring in the filter bowl.

The element should be installed over the retaining bolt so that the drilled centre piece is to the top and the recessed portion of the lower sleeve seats against the spring loaded cork washer.

15. Ensure that the conical cork sealing washer and cup washer are fitted correctly. Failure to fit either one or both of these washers will allow unfiltered oil to pass up the centre of the filter, and this can result in serious damage to the engine bearings.

16. Pour a quantity of clean oil into the filter bowl and fit the bowl together with a new rubber ring to the filter head.

17. Ensure that the corners of the element are not trapped between the bowl and the head; as a precaution to prevent this, it is permissible to turn the corners over. Check also, that the bowl and the ring are seating correctly. Torque tighten the centre retaining bolt to the figure quoted in Chapter P.

Filter head - To fit

Fit the filter head by reversing the procedure given for removal, noting the following points.

1. Fit a new joint between the head and the crankcase adapter.
2. Tighten the setscrews to the figure quoted in Chapter P.
3. The filter head must be in position before the filter and bowl can be replaced.

Filter head - To remove

1. If it is necessary to remove the filter head from the crankcase adapter, the bowl must first be removed as previously described.
2. Unscrew the two setscrews securing the head to the crankcase adapter, remove the head and discard the joint.
3. Scrape the faces to remove all old joint material.

Oil pressure transmitter (if fitted) - To assemble

To obtain an accurate oil pressure reading, it is essential that the oil pressure transmitter is correctly assembled to the crankcase oil filter adapter.

The transmitter should be fitted so that the raised portion of the cover is towards the top and within 60° either side of the vertical datum.

The correct position of the transmitter can be achieved by fitting an additional copper washer to the threaded union (*see Fig. E9*).

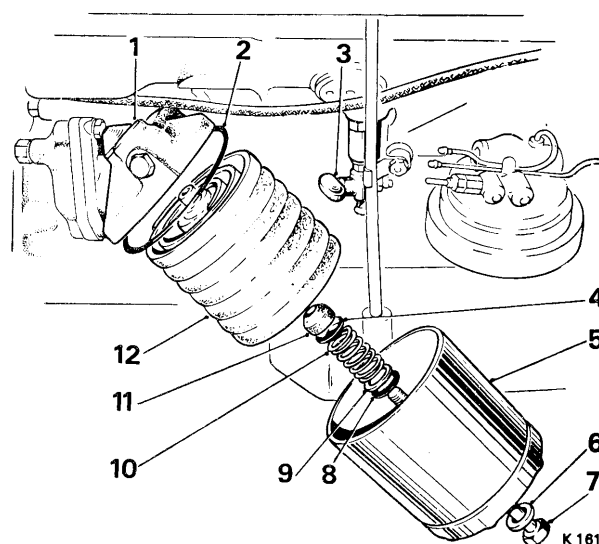


FIG. E56 EXPLODED VIEW OF FILTER ASSEMBLY
(Early Cars)

- | | |
|-----------------------|------------------|
| 1 Filter head | 7 Retaining bolt |
| 2 Rubber sealing ring | 8 Rubber washer |
| 3 Coolant drain tap | 9 Plain washer |
| 4 Cup washer | 10 Spring |
| 5 Filter bowl | 11 Cork washer |
| 6 Dowty seal | 12 Element |

Oil level sender unit - To replace

1. Disconnect the battery.
2. Before removing the unit which is fitted into the side of the sump, drain the sump oil (*see Oil filter element - To renew*).
3. Disconnect the electrical leads from the unit and remove.
4. Fit a new joint between the sender and the sump face before replacing an existing unit or fitting a new one.
5. Ensure that the spring washers are fitted to the securing setscrews.
6. Fill the sump with approved clean oil to the 'Max.' mark on the dipstick. See Chapter A for capacities.

Section E11

ENGINE DIMENSIONAL DATA

Description	Dimension	Permissible Worn Dimensions	Remarks
Crankcase and Cylinders			
Cylinder liner bore grading	H. 10,414 cm. to 10,41476 cm. (4·100 in. to 4·1003 in.) J. 10,41502 cm. to 10,41578 cm. (4·1004 in. to 4·1007 in.) K. 10,41603 cm. to 10,41679 cm. (4·1008 in. to 4·1011 in.) L. 10,41705 cm. to 10,41781 cm. (4·1012 in. to 4·1015 in.) M. 10,41806 cm. to 10,41908 cm. (4·1016 in. to 4·102 in.)	0,1016 mm. (0·004 in.) wear	If these measurements are exceeded a new assembly of liner and piston must be fitted
Cylinder liner 'nip'	0,051 mm. to 0,076 mm. (0·002 in. to 0·003 in.)		New liners must be selectively fitted or ground on the end to give this dimension
Pistons			
Piston grading	H. 10,41019 cm. to 10,41095 cm. (4·0985 in. to 4·0988 in.) J. 10,41121 cm. to 10,41197 cm. (4·0989 in. to 4·0992 in.) K. 10,41222 cm. to 10,41298 cm. (4·0993 in. to 4·0996 in.) L. 10,41324 cm. to 10,4140 cm. (4·0997 in. to 4·100 in.) M. 10,41425 cm. to 10,41502 cm. (4·1001 in. to 4·1004 in.)		Piston clearance in the bore 0,0305 mm. to 0,0457 mm. (0 0012 in. to 0 0018 in.) measured 23,012 mm. (0 906 in.) from the bottom of the skirt across the thrust axis
Compression ring groove widths	2,049 mm. to 2,075 mm. (0·0807 in. to 0·0817 in.)		

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Description	Dimension	Permissible Worn Dimensions	Remarks
Pistons - continued			
Compression ring widths	1,973 mm. to 1,998 mm. (0.0777 in. to 0.0787 in.)		The rings should be assembled with staggered gaps
Clearance	0,051 mm. to 1,1016 mm. (0.002 in. to 0.004 in.)	0,127 mm. (0.005 in.)	
Compression ring closed	0,38 mm. to 0,051 mm. (0.015 in. to 0.020 in.)	0,64 mm. (0.025 in.)	Engine No. Prefix 'SY'
Compression ring closed	0,33 mm. to 0,64 mm. (0.013 in. to 0.025 in.)		Engine No. Prefix 'SYL'
Open gap, (nominal)	13,21 mm. (0.520 in.)		
Scraper ring groove width	4,521 mm. to 4,547 mm. (0.178 in. to 0.179 in.)	4,597 mm. (0.181 in.)	
Scraper ring width	4,458 mm. to 4,470 mm. (0.1755 in. to 0.1760 in.)		Neglecting spring
Clearance	Nil		Clearance taken up by spring load
Closed gap	0,38 mm. to 0,51 mm. (0.015 in. to 0.020 in.)	0,64 mm. (0.025 in.)	
Open gap, (nominal)	13,21 mm. (0.520 in.)		
Gudgeon Pins			
Bore diameter in piston	2,5397 cm. to 2,5402 cm. (0.9999 in. to 1.0001 in.)		} Engine No. Prefix 'SY' } By selective assembly at room temp. 20°C to 22.2°C (68°F to 72°F)
Gudgeon pin diameter	2,5402 cm. to 2,5407 cm. (1.0001 in. to 1.0003 in.)		
Interference in boss	0,0051 mm. (0.0002 in.)		
Bore diameter in piston	2,5408 cm. to 2,5413 cm. (1.0003 in. to 1.0005 in.)		} Engine No. Prefix 'SYL'
Gudgeon pin diameter	2,5402 cm. to 2,5407 cm. (1.0001 in. to 1.0003 in.)		
Clearance in boss	0,0025 mm. to 0,0076 mm. (0.0001 in. to 0.0003 in.)		

Description	Dimension	Permissible Worn Dimensions	Remarks
Crankshaft and Connecting Rods			
Connecting rod small-end bush internal diameter	2,5408 cm. to 2,5413 cm. (1.0003 in. to 1.0005 in.)		
Gudgeon pin clearance	0,002 mm. to 0,0068 mm. (0.00008 in. to 0.00027 in.)	0,0127 mm. (0.0005 in.)	At room temp. 20° C to 22.2° C (68° F to 72° F)
Big-end bearing housing, internal diameter	6,0833 cm. to 6,0846 cm. (2.395 in. to 2.3955 in.)		This diameter should be checked with the big-end bolts in position and the nuts torque tightened to 4,147 kgf.m. (30 lbf.ft.)
Big-end bearing shell, internal diameter	5,71627 cm. to 5,71881 cm. (2.2505 in. to 2.2515 in.)		
Crankpin diameter	5,71119 cm. to 5,71246 cm. (2.2485 in. to 2.249 in.)	5,70865 cm. (2.2475 in.)	
Clearance	0,0381 mm. to 0,0762 mm. (0.0015 in. to 0.003 in.)	0,1016 mm. (0.004 in.)	Clearance measured vertically. Renew bearings if lead plating is worn through
Small-end bush housing, internal diameter	2,8956 cm. to 2,89687 cm. (1.140 in. to 1.1405 in.)		
Small-end bush external diameter	2,902 cm. to 2,9058 cm. (1.1425 in. to 1.144 in.)		Handpush fit in ring gauge.
Interference	0,051 mm. to 0,1016 mm. (0.002 in. to 0.004 in.)		
Connecting rod and cap bolt holes diameter for location	9,525 mm. to 9,538 mm. (0.375 in. to 0.3755 in.)		On location diameter
Connecting rod bolt diameter for location	9,512 mm. to 9,525 mm. (0.3745 in. to 0.375 in.)		On location diameter
Clearance	Size to 0,0254 mm. (0.001 in.)		
Connecting rod bolt			
Interference on knurled diameter	0,081 mm. to 0,183 mm. (0.0032 in. to 0.0072 in.)		Bolts should not be removed from rods unless they are to be renewed
Theoretical nip on connecting rod bearing shells	0,076 mm. to 0,203 mm. (0.003 in. to 0.008 in.)		Controlled by clearance between rods and crankpin end faces
Connecting rod end - float	0,203 mm. to 0,432 mm. (0.008 in. to 0.017 in.)		

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Description	Dimension	Permissible Worn Dimensions	Remarks
Crankshaft and Connecting Rods - continued			
Main bearing shell internal diameter: Theoretical	6,3525 cm. to 6,3551 cm. (2·501 in. to 2·502 in.)		
Crankshaft journal diameter	6,3487 cm. to 6,35 cm. (2·4995 in. to 2·500 in.)	6,3462 cm. (2·4985 in.)	
Diametral clearance	0,025 mm. to 0,063 mm. (0·001 in. to 0·0025 in.)	0,0889 mm. (0·0035 in.)	Renew bearings if lead plating is worn through
Crankshaft end - float	0,1016 mm. to 0,25 mm. (0·004 in. to 0·010 in.)	0,31 mm. (0·012 in.)	
Connecting rod bolt stretch	From 0,152 mm. to 0,203 mm. (0·006 in. to 0·008 in.) bolt stretch Torque load - 4,84 kgf.m. to 5,53 kgf.m. (35 lbf.ft. to 40 lbf.ft.)		

Crankshaft Size	Crankshaft Journal	Main Shell Bearing
Crankcase grinding dimensions Standard 	6,35 cm. - 0,0127 mm. (2·500 in. - 0·0005 in.)	6,35254 cm. + 0,0254 mm. (2·501 in. + 0·001 in.)
0,254 mm. undersize (0 010 in. undersize) 	6,3246 cm. - 0,0127 mm. (2·490 in. - 0·0005 in.)	6,32714 cm. + 0,0254 mm. (2·491 in. + 0·001 in.)
0,508 mm. undersize (0 020 in. undersize) 	6,299 cm. - 0,0127 mm. (2·480 in. - 0·0005 in.)	6,30174 cm. + 0,0254 mm. (2·481 in. + 0·001 in.)

Crankshaft Size	Crankpin	Big-end Bearing
Standard 	5,7125 cm. - 0,0127 mm. (2·249 in. - 0·0005 in.)	5,7163 cm. + 0,0254 mm. (2·2505 in. + 0·001 in.)
0,254 mm. undersize (0 010 in. undersize) 	5,6871 cm. - 0,0127 mm. (2·239 in. - 0·0005 in.)	5,6909 cm. + 0,0254 mm. (2·2405 in. + 0·001 in.)
0,508 mm. undersize (0 020 in. undersize) 	5,6617 cm. - 0,0127 mm. (2·229 in. - 0·0005 in.)	5,6655 cm. + 0,0254 mm. (2·2305 in. + 0·001 in.)

Description	Dimension	Permissible Worn Dimensions	Remarks
Main Bearing Housings Bore diameter	6,7704 cm. to 6,77164 cm. (2.6655 in. to 2.6660 in.)		This diameter should be checked with the main bearing cap nuts in position and torque loaded to 4,839 kgf.m. (35 lbf.ft.)
Main Bearing Cap Width of cap Crankcase location gap Fit - Interference Clearance	12,955 cm. to 12,957 cm. (5.1005 in. to 5.1010 in.) 12,954 cm. to 12,957 cm. (5.1000 in. to 5.1010 in.) 0,0254 mm. (0.001 in.) 0,0127 mm. (0.0005 in.)		
Valve Gear Camshaft timing gear backlash Camshaft gear face run-out Camshaft end - float Camshaft journal diameter Camshaft bearing, internal diameter Camshaft journal clearance Inlet cam and base circle - overall dimension Exhaust cam and base circle - overall dimension Tappet block bore diameter Colour code white (grade Y) Colour code red (grade Z) Tappet external diameter One groove	0,0254 mm. to 0,1143 mm. (0.001 in. to 0.0045 in.) 0,000 mm. to 0,051 mm. (0.000 in. to 0.002 in.) 0,051 mm. to 0,152 mm. (0.002 in. to 0.006 in.) 5,0737 cm. to 5,0749 cm. (1.9975 in. to 1.998 in.) 5,08 cm. to 5,0813 cm. (2.000 in. to 2.0005 in.) 0,0508 mm. to 0,0762 mm. (0.002 in. to 0.003 in.) 3,727 cm. to 3,739 cm. (1.467 in. to 1.472 in.) 3,727 cm. to 3,739 cm. (1.467 in. to 1.472 in.) 22,981 mm. to 22,987 mm. (0.90475 in. to 0.9050 in.) 22,987 mm. to 22,993 mm. (0.9050 in. to 0.90525 in.) 22,962 mm. to 22,968 mm. (0.9040 in. to 0.90425 in.)	0,152 mm. (0.006 in.) 5,07111 cm. (1.9965 in.) 5,0851 cm. (2.002 in.) 0,1016 mm. (0.004 in.) 3,701 cm. (1.457 in.) 3,701 cm. (1.457 in.)	Max. cam lift is 6,44 mm. (0.25355 in.). Minimum permissible lift is 5,969 mm. (0.235 in.) Max. cam lift is 6,44 mm. (0.25355 in.). Minimum permissible lift is 5,969 mm. (0.235 in.) Groove(s) etched onto the top face of tappet barrel. Tappets marked with one groove should be used with tappet block bores colour coded white and tappets marked with two grooves should be used with tappet block bores colour coded red

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Description	Dimension	Permissible Worn Dimensions	Remarks
Valve Gear - continued			
Two grooves	22,968 mm. to 22,974 mm. (0.90425 in. to 0.9045 in.)		
Clearance	0,0127 mm. to 0,0254 mm. (0.0005 in. to 0.001 in.)	0,0381 mm. (0.0015 in.)	
Exhaust valve guide - external diameter	15,9385 mm. to 15,9512 mm. (0.6275 in. to 0.628 in.)		
Cylinder head bore diameter for exhaust valve guide	15,875 mm. to 15,9004 mm. (0.625 in. to 0.626 in.)		
Interference in head	0,0381 mm. to 0,0762 mm. (0.0015 in. to 0.003 in.)		
Exhaust valve guide - internal diameter	9,525 mm. to 9,54 mm. (0.375 in. to 0.3755 in.)	9,588 mm. (0.3775 in.)	'Bellmouth' at the lower end is permissible up to 0,1524 mm. (0.006 in.) for a depth of 9,4615 mm. (0.3725 in.)
Exhaust valve stem diameter	9,492 mm. to 9,499 mm. (0.37375 in. to 0.374 in.)	9,468 mm. (0.37275 in.)	
Clearance	0,025 mm. to 0,044 mm. (0.001 in. to 0.00175 in.)	0,089 mm. (0.0035 in.)	
Exhaust valve spring compressed to 4,064 cm. (1.600 in.)	37,195 kg. to 39,009 kg. (82 lb. to 86 lb.)	32,205 kg. (71 lb.)	Engine No. Prefix 'SY'
Exhaust valve spring compressed to 4,470 cm. (1.725 in.)	39,009 kg. to 40,823 kg. (86 lb. to 90 lb.)	36,287 kg. (80 lb.)	Engine No. Prefix 'SYL'
Exhaust and inlet valve seat angle	45°		'Crown' with 30° cutter to avoid pocketing after re-grinding seat
Exhaust valve seat insert - external diameter	4,4552 cm. to 4,4564 cm. (1.7540 in. to 1.7545 in.)		Standard size
Cylinder head bore diameter for exhaust seat insert	4,445 cm. to 4,4475 cm. (1.750 in. to 1.751 in.)		
Interference	0,0762 mm. to 0,1143 mm. (0.003 in. to 0.0045 in.)		
Inlet valve seat insert - external diameter	5,1536 cm. to 5,1549 cm. (2.0290 in. to 2.0295 in.)		Standard size

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Description	Dimension	Permissible Worn Dimensions	Remarks
Valve Gear continued			
Cylinder head bore diameter for inlet seat insert	5,1435 cm. to 5,1460 cm. (2.025 in. to 2.026 in.)		
Interference	0,0762 mm. to 0,1143 mm. (0.003 in. to 0.0045 in.)		
Inlet valve guide - external diameter	15,9385 mm. to 15,9512 mm. (0.6275 in. to 0.628 in.)		
Cylinder head bore diameter for inlet valve guide	15,875 mm. to 15,90 mm. (0.625 in. to 0.626 in.)		
Interference in head	0,0381 mm. to 0,0762 mm. (0.0015 in. to 0.003 in.)		
Inlet valve guide - internal diameter	9,525 mm. to 9,54 mm. (0.375 in. to 0.3755 in.)	9,588 mm. (0.3775 in.)	
Inlet valve stem diameter	9,492 mm. to 9,499 mm. (0.37375 in. to 0.374 in.)	9,468 mm. (0.37275 in.)	
Clearance	0,025 mm. to 0,044 mm. (0.001 in. to 0.00175 in.)	0,089 mm. (0.0035 in.)	
Inlet valve spring compressed to 4,064 cm. (1 600 in.)	37,195 kg. to 39,009 kg. (82 lb. to 86 lb.)	32,205 kg. (71 lb.)	
Exhaust valve - overall length	12,42 cm. (4.891 in.)		
Inlet valve - overall length	12,509 cm. (4.925 in.)		
Distributor gear backlash	0,0254 mm. to 0,1524 mm. (0.001 in. to 0.006 in.)	0,2286 mm. (0.009 in.)	
Rocker bore diameter	19,031 mm. to 19,044 mm. (0.74925 in. to 0.74975 in.)	19,075 mm. (0.751 in.)	
Rocker shaft diameter	19,006 mm. to 19,012 mm. (0.74825 in. to 0.7485 in.)		
Clearance	0,0191 mm. to 0,0331 mm. (0.00075 in. to 0.0015 in.)	0,089 mm. (0.0035 in.)	
Hydraulic brake pump push rod lift	13,26 mm. to 13,33 mm. (0.522 in. to 0.525 in.)		This measurement is taken from the top face of the mounting flange to the top of the push rod (see Fig. E40)

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Description	Dimension	Permissible Worn Dimensions	Remarks
Oil Pump			
Driving shaft diameter	12,675 mm. to 12,687 mm. (0.4990 in. to 0.4995 in.)	12,624 mm. (0.4970 in.)	
Shaft bore diameter	12,70 mm. to 12,713 mm. (0.500 in. to 0.5005 in.)		
Shaft clearance in casing bore	0,0127 mm. to 0,038 mm. (0.0005 in. to 0.0015 in.)	0,0762 mm.	
Stationary spindle diameter	12,675 mm. to 12,687 mm. (0.499 in. to 0.4995 in.)	12,637 mm. (0.4975 in.)	
Driven gear internal diameter	12,70 mm. to 12,713 mm. (0.500 in. to 0.5005 in.)	12,738 mm. (0.5015 in.)	
Clearance on spindle	0,0127 mm. to 0,038 mm. (0.0005 in. to 0.0015 in.)	0,076 mm. (0.003 in.)	Permissible only when the radial clearance of the gears in the case exceeds this figure
Diametrical clearance between gears and side of chamber	0,0508 mm. to 0,089 mm. (0.002 in. to 0.0035 in.)	0,152 mm. (0.006 in.)	
Pump gears - backlash	0,0762 mm. to 0,1778 mm. (0.003 in. to 0.007 in.)	0,2159 mm.	
Pump gears - end float	0,0254 mm. to 0,1016 mm. (0.001 in. to 0.004 in.)	0,127 mm. (0.005 in.)	
Drive gear backlash	0,0254 mm. to 0,1524 mm. (0.001 in. to 0.006 in.)	0,305 mm. (0.012 in.)	
Cylinder Head Studs			
Stud diameter	Yellow 10,287 mm. to 10,262 mm. (0.405 in. to 0.404 in.) Red 10,262 mm. to 10,236 mm. (0.404 in. to 0.403 in.) Blue 10,236 mm. to 10,208 mm. (0.403 in. to 0.4019 in.)		Studs must be matched to hole, colour for colour
Threaded hole diameter	Yellow 10,262 mm. to 10,236 mm. (0.404 in. to 0.403 in.) Red 10,236 mm. to 10,211 mm. (0.403 in. to 0.402 in.) Blue 10,211 mm. to 10,185 mm. (0.402 in. to 0.401 in.)		
Interference	0,000 mm. to 0,0508 mm. (0.000 in. to 0.002 in.)		

Description	Dimension	Permissible Worn Dimensions	Remarks
Main Bearing Housing Studs Stud diameter Threaded hole diameter Interference	Yellow 11,874 mm. to 11,849 mm. (0.4675 in. to 0.4665 in.) Red 11,849 mm. to 11,824 mm. (0.4665 in. to 0.4655 in.) Blue 11,824 mm. to 11,793 mm. (0.4655 in. to 0.4643 in.) Yellow 11,849 mm. to 11,824 mm. (0.4665 in. to 0.4655 in.) Red 11,824 mm. to 11,798 mm. (0.4655 in. to 0.4645 in.) Blue 11,798 mm. to 11,758 mm. (0.4645 in. to 0.4635 in.) 0,000 mm. to 0,0508 mm. (0.000 in. to 0.002 in.)		Studs must be matched to hole, colour for colour

Section E12

FAULT DIAGNOSIS

(For cars fitted with Exhaust Emission Control and Evaporative Emission Control Systems, see also Chapter U)

Symptom	Possible Cause	Action
1 Engine fails to start; starter motor inoperative	<p>1(a) Gearchange selector out of neutral position or neutral or park position on cars fitted with torque converter transmission</p> <p>(b) Parking lamp switch in park position (early cars only)</p> <p>(c) Ignition fuse blown</p> <p>(d) Battery discharged</p> <p>(e) Break or high resistance in battery connections and starter relay connections</p> <p>(f) Auxiliary starter relay faulty</p> <p>(g) Starter motor commutator or brushes in poor condition</p> <p>(h) Defective starter motor</p>	<p>1(a) Move gear lever into neutral position or neutral or park position on cars fitted with the torque converter transmission</p> <p>(b) Return switch to central position</p> <p>(c) Fit new fuse (see Chapter M)</p> <p>(d) Charge battery and check specific gravity (see Chapter M)</p> <p>(e) Clean all terminals and repair any broken connections (see Chapter M)</p> <p>(f) Fit new relay (see Chapter M)</p> <p>(g) Clean or machine commutator as necessary and renew brushes (see Chapter M). If the overall condition of the starter motor is poor, a new or re-conditioned starter motor should be fitted</p> <p>(h) Remove and examine the starter motor (see Chapter M)</p>
2 Engine fails to start; starter motor operates but fails to turn engine	<p>2(a) Discharged battery</p> <p>(b) Fault in starter circuit</p>	<p>2(a) Check voltage supply across terminals with battery under equivalent starter motor load (see Chapter M)</p> <p>(b) Examine starter circuit connections and starter switch (see Chapter M)</p>

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Symptom	Possible Cause	Action
	(c) Defective starter motor (d) Starter motor spinning but not engaging	(c) Remove and examine the starter motor (see Chapter M) (d) Check solenoid for correct operation (see Chapter M)
3 Engine fails to fire	3(a) No fuel at carburettors (b) Defective ignition (c) Excess fuel in combustion chamber (d) Incorrect metering of fuel by carburettors	3(a) Check fuel level in fuel tank. Check operation of fuel pumps and examine fuel pipes for blockage or excessive leakage (see Chapter K) (b) Examine leads and connections to ignition switch, battery, coil, distributor contact breaker gap. (if fitted) Check operation and condition of contact breaker points (burnt points may indicate a faulty condenser). Test condenser and coil. Examine distributor cap for tracking. Remove, clean and adjust sparking plugs. Check ignition timing (see Chapter M) (c) Remove, clean and dry sparking plugs. Turn engine with sparking plugs removed, to blow out excess fuel. Check carburettors and controls for correct operation (see Chapter K) (d) Check level of floats. Examine jets for blockage. Examine needles for distortion. Examine filters in the float chamber caps. Examine float chamber needles for freedom of movement and wear. Examine jets for wear and correct settings. Refer to Chapter K
4 Engine fails to fire (hot engine only)	4(a) Incorrect choke operation	4(a) Ensure that the choke is not on the fast-idle step of the cam (trigger choke by depressing accelerator pedal with engine stationary). Examine the choke controls for freedom of movement. Examine the bi-metal coils to ensure that they are correctly operating the choke (see Chapter K)

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Symptom	Possible Cause	Action
5 Poor engine idling	<p>5(a) Throttle butterfly valves not synchronised</p> <p>(b) Incorrect mixture</p> <p>(c) Sticking carburetter piston caused by a bent damper rod</p> <p>(d) Incorrect ignition timing</p> <p>(e) Air leaks in induction system</p>	<p>5(a) Correctly adjust throttle butterfly valves (see Chapter K)</p> <p>(b) Tune the carburetters (see Chapter K)</p> <p>(c) Carry out the check given in Chapter K</p> <p>(d) Check the ignition timing and correct if necessary (see Chapter M)</p> <p>(e) Examine the induction manifold joints, carburetter joints and manifold vacuum connections (see Chapter K and Section E4)</p>
6 Incorrect engine idle speed	<p>6(a) Carburetters incorrectly set</p> <p>(b) Choke controls incorrectly adjusted or sticking</p>	<p>6(a) Tune carburetters (see Chapter K)</p> <p>(b) Ensure correct operation and freedom of movement of choke controls (see Chapter K)</p>
7 Poor engine idling (black smoke from exhaust)	<p>7(a) Flooding of the float chamber or the jet</p>	<p>7(a) Examine floats and needle valves in the float chambers. Check the float height (see Chapter K)</p>
8 Irregular running; engine misfiring	<p>8(a) Dirty or defective sparking plugs</p> <p>(b) Defective ignition circuit</p>	<p>8(a) Clean and examine sparking plugs. Examine insulators. Check gaps. Renew plugs if necessary (see Chapter M)</p> <p>(b) Examine all leads for security. Examine the L.T. and earth leads in the distributor for damage to the braiding. Ensure that the wires are not trapped by the distributor cap. Examine the contact breaker spring connections and the lubricating pad spring connection for security (if fitted). Examine the rotor for signs of tracking. Check the contact breaker gap. Examine the condition of the points. Check the operation of the coil. Check the carbon brush for freedom of movement in the distributor cap (see Chapter M)</p>

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Symptom	Possible Cause	Action
	<p>(c) Air leaks in induction system</p> <p>(d) Valves not seating correctly</p> <p>(e) Defective cylinder head gasket(s)</p>	<p>(c) Examine the induction manifold joints, carburetter joints and manifold vacuum connections (see Chapter K and Section E4)</p> <p>(d) Examine the valves for freedom of movement, also examine valve seats and valve springs</p> <p>(e) Remove the cylinder head(s) and examine the gasket(s). Refer to Section E4</p>
<p>9 Loss of power</p>	<p>9(a) Dirty or defective sparking plugs</p> <p>(b) Defective ignition circuit</p> <p>(c) Air leaks in induction system</p> <p>(d) Blocked air cleaner</p> <p>(e) Faulty carburetter, insufficient fuel supply or sticking carburetter air valve piston</p> <p>(f) Throttle linkage incorrectly adjusted or sticking</p> <p>(g) Worn or burnt valves. Broken or weak valve springs</p> <p>(h) Defective cylinder head gasket(s)</p>	<p>9(a) Clean and examine the sparking plugs. Check the gaps. Renew the sparking plugs if necessary (see Chapter M)</p> <p>(b) Examine all electrical leads in circuit. Check operation and condition of distributor points and ignition timing</p> <p>(c) Examine induction manifold joints, carburetter joints and manifold vacuum connections (see Chapter K and Section E4)</p> <p>(d) Clean or renew air filter element (see Chapter K)</p> <p>(e) Examine jets and filters for foreign matter. Examine float chamber needle valves. Check operation of fuel pumps. Examine fuel pipes for leakage or obstruction. Examine air valves pistons and dampers (see Chapter K)</p> <p>(f) Correctly adjust the throttle linkage (see Chapter K)</p> <p>(g) Examine the condition of the valves and springs (see Section E4)</p> <p>(h) Examine the condition of the gasket(s). Refer to Section E4</p>

Symptom	Possible Cause	Action
10 Engine spits back through carburetters	<p>10(a) Insufficient fuel supply or weak mixture</p> <p>(b) Inlet valve not seating</p> <p>(c) Detonation or incorrect timing</p> <p>(d) Heavily carboned engine</p>	<p>10(a) Examine jets and filters for foreign matter. Examine the float chamber needle valves. Check the operation of the fuel pumps. Examine the fuel pipes for leakage or obstruction (see Chapter K)</p> <p>(b) Examine the valves for correct operation (see Section E4)</p> <p>(c) Ensure that the fuel grade is correct. Check that the distributor octane selector setting is correct (if fitted). Check for correct advance and retard operation. Examine the condition and setting of the distributor points (if fitted). Examine the condition of the sparking plugs (see Chapter M)</p> <p>(d) Decarbonise engine (see Section E9)</p>
11 Detonations in silencer	<p>11(a) Incorrect mixture</p> <p>(b) Incorrect ignition timing or intermittent 'short' in ignition circuit</p> <p>(c) Exhaust valves sticking</p>	<p>11(a) Examine the carburetter jets, filters, floats, float chamber needles and adjust mixture (see Chapter K)</p> <p>(b) Check the distributor for correct ignition timing, and correct contact breaker gaps. Examine connections for security and leads for damage to the braiding (see Chapter M)</p> <p>(c) Examine exhaust valves for freedom of movement (see Section E2)</p>
12 Overheating	<p>12(a) Loss of coolant</p> <p>(b) Faulty thermostat</p> <p>(c) Broken or slipping fan belts</p>	<p>12(a) Check level of coolant in header tank. Examine the coolant system for leaks</p> <p>(b) Check the thermostat for correct operation (see Chapter L)</p> <p>(c) Examine the condition of the fan belts. Renew or adjust (see Chapter L)</p>

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Chapter E

Symptom	Possible Cause	Action
Overheating (continued)	(d) Faulty coolant pump (e) Faulty cylinder head gasket or gasket fitted incorrectly (f) Weak/fuel/air mixture (g) Inadequate lubrication (h) Incorrect ignition timing (i) Blocked coolant system	(d) Drain the coolant system then remove and check the operation of the pump (see Chapter L) (e) Examine the cylinder head gasket(s). Check the torque tightness of the cylinder head securing nuts (see Chapter P) (f) Examine jets, filters, floats and needle valves (see Chapter K) (g) Check the level of oil in the sump. Examine the oil filter element. Check operation of the relief valve (h) Check the ignition timing and for correct operation of the advance and retard mechanism (see Chapter M) (i) Drain and reverse flush coolant system. Examine matrix face for flies, leaves, paper etc., which would restrict air flow (see Chapter L)
13 Low oil pressure	13(a) Inadequate oil supply (b) Engine overheating (c) Defective oil pressure relief valve (d) Defective oil pressure transmitter (e) Defective oil pressure gauge (f) Blocked oil filter	13(a) Check level of oil in sump. Examine oil pipes, joints, seals and connections for leaks (b) See 'Overheating' (c) Examine and clean relief valve (see Section E10) (d) Check transmitter (see Section E10) (e) Fit new oil pressure gauge (see Chapter M) (f) Change filter
14 Excessive fuel consumption	14(a) Fuel leakage (b) Incorrect choke operation	14(a) Examine all fuel connections for leaks (b) Correctly adjust choke controls and check for freedom of operation (see Chapter K)

Chapter E

Symptom	Possible Cause	Action
Excessive fuel consumption (continued)	(c) Worn or maladjusted carburetters Piston air valve damper sticking (d) Blocked air cleaner (e) Incorrect ignition timing (f) Loss of compression (g) Decarbonize engine (see Section E9)	(c) Examine the carburetter for excessive wear. Check for correct adjustment (see Chapter K) (d) Clean or renew air filter element (see Chapter K) (e) Check the distributor for correct ignition timing and correct contact breaker gaps (see Chapter M) (f) Examine valves, valve spring and piston rings (see Sections E2 and E5) (g) Heavily carboned engine

Section E13

WORKSHOP TOOLS

<i>Tool Number</i>	<i>Description</i>
RH 2684	Wing Cover Set
RH 2685	Wing Cover Liners
RH 7094	Valve Spring Compressor
RH 7095	Extraction Tool - Cylinder Liner
RH 7097	Withdrawal Tool - Front Pulley Driving Flange
RH 7110	Serrated Nut (small) Spanner - Crankshaft
RH 7126	Box Spanner - Cylinder Head Nuts
RH 7131	Serrated Nut (large) Spanner - Crankshaft
RH 7200	Base - Valve Spring Compressor
RH 7207	Extraction and Insertion Tool - Inlet and Exhaust Valve Guides
RH 7208	Extractor - Main Bearing Caps
RH 7498	Attachment - Extractor - Main Bearing Caps
RH 7272	Guide Block
RH 7825	Reamer - Inlet and Exhaust Valve Guides
RH 7827	Reamer - (tipped) - Inlet and Exhaust Valve Guides
RH 7856	Serrated Nut Spanner - Hydraulic Brake Pumps

Chapter F

PROPELLER SHAFT AND UNIVERSAL JOINTS

SECTION	PAGE
F1 Overhaul	F1
F2 Dimensional Data	F7

Chapter F

PROPELLER SHAFT AND UNIVERSAL JOINTS

Section F1

OVERHAUL

Introduction

Cars fitted with the torque converter transmission have a propeller shaft fitted with a Hardy Spicer universal joint at each end (*see Fig. F1*), whereas cars fitted with the four speed automatic gearbox have a propeller shaft fitted with a Hardy Spicer universal joint at the rear end, but a Detroit ball and trunnion joint at the forward end (*see Fig. F2*).

If a propeller shaft is dismantled and any parts other than the eight nuts and bolts securing the flanges are renewed, the propeller shaft **must** be re-balanced when assembled.

Shafts with the Hardy Spicer joints at each end must be dynamically balanced to within 0.25 oz. in. (18,00 gm. cm.) at 3,000 r.p.m. and shafts with the Detroit joint at the forward end should be balanced to within 0.25 oz. in. (18,00 gm. cm.) at 2,000 r.p.m.

If facilities for balancing the propeller shafts are not available, fully balanced assemblies can be obtained as Service Exchange Units.

Propeller Shaft—To remove

1. Place the car on a ramp and securely chock the road wheels.

2. Disconnect the battery located in the boot.
3. Release the hand brake lever to the 'off' position.
4. Unhook the hand brake return spring from the operating lever and unpin and remove the clevis pin from the pivot point in the end of the operating lever (*see Fig. F3*).
5. Remove the bolts securing the centre of the box section cross-member on which the hand brake operating and balance levers are mounted.
6. Remove the cross-member centre section and lever the assembly away from its mounting. The centre section may be moved to one side or lowered, away from the underside of the car, but it must be suitably supported to avoid strain or 'kinking' of the hand brake cables.

Note The cross-member centre section must not be allowed to hang on the hand brake cables.
7. Jack up one rear wheel to enable the propeller shaft to be revolved, in order to gain access to all the propeller shaft flange bolts.
8. Remove the four securing bolts and nuts from the propeller shaft rear flange. It is advisable to leave one bolt supporting the shaft.
9. Remove the four bolts and nuts securing the front flange to the transmission output flange.

Chapter F

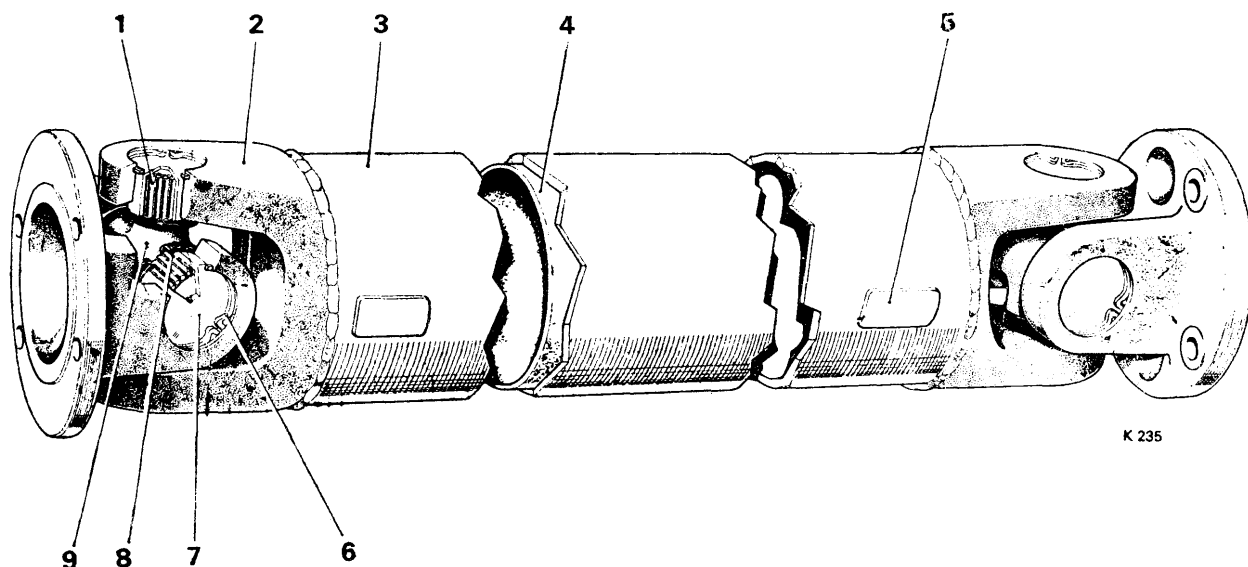


FIG. F1 PROPELLER SHAFT—TORQUE CONVERTER TRANSMISSION

- | | | |
|------------------------|------------------|--------------------|
| 1 Needle bearing | 4 Damping insert | 7 Bearing retainer |
| 2 Universal joint yoke | 5 Balance weight | 8 Rubber seal |
| 3 Centre tube | 6 Circlip | 9 Cruciform |

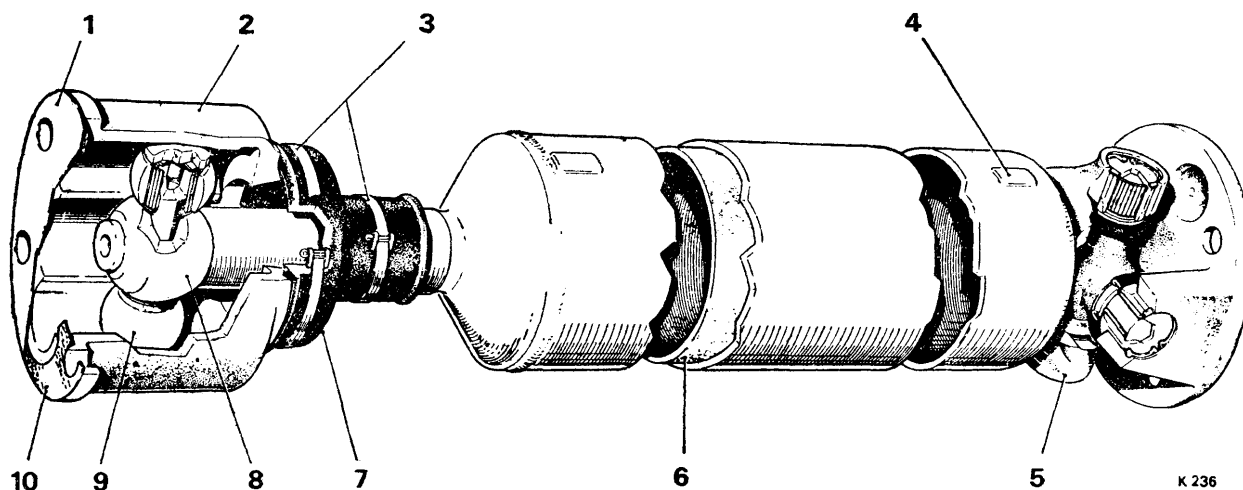


FIG. F2 PROPELLER SHAFT—FOUR SPEED AUTOMATIC GEARBOX

- | | |
|-----------------------------------|--------------------------------|
| 1 End cover | 6 Damping insert |
| 2 Ball and trunnion joint housing | 7 Ball and trunnion joint seal |
| 3 Seal clips | 8 Ball and trunnion |
| 4 Balance weight | 9 Needle roller race |
| 5 Hardy Spicer joint | 10 Gasket |

10. Disconnect the ends of the rear hand brake cables from the caliper mechanism at the clevis pins on the two triangular operating levers.

11. Unclip the cables from the trailing arms.

12. Release the lock-nuts at the outer cable ends and release the clip securing the two cables to the abutment bracket at the rear end of the propeller shaft tunnel.

13. Pull the two cables forward through the aperture in the sub-frame cross-member.

14. Lower the propeller shaft front end and remove the shaft by moving it forward and downward.

Care must be taken when manoeuvring the rear universal joint through the aperture in the rear sub-frame member.

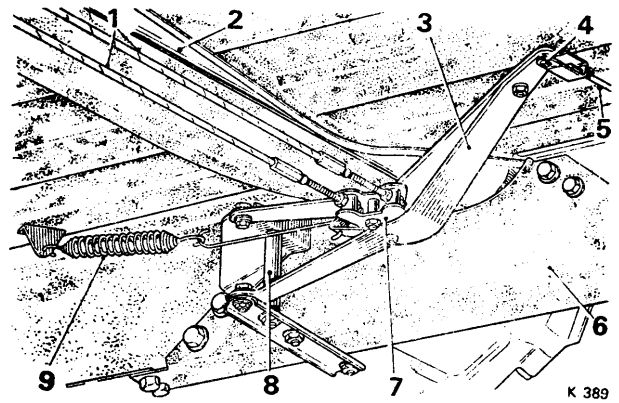


FIG. F3 HAND BRAKE OPERATING LEVER

- | | |
|-------------------|---------------------------|
| 1 Rear cables | 5 Front cables |
| 2 Propeller shaft | 6 Detachable cross-member |
| 3 Operating lever | 7 Balance lever |
| 4 Clevis pin | 8 Operating lever pivot |
| | 9 Return spring |

Hardy Spicer joint—To dismantle

If a Hardy Spicer joint becomes unserviceable it must be dismantled and a replacement joint fitted.

1. Clean and remove any paint from the yoke eyes.
2. Remove the circlips which retain the needle roller bearing races.
3. Using a hide mallet, tap the yokes until the races are driven out of the yoke eyes (*see Fig. F4*).

Hardy Spicer joint—To assemble

1. Fit the cross-piece and seals, hold the cross-piece centrally and carefully press the needle roller bearing assemblies into the yoke eyes far enough to enable the circlip to be fitted.
2. If this is found to be difficult to accomplish due to pressurisation, release the small setscrew situated between two of the cross-piece trunnions, thus allowing the trapped air to bleed.
3. Fit the circlips.
4. Tighten the screw between the cross-piece trunnions.

Ball and trunnion joint—To dismantle

The ball and trunnion joint may be readily dismantled for inspection. It is only necessary to remove the trunnion pin in the event of the neoprene seal requiring replacement or if it is necessary to replace the pin itself.

1. Bend the tabs of the front cover plate away from the trunnion joint body and remove the cover plate and gasket.

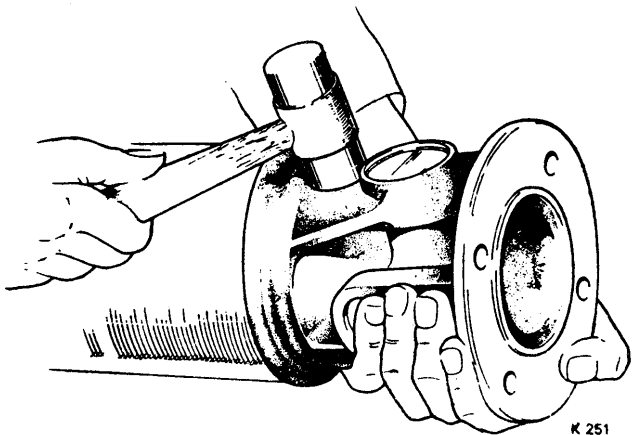


FIG. F4 REMOVING THE HARDY SPICER RACES

Chapter F

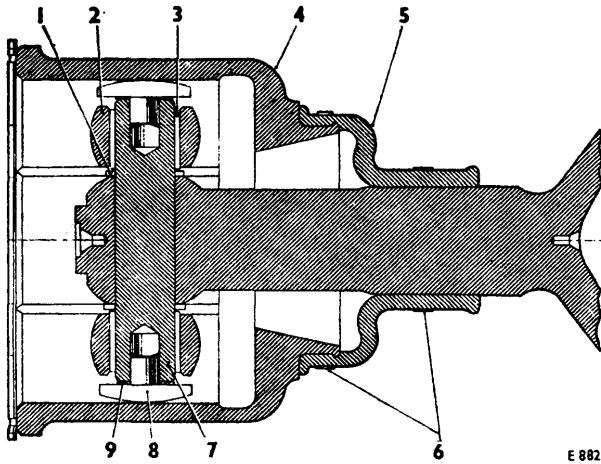


FIG. F5 BALL AND TRUNNION JOINT

- | | |
|--------------------------|-------------------|
| 1 Hardened washer | 5 Neoprene seal |
| 2 Bearing outer race | 6 Seal clips |
| 3 Needle roller bearings | 7 Trunnion pin |
| 4 Joint body | 8 Trunnion button |
| 9 Shim washer | |

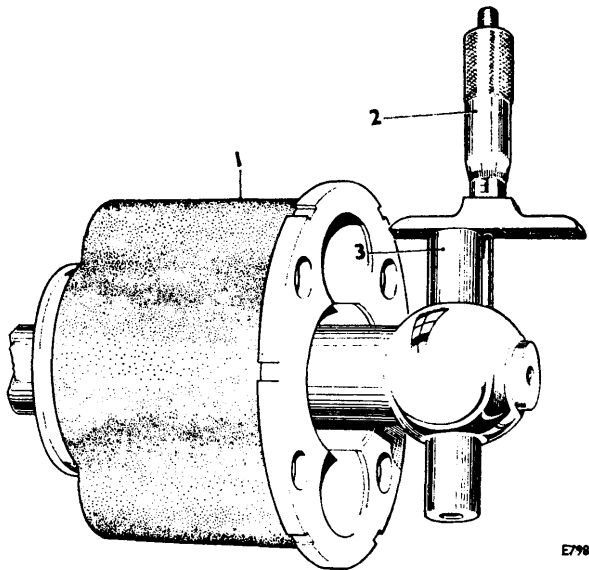


FIG. F6 TRUNNION PIN POSITION

- | |
|----------------|
| 1 Joint body |
| 2 Micrometer |
| 3 Trunnion pin |

4. Hold back the housing and neoprene seal and press out the trunnion pin. This operation may require a pressure of over 5 ton/sq. in. (7,874 kg/sq. mm.) but heat **must not** be used during this operation.

5. Remove the remaining seal clip; remove the trunnion joint body and seal.

6. Clean all parts and inspect for serviceability.

The bores in the trunnion body must be smooth and free from damage and the bearing surfaces of the buttons must also be undamaged.

Slight damage or marks on the trunnion buttons and housing bores may be removed by **light** stoning.

Ball and trunnion joint—To assemble

To assemble the ball and trunnion joint reverse the procedure given for its dismantling, noting the following points.

1. Whenever the trunnion pin has been removed, the opportunity should be taken on assembly to fit a new neoprene seal.

2. The trunnion pin should have an interference fit of 0.003 in. (0.08 mm.) in the shaft and a pressure of up to 5 ton/sq. in. (7,874 kg/sq. mm.) may be required to press it into the shaft.

The minimum interference pressure is 2½ ton/sq. in. (3,937 kg/sq. mm.).

3. It must be noted that the trunnion housing and the propeller shaft have correlation spots painted on them and when the joint is assembled, these marks must be aligned.

4. The pin must be pressed in squarely and, when the operation is complete, the amount by which the pin protrudes from each side of the shaft must be equal to within 0.006 in. (0.15 mm.) when checked with a depth micrometer (see Fig. F6).

5. The fit of the trunnion assembly in the trunnion housing should be checked and adjusted if necessary.

Adjustment is effected by altering the thickness of the shim washers fitted beneath the trunnion buttons, until the trunnion assembly is 0.0005 in. (0.013 mm.) slack to 0.0005 in. (0.013 mm.) tight in the housing.

These shim washers are available in a range from 0.012 in. (0,30 mm.) to 0.023 in. (0,58 mm.) in 0.001 in. (0,025 mm.) increments.

Note In order to preserve the balance of the assembly the shim washers must be selected to give not more than 0.003 in. (0,076 mm.) variation between the centre line of the joint housing and the centre line of the propeller shaft when the assembly is 0.0005 in. (0,013 mm.) slack to 0.0005 in. (0,013 mm.) tight in the joint housing.

6. Pack the trunnion joint with 1½ oz. (42,5 gm.) of Retinax 'A' grease.
7. Fit a new gasket and cover plate.
8. If any parts have been renewed the shaft must now be balanced to the limits stated previously. Balance is adjusted by weights spot-welded to each end of the centre tube.

Ball and trunnion joint seal—To renew

If a ball and trunnion joint seal requires renewal, the propeller shaft must be removed, the trunnion joint dismantled and the trunnion pin pressed out as described previously.

When the seal has been fitted, the pin must be replaced as described under 'Ball and trunnion joint—To assemble'.

Propeller shaft—To fit

To fit the propeller shaft, reverse the procedure given for its removal, noting the following points.

1. The joint faces of the flanges must be clean and free from damage and all bolts must be torque tightened.

The torque tightness of the flange bolts must be between 42 lb. ft. and 45 lb. ft. (5,80 kg.m. and 6,22 kg.m.) for front and rear Hardy Spicer joints, and between 70 lb. ft. and 75 lb. ft. (9,67 kg.m. and 10,36 kg.m.) for ball and trunnion forward joints.

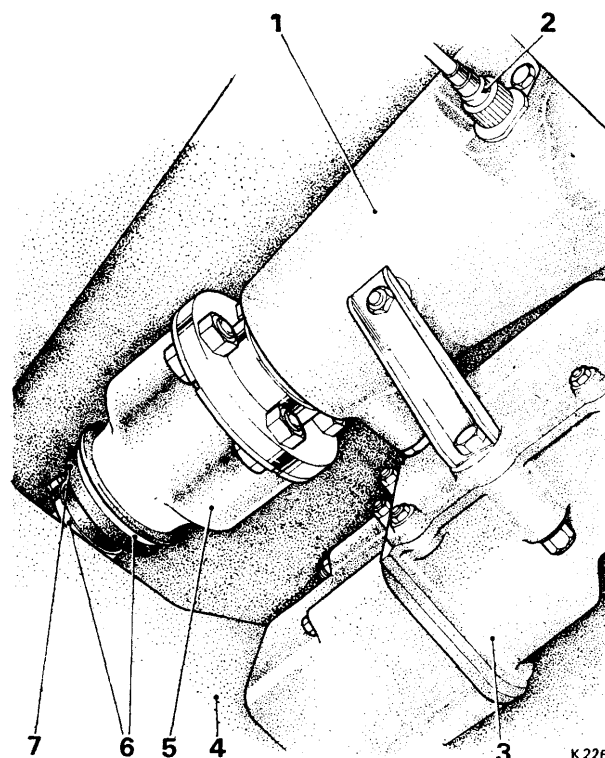


FIG. F7 PROPELLER SHAFT FRONT JOINT

- 1 Transmission extension
- 2 Speedometer cable
- 3 Electric gearchange actuator
- 4 Detachable cross-member
- 5 Ball and trunnion joint
- 6 Seal clips
- 7 Joint seal

2. All other bolts and nuts must be torque tightened in accordance with the standard torque figures given in Chapter P.

3. If a ball and trunnion joint has been dismantled for any reason, run the car for approximately 10 miles (16 km.), and then check and tighten the securing bolts to counteract any settling of the gasket.

4. The joint should also be inspected to ensure that the grease packed into the joint on assembly is not leaking from the joint seal.

Section F2

DIMENSIONAL DATA

DESCRIPTION	DIMENSION NEW	REMARKS
Ball and Trunnion joint housing Diameter of two outer bores Nominal dimension between extremities of outer bores	1.250 in. (3,175 cm.) 1.251 in. (3,177 cm.) 3.625 in. (9,207 cm.)	Bores must be in good condition and free from heavy indentations or pitting. The bores must be within 0.003 in. (0,076 mm.) of true position to centre line of body
Trunnion pin Diameter of pin	0.68975 in. (17,5196 mm.) 0.68955 in. (17,5133 mm.)	There should be 0.003 in. (0,076 mm.) interference between the trunnion pin and the knuckle end piece bore
Knuckle end piece Pin bore diameter Min. load for pressing in pin	0.6875 in. (17,4625 mm.) 0.685 in. (17,399 mm.) 2½ ton/sq. in. (3,937 kg/sq. mm.)	Pin must be pressed in squarely to within 0.006 in. (0,15 mm.) of centre position
Needle roller bearing (62 off) Diameter of roller	0.0772 in. (1,961 mm.) 0.0770 in. (1,956 mm.)	Rollers must be free from pitting or damage
Spherical bearing Inside diameter Outside diameter	0.8444 in. (21,448 mm.) 0.8439 in. (21,44 mm.) 1.2495 in. (3,1737 cm.) 1.2490 in. (3,1724 cm.)	Case hardened 0.040 in. (10,2 mm.) to 0.050 in. (12,7 mm.) deep
Bearing and button assembly Dimension over buttons when assembled	As diameter measured between extremities of housing outer bores	Trunnion assembly may be 0.0005 in. (0,013 mm.) slack to 0.0005 in. (0,013 mm.) tight in housing but must be shimmed so that when assembled the centre lines of the housing and the trunnion assemblies must be within 0.003 in. (0,08 mm.)
Propeller shaft balance assembly Hardy Spicer Ball and trunnion	To be within 0.025 oz. in. (18,00 gm. cm.) at 3,000 r.p.m. To be within 0.025 oz. in. (18,00 gm. cm.) at 2,000 r.p.m.	Balance by small weights welded on to Balance adjusted by small weights welded on to centre tube

Chapter G

HYDRAULICS

(POWER BRAKING AND AUTOMATIC HEIGHT CONTROL SYSTEMS)

SECTION	PAGE
- Introduction	G1
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G2 Bleeding the Hydraulic Systems	G7
G3 Hydraulic Systems Pipework	G11
G4 Hydraulic Systems Reservoirs	G15
G5 Hydraulic Pumps	G19
G6 Hydraulic Accumulators	G23
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Chapter G

HYDRAULICS

(POWER BRAKING AND HEIGHT CONTROL SYSTEMS)

INTRODUCTION

Introduction

The Rolls-Royce Silver Shadow and Bentley T Series motor cars are equipped with a power braking system and an automatic height control system, both of which utilise the same hydraulic fluid (refer to Chapter D), and employ similar power sources.

The two systems are, to some extent, integrated and various components used in each system are common. Both systems are entirely new, thus different servicing procedures and operations are involved.

Since some of these new procedures and techniques are common to both systems, the opportunity has

been taken to combine the two in one Chapter under the general heading 'Hydraulics'.

Details of the mechanical hand brake linkage are included for convenience.

Acknowledgement

"Features of the hydraulic control of the brake system licenced by Soc. Anon. André Citroën under French Patent Number 1,014,251 and Pat. of Add. Number 61,598."

Section G1

SPECIAL PRECAUTIONS

Important

It is of the utmost importance that Service Personnel should fully appreciate that the hydraulic systems fitted to the Rolls-Royce Silver Shadow and Bentley T Series cars operate at **high pressures**.

The systems are designed to operate safely under normal working conditions, but, as is the case with any high pressure fluid or gas, when service procedures are carried out or work is performed on the systems, certain precautions **must** be observed to ensure adequate safety to Personnel and equipment.

It is essential that before attempting any work on the hydraulics of the car, Service Personnel should note carefully the contents of this Section and by fully conversant with the precautions which must be taken to ensure adequate safety and correct system operation.

It is also important to note and conform with the instructions given on the reservoir sight glass plate and the hydraulic accumulator warning plates.

Cleanliness

For the correct functioning of the hydraulic systems it is imperative that meticulous care is taken to ensure complete cleanliness at all times.

Since both the braking system and the height control system employ components which have very fine manufacturing limits, the ingress of even very fine particles of foreign matter could have very serious effects on the operation of the systems.

Care must therefore be taken to ensure that at all times only clean fluid of the specified type (refer to Chapter D) is used in the systems and that any overhauled units or components have not been exposed to contamination before they are fitted to the car. Contact with mineral based oils must be avoided at all times as these oils have a detrimental effect on the rubber seals used in the hydraulic systems.

Hydraulic fluid

Always refer to Chapter D for correct type of fluid to be used in the systems.

It must be noted that brake fluid is hygroscopic, i.e. that the fluid will absorb and chemically combine with water from the atmosphere.

Brake fluid which is contaminated by water will boil at a much lower temperature than fluid with no water content.

If the fluid is contaminated and the car is braked excessively or very hard from high speeds, there will be a tendency for the heat generated by the brakes to boil the fluid, finally resulting in vaporisation of the brake fluid and ineffective brakes.

To eliminate possible contamination of the brake fluid it is most essential that the fluid is not exposed to the atmosphere for more than the absolute minimum of time. It should always be stored in and used direct from **small** sealed containers and when the systems are replenished, the two reservoir covers and the container cover must be replaced immediately.

Chapter G

Blanks

Whenever units, pipes or components are disconnected from the hydraulic systems all open ports and pipe ends must be blanked off immediately to avoid system contamination.

It is stressed that the clean condition of any blanks used is equally as important as the clean condition of the components they seal.

The size and type of each blank is as follows:

Male $\frac{3}{8}$ in. U.N.F.

Female $\frac{3}{8}$ in. U.N.F.

Male $\frac{7}{16}$ in. U.N.F.

Female push-on blanking cap (two types).

Male $\frac{3}{8}$ in. U.N.F.

Quantities of blanks may be obtained, on request, from the Parts Department at Crewe.

Note Masking tape and/or cork bungs do not constitute blanks. In addition, **special pressure blanks** are available, capable of withstanding full hydraulic system pressure, for use during testing and fault diagnosis procedures where it may be necessary to blank off a pipe or component and then charge the systems.

The Part Numbers of the pressure blanks listed in the Tools Catalogue are as follows:

When used, these blanks must be torque tightened to the figures quoted for the pipe unions which they replace.

RH 7810 Male $\frac{3}{8}$ in. U.N.F.

RH 7809 Female $\frac{3}{8}$ in. U.N.F.

It must be noted that normal bleed screws may be used in place of charging adaptor plunger (RH 7810) if desired.

Precautions before working on the car

Before any work, excepting bleeding and specified tests, is carried out on the car hydraulics, the systems must be de-pressurised as follows:

With the exception of bleed screws, pipes and components must never be disturbed when the systems are in a pressurised state.

System De-pressurisation

Either of the two following methods may be employed to de-pressurise the systems but generally it will be found that the first is the more convenient.

Method 1

Switch on the ignition with the gearchange selector in Neutral or a car door open (fast height control conditions) but do not start the engine, then pump the brake pedal 50 or 60 times until both hydraulic

warning lamps on the instrument panel are illuminated and remain illuminated.

De-pressurise the height control rams by placing a bleed tube on each ram bleed screw in turn, opening the screws and bleeding off the fluid into a clean container.

After each ram has been de-pressurised the bleed screw must be tightened up and the reservoir topped-up to replace that fluid bled off.

If the work on the system requires the removal of hydraulic pipes or components, disconnect the battery which is located in the boot.

Method 2

With the ignition switched off, place a length of bleed tube over the bleed screw in the accumulator valve body and immerse and hold the free end in a clean container.

Open the bleed screw slightly and bleed until fluid no longer flows from the accumulator. The bleed screw should only be opened fractionally otherwise the accumulator pressure will force the tube off the bleed screw.

Close the bleed screw, remove the tube and repeat the operation for the other accumulator.

Repeat the procedure for evacuating the height control rams, as given under Method 1.

Removing components

Prior to disconnecting any pipes or removing hydraulic components from the car, the area around the pipes and components should be thoroughly cleaned; particular attention should be paid to the localised areas around the pipe unions and their corresponding ports.

Blanks should be cleaned and fitted as quickly as possible to the exposed ports.

Cleaning components

Components which have been removed should be thoroughly cleaned before replacement.

Blow dry, compressed air through all pipes. Rubber pipes, sealing rings and other components should be washed in methylated spirits and then dried with dry compressed air.

Cloths, even the lint free type, should **never** be used to clean hydraulic components or sealing rings.

Note When rubber seals are washed in methylated spirits, they must not be allowed to soak, as prolonged immersion in spirit could have a detrimental effect.

Methylated spirits is the only recommended cleanser; trichlorethylene, paraffin or petrol must never be used to clean hydraulic components.

Hydraulic accumulator spheres

The hydraulic accumulator spheres are charged on one side of the diaphragm with Nitrogen gas (see Section G6—The hydraulic accumulators) through a one-way charging valve in the end of the sphere.

Replacement spheres are supplied in an uncharged state and therefore must be charged by the Retailer before they are used to replace existing faulty spheres.

Exchange spheres are supplied complete with charging valve cap; a warning plate and locking washer are supplied loose. A label is attached which reads 'Uncharged—Remove label on charging and attach warning plate'.

It is of the utmost importance that, when the sphere is charged, the warning plate is fitted below the charging valve cap (see Fig. G13).

Spheres must never be transported in a charged state. If spheres are to be returned to the Parts Department at Crewe, or transported by rail, air or sea, they **must** be discharged before despatch.

Service Personnel are advised that spare accumulator spheres should be charged and leak tested immediately on receipt and then stored in a charged condition.

This ensures that the storage period is utilised as a time/leakage test so that when a sphere is removed from store and the pressure of the Nitrogen is tested after fitting, it can be seen whether the sphere is still fully charged with Nitrogen.

Spheres which have been correctly charged and successfully leak tested before storage and which then show a loss of pressure in excess of 25 lb/sq. in. (1.75 kg/sq. cm.) when tested prior to fitting, must be rejected. The sphere should be recharged and leak tested again to determine the cause of leakage. If the leak persists, the sphere should be discharged and dismantled and the diaphragm checked and renewed if necessary (refer to Section G6) and returned to the Parts Department at Crewe, with all relevant information.

Lubrication

Seals, other than dust covers, used in the hydraulic systems should only be lubricated with **clean** brake fluid of the approved type.

Servicing rubber components

In the interest of safety, the rubber components used in the hydraulic systems have been allotted specific 'life' mileages at the completion of which, or at the nearest Service, it is recommended that the components are renewed. (Refer to Chapter D for the recommendations.)

Hydraulic system—General maintenance

When the hydraulic reservoir and systems are drained completely always fill with fresh clean fluid of the specified type. Refer to Chapter D for the mileage/time interval and fluid specification.

This procedure will require a complete bleeding operation to be performed afterwards to remove all air from the systems.

Storage and Transportation

The care taken to prevent contamination of components during storage or transportation is extremely important.

Replacement parts, pipes and units must be correctly and securely sealed with the recommended blanks which must not be removed until immediately prior to fitting. They must also be adequately protected from dust or damage.

Sealing rings and rubber pipes in store should be protected from dust, air, light and heat.

Fitting replacement units

Replacement hydraulic units are tested and blanked off before being despatched from the factory and are full of hydraulic fluid.

It is advisable, when fitting a replacement unit, that when the unit has been placed in position and the blanks removed, the fluid in the unit is allowed to drain before the pipes are connected.

Note The fluid should not be blown out; allowing it to drain is sufficient.

When drained, the pipes should be connected and the appropriate bleeding operations carried out.

Section G2

BLEEDING THE HYDRAULIC SYSTEMS

Introduction

It is essential that, in order to obtain optimum performance, the hydraulic systems must at all times be completely free from air. The two hydraulic systems are re-circulatory and therefore, if air is allowed to enter them at any point it could cause reduced efficiency.

Bleed screws are fitted to the systems at various points and it is imperative, should a system be disturbed in Service and pipes disconnected, that the entire system downstream of this point be thoroughly bled to expel all air.

The bleed screws are fitted to the following components.

The hydraulic accumulators, the brake calipers and the height control rams.

On early cars, bleed screws were fitted to both brake distribution valves but, owing to valve design changes, these are no longer necessary and can be ignored.

Two operators are necessary to bleed the systems. Whilst bleeding is being carried out it is essential that the two reservoir compartments are kept topped-up, above the topping-up level on the sight glass, with clean approved fluid (refer to Chapter D).

Note Bleed screws must be torque tightened to between 8 lb.ft. and 10 lb.ft. (1,10 kg.m. and 1,38 kg.m.).

Bleeding the low pressure (master cylinder) system

It is important that the following method of bleeding

the master cylinder hydraulic system is always employed.

1. Check that the hydraulic reservoir is topped-up to the 'Max' level mark; the low pressure system is fed from the rear reservoir compartment.

2. Before bleeding the low pressure system, depressurise the high pressure systems (see Special Precautions).

3. Fit a rubber bleed tube to one of the rear brake caliper **upper** cylinder of **early cars** and **lower** cylinder of **later cars** bleed screws (see Figs. G44 and G45) and immerse the free end in about one inch of fluid in a clean bottle.

Note The cars affected by this modification are, Standard cars—1899 and onwards, Coachbuilt cars 1874 and onwards including Nos. 1807 and 1869.

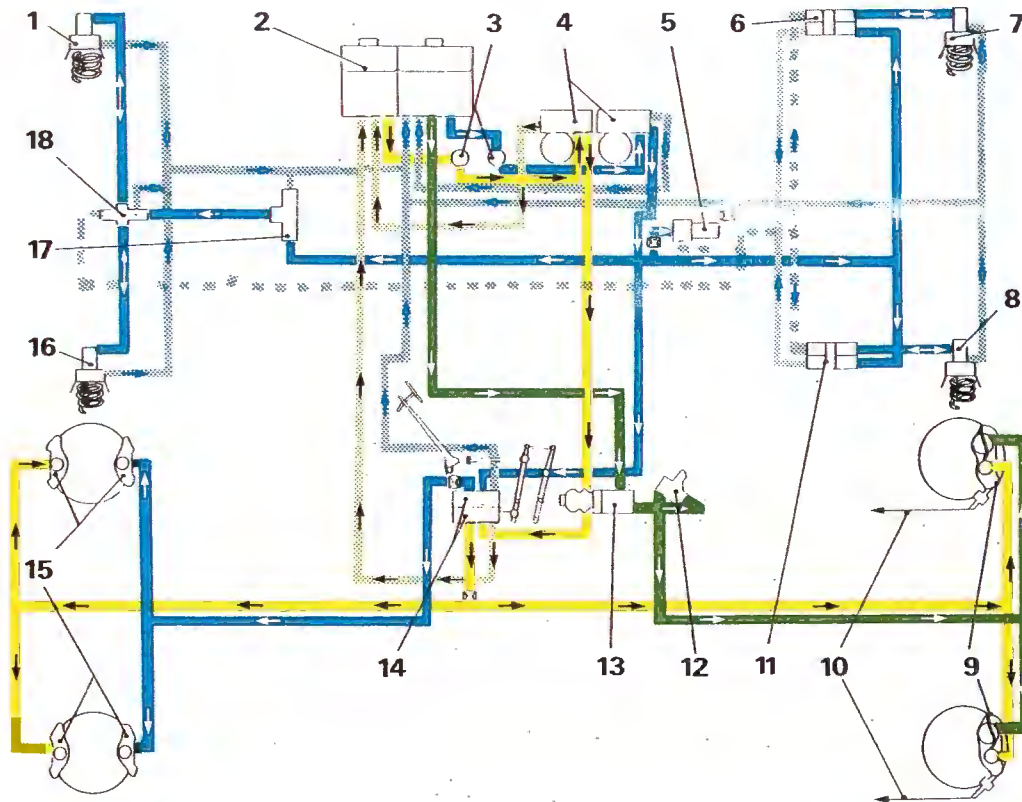
As a second means of identification, the **green sleeved** pipe denotes the master cylinder system; the **blue sleeved** pipe denotes the high pressure (power braking) system.

4. Open the bleed screw wide while the second operator presses the foot brake pedal quickly down, tighten the bleed screw, then allow the pedal to return slowly. Repeat this operation until all bubbles cease, then tighten the bleed screw on a downward stroke of the pedal, i.e. when fluid is flowing into the container.

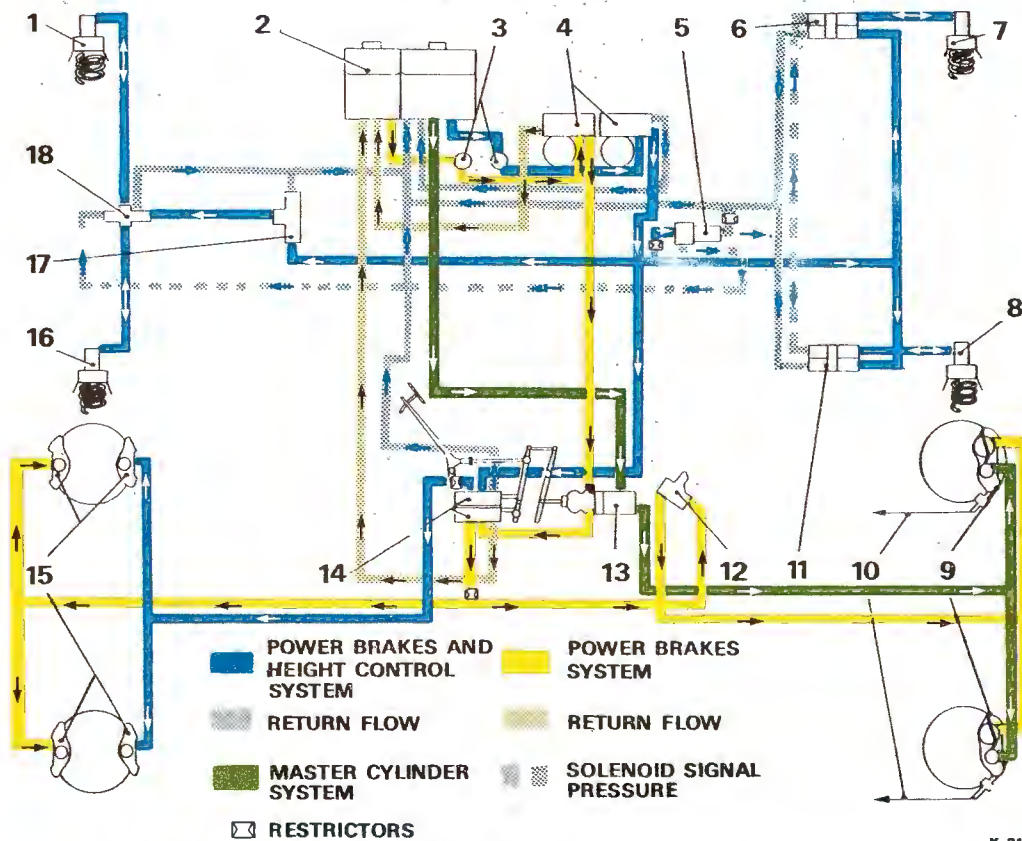
5. The operation should be repeated for the other rear brake caliper **upper** or **lower** cylinder, whichever

Chapter G

EARLY CARS



LATE CARS



- POWER BRAKES AND HEIGHT CONTROL SYSTEM
- POWER BRAKES SYSTEM
- RETURN FLOW
- RETURN FLOW
- MASTER CYLINDER SYSTEM
- SOLENOID SIGNAL PRESSURE
- RESTRICTORS

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FIG. G1 DIAGRAM OF HYDRAULIC SYSTEMS (EARLY AND LATER CARS)

- | | | |
|-----------------------------|---|-------------------------------|
| 1 Front height control ram | 7 Rear height control ram | 13 Brake master cylinder |
| 2 Reservoirs—brake fluid | 8 Rear height control ram | 14 Brake distribution valves |
| 3 Hydraulic pumps | 9 Rear wheel brake calipers | 15 Front wheel brake calipers |
| 4 Hydraulic accumulators | 10 Hand brake—mechanical | 16 Front height control ram |
| 5 Solenoid valve | 11 Rear height control valve | 17 Roll restrictor valve |
| 6 Rear height control valve | 12 Deceleration conscious pressure limiting valve | 18 Front height control valve |

is applicable, ensuring at all times that there is sufficient fluid in the reservoir. It is not necessary to bleed the front brakes, the low pressure system being applicable to the **upper** or **lower** cylinders of the rear brakes only.

6. After bleeding the master cylinder system, run the engine to charge the power systems, then top-up the reservoir compartment(s) to the level indicated.

Bleeding the high pressure (power braking and height control) systems

The front reservoir compartment supplies fluid for the front brake pump, the front hydraulic accumulator, the lower brake distribution valve, the front calipers of the front brakes and the **lower** or **upper** cylinders of the rear brake calipers. Refer to Operation 3 under 'Bleeding the low pressure (master cylinder) system'.

The rear reservoir compartment supplies the rear pump, the rear hydraulic accumulator, the automatic height control system, the upper brake distribution valve and the rear calipers of the front brakes.

It is recommended, in the interests of safety, that the gearchange thermal cut-out is removed from the fuse board underneath the fascia, to isolate the electric gearchange.

1. To bleed either of the high pressure systems, run the engine for a short time to charge fully the power systems. Ensure that the reservoir fluid levels are topped-up to at least the topping-up mark on the sight glass at all times.

Run the engine at approximately 1,000 r.p.m. This can be best achieved by manipulating the throttle linkage manually on the fast-idle cams to obtain the correct speed.

2. Attach a bleed tube to one of the **hydraulic accumulator** bleed screws and immerse and hold the free end in a small quantity of fluid in a clean container. Carefully slacken the bleed screw just sufficiently for fluid to flow. Bleed until all air bubbles have ceased and for approximately a further 15 seconds after, then tighten the bleed screw.

3. Repeat the above operation on the other hydraulic accumulator.

4(a) Attach the bleed tube to the bleed screw in one of the **power brake** calipers then, while the second operator lightly depresses the brake pedal and holds it under a steady pressure of between 20 lb. (9,07 kg.) and 25 lb. (11,34 kg.), open the bleed screw and bleed until all bubbles have ceased and for approximately a further 15 seconds after; tighten the bleed screw.

4(b) To bleed the rear disc brake calipers on cars mentioned in the note under 'Bleeding the low

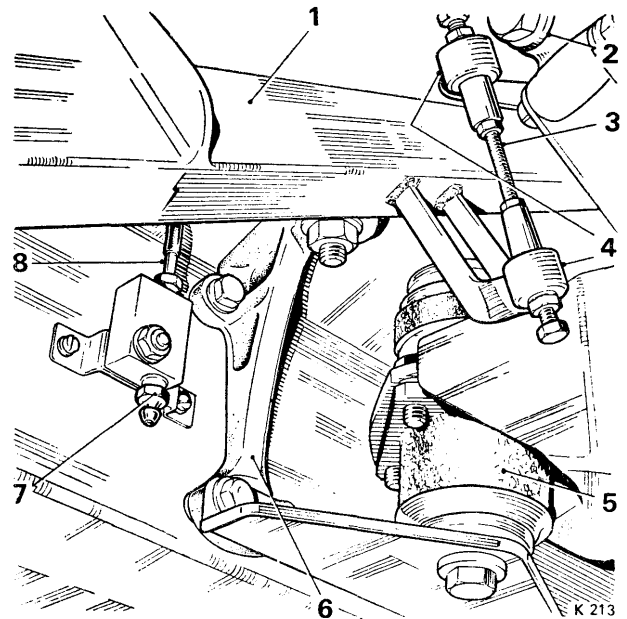


FIG. G2 REMOTE BLEED SCREW—REAR HEIGHT CONTROL RAM

- 1 Rear suspension trailing arm
- 2 Left-hand height control valve
- 3 Operating link—height control valve to trailing arm
- 4 Sealing boot—operating link ball joint
- 5 Rear suspension cross-member mount
- 6 Forged mounting bracket—rear suspension cross-member
- 7 Bleed screw
- 8 Pipe—ram to remote bleed screw (pink)

pressure (master cylinder) system' proceed as follows.

Attach the bleed tube to the upper bleed screw in one of the rear disc **power brake** calipers then while the second operator depresses the brake pedal half-way, open the bleed screw a very small amount until fluid appears in the bleed tube. When the fluid is free of air, the bleed screw may be opened a little further and the bleeding then continued for at least 15 seconds after air bubbles have ceased to appear.

Tighten the bleed screw then allow the brake pedal to return to its off position.

Note With these later cars (see Fig. 1) having the pressure conscious limiting valve in the power circuit, it is possible that if the upper bleed screw is opened too wide, the ball in the valve will be forced against its seat. If this happens, no fluid will flow into the bleed tube and this will necessitate closing the bleed screw, releasing the brake pedal and carefully repeating the procedure until fluid flows into the tube.

Chapter G

5. Repeat this operation on the other power brake calipers.

Note The **upper** or **lower** cylinders of the rear wheel brake calipers are the only caliper cylinders which are not power operated (refer to Operation 3 under 'Bleeding the low pressure (master cylinder) system').

The engine should be allowed to run for approximately two minutes after the last caliper has been bled and before the height control rams are bled.

When bleeding the height control rams, the weight of one person in the boot, or on the front of the car, is usually sufficient to compress the suspension sufficiently for the height control valves to actuate and allow pressurised fluid through to the rams. If, however, this weight is not sufficient, the front and rear of the car must be weighted slightly until fluid flows satisfactorily through the bleed tube.

Bleed the height control rams by attaching a bleed tube to the appropriate bleed screw, opening the bleed screw slightly and bleeding for approximately

15 seconds after bubbles have ceased.

The **front ram** bleed screws are located in the 'T' shaped castings on top of the front spring pots (see Fig. G31). The bleed screws for the rear rams will be found in two adaptors mounted on the body sills, just aft of the rear suspension cross-member, one on each side of the car (see Fig. G2).

The brake pedal need not be depressed when bleeding the height control rams, but the system must be on fast height control. This condition should exist even though the transmission is isolated, as the engine must have been started initially with Neutral selected.

The foregoing information is a comprehensive bleeding operation such as might be applied after a major overhaul or engine removal but, as previously stated, each system can be bled separately and must be bled at all points downstream after any replacements or pipe disconnections have been carried out. A planned bleeding chart is given below for this purpose but, if any doubt exists, it is advisable to bleed the complete system concerned.

Planned bleeding chart

DISTURBED PIPE RUN	PIPE COLOUR	BLEEDING REQUIRED
*1. (a) Any pipe between the hydraulic reservoir front compartment, front hydraulic pump and front hydraulic accumulator. (b) Any pipes between the hydraulic reservoir rear compartment, rear hydraulic pump and rear hydraulic accumulator.	Red Orange	Complete system: front accumulator, front calipers on the front wheels and the lower or upper cylinders on the rear wheel calipers. Complete system: rear accumulator, rear calipers on the front brakes, all height control rams.
*2. (a) Any pipes between the front hydraulic accumulator and the lower brake distribution valve. (b) Any pipes between the rear hydraulic accumulator and upper brake distribution valve.	Red Orange	Front calipers of the front wheels and the lower or upper cylinders of the rear wheel calipers. Rear calipers of the front wheels and all height control rams.
*3. Any pipes between the lower brake distribution valve and front calipers on the front wheels and lower or upper cylinders on the rear wheel calipers.	Blue	Front calipers of the front wheels and lower or upper cylinders of the rear wheel calipers.
4. Any pipes between the upper brake distribution valve and rear calipers on the front wheels.	Mauve	Rear calipers front wheels.
5. Any pipes between the pressure feed from the accumulator and the height control valves.	Orange	Height control rams.
6. Pipes between height control valves and height control rams.	Brown	Height control rams.
*7. Pipe between the rear reservoir compartment and the brake master cylinder.	Grey	Upper or lower cylinders of the rear wheel calipers.
*8. Any pipes between the brake master cylinder and the upper or lower cylinders on the rear wheel calipers.	Green	Upper or lower cylinders of the rear wheel calipers.

After bleeding, the system(s) must be fully charged and the reservoir compartment(s) topped-up in accordance with the instructions given on the sight glass instruction plate.

* Refer to Operation 3 and explanatory note given under 'Bleeding the low pressure (master cylinder) system.'

Section G3

HYDRAULIC SYSTEMS PIPEWORK

General

The fluid for the hydraulic systems is carried in bundy tubing throughout the car, except in certain cases where flexible hoses are used to accommodate relative movements between two units.

The pipework, with the exception of flexible hoses, is almost entirely $\frac{3}{16}$ in. (4,76 mm.) diameter tubing. The only exceptions are the ends of the return pipes from the hydraulic accumulators to the reservoir and the feed pipe to the master cylinder which are $\frac{1}{4}$ in. (6,35 mm.) diameter. The metal sections of the feed pipes from the reservoir to the hydraulic pumps are $\frac{3}{8}$ in. (9,52 mm.).

For the purposes of identification, a colour coding system has been devised to enable the various metal pipes to be easily recognizable anywhere on the car without the necessity of having to trace the pipe run back to a source.

The identification is by means of coloured Neoprene sleeves fitted over each end of the all metal pipes, except the short brake pipes bridging the brake calipers, i.e. passing over the braking disc, adjacent to the unions. A chart quoting the pipe colours and the functions is given on Page G13.

Thus, if the chart which follows is consulted, the function (i.e. high pressure, low pressure) and system of any pipe on the car can be quickly and easily identified.

Generally, pipework connections are effected by flared pipe ends and unions, either male or female as necessary, with conical seats machined in the components or junctions to seat the flares and provide

effective joints. In the case of certain flexible pipe joints, face seals and copper washers are employed.

If, at any time, hydraulic pipes are disturbed the following points should be noted.

The area around the pipe union and the pipe end must be **thoroughly** cleaned before the union is unscrewed.

Pipe ends should always be blanked off immediately after removal and the blanks should not be removed until immediately before fitting.

Whenever pipes are removed, the flares should be inspected for serviceability and pipes with flares showing any signs of damage, cracking or collapse must be renewed.

Before fitting, pipes and unions should be cleaned thoroughly, using methylated spirits, then blown through with clean dry compressed air. Particular attention should be paid to the union and the exterior of the pipe immediately behind the flare.

When fitting pipes, care should be taken not to overtighten unions as this could cause damage to the pipe flares. In the case of face seals, new copper washers must be used each time a pipe is refitted.

Care must be taken to ensure that when pipes are removed or fitted, the coloured pipe code sleeves are correctly fitted to each end and in good condition. If a pipe is removed and the coloured sleeves are in poor condition, the sleeves must be renewed before fitting the pipe. The sleeves expand sufficiently to clear the union when fitting a new one to a pipe. This is best achieved by using a small three-prong expander hand tool ('Penguin' pliers).

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As stated earlier, flexible pipes are fitted into the hydraulic systems, some of which are high pressure fluid transmitters and others which are low pressure fluid transmitters.

The flexible pipes can be readily identified, as with the rest of the systems, by means of the colour coding chart, and (*see Figs. G3 to G6 inclusive*) to determine whether the pipe is high or low pressure, or feed or return.

Identification sleeves are not fitted to the flexible hoses but the sleeves on the connecting pipes at either end may be used to identify the flexible pipe and its function.

Note The two flexible high pressure pipes from the hydraulic pumps to the hydraulic accumulators, the two low pressure hose returns from the accumulators to the reservoir and the feeds from the reservoir to the hydraulic pumps are not marked and do not connect to any other marked pipes. Since these pipes are the only ones in the systems without means of identification confusion should not arise.

Extreme caution should be exercised, when fitting or renewing flexible pipes, to ensure that the correct type of pipe is fitted in the correct place in accordance with the colour coding.

In the interests of safety, the flexible pipes fitted to the hydraulic systems have been allotted specific 'life' mileages at the completion of which or at the Service nearest to this mileage it is recommended that the flexible pipes be renewed.

The recommended 'life' mileages, pipe locations and colours are quoted in Chapter D, 'Lubrication and Maintenance'.

The positions of the flexible hoses are shown in *Figures G3 to G6 inclusive*, which give a complete illustration of the hydraulic systems pipework and the correct colours as located on the car.

It must be noted that non-standard torque figures are specified for certain pipe unions and fittings in the hydraulic systems. These figures are given in Chapter P which quotes all standard and non-standard torque figures. These must be adhered to at all times to avoid overtightening and possible damage.

The clipping points of all pipes, whether rigid or flexible, is most important because of the possibility of chafing or vibration. Always ensure that the pipes, particularly the flexible pipes, are routed to clear other components. Note the position and clipping point(s) of each pipe as it is removed to ensure that when it is refitted or replaced by a new one, the clipping point(s) is correct.

Pipework colour coding

COLOUR	FUNCTION	SYSTEM AND LOCATION
Red	High pressure	All brakes system pipes from the front hydraulic pump, to front accumulator and from front accumulator to lower brake distribution valve.
Orange	High pressure	Brakes and height control system pipes from the rear hydraulic pump, to the rear accumulator; rear accumulator to front and rear height control valves; rear accumulator to height control solenoid valve and rear accumulator to upper brake distribution valve.
Black	Low pressure	All brakes system return pipe from the lower brake distribution valve to the fluid reservoir.
White	Low pressure	Brakes and height control system return pipes from the upper brake distribution valve to the fluid reservoir; return from front and rear height control valves to reservoir; returns from roll restrictor and height control solenoid valves to reservoir (all cars); returns from front and rear height control rams to reservoir (early right-hand and left-hand drive unmodified cars only, (see Figs. G3 and G4),
Green	High pressure	Brake master cylinder pipes from master cylinder to deceleration conscious pressure limiting valve and to upper cylinders of rear wheel brake calipers (early cars, see Figs. G3 and G4) and from master cylinder to lower cylinders of rear wheel brake calipers later cars (see Figs. G5 and G6).
Grey	Low pressure	Brake master cylinder feed pipe from rear reservoir compartment to master cylinder.
Blue	High pressure	All brakes system pipes from lower brake distribution valve to front calipers of front wheels (all cars) and lower cylinders of rear wheel calipers (early cars, see Figs. G3 and G4) and upper cylinders of rear wheel calipers, later cars (see Figs. G5 and G6).
Mauve	High pressure	Brakes and height control system pipes from upper brake distribution valve to rear calipers of front wheels.
Yellow	High pressure	Brakes and height control system pipes carrying signal pressure from solenoid valve to front and rear height control valves and roll restrictor valve.
Brown	High pressure	Brakes and height control system pipes from roll restrictor valve to front height control valve; front height control valve to front height control rams; rear height control valves to rear height control rams.
Pink	High pressure	Brakes and height control system pipes from rear height control rams to remote bleed screws on the body sills.

Fig. G3 Hydraulic systems pipework colour coding and component positions (early R.H.D. cars)

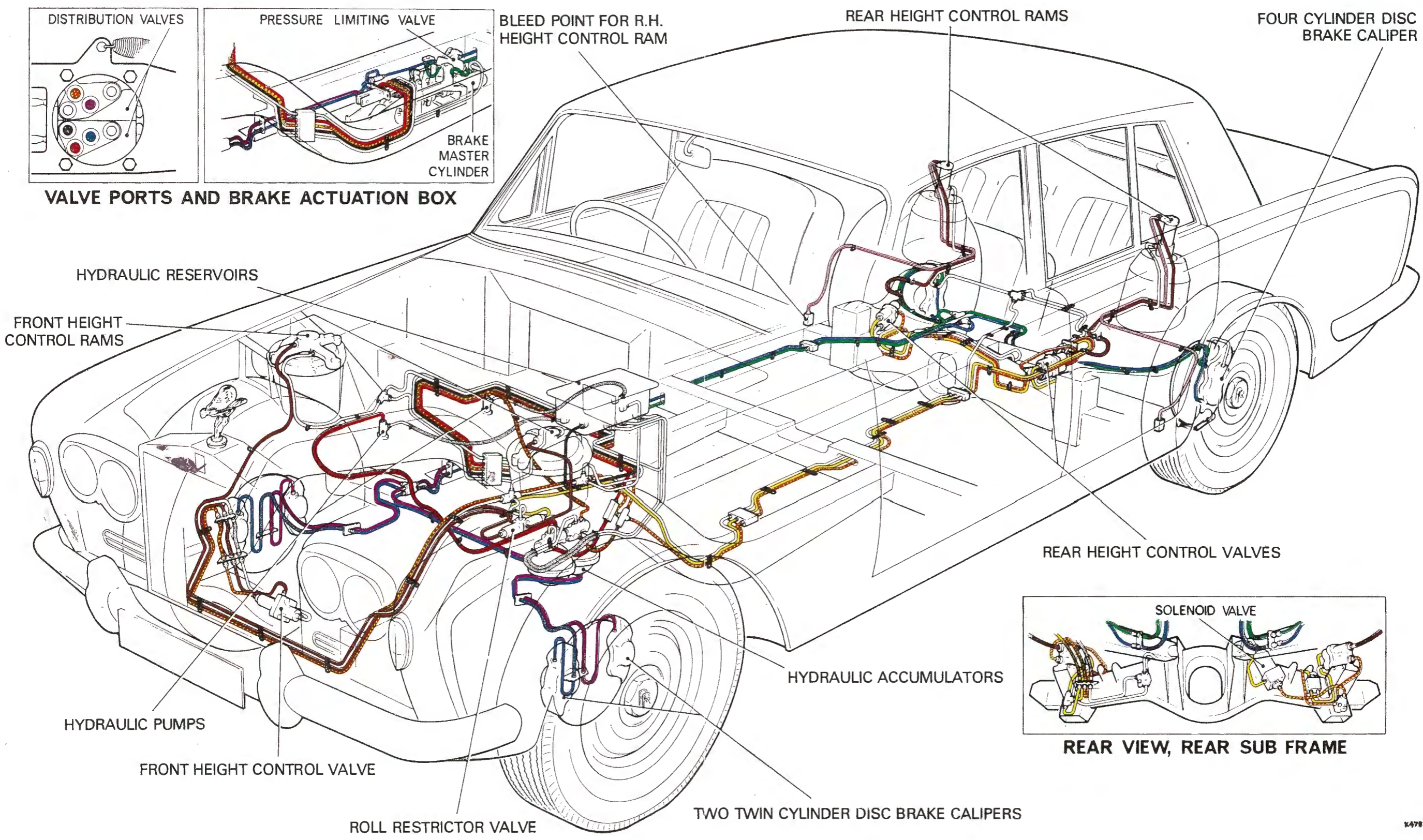


FIG. G3 HYDRAULIC SYSTEMS PIPEWORK COLOUR CODING AND COMPONENT LOCATION (LATER R.H.D. CARS)

Fig. G4 Hydraulic systems pipework colour coding and component location (early L.H.D. cars)

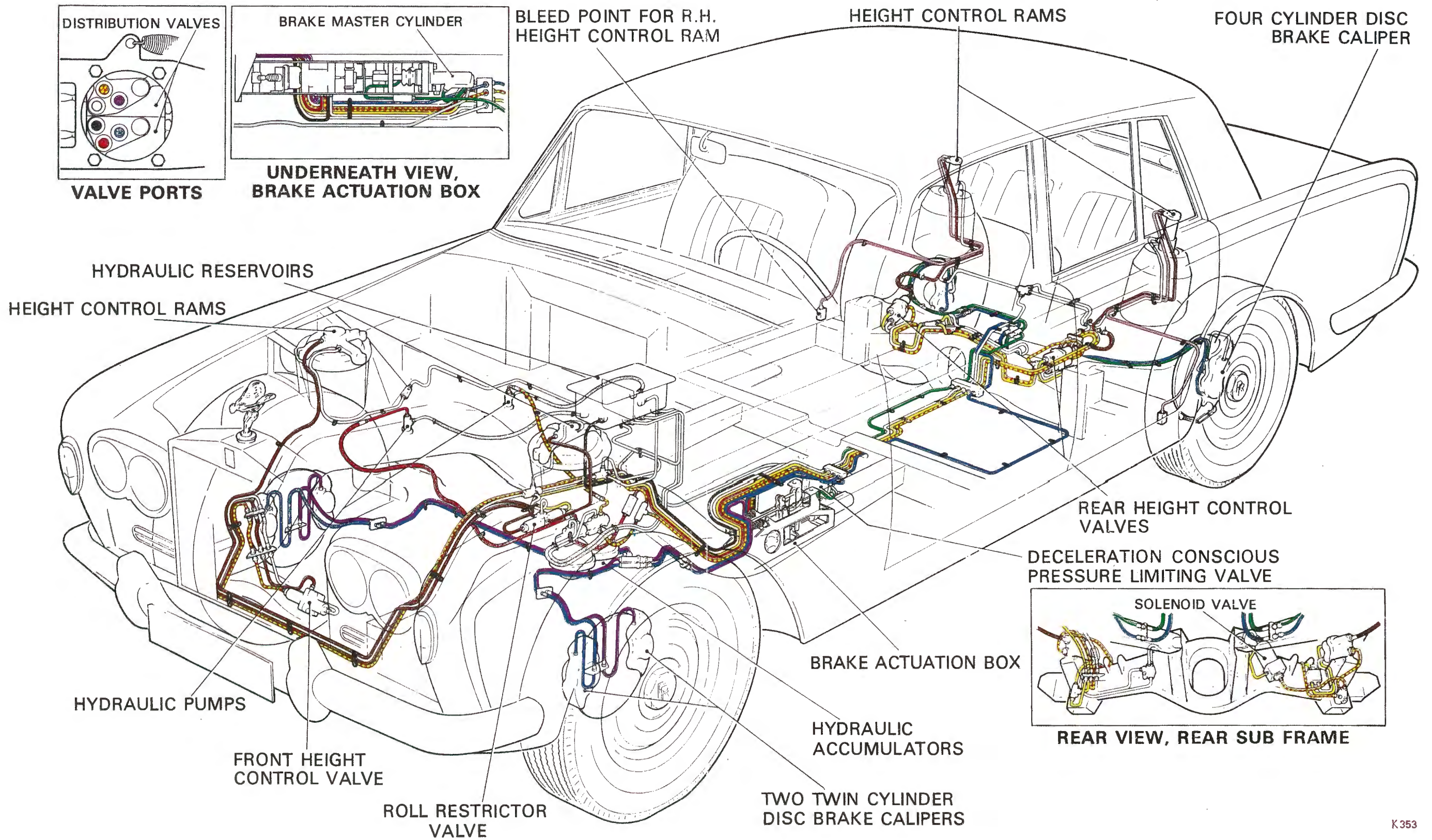


FIG. G4 HYDRAULIC SYSTEMS PIPEWORK COLOUR CODING AND COMPONENT LOCATION (LATER L.H.D. CARS)

Fig. G5 Hydraulic systems pipework colour coding and component location (later R.H.D. cars)

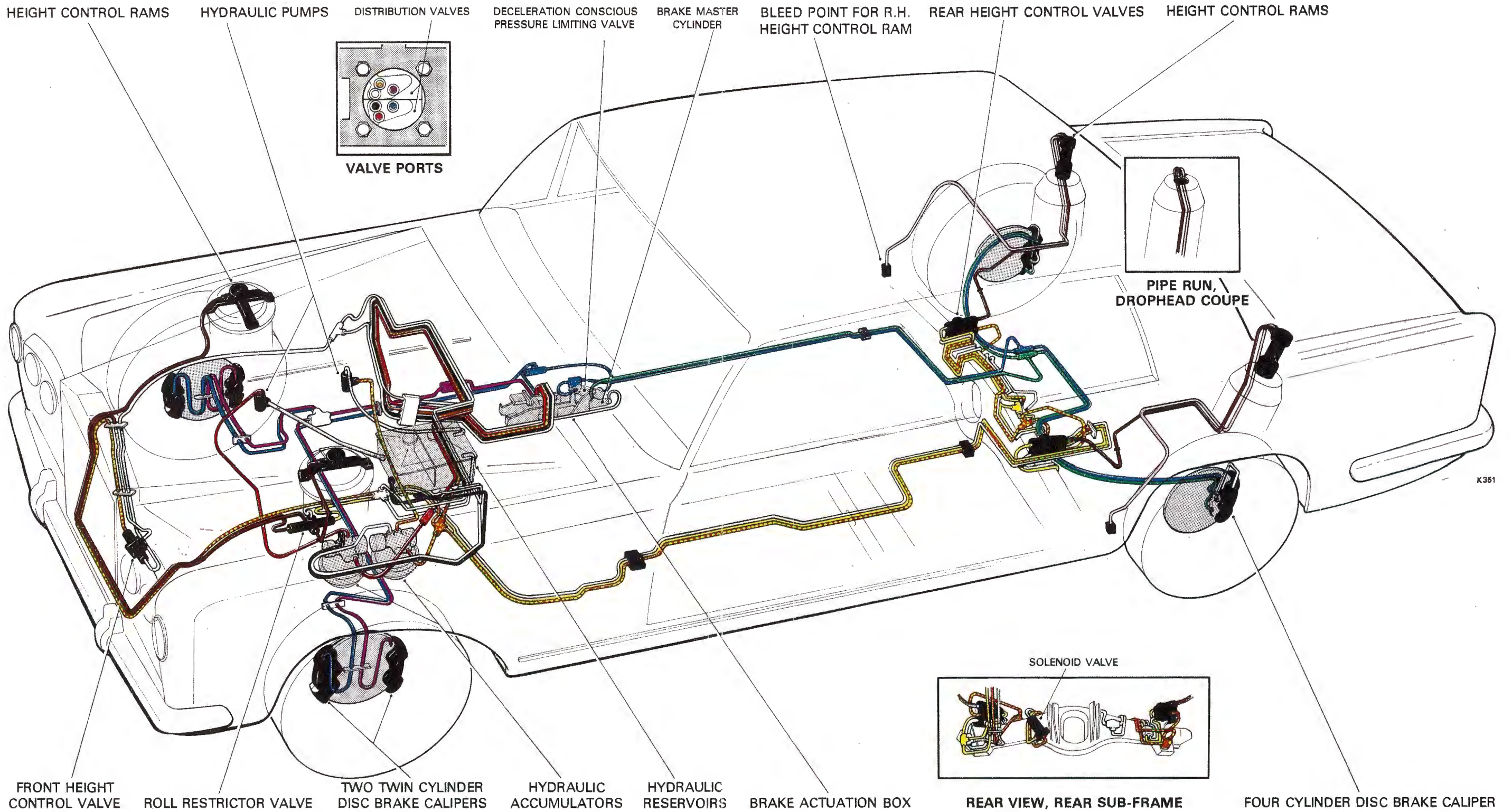
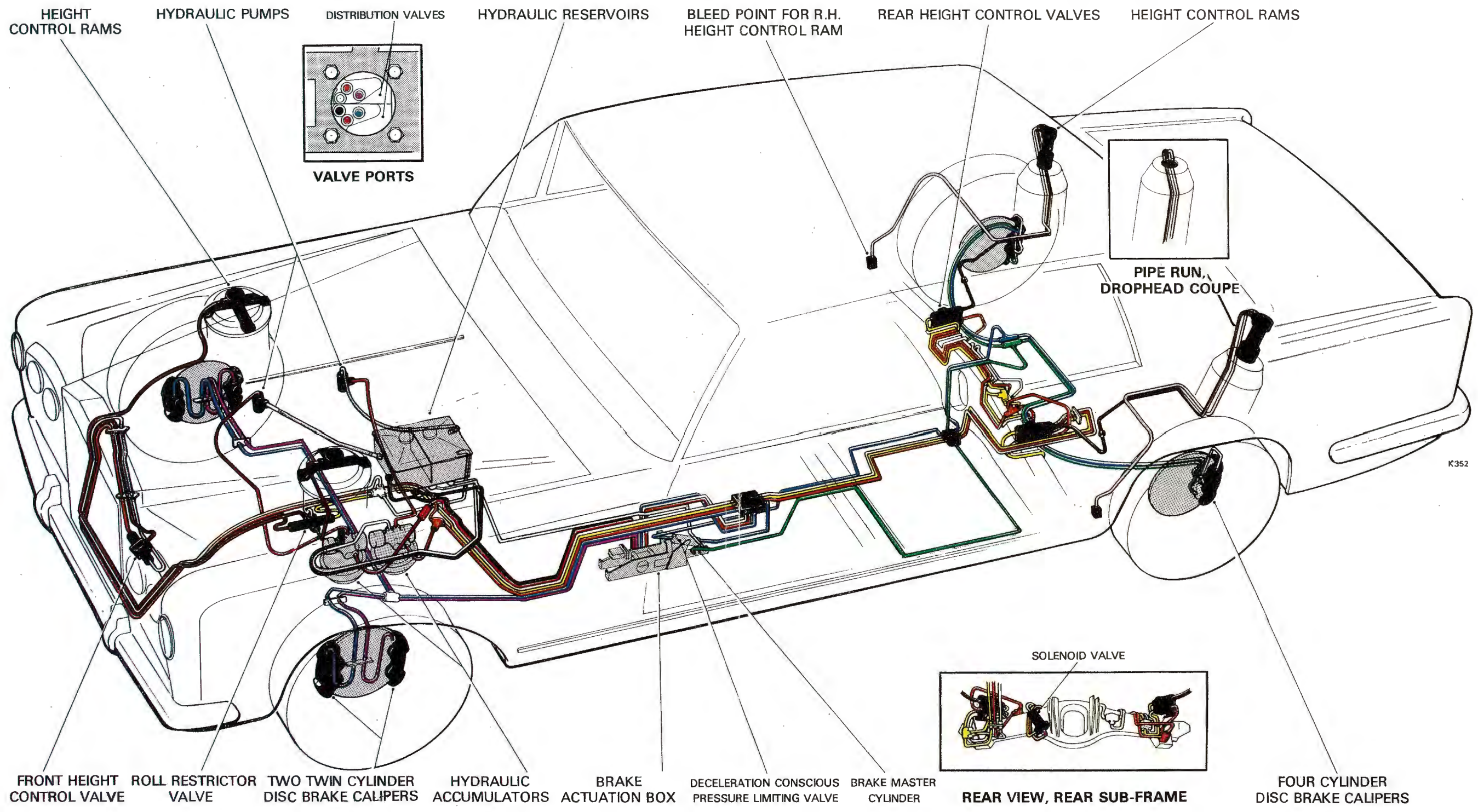


FIG. G5 HYDRAULIC SYSTEMS PIPEWORK COLOUR CODING AND COMPONENT LOCATION (LATER R.H.D. CARS)

Fig. G6 Hydraulic systems pipework colour coding and component location (later L.H.D. cars)



HEIGHT CONTROL RAMS

HYDRAULIC PUMPS

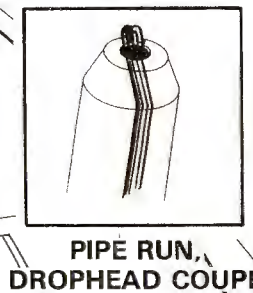
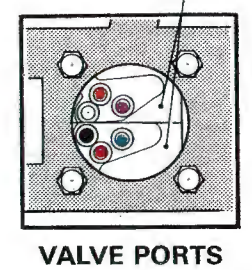
DISTRIBUTION VALVES

HYDRAULIC RESERVOIRS

BLEED POINT FOR R.H. HEIGHT CONTROL RAM

REAR HEIGHT CONTROL VALVES

HEIGHT CONTROL RAMS



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FRONT HEIGHT CONTROL VALVE

ROLL RESTRICTOR VALVE

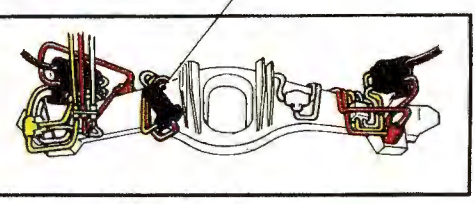
TWO TWIN CYLINDER DISC BRAKE CALIPERS

HYDRAULIC ACCUMULATORS

BRAKE ACTUATION BOX

DECELERATION CONSCIOUS PRESSURE LIMITING VALVE

BRAKE MASTER CYLINDER



REAR VIEW, REAR SUB-FRAME

FOUR CYLINDER DISC BRAKE CALIPERS

FIG. G6 HYDRAULIC SYSTEMS PIPEWORK COLOUR CODING AND COMPONENT LOCATION (LATER L.H.D. CARS)

Fig. G6 Hydraulic systems pipework colour coding and component location (later L.H.D. cars)

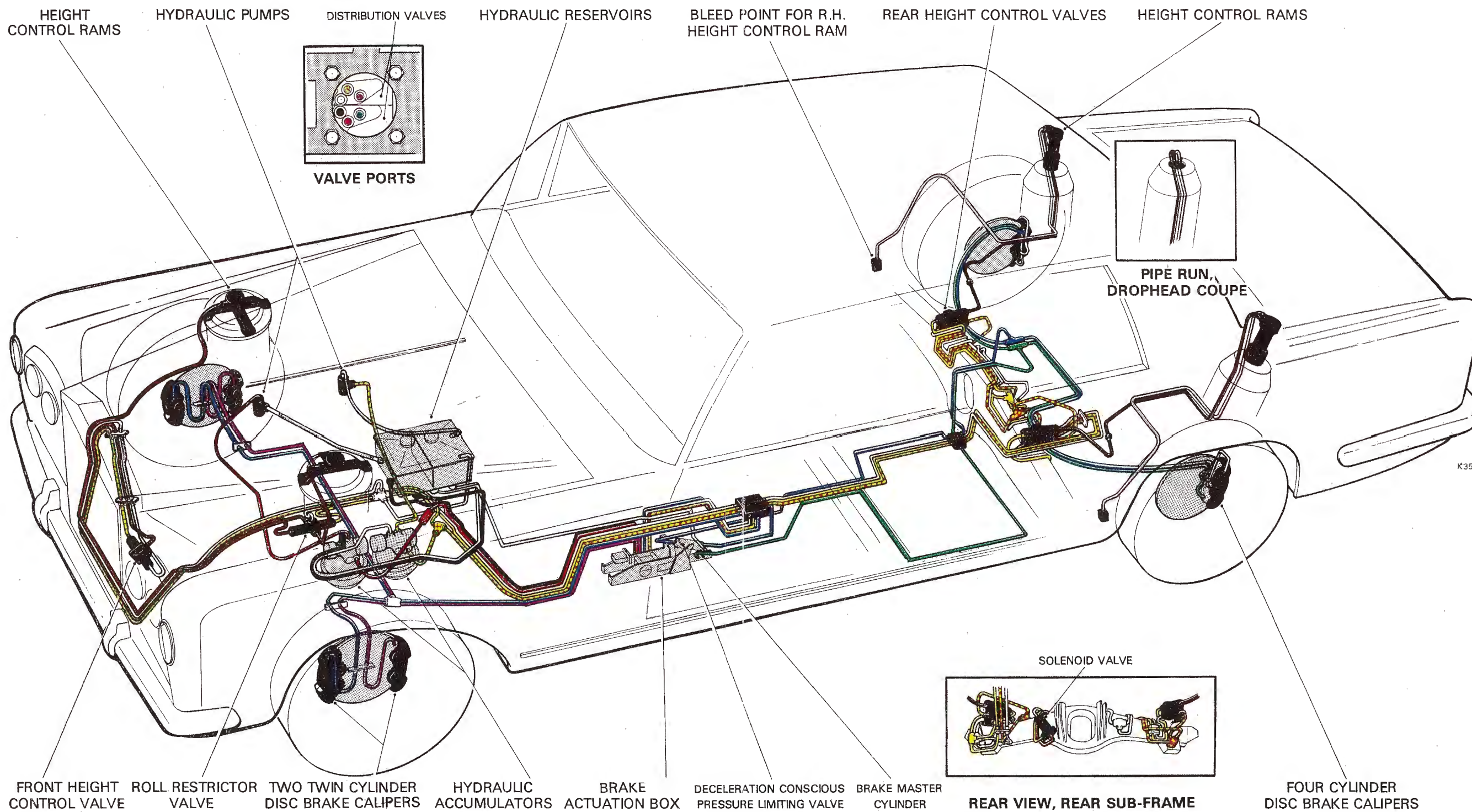


FIG. G6 HYDRAULIC SYSTEMS PIPEWORK COLOUR CODING AND COMPONENT LOCATION (LATER L.H.D. CARS)

Section G4

HYDRAULIC SYSTEMS RESERVOIRS

Reservoir—To remove

1. De-pressurise the hydraulic systems (see Section G1—Special Precautions) then disconnect the battery which is located in the boot.
2. Slacken the worm-drive clips securing the accumulator low pressure return pipes to the adaptors in the reservoir base, then remove the pipes and drain the contents of each compartment into a clean container.
3. Blank off the ends of the return pipes and the adaptors in the reservoir base.
4. Remove the remaining five pipes from the reservoir base and securely blank off all pipe ends and ports.
5. Remove the three setscrews, nuts and washers securing the reservoir bracket to the spring pot.
6. Remove the three setscrews, nuts and washers which secure the reservoir to the vertical rear mounting bracket.
7. Lift the reservoir from its location.

Reservoir filters—To clean or renew

Providing that proper precautions are taken against the ingress of dirt into the systems and that perfectly clean fluid is always used when topping-up, the reservoir will not require servicing and the filters should never require attention.

If, however, the system has become contaminated and it is necessary to clean the reservoir and filters, the following procedure should be adopted.

1. Drain and remove the reservoir as described previously.
2. Remove the screws and nuts which secure the top cover, then remove the cover.
3. Remove the large combined filter and gasket.
4. Remove the two setscrews and nuts which secure the baffle plate over the dividing wall then remove the plate.

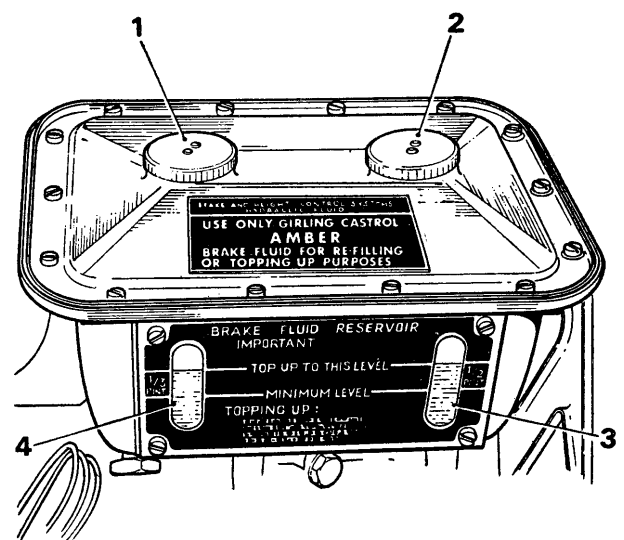


FIG. G7 HYDRAULIC SYSTEMS RESERVOIRS

- 1 Front reservoir filler cap
- 2 Rear reservoir filler cap
- 3 Rear reservoir sight glass
- 4 Front reservoir sight glass

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5. Clean out any residual fluid in the reservoir.
6. On **early cars** remove the centre setscrew from each filter and remove the filters.

On **later cars**, unscrew and remove the hexagon based filters from their respective positions (see Fig. G8).

7. Clean the filters, thoroughly washing them in methylated spirits, then drying them with dry compressed air. The large filter, fitted under the top cover, should be cleaned in a similar manner.

8. Thoroughly clean out the reservoir tank, washing it with methylated spirits and drying it with dry compressed air.

Note It is important to clean carefully the threads and holes in the adaptors fitted to the reservoir base and blank them off with clean blanks immediately afterwards.

9. Assembly is the reverse of the procedure given for dismantling, noting that, if it is considered necessary, new filters should be fitted.

Note On reservoirs of **early cars**, care must be taken when tightening the filter retaining setscrews so as not to damage the filters compression.

Reservoir sight glass sealing rings—To renew

To renew the two rubber sealing rings which are fitted behind the sight glass and instruction plate, proceed as follows.

1. Drain the reservoir as described previously.
2. Remove the four screws which secure the instruction plate to the reservoir; remove the instruction plate.

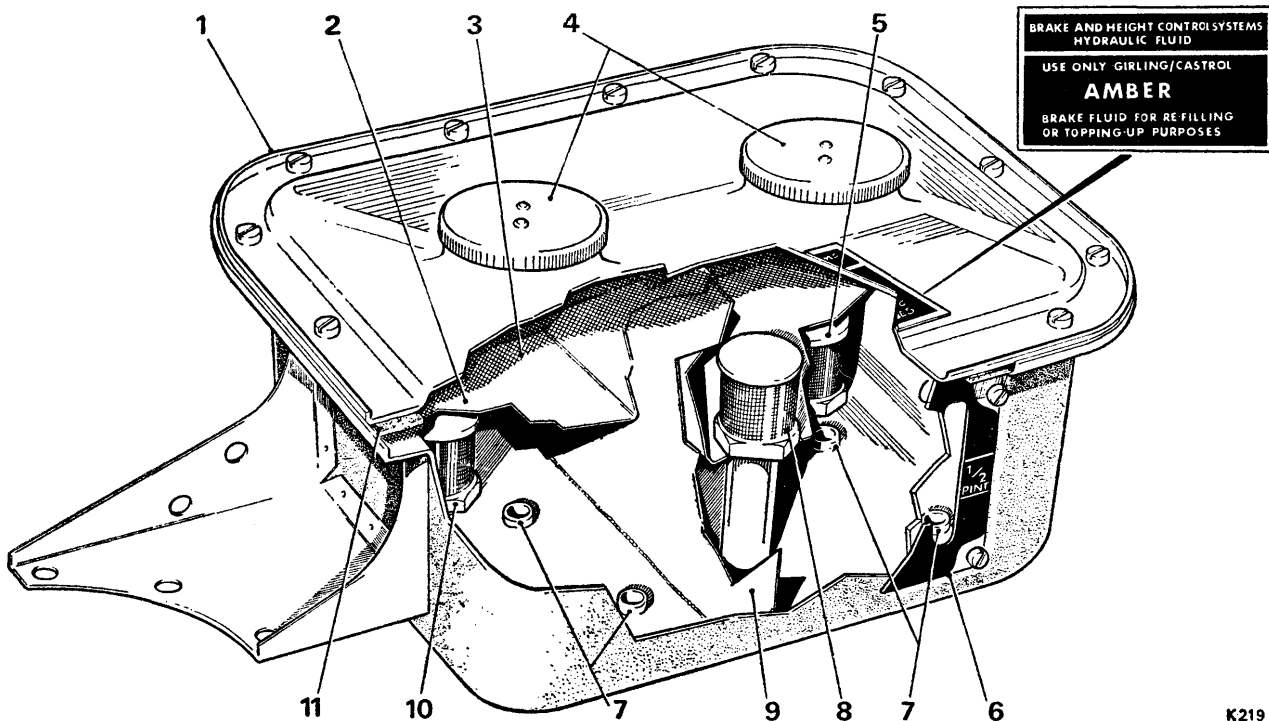


FIG. G8 CUT-AWAY VIEW OF HYDRAULIC SYSTEMS RESERVOIRS

- | | |
|----------------------------------|--|
| 1 Cover | 6 Sight glass instruction plate |
| 2 Baffle plate | 7 Low pressure return ports |
| 3 Filter gauze | 8 Filter and outlet to master cylinder |
| 4 Filler caps | 9 Dividing wall |
| 5 Filter and outlet to rear pump | 10 Filter and outlet to front pump |
| 11 Cover gasket | |

3. Remove the four screws which secure the inner ends of the glass retaining plates; carefully remove the plates and the glass.

4. Remove the sealing rings.

Lightly smear the new sealing rings with clean brake fluid and locate them in position.

5. Assembly is the reverse of the procedure given for dismantling but care must be taken to ensure that the sealing rings and glasses are clean and properly located.

Reservoir—To fit and top-up

To fit the reservoir, reverse the procedure given for its removal, noting the positions.

1. When the reservoir has been fitted and all pipes securely connected, fill the reservoir with clean

specified fluid (see Chapter D) until the levels are slightly above the topping-up level on the sight glass.

2. Run the engine for approximately five minutes then top-up the reservoir to the topping-up marks on the sight glass. Never allow the levels to drop below the minimum levels on the sight glass.

3. Check for leaks around all unions and pipes which have been disturbed.

4. The hydraulic systems must now be bled completely as described in Section G2—Bleeding the systems.

On completion, and if not already fitted, an identification plate marked 'AMBER BRAKE FLUID', etc. (see *Fig. G8*) must be bonded to the reservoirs' covers with a suitable adhesive ('Araldite' or equivalent).

Section G5

THE HYDRAULIC PUMPS

Hydraulic pump outer sealing rings—To renew

Should the fault at the pump(s) be leakage only, it is possible to renew the two outer sealing rings with the pump(s) in position on the engine.

The procedure to adopt is as follows:

1. Remove any engine accessories in the vicinity of the pump(s) as described in Chapter E—Engine—Valve gear and hydraulic pumps.
2. Ensure that the pump(s) and immediate area around it is as clean as possible.
3. De-pressurise the hydraulic systems and disconnect the two pipe connections on the pump(s).
4. Remove the large circlip from the top of the pump body and draw the outer housing upwards to clear the pump and expose the two sealing rings.
5. Discard the two old sealing rings and fit new ones, lubricating them in clean brake fluid of the correct type.
6. Fit the pump body outer sleeve, aligning the ports with the appropriate pipes. Press the sleeve firmly into position then fit the circlip.
7. Prime the pump with the approved fluid then connect the pipes to the pump, pressurise the systems and check the pump(s) for leaks.

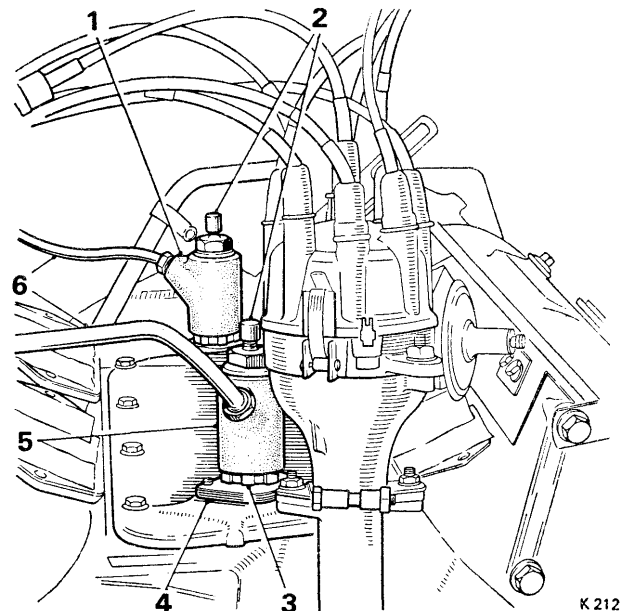


FIG. G9 HYDRAULIC PUMPS IN POSITION

- 1 Front pump
- 2 Outlet ports and adaptors
- 3 Serrated nut
- 4 Pump pedestal
- 5 Rear pump
- 6 Inlet pipes from reservoir

Chapter G

Hydraulic pump—To remove

1. To remove a hydraulic pump from the engine, the following procedure must be adopted.

2. De-pressurise the hydraulic systems (see Section G1—Special Precautions) then disconnect the battery which is located in the boot.

3. Remove the flexible air intake from the carburettors; remove the carburettors, generator or refrigeration compressor and associated parts as described in Chapter E—Engine.

4. Remove the low pressure inlet pipes and high pressure outlet pipes from both brake pumps, blanking off the pipe ends and pump apertures.

5. Remove the setscrew and clip which secures the rear pump feed pipe and ignition coil to the manifold; replace the setscrew to secure the coil.

6. Remove the inlet manifold as described in Chapter E—Engine.

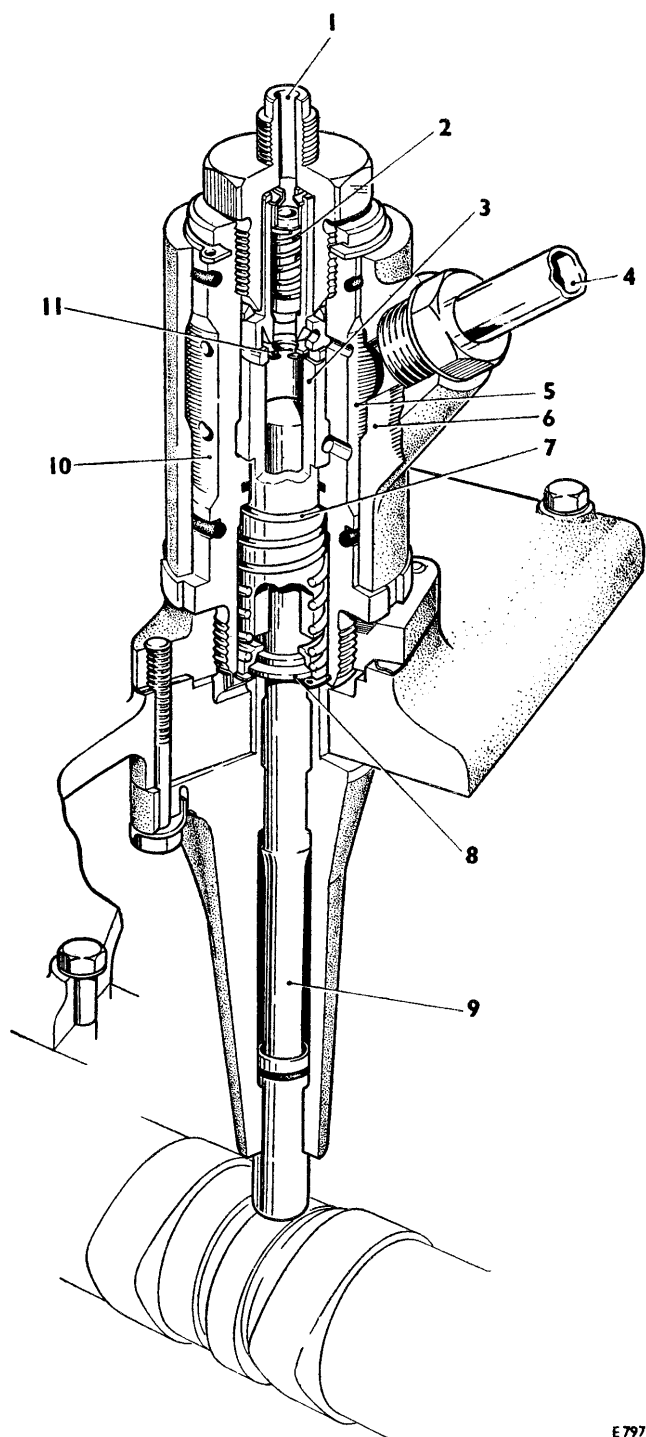
7. Using special 'C' spanner (RH7856), unscrew and remove the hydraulic pump from its pedestal on the tappet chest cover; blank off the pedestal against the ingress of dirt.

Note Prior to dismantling two pumps, remember that the parts from each must not be mixed.

Hydraulic pumps—To service

Distributors and Retailers are advised that the hydraulic pumps are units which can now be overhauled on the premises and all parts are available as spares. Prior to this, the pumps were treated as sealed units and as such, service exchange units were supplied in the event of pump failure.

It should be noted that on cars produced after SRH 2970—Standard cars and CRH 3130—Coach-built cars the sealing arrangement of the reservoir pipe to hydraulic pump outer body was changed.



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FIG. G10 CUT-AWAY OF HYDRAULIC PUMP

- | | |
|-------------------------------|-----------------------|
| 1 Adaptor and outlet port | 6 Pump housing—outer |
| 2 Non-return valve and spring | 7 Plunger spring |
| 3 Pump barrel | 8 Plunger |
| 4 Adaptor and inlet port | 9 Push rod |
| 5 Inlet annulus | 10 Pump housing—inner |
| 11 Inlet valve | |

Earlier cars were fitted with a pipe connected to the pump by means of a brass olive and special nut, the pump housing having a stepped seating.

Later cars are fitted with a pipe having a flared end and a special nut, the pump housing seat being conical.

Should it be necessary to replace a hydraulic pump, ensure that the seat of the low pressure inlet port is correct for the type of reservoir pipe fitted to the car. If this is not so, the outer housing of the new pump should be replaced with the housing of the original pump.

Hydraulic pump—To dismantle

(refer to Figs. G10 and G11)

1. Working on a clean bench, remove the adaptor.
2. Using suitable circlip pliers remove the circlip which secures the pump outer housing. Remove the housing.
3. Remove and discard the two 'O' ring seals.
4. From the pump adaptor bore remove the non-return valve assembly and the chamfered sealing ring.

Gentle use of a small screw-driver may be necessary to assist removal of the chamfered washer; if the washer has been badly spread it should be discarded and a new one fitted in its place on assembly.

5. Remove the inlet valve ring, spacer ring and valve spring (conical).
6. Carefully withdraw the plunger barrel.
7. From the opposite end (lower) of the pump remove the circlip and withdraw the barrel and spring collar from the pump body. Collect the spring.
8. Remove the one remaining 'O' ring seal from the pump body bore. Discard the ring. Dismantle the non-return valve as follows.
9. Remove the circlip.
10. Push out the non-return valve from the outer body and collect the spring, end stop and valve.

Hydraulic pump components—To clean and inspect

Important Ensure that all parts are absolutely clean. Tapped holes require special attention to ensure that they are free from foreign matter and slivers of thread which might break off during assembly and become entrapped in the hydraulic system. One method of achieving this is to screw 'slave' adaptors or setscrews down the threads then thoroughly clean the components in methylated spirits and dry with compressed air, **not cloth**.

Wash all retained components in methylated spirits only. No other cleanser is recommended.

Under normal circumstances, after a thorough cleaning, and the introduction of a new set of sealing rings, the only parts that might require renewal are the small coil springs.

Another important check is the correct seating of the valves in their seatings and that the finely machined valve outer diameter is not scuffed or scored.

Hydraulic pump—To assemble

1. Wet all new 'O' rings in Castrol-Girling Brake Fluid Amber and insert them in their respective positions in and around the pump body.

Lubricate each part with clean fluid prior to fitting to the pump body.

2. Insert the plunger barrel into position in the pump body, pressing it through the sealing ring until it abuts the shoulder.

3. Insert the spacer, valve spring (conical face downward) and inlet valve into position adjacent to the barrel head.

Note Should the seating face of the inlet valve be marked, the valve should be inserted with the unused face toward the valve seat.

4. Assemble the non-return valve reversing the procedure given for its dismantling, ensuring that the valve is fully seated and the circlip is fully engaged in its groove. The end stop should be drawn upward to abut the circlip.

5. Fit the non-return valve assembly, larger diameter leading, into the pump body bore to abut the inlet valve ring.

6. Fit the chamfered sealing ring, small bore diameter leading, into the pump body bore, to abut the shoulder of the non-return valve.

7. Fit and torque tighten the adaptor in the threaded hole to between 55 lb.ft. and 60 lb.ft. (7,60 kg.m. and 8,30 kg.m.). Ensure that a blanking plug is fitted to the adaptor open end.

8. Lubricate the bore of the pump outer housing with brake fluid amber then fit it over the brake pump body taking care when passing over the fitted 'O' sealing rings.

9. Ensure that the housing abuts the slotted end of the pump body then fit the circlip. Ensure that a blanking plug is fitted to the exposed port.

10. Fit the coil spring into the lower end of the pump body, then fit the spring collar to the barrel plunger.

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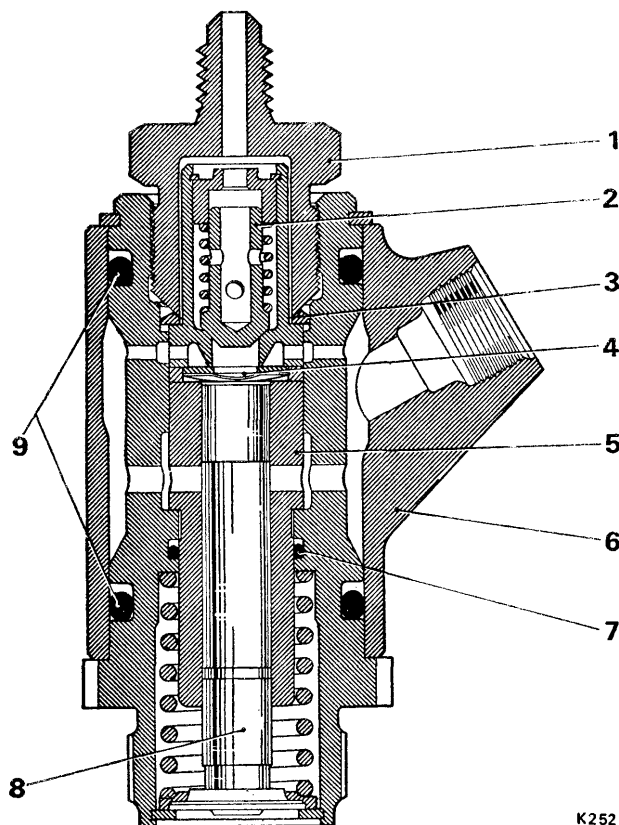
11. Smear amber brake fluid on the plunger and carefully fit the close fitting plunger into the bore of the barrel.

12. Depress the plunger against the spring sufficiently to enable the circlip to be fitted. Fit the circlip, ensuring that it is fully seated.

The pump is now ready for fitting to the engine.

Hydraulic pump—To fit and set

Prior to fitting the pump to the engine tappet cover flange, ensure that the shim washer fitted between the flange and cover is of the correct thickness. The procedure for this check is to be found in Chapter E—Engine—Section E10.



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FIG G11. SECTIONAL VIEW-HYDRAULIC PUMP

- | | |
|--------------------|-----------------|
| 1 Adaptor | 5 Pump barrel |
| 2 Non-return valve | 6 Outer housing |
| 3 Chamfered ring | 7 Sealing ring |
| 4 Inlet valve | 8 Plunger |
| 9 Sealing rings | |

To fit the hydraulic pump, reverse the procedure given for its removal noting the following points.

1. It will be found that when the pump has been fitted to the tappet chest cover, the pump outer casing can be rotated to position the inlet port relative to the feed pipe run from the reservoir.

2. When the pump has been correctly positioned, it must be secured using the special 'C' spanner (RH7856) and torque tightened to between 32 lb.ft. and 35 lb.ft. (4,42 kg.m. and 4,83 kg.m.). The pump must not be tightened down by using the adaptor in the top as a spannering point.

3. Replace the induction manifold, connect the pump feed and pressure pipes then fit the carburetters, generator and associated parts (see respective Chapters in this Manual).

4. Bleed the hydraulic system as described in Section G2—Bleeding the systems. At the same time check the pump's disturbed unions for leaks.

Hydraulic Pumps—To test (on the car)

- De-pressurise the system(s).
- Place a length of bleed tube over the bleed screw in the accumulator which is fed by the suspect pump; open the bleed screw then place and secure the other end of the tube in a clean measuring vessel.
- Fill the appropriate reservoir compartment and start the engine.
- Fluid should flow from the bleed tube in a series of spurts, coinciding with each revolution of the camshaft. The rate of flow should be approximately 250 c.c. or just under $\frac{1}{2}$ pint per minute at an engine speed of 1,000 r.p.m.
- If fluid does not flow from the accumulator then the pump has failed, but a second check can be made as follows.
- Switch off the ignition, de-pressurise the systems, then tighten the accumulator bleed screw and remove the tube.
- Disconnect the flexible high pressure inlet hose from the accumulator (see Fig. G12) and repeat the above test procedure. The fluid should now be ejected from the hose and will not be passed through the accumulator.
- If a pump is faulty it must be removed and overhauled.

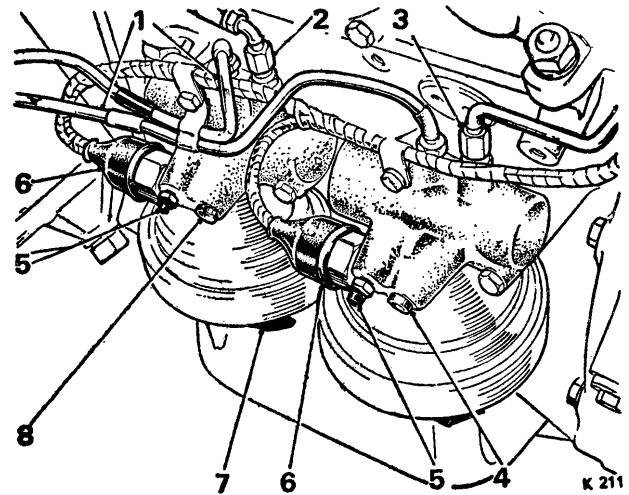
Section G6

THE HYDRAULIC ACCUMULATORS (comprising a sphere, valve and pressure switch)

Hydraulic pressure switches—Introduction

Since the introduction of the Rolls-Royce Silver Shadow and Bentley T Series cars, three types of pressure switch have been fitted, any one of which may be found on a car being serviced. The most common of these are the S.T.O.P. and Rolls-Royce manufactured switches.

If a pressure switch requires renewal, only the latest type (Rolls-Royce) must be fitted. The two types displaced are the Lucas and S.T.O.P. manufactured switches. The S.T.O.P. switch has metric threads and to enable it to be fitted to the accumulator, an adaptor was attached with the appropriate threaded end piece.



**FIG. G12 HYDRAULIC ACCUMULATORS
IN POSITION**

Hydraulic pressure switch—To remove

Lucas Type

1. De-pressurise the hydraulic systems (see Section G1—Special Precautions), then disconnect the battery.
2. Ease the rubber seal to expose the electrical terminals.
3. Detach the terminal of the black cable from the switch, bend the cable back along the loom and secure with adhesive tape.
4. Detach the feed cable from the switch.

- 1 Return pipes to reservoir
- 2 Inlet from front pump
- 3 Inlet from rear pump
- 4 Outlet to distribution valve
- 5 Bleed screw
- 6 Warning lamp (pressure) switch
- 7 Warning plate
- 8 Outlet to distribution valve and height control

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5. Using a suitable spanner, unscrew and remove the switch from the accumulator valve, then blank off the accumulator port to prevent the ingress of dirt.

Note It is recommended that the opportunity be made to renew both switches even though one only may be unserviceable.

Repeat Operations 1 to 5 inclusive for the other switch.

S.T.O.P. Type

1. Carry out Operation 1 of 'Lucas switch—To remove'. The note after Operation 5 also applies.

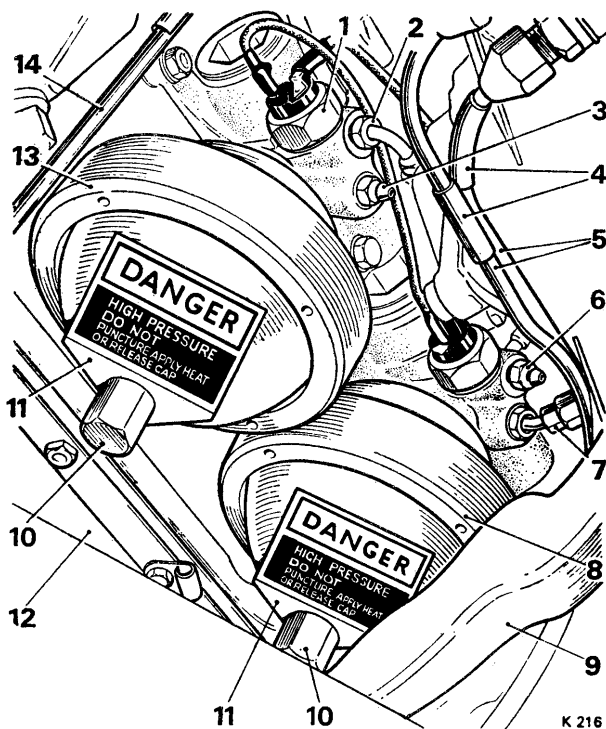


FIG. G13 ACCUMULATORS AND WARNING PLATES

- 1 Pressure switch (early type)
- 2 High pressure outlet—front accumulator
- 3 Bleed screw—front accumulator
- 4 Identification sleeves (blue or mauve)
- 5 Front brake pipes
- 6 Bleed screw—rear accumulator
- 7 High pressure outlet—rear accumulator
- 8 Rear accumulator
- 9 Suspension lever—lower
- 10 Charging valve cap (nitrogen)
- 11 Warning plate
- 12 Engine sump
- 13 Front accumulator
- 14 Engine dipstick

2. Ease back the rubber sleeve to expose the feed terminal and disconnect the cable from the terminal.

3. Using a suitable spanner, remove the pressure switch from the accumulator.

Rolls-Royce Type

In the event of failure of a Rolls-Royce type switch, use the removal procedure adopted for the S.T.O.P. switch, noting that a single Lucar blade is fitted to the switch.

Pressure switch (*Rolls-Royce type*)—To fit

1. Fit one steel and two aluminium washers to the pressure switch, the steel one located between the two aluminium washers.

2. Fit the new switch to the accumulator valve and torque tighten them to between 12 lb.ft. and 15 lb.ft. (1,66 kg.m. and 2,10 kg.m.).

3. If necessary fit a Lucar terminal to the feed cable with appropriate sleeve and connect to the switch terminal.

4. Fit the rubber boot over the switch and terminal to keep out foreign matter and water.

5. Run the engine and check the base of the pressure switch for leaks and the operation of the warning lamp on the instrument panel.

6. When the engine has been running for approximately four minutes top-up the appropriate compartment of the reservoir to the level indicated.

Repeat operations 1 to 4 to fit the other switch.

Pressure switches—To test (*on the car*)

1. The hydraulic pressure switches will normally always 'fail safe', i.e. if a pressure switch fails, it will operate the warning lamp on the instrument panel.

2. The warning lamp bulbs can be checked for correct operation by pressing the oil level indicator button on the instrument panel which will result in all the bulbs in the warning lamp panel being illuminated.

3. The easiest way of testing a pressure switch is by substitution, but if it is required to test a switch and a hydraulic rig is not available, a test may be carried out utilising the master cylinder system on the car.

4. De-pressurise the hydraulic systems then remove the bleed screws from the upper cylinders of each rear brake caliper and connect a Zero lb/sq.in. to 3,000 lb/sq.in. (Zero kg/sq.cm. to 210,92 kg/sq.cm.) gauge and pipe to one of the bleed screw ports, and the pressure switch and a suitable pipe and adaptor to the other bleed screw port.

5. The electrical contacts of the switch should be wired as shown in *Figures G12 and G13*.

The switch can now be tested by actuating the brake pedal which, with 'flat' power systems, operates the upper cylinders of the rear calipers only, through the master cylinder.

Hydraulic accumulator assembly— To service

The hydraulic accumulator assembly comprises the accumulator sphere and valve fitted to the top of the sphere, complete with pressure switch. These items were previously treated as sealed units and service exchange units were provided in the event of failure.

These units, with the exception of the pressure switch, may now be dismantled and overhauled, although not all parts are supplied as individual spares. Those that are can be seen itemised in the current Parts List.

In order to comply with French regulations, a modified type of accumulator sphere is fitted to cars destined for France. This sphere functions identically to the standard type, the difference being a more shallow sphere lower half, thus decreased volume.

Front hydraulic accumulator assembly— To remove

The hydraulic accumulator must be removed from underneath the car.

1. De-pressurise the system (see Section G1—Special Precautions) then disconnect the battery which is located in the boot.

2. Carefully ease the rubber boot away from the pressure switch body and remove the electrical connection(s).

3. Remove the pipe union from the accumulator outlet, which is situated adjacent to the bleed screw and blank off the pipe and the accumulator port.

4. Remove the rearmost of the pipes fitted to the top of the accumulator valve body. This is the pressure feed from the hydraulic pump. Blank off the pipe quickly to avoid loss of fluid, then blank the port in the accumulator valve body.

5. Remove the setscrew and clip which secures the remaining pipe—the low pressure return to the fluid reservoir—from the accumulator; then remove the pipe.

Note The low pressure return pipes are under a large head pressure and consequently they must be blanked off quickly to prevent excessive loss of fluid.

6. Release and remove the two remaining setscrews securing the accumulator to the crankcase, noting that the dipstick tube is secured by the front setscrew on the front accumulator, then carefully remove the accumulator from the engine.

Front hydraulic accumulator (sphere) and valve—To separate

1. Carefully remove the charging valve cap and the warning plate (refer to special precautions given under 'Hydraulic accumulator sphere—To discharge').

Note Great care must be taken when removing this cap should any gas escape from the sphere at this point. If the later type of cap with the additional sealing nylon ball fitted (see Fig. G14), the gas pressure may cause the ball to eject quickly from the cap thus possibly causing personal injury.

2. Using special tool RH7860 on the hexagon machined on the sphere adjacent to the charging valve cap position on the accumulator, unscrew the sphere from the valve body. Re-fit the valve cap immediately.

Note It is of the utmost importance that, when the sphere is unlocked and unscrewed from the valve body, both halves of the sphere MUST rotate as a unit. The halves must not rotate relative to each other.

One method of checking this is to mark the halves with a piece of chalk and observe the markings whilst unlocking the sphere.

In the unlikely event of the halves rotating relative to each other, i.e. the lower half unscrewing from the upper half, the operation must be stopped IMMEDIATELY. The large hexagon machined on the upper half of the sphere just below the valve body should then be used to separate the sphere from the valve body.

Rear hydraulic accumulator assembly— To remove

1. Remove the front hydraulic accumulator as already described.

2. Carefully ease the rubber boot away from the pressure switch body and remove the electrical connection(s).

3. Disconnect the pipes from the valve body, blanking off each pipe and port in turn and noting that the return to the fluid reservoir must be blanked off quickly to avoid excessive loss of fluid.

4. Remove the setscrews securing the accumulator assembly to the crankcase then remove the assembly.

Rear hydraulic accumulator (sphere) and valve—To separate

1. Refer to 'Front hydraulic accumulator sphere and valve—To separate'.

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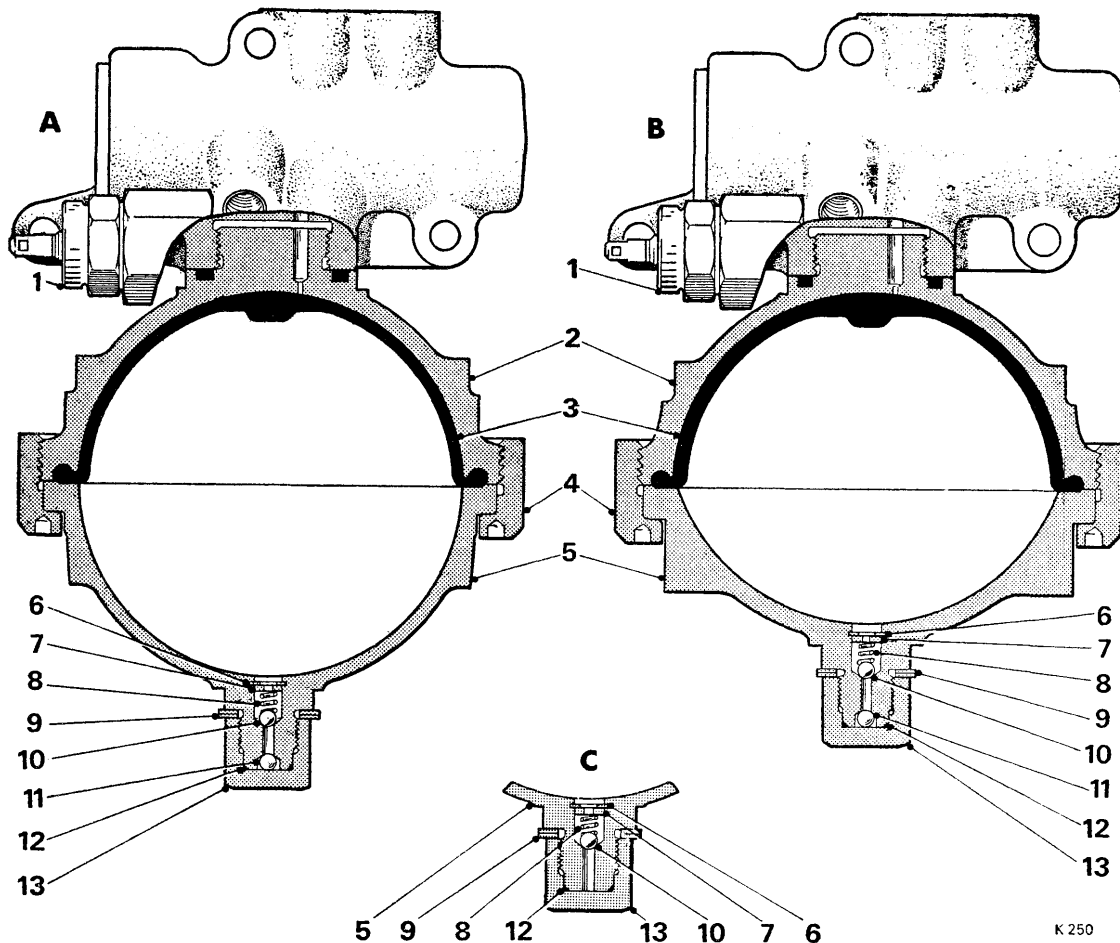


FIG. G14 SECTIONAL VIEW—HYDRAULIC ACCUMULATORS

- | | | |
|---------------------------------|---------------------------------|-----------------------|
| 1 Pressure switch | 5 Accumulator sphere—lower half | 10 Steel ball |
| 2 Accumulator sphere—upper half | 6 Circlip | 11 Nylon ball |
| 3 Diaphragm | 7 Washer | 12 Sealing ring |
| 4 Clamping ring | 8 Spring | 13 Charging valve cap |
| | 9 Washer and warning plate | |

- A** Accumulator valve and sphere assembly, all cars other than those destined for France
- B** Accumulator valve and sphere assembly, cars destined for France
- C** Charging valve and cap sealing arrangement—early cars

Hydraulic accumulator (sphere)—To discharge

Before commencing to remove the charging valve sealing cap from the base of the sphere, compare the illustrations of *Figure G14*. The later type sealing arrangement shows an additional sealing steel ball which comes out as the cap is removed. If the cap is removed too quickly, and if gas is escaping from the

sphere, this ball may be ejected quickly, thus possibly causing injury to a person. This can only happen, however, if the ball, itemised 11 in *Figure G14*, is not seating correctly.

1. Carefully remove the sealing cap and collect the nylon ball (if fitted). Collect the warning plate and waved washer, if not previously removed. Discard the nylon ball and sealing ring.

Accumulator (sphere)—To dismantle

1. De-pressurise the sphere by fitting the charging/discharging valve (RH 7808) to the base of the sphere and by screwing the end cap/plunger assembly inward just sufficiently to 'crack' the one-way valve from its seating.

This allows the gas to escape slowly. It is not advisable to open the valve too quickly or too wide, thus allowing the Nitrogen gas to escape quickly.

When the sphere is completely discharged, remove the adaptor from the sphere.

2. Clamp the sphere in a vice fitted with jaw protectors and using the special tool RH 8144 remove the clamping ring in order to separate the halves of the sphere.

3. Remove the rubber diaphragm.

4. In order to dismantle the one-way valve at the base of the sphere lower half, remove the circlip, washer, small spring and valve steel ball.

**Hydraulic accumulator (sphere)
—To assemble**

Assemble the sphere by reversing the method adopted for dismantling, noting the following points.

1. If necessary, renew the diaphragm.

2. Examine the one-way valve seating and return spring. Renew the ball. Renew the spring if necessary.

3. Lightly tap a new steel ball onto the charging valve seat then fit the spring, washer and circlip. The washer counterbore is seating location for the spring.

4. Smear a little Molytone C grease or its equivalent onto the buttress threads of the clamping ring.

When tightening the sphere clamping ring, use a suitable torque spanner attached to the special tool (RH8144) and torque tighten to between 265 lb.ft. and 275 lb.ft. (36,6 kg.m. and 38 kg.m.).

Ensure that the halves of the sphere do not rotate during the tightening process otherwise damage to the diaphragm may result.

Note A new steel ball and seal will be required for the charging valve cap after charging the accumulator sphere with Nitrogen.

Hydraulic accumulator (sphere)—To charge

1. Fit the charging valve (RH 7808), less the nut and plunger assembly, to the base of the sphere and attach the high pressure hose of the nitrogen gas cylinder to the valve.

2. Slowly open the valve in the top of the cylinder and gradually build up the pressure until the gauge shows a reading of 1,000 lb/sq.in. (70,31 kg/sq.cm.).

3. Close the valve and observe the gauge. If the gauge does not remain steady at 1,000 lb/sq.in.

(70,31 kg/sq.cm.) there is a leak either from the sphere or from the high pressure pipe.

4. If the pressure is maintained, remove the pipe from the sphere slowly allowing the pressure in the pipe to escape, then quickly fit the warning plate, washer and charging valve cap complete with new steel ball and sealing ring, torque tightening the cap to between 22 lb.ft. and 25 lb.ft. (3,07 kg.m. and 3,46 kg.m.).

Note The cap should be fitted as quickly as possible to provide a secondary seal in case there is a slight seepage from the one-way charging valve.

5. With the fluid inlet ports in the upper half of the sphere suitably blanked, partially immerse the other end of the sphere in water until the level is above the clamping ring and check for leakage around the clamping ring and the charging valve cap. If leakage is evident from the clamping ring then the diaphragm is faulty, presumed damaged on assembly, and the diaphragm must be renewed.

6. If a leak is observed from the charging valve cap, the 'O' ring fitted in the cap may be renewed, but the sphere must be re-charged to 1,000 lb/sq.in. (70,31 kg/sq.cm.) before the cap is refitted. The submerged leak test must also be carried out again.

7. After a successful submerged test, the sphere should be thoroughly dried with dry compressed air, with particular attention being paid to the fluid inlet ports, and the fluid inlet ports then correctly blanked off while awaiting fitting to the engine.

8. A more accurate check of the accumulator pressure when fitted to the engine may be achieved by using the hydraulic system pressure gauge rig (RH 7938).

Hydraulic accumulator valve—To dismantle

Separate the hydraulic accumulator (sphere) from the valve as described earlier.

Dismantle the valve as follows.

1. Remove the end plug from the accumulator valve, by using either a length of hexagon bar or the barrel of a discarded Lucas pressure switch inserted into the plug end and slacken by using a suitable spanner.

2. Using a $\frac{1}{4}$ in. U.N.F. setscrew screwed into the threaded hole of the valve sealing plug, withdraw the plug then discard the sealing ring.

3. Remove the aluminium sealing disc (if fitted), non-return valve, and the return spring from the smaller bore of the bobbin.

4. Remove the valve bobbin by gently tapping the valve body on a piece of wood. Remove and discard the three sealing rings.

Note The white Fluon seal remains in place.

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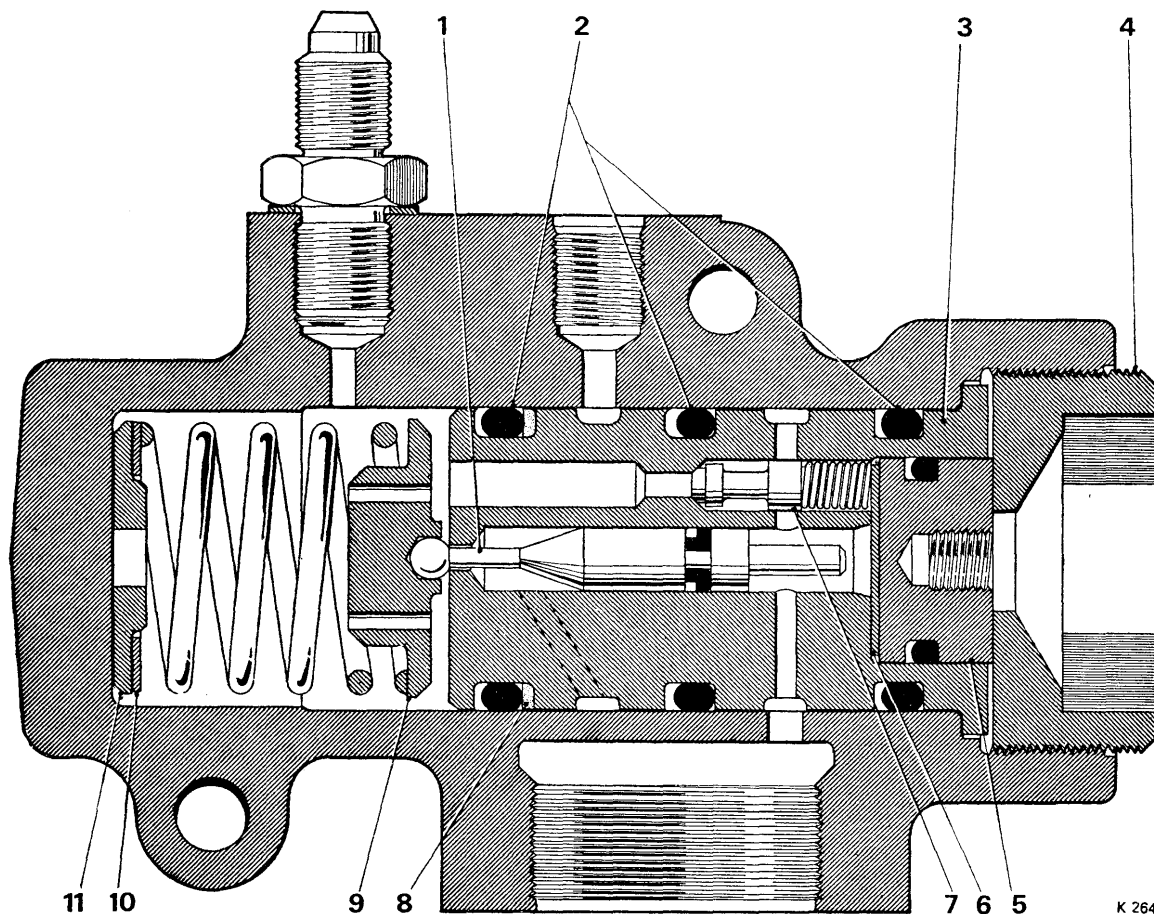


FIG. G15 SECTIONAL VIEW—ACCUMULATOR VALVE

- | | |
|---------------------------------------|------------------------|
| 1 Piston and sealing ring | 6 Sealing disc |
| 2 Bobbin and sealing rings | 7 Non-return valve |
| 3 Valve bobbin | 8 Fluon washer |
| 4 End plug | 9 Regulator valve |
| 5 Valve seating plug and sealing ring | 10 Adjusting washer(s) |
| 11 Seating washer | |

5. Remove the piston from the centre bore of the bobbin, remove and discard the combined Fluon and rubber sealing ring only if obviously damaged, necessitating renewal.

6. Remove the regulator valve, spring and adjusting washers from the valve body.

Hydraulic accumulator valve—To inspect

1. Thoroughly wash all the components, including the valve housing, in clean methylated spirits. Dry, using clean compressed air. Never use cloths to dry the components.

2. Inspect the ball seat in the bobbin and the ball of the regulator valve for ingrained dirt. Any dirt present should be removed and the parts washed a second time in clean methylated spirits.

3. Burnish the ball seat of the bobbin by holding lightly, the ball on to the seat, rotating the regulator valve by hand.

Service experience to date has shown that no other faults have occurred on this unit, but if a dismantled unit is damaged during handling, parts are available as matched sets, refer to current Parts Lists.

Hydraulic accumulator valve—To assemble

1. Assemble the valve by reversing the procedure adopted for dismantling, lubricating all internal parts with clean brake fluid of the correct type (see Chapter D).
2. Fit new sealing rings to the bobbin, piston and sealing plug (see Operation 3).
3. If renewal of the combined Fluon/rubber sealing ring of the small piston is **necessary**, great care should be taken when fitting it. Note also the position in which it is to be fitted.

**Hydraulic accumulator (Sphere) and valve—
To fit**

1. Screw the sphere into the accumulator valve body and, using the special tool (RH 7860), lock the sphere to the valve, torque tightening to between 55 lb.ft. and 60 lb.ft. (7,6 kg.m. and 8,3 kg.m.).

Note Do not use the charging valve cap as a spanning point.

2. Fit the accumulator assembly to the engine, reversing the procedure adopted for its removal, noting the following points.

Note Blanks should only be removed immediately prior to connecting the pipes.

All securing setscrews must be torque tightened to the standard figures quoted in Chapter P and care should be taken not to overtighten the pipe unions, as this could cause damage to the pipe flares.

After fitting, the appropriate compartment of the reservoir should be topped-up and the system must be bled at the accumulator and all points downstream from it on that particular system, as described in Section G2—Bleeding the systems.

When the engine is running and immediately prior to bleeding, check all unions which have been disturbed to ensure that none is leaking.

Check the nitrogen pressure as follows.

Hydraulic accumulators—To test

1. De-pressurise the system(s).
2. Remove the high pressure outlet pipe (red or orange) and attach a Zero lb/sq.in. to 3,000 lb/sq.in. (Zero kg/sq.cm. to 210,92 kg/sq.cm.) pressure gauge (RH 7938) with a length of high pressure pipe to the outlet port or alternatively remove the pressure switch and attach the pipe to the switch port.

3. Start the engine. The gauge needle should immediately jump to 1,000 lb/sq.in. (70,307 kg/sq.cm.) which is the Nitrogen pressure in the accumulator sphere, and then rise slowly to 2,500 lb/sq.in. (175,77 kg/sq.cm.). At this pressure the accumulator control valve should operate and the pump should cease to charge the accumulator.

4. After initially settling to approximately 2,400 lb/sq.in. (168,74 kg/sq.cm.) the pressure should remain steady unless the brake pedal is operated, the height control is actuated, or the accumulator bleed screw is opened.

5. Fit a bleed pipe to the accumulator bleed screw, then slightly open the accumulator bleed screw, thus allowing the pressure gauge reading to fall. When the pressure has fallen to between 1,850 lb/sq.in. and 1,900 lb/sq.in. (126,55 kg/sq.cm. and 133,58 kg/sq.cm.) the accumulator control valve should allow the pump to cut in again and charge the accumulator back to 2,500 lb/sq.in. (175,77 kg/sq.cm.).

If the above requirements are met the accumulator is operating correctly.

6. If, on first starting the engine, the pressure gauge needle fluctuates violently, rapidly climbs to 2,500 lb/sq.in. (175,77 kg/sq.cm.) and then immediately falls to zero when the brake pedal is depressed, this indicates a complete loss of nitrogen pressure from the accumulator sphere.

7. This could be caused by a leaking charging cap or a failure of the Butyl diaphragm in the sphere.

If, when the engine is started, the gauge needle jumps to a pressure less than the accumulator nitrogen pressure of 1,000 lb/sq.in. (70,31 kg/sq.cm.) this indicates a partial loss of nitrogen pressure from the sphere.

If the above condition exists the sphere must be further charged.

If, on starting the engine, the pressure gauge correctly jumps to 1,000 lb/sq.in. (70,31 kg/sq.cm.) but then fails to attain 2,500 lb/sq.in. (175,77 kg/sq.cm.) this could be due to either the accumulator controlling at a low pressure or leakage. Should the gauge needle rise to a pressure below 2,500 lb/sq.in. (175,77 kg/sq.cm.) and then remain steady, the accumulator valve is controlling at too low a pressure and the valve body (minus sphere) should be overhauled or renewed. If observation of the gauge shows that the pump is still pumping (needle fluctuating with the pump pulses) without giving a pressure rise then there is a leak which is equal to the pump flow at that pressure.

To verify this, de-pressurise the systems, remove the hose connection and blank off the high pressure outlet from the accumulator to the system. Repeat

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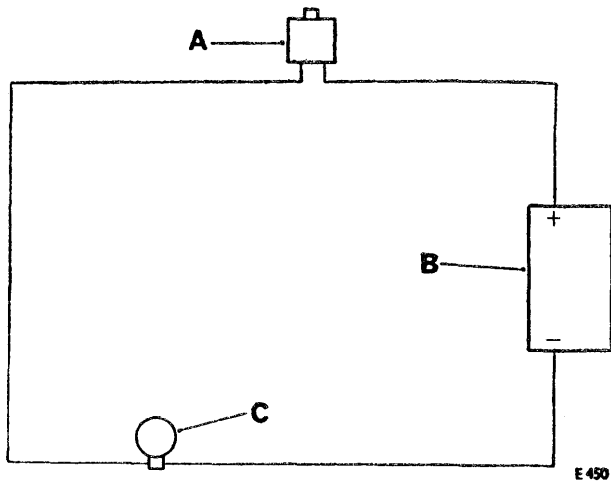


FIG. G16 PRESSURE SWITCH TEST CIRCUIT

A Pressure switch **B** Battery **C** Test lamp

the test. If the above symptom persists then the accumulator valve body has an internal leak and the accumulator valve body should be removed and overhauled. If, however, the gauge now behaves correctly, the leakage is occurring downstream and further checking will be necessary in order to isolate the faulty item, including blanking off the feeds to individual components such as the distribution valves and height control valves, depending upon the system involved.

The component isolating procedure consists of de-pressurising the system(s) then removing or blanking off the pressure feed to the various components and repeating the above test.

The pressure feeds to the components can be readily identified from the colour coding chart (see Section G3—Hydraulic pipework) and the symptoms for determining whether units are functioning correctly are given under their applicable test procedures, within their respective sections.

Note When a unit has been blanked off, before removing the blank, the systems **must be de-pressurised** either by continuous system operation with the engine switched off or by bleeding the appropriate accumulator until it is de-pressurised.

If, when the engine is started, the gauge works correctly and the accumulator controls at 2,500 lb/sq.in. (175,77 kg/sq.cm.) but then the pressure drops steadily without brake or height control actuation, until the accumulator allows the pump to cut in again at 1,850 lb/sq.in. to 1,900 lb/sq.in. (130,06 kg/sq.cm. to 133,58 kg/sq.cm.) a leak in the system is indicated and the component checking procedure should be carried out to determine the location.

Note After tests have been carried out involving blanking off components **do not** forget to remove blanks and reconnect the components to the system(s).

Section G7

FRONT AND REAR HEIGHT CONTROL VALVES

Height control valve—To service

The one front and two rear height control valves, formerly classified as service exchange units, may now be dismantled, cleaned and have new sealing rings fitted if leakage is evident and/or a fault is suspected caused by dirt in the fluid.

It will be seen from the current Parts List that only **sealing rings** of the units internal components are supplied as individual items. If other damage is evident, the unit must be renewed as an assembly.

The only maintenance required on the height control valves is lubrication of the operating arm ball joints.

1. Disconnect, clean and pack the joints with the approved grease at the specified mileage (see Chapter D).

Note When this operation is performed, the length of the link must not be altered as this would necessitate setting the height control valves relating to the car standing height.

2. After greasing, the rubber seals fitted to the rear height control valves must be fitted, then all joints connected and adjusted to give free movement without any lost motion.

Front height control valve—To remove

The height control valves are removed from underneath the car.

1. Place the car on a ramp, de-pressurise the hydraulic systems as described in Section G1—Special Precautions, then disconnect the battery, located in the boot.

2. Remove the small pinch bolt from the lower ball joint on the connecting rod and remove the rod from its pivot by unscrewing the centre adjusting screw and seat (*see Fig. G25*).

3. Remove the single pipe union from the end of the height control valve which faces the nearside of the car (white). This pipe is the low pressure return to the fluid reservoir and is subjected to a head pressure from the reservoir. Consequently, the pipe must be blanked off quickly to avoid loss of fluid.

4. Remove the two remaining pipes, blanking off each pipe and port in turn.

5. Remove the nuts and bolts securing the height control valve to the front sub-frame member. Note that only the two nuts actually connecting the valve to the bracket should be removed. Removal of all four nuts will result in the valve halves parting which must be avoided at this stage.

6. Remove the height control valve.

7. Disconnect and remove completely the connecting rod from the valve.

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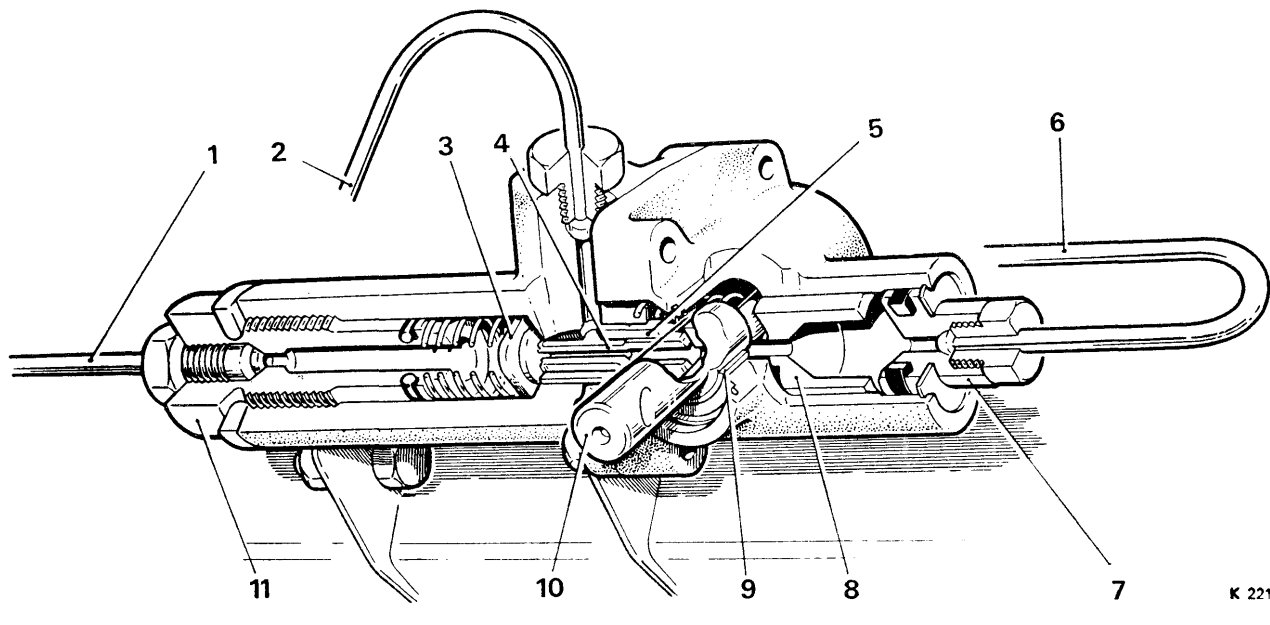


FIG. G17 CUT-AWAY VIEW—FRONT HEIGHT CONTROL VALVE

- | | | |
|--|--|---|
| <p>1 High pressure inlet port (orange)
 2 Connection to roll restrictor valve (brown)
 3 Inlet valve
 4 Sleeve valve</p> | <p>5 Insert
 6 Connection to hydraulic reservoir (white)
 7 Adaptor</p> | <p>8 Plunger
 9 Shaft bearing
 10 Operating shaft
 11 Adaptor</p> |
|--|--|---|

Front height control valve—To dismantle

(see Figs. G17 and G18)

1. Remove the nuts and collect the washers (where fitted) to separate the halves of the valve.
2. Remove the exposed return spring and discard the casing sealing ring. Carefully remove the housing sleeve valve.
3. Remove the adaptor complete with thick washer from the valve housing; remove and discard the sealing ring.
4. Remove the inlet valve return spring and the inlet valve from the housing bore.
5. Remove the circlip from the casing bore; remove the adaptor and discard its sealing ring.
6. In order to remove the valve plunger, rotate the valve operating shaft to clear the plunger groove. When clear, push the plunger out of the valve casing bore.
7. In order to remove the operating shaft, remove the circlip from each end of the shaft, push the

shaft out of its bush bearings and collect the two seal washers. Discard the two sealing rings.

Front height control valve—To clean and inspect

1. Wash all parts of the unit thoroughly in methylated spirits and dry with clean compressed air, not cloths.
2. Lubricate the valve moving parts and respective bores with clean brake fluid of the correct type (see Chapter D).
3. Check that the sleeve valve slides smoothly along its bore in the valve housing.
4. Similarly, check that the plunger slides smoothly in its bore in the valve casing and that the operating shaft rotates smoothly in its bearings.
5. Examine for smoothness, the end faces of the inlet valve, the sleeve valve and the plunger where they abut.
6. Re-wash all parts thoroughly in methylated

spirits and dry with compressed air. Pay particular attention to the adaptor and pipe connection threads.

Front height control valve—To assemble

Assembly of the front height control valve is a careful reversal of the procedure adopted for its dismantling, noting the following points.

Refer also to 'Rear Height Control Valve—To assemble' for the method adopted to fit the inlet valve.

1. Lubricate all moving parts, respective bores and sealing rings with clean brake fluid of the correct type (see Chapter D).
2. Smear a little Molytone C grease or equivalent on the adaptor threads prior to fitting.
3. Ensure that all moving parts are free to move as required. Ensure also that the plunger is located correctly by the eccentric portion of the operating shaft and that the shaft is fitted the correct way round.
4. Note that when securing the halves of the valve together, two washers only are fitted, these being fitted beneath the two upper nuts.

5. Fit plastic plugs to each threaded orifice to prevent the ingress of dirt, etc., until such time as the valve is fitted to the car.

Front height control valve—To fit

To fit a front height control valve reverse the procedure given for its removal, noting the following points.

1. Before fitting the valve, assemble the connecting rod to the ball pin on the height control valve operating arm, grease the linkage joints with Rocol MT 265 grease or equivalent and adjust the joint to give free movement but without free play.
2. The valve securing nuts should be torque tightened to conform with the standard figures given in Chapter P; pressure blanks should not be removed until immediately prior to fitting the pipes.
3. After fitting, the system must be bled as described in Section G2—Bleeding the Systems; at the same time, while the engine is running, all pipes which have been disturbed must be checked for leaks.

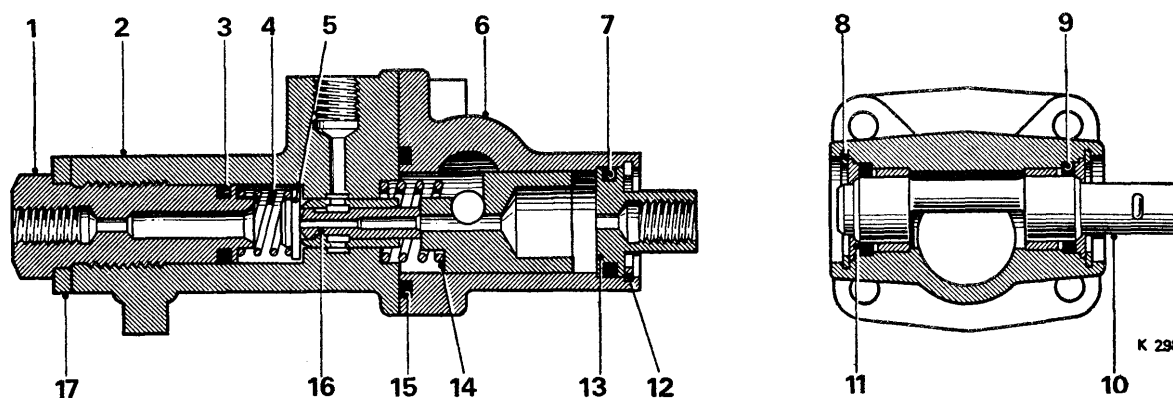


FIG. G18 SECTIONAL VIEW—FRONT HEIGHT CONTROL VALVE

- | | |
|----------------|--------------------|
| 1 Adaptor | 9 Sealing ring (2) |
| 2 Housing | 10 Operating shaft |
| 3 Housing ring | 11 Washer (2) |
| 4 Spring | 12 Circlip |
| 5 Inlet valve | 13 Adaptor |
| 6 Casing | 14 Spring |
| 7 Sealing ring | 15 Sealing ring |
| 8 Circlip (2) | 16 Plunger valve |
| | 17 Washer |

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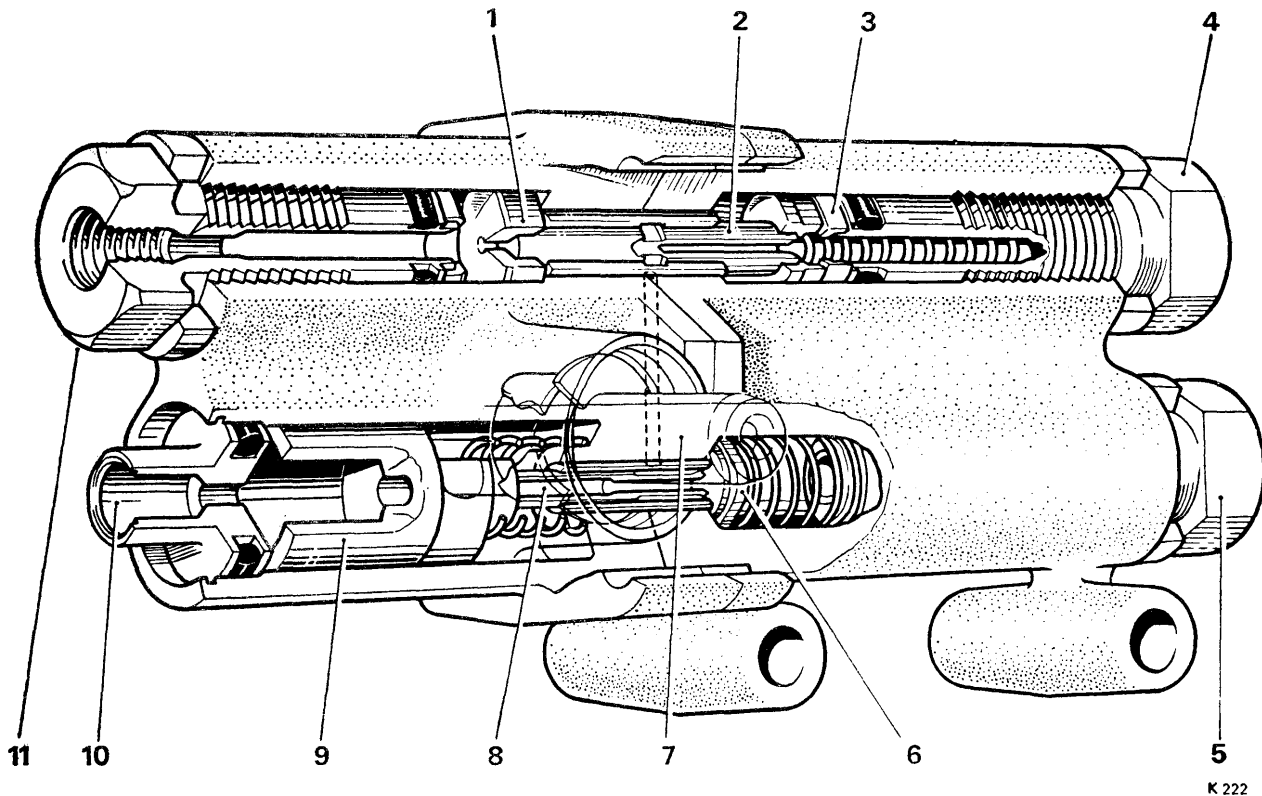


FIG. G19 CUT-AWAY VIEW—REAR HEIGHT CONTROL VALVE

- | | |
|--|--|
| 1 Fast height control plunger | 6 Inlet valve |
| 2 Restrictor plunger | 7 Operating shaft |
| 3 Plunger stop | 8 Sleeve valve |
| 4 Adaptor—connection to height control ram (brown) | 9 Sleeve valve plunger |
| 5 Adaptor—high pressure inlet (orange) | 10 Adaptor—connection to reservoir (white) |
| 11 Adaptor—connection to solenoid valve (yellow) | |

4. Following this operation the height control valve must be adjusted to give the correct standing height at the front of the car (see Standing height—To set).

Rear height control valve—To remove

1. Place the car on a ramp, de-pressurise the hydraulic systems (see Section G1—Special Precautions) then disconnect the battery located in the boot.

2. Slacken the lock-nut on the adjusting screw underneath the bottom ball joint; remove the adjusting screw and lock-nut then disengage the joint.

Right-hand rear height control valve:

1. Remove the flexible and the steel pipes from the rear end of the valve.

Note Since the steel lower pipe is a short 'S' shape it may be necessary to release both ends of it before the pipe can be removed from the valve.

2. The two pipes from the front end of the valve are connected into a four-way junction on the rear face of the sub-frame cross-member and must be removed (see Fig. G21). Remove the two unions indicated then remove the two valve mounting bolts and nuts and remove the valve, operating arm and the two pipes from the car.

Left-hand rear height control valve:

1. Remove the flexible and steel pipes from the rear of the valve.

2. The two pipes entering the front of the valve are connected into a three-way junction and a restrictor

mounted on the rear face of the sub-frame cross-member; release the pipes at these points (see Fig. G22).

3. Remove the two valve mounting bolts and nuts. Remove the valve, operating arm and the two pipes as a complete assembly.

Note If an exchange valve is being fitted the two pipes must be removed from the faulty valve and fitted to the exchange valve before it is located in position on the car.

Rear height control valve—To dismantle (see Figs. G19 and G20)

Prior to removing any part of the valve, refer to its position relative to the valve to facilitate assembly.

1. Remove the adaptor complete with washer, sealing ring, nylon valve stop and return spring from the valve (top left-hand bore of illustrations); discard the sealing ring.

2. Remove adaptor complete with washer and sealing ring (bottom left-hand bore of illustration); discard the sealing ring.

3. Remove the return spring and inlet valve from the bore.

4. Remove the nuts and washers securing the halves of the unit together. Carefully separate the unit and discard the sealing rings.

5. Collect the exposed plunger return spring and remove the sleeve valve from its bore.

6. Carefully remove the restrictor valve assembly from the upper bore (see illustrations) and collect the spring seating from the upper bore of the housing.

7. Unscrew and remove the threaded adaptor complete with washer, adjusting washers (when fitted) and fitted valve stop. Discard the sealing ring.

8. Remove the circlip from the lower bore, remove the adaptor and discard the sealing ring.

9. Rotate the operating shaft to allow the shaft eccentric to clear the plunger groove; push the plunger out of its bore.

10. Remove the circlips retaining the operating shaft in its bore, remove the stepped washers and press out the driving shaft. Remove and discard the two sealing rings.

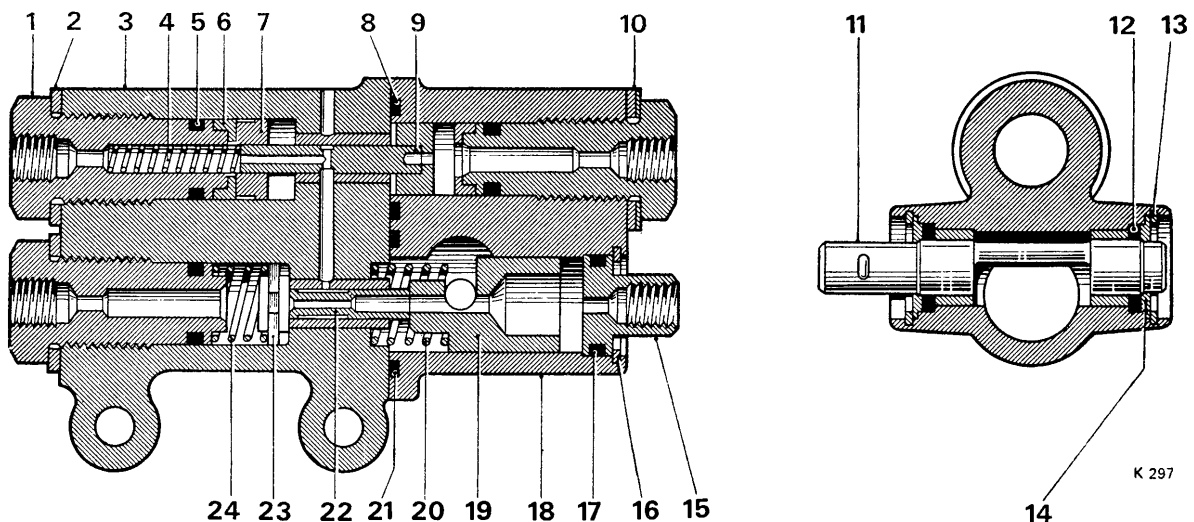


FIG. G20 SECTIONAL VIEW—REAR HEIGHT CONTROL VALVE

- | | |
|----------------------|-------------------|
| 1 Adaptor (3) | 13 Circlip (2) |
| 2 Washer (3) | 14 Washer (2) |
| 3 Housing | 15 Adaptor nut |
| 4 Spring | 16 Circlip |
| 5 Sealing ring (3) | 17 Sealing ring |
| 6 Valve (2) | 18 Casing |
| 7 Spring seat | 19 Plunger |
| 8 Sealing ring | 20 Plunger spring |
| 9 Valve | 21 Sealing ring |
| 10 Adjusting washers | 22 Plunger valve |
| 11 Operating shaft | 23 Inlet valve |
| 12 Sealing ring (2) | 24 Spring |

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Rear height control valve—To clean and inspect

1. The operations necessary are similar to those quoted for the front height control valve, noting that two valves (sleeve and restrictor) are to be checked for freedom of movement without excess radial clearance and that the end face of the sleeve valve and adjacent valve and plunger faces are smooth and free from burrs, etc.

Rear height control valve—To assemble

Ensure that all parts to be used in the assembly are scrupulously clean and free from minute particles of swarf; lubricate the internal components and rubber

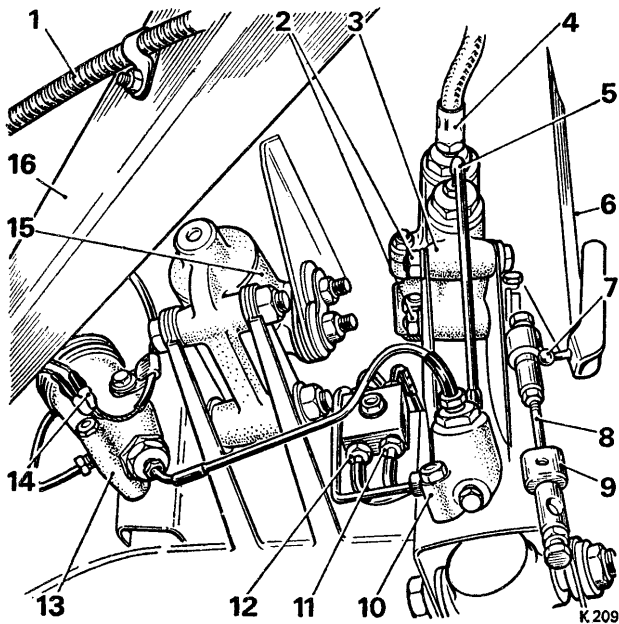


FIG. G21 REAR RIGHT-HAND HEIGHT CONTROL VALVE

- 1 Hand brake cable
- 2 Securing bolts
- 3 Rear height control valve
- 4 Connection to height control ram (brown)
Connection—high pressure feed pipe (orange)
- 6 Trailing arm outer
- 7 Ball connection—height control valve link
- 8 Operating link—trailing arm to height control valve
- 9 Joint sealing boot
- 10 Restrictor—solenoid valve
- 11 Disconnection point—valve removal (white)
- 12 Disconnection point—valve removal (yellow)
- 13 Height control solenoid valve
- 14 Solenoid valve electrical connections
- 15 Rear suspension compliance mount
- 16 Trailing arm inner

sealing rings with clean brake fluid of the correct type (see Chapter D). Apply a little Molytone C grease or equivalent onto the threads of each adaptor.

1. Insert the operating shaft into position in the casing bearing bores, noting that the position of the shaft denotes whether the valve assembly is to be left-hand or right-hand (refer to *Figs. G19 and G20* for relative positions).

2. Fit a seal to one end of the shaft and (by using a blunt instrument) ensure that it is fully seated.

3. Position a seal retaining washer over the end of the shaft and locate it in its recess. Fit a circlip.

4. Position the second seal into its recess between the shaft and casing. Take care not to damage the seal.

5. Fit the seal retaining washer, locating it in its recess, then fit the circlip.

6. Insert the plunger into its bore ensuring that it moves freely. Allow the nose of the plunger to pass the operating shaft then rotate the shaft 180° to lock the plunger into position. Leave the plunger in this position.

7. Carefully fit a sealing ring to the adaptor nut. Fit this assembly into position in the casing behind the plunger and locate it with the circlip.

8. Fit a sealing ring to the casing threaded adaptor (complete with nylon end stop). Fit the large washer and any previously fitted adjusting washers to the adaptor, then fit and tighten the adaptor into position in the casing.

9. Fit a sealing washer to each of the remaining adaptors (one adaptor fitted with a nylon stop).

10. Fit a sealing ring to each groove in the end face of the casing and fit the return spring over the nose of the plunger.

11. Ensure that each valve (restrictor and sleeve) is well lubricated with brake fluid. Position them in their respective bores in the housing and ensure that they move freely.

12. Carefully secure the housing and casing of the height control valve together using the four nuts and washers.

13. Insert through the adaptor (with nylon stop), a length of clean straight $\frac{1}{16}$ in. (1.59 mm.) wire, approximately 6 in. (15 cm.) long. Thread the return spring onto the wire and into the adaptor bore. Locate the spring seat on the wire to abut the spring.

14. Locate the large washer on the adaptor, then carefully locate the end of the wire in the restrictor valve bore. Carefully slide the parts down the wire into their correct positions then screw and tighten the adaptor into position in the end of the housing.

15. Fit the nylon inlet/exhaust valve in the following manner. Rest the valve on a short length of clean aluminium bar of approximately $\frac{1}{2}$ in. (12.7 mm.)

diameter. Invert the height control valve assembly and feed the bar and valve carefully into the housing bore. Uprturn the valve assembly and withdraw the bar.

16. Fit the return spring, fit the large washer to the adaptor, then fit and tighten the adaptor into the bore.

17. Fit clean plastic plugs to each of the exposed ports to prevent the possible ingress of dirt, etc. Remove these plugs immediately prior to fitting the unit to the car.

Rear height control valve—To fit

To fit a rear height control valve, reverse the procedure given for its removal, noting the following points.

1. The linkage joints must be greased with Rocol MT 265 grease or equivalent and the ball joints should be adjusted to give complete freedom of movement without slackness or free play and the valve securing setscrews should be torque tightened to conform with the figures given in Chapter P.

2. After fitting a height control valve the system must be bled as described in Section G2—Bleeding the System(s) and then the height control valve must be 'set' to give the correct car levelled height as described in the following paragraphs.

Levelled height—To set

The levelled height of the car is set correctly before leaving the factory and is to be checked at the required intervals (see Chapter D). If, however, any of the height control valves are removed from the car, on their replacement the levelled height must be checked and corrected as necessary.

The procedure for checking and setting the levelled height is as follows.

Note Before any attempt is made to set the levelled height it is imperative that the car suspension height is checked to ensure that it is correct (see Chapter H).

1. Weight the car with four occupants, or weights to simulate four occupants (600 lb. approx.) (272,16 kg.) equally disposed between the front and rear seats.

2. Run the engine with the accumulators charged and the gearchange selector in 'Neutral' so that the system is on 'fast' height control. In the interests of safety it is recommended that the gearchange thermal cut-out is removed from the fuse board beneath the instrument panel.

3. For the car to be standing at the correct height the following dimensions must be correct.

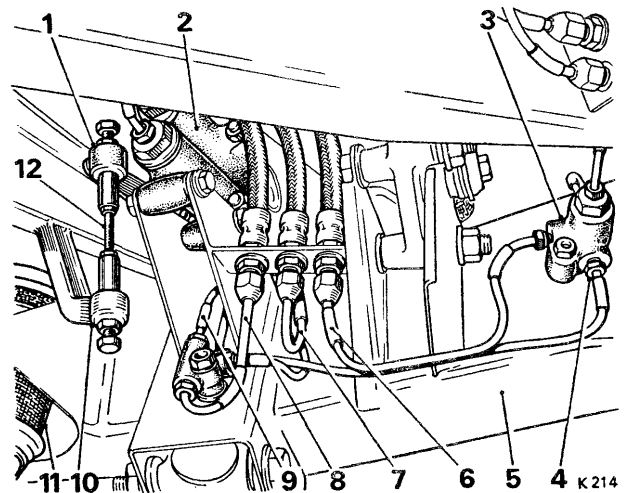


FIG. G22 LEFT-HAND SIDE REAR HEIGHT CONTROL VALVE IN POSITION

- 1 Upper ball joint—connecting rod
- 2 Height control valve
- 3 Restrictor—solenoid valve
- 4 Disconnection point—valve removal (white)
- 5 Rear suspension cross-member
- 6 Return to reservoir (white)
- 7 High pressure feed (orange)
- 8 Pressure line from solenoid valve (yellow)
- 9 Disconnection point—valve removal (yellow)
- 10 Lower ball joint—connecting rod
- 11 Rear cross-member mount
- 12 Connecting rod—height control ram

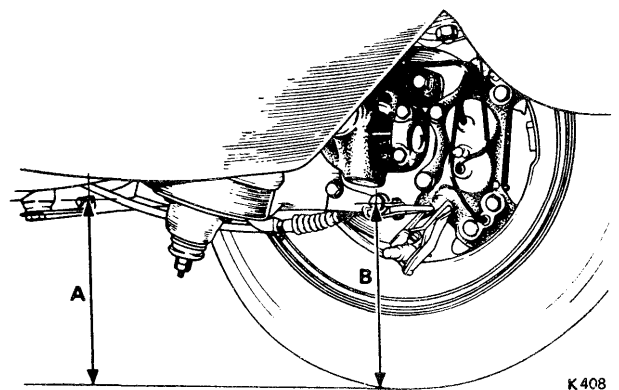


FIG. G23 CAR HEIGHT CHECKING POINTS—REAR

- A Datum to centre of forging securing bolt
- B Datum to centre of axle yoke securing bolt

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(a) Front (see Fig. G24)

The height from the ground, or some other convenient datum, to the faces of the machined locating pads on the front of the sub-frame should be 3.525 in. \pm 0.125 in. (8,953 cm. \pm 3,175 mm.) **greater than** the height from the floor to the centre of the outer bolts connecting the lower suspension ball joint housings to the lower triangle levers.

(b) Rear (see Fig. G23)

The height from the ground or other datum, to the centre of the rearmost bottom bolt which attaches the rear suspension cross-member mounting forging to the body sill should be 0.875 in. \pm 0.125 in. (22,22 mm. \pm 3,175 mm.) **less than** the distance from the datum to the centre of the rearmost bottom bolt attaching the rear yoke to the trailing arm.

Front and Rear

In each case it is necessary to take two measurements. Before taking the first measurement, the car should be lifted approximately 2 in. (5,08 cm.) above its static position and then lowered gently before the measurements are taken.

The car should then be depressed approximately 2 in. (5,08 cm.) below its static position and again allowed to rise gently before measurements are taken.

The levelled height is the average of the two readings.

The levelled height is adjusted by varying the lengths of the height control valve operating links.

If the car is sitting too low at the **rear**, the rear height control valve connecting rods require lengthening and conversely, if it is too high they require shortening.

At the **front** the opposite applies. If the car is too low the valve connecting rod requires shortening and if it is too high the link must be lengthened.

The links must be adjusted by unlocking the lock-nut on the lower end of the link and re-setting the joint housing. The lock-nut must be tightened after the desired setting has been achieved.

Note At least 0.250 in. (6,35 mm.) of rod must remain in engagement in the joint housing.

Should the linkages be disturbed at any time between the specified maintenance periods, e.g. levelled height setting, the linkages and rubber boots should be greased on replacement.

It must be noted that adjustment can be effected at three points on the car (**one at the front and two at the rear**) and it is probable that adjustment at any one point may influence the setting at the others. Therefore, if any one point of the three is adjusted, the other two must be checked and adjusted if necessary. This triangulated check must be done as often as is necessary to achieve the correct front and rear settings.

Height control valves—To test (on the car)

The height control valves can be isolated and checked for operation on the car as follows.

1. De-pressurise the systems and isolate the gear-change selector by removing the thermal cut-out.
2. Remove the feed pipe from a rear height control valve (orange pipe) at the junction on the rear suspension cross-member and blank off the pipe and valve port.
3. Run the engine at approximately 1,000 r.p.m. If the height control valve was not operating before and now works on the opposite side of the car to the isolated valve then the isolated valve or its associated height control ram is at fault.

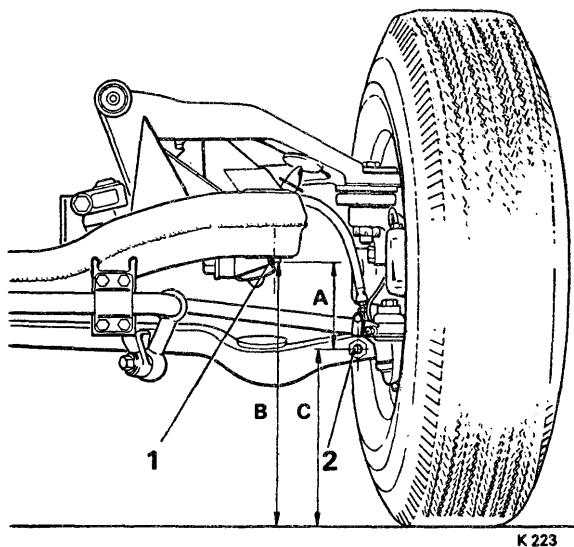


FIG. G24 CAR HEIGHT CHECKING POINTS—FRONT

- 1 Sub-frame boss 2 Lower triangle lever bolt
- A Difference between dimensions
 B Measurement to sub-frame boss
 C Measurement to bolt centre

4. Stop the engine, de-pressurise the system(s) and reconnect the height control valve feed.

5. A further check can be made by removing the height control valve return pipe (white pipe) from the junction on the rear suspension cross-member (rear valve) or the end of the valve (front height control valve). Blank off the junction and insert the end of the pipe into a clean container (rear valve) or blank off the pipe and insert a union and short length of pipe into the valve port and place the open end of the pipe in a clean container (front valve).

6. Disconnect the height control valve operating arm and link from its pivot on the suspension then push the operating arm upward if it is a rear height control valve or pull it downward if it is the front height control valve. Run the engine at a fast tick-over.

Fluid should not flow from the pipe, if it does, the height control valve is at fault and should be changed.

7. Manually operate the height control valve linkage so as to lower the car, i.e. pull the lever downward on a rear height control valve or push it upward on the front height control valve.

Note Do not push the front height control valve linkage upward too far otherwise a foul with the engine fan may occur.

Fluid contained in the ram(s) should now flow into the container and then stop when the rams are completely exhausted. If the flow does not stop then the height control valve has a damaged valve seat.

8. If the valve is working correctly, de-pressurise the systems, remove the spare pipe and reconnect the height control valve return pipe.

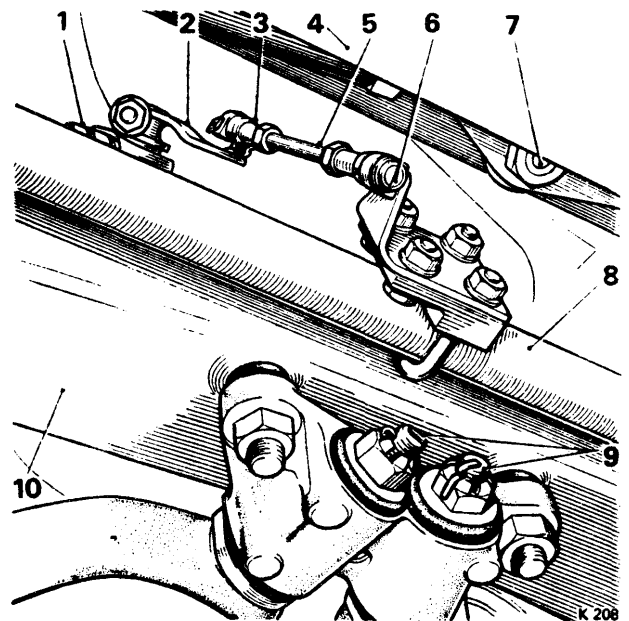


FIG. G25 OPERATING LINKAGE—FRONT HEIGHT CONTROL VALVE

- 1 Front height control valve
- 2 Valve operating arm
- 3 Connecting rod upper ball joint
- 4 Body front panel
- 5 Connecting rod
- 6 Connecting rod lower joint
- 7 Body pivot—transverse link
- 8 Suspension stabiliser bar
- 9 Lower suspension lever front pivots (early type)
- 10 Front sub-frame

Section G8

THE ROLL RESTRICTOR VALVE

Roll restrictor valve—To service

The roll restrictor valve unit was previously treated as a sealed unit and service exchange units were provided in the event of failure. This unit may now be dismantled and overhauled, although not all parts of the unit are supplied as individual items. Those that are can be seen itemised in the current Parts List.

Service experience has shown that a fault in the valve is usually seal leakage and/or attributed to dirt, the latter causing malfunctioning.

Roll restrictor valve—To remove

1. De-pressurise the hydraulic systems (see Section G1—Special Precautions).
2. Remove the five pipes from the roll restrictor valve and blank off each pipe end and valve port securely.
3. Remove the two securing setscrews; remove the valve.

Roll restrictor valve—To dismantle (refer to Figs. G26 and G27)

1. Remove the longer of the two adaptors and the plain washer.
2. Remove and then discard the sealing ring from the adaptor.
3. Remove the valve spring.
4. Remove the spring seating. This can be achieved by gently striking the restrictor valve against a piece of wood such that the spring seat drops down the bore.

5. Remove the adaptor from the opposite end of the valve, noting the number and position of the adjusting washers. A plain washer is also fitted.

6. Remove and then discard the adaptor sealing ring.

7. Remove the four nuts and plain washers, then detach the plunger housing from the restrictor valve housing. Discard the sealing ring.

8. Remove the plunger from its sleeve in the housing, noting its position to facilitate assembly.

9. Remove the restrictor valve, noting that the axial bore of the valve faces the spring on assembly.

10. Remove and then discard the restrictor valve sealing ring.

11. Thoroughly wash all components in methylated spirits and dry with compressed air, not cloths.

Roll restrictor valve—To assemble

Assemble the valve by carefully reversing the procedure given for dismantling, noting the following points.

1. Lubricate all moving parts of the valve and the new sealing rings with clean brake fluid of the correct type.

2. Note also the position of the adjusting washers and the restrictor valve (see Fig. G27).

3. Should the valve assembly not be fitted to the car immediately, fit suitable blanks to the exposed threaded ports.

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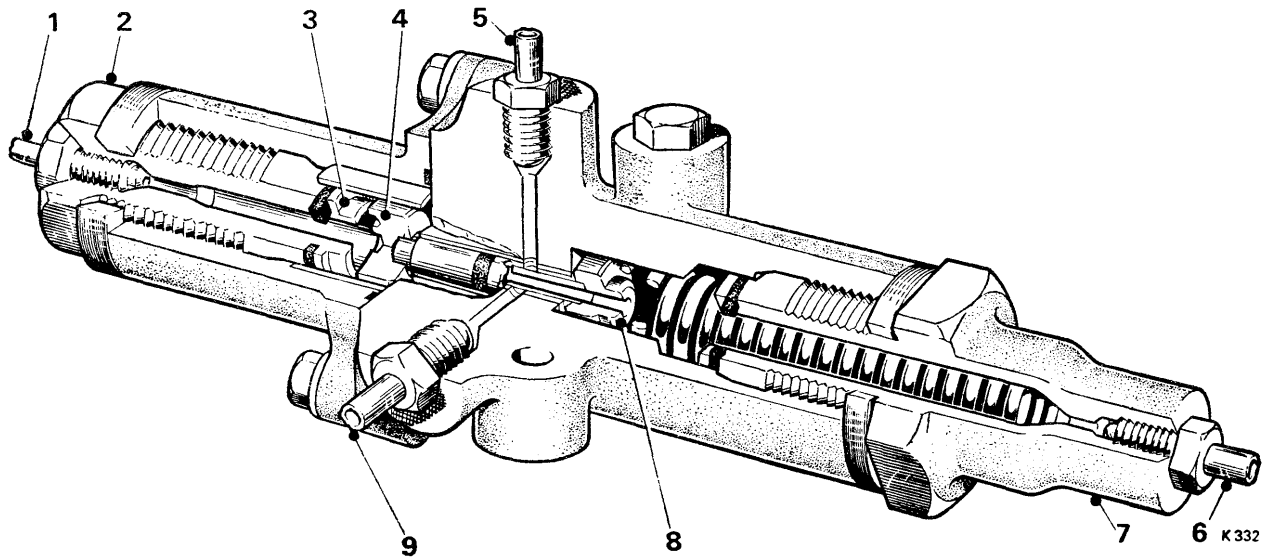
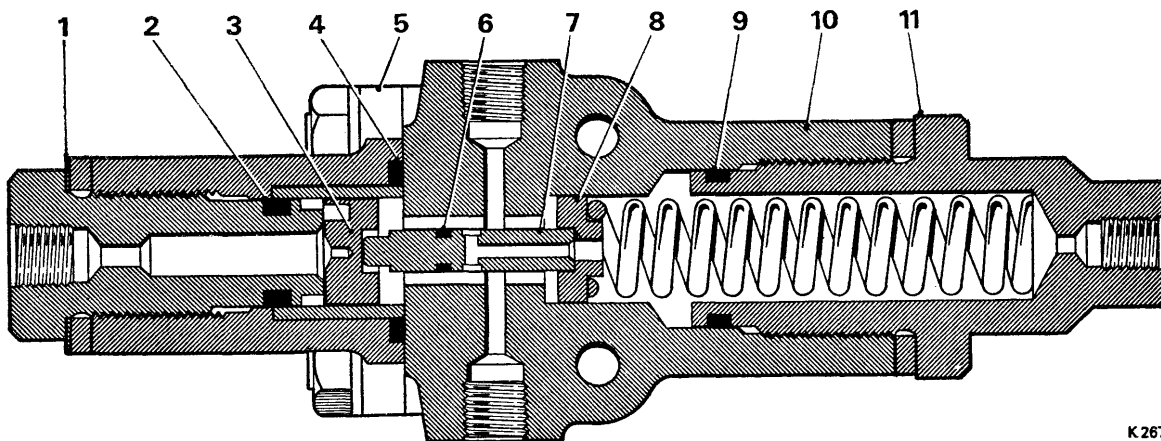


FIG. G26 CUT-AWAY VIEW—ROLL RESTRICTOR VALVE

- | | |
|--|---|
| <ul style="list-style-type: none"> 1 Connection to solenoid valve (yellow) 2 Adaptor 3 Adaptor seal and plunger stop 4 Fast height control plunger 5 Connection to height control ram (brown) | <ul style="list-style-type: none"> 6 Connection to front height control valve (brown) 7 Adaptor 8 Restrictor valve 9 Connection to height control ram (brown) |
|--|---|



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FIG. G27 SECTIONAL VIEW—ROLL RESTRICTOR VALVE

- | | | |
|---|--|---|
| <ul style="list-style-type: none"> 1 Adjusting washer 2 Sealing ring 3 Plunger 4 Sealing ring | <ul style="list-style-type: none"> 5 Plunger housing 6 Sealing ring 7 Restrictor valve 8 Spring seat | <ul style="list-style-type: none"> 9 Sealing ring 10 Restrictor valve housing 11 Adaptor |
|---|--|---|

Roll restrictor valve—To fit

To fit the roll restrictor valve reverse the procedure given for its removal.

1. The two securing setscrews should be torque tightened to the standard figures given in Chapter P.
2. After fitting, the systems must be bled as described in Section G2—Bleeding the Systems, and the valve and pipes should be visually inspected for leaks.

Roll restrictor valve—To test (on the car)

If the front height control is not functioning correctly and tests have shown that the height control valve is in order, the roll restrictor valve should be checked for serviceability.

1. To check whether solenoid signal pressure is reaching the roll restrictor, pressurise the systems then with the ignition still switched on energise and de-energise the solenoid valve by removing and re-

placing one of the electrical leads, at the same time holding the roll restrictor signal pressure pipe (yellow pipe). A faint pulse should be felt through the pipe.

The 'slow' height control action of the restrictor valve should be checked as follows.

1. De-pressurise the systems then connect a bleed tube to each front ram bleed screw and place the ends in clean containers.
2. Disconnect an electrical lead from the solenoid valve and disconnect the front height control valve operating link from the front stabiliser bar and pull the valve operating arm down.
3. Slacken the two bleed screws slightly then run the engine at a fast tick-over.

Fluid should flow slowly from both bleed screws.

4. If the loose electrical lead is now touched onto the solenoid valve terminal to energise the valve and select 'fast' height control, fluid should flow quickly from the bleed tubes.

Section G9

THE SOLENOID VALVE AND RESTRICTORS

Solenoid valve—To service

The solenoid valve, formerly classified as a service exchange unit, may now if the need arises be overhauled by Service Personnel. The majority of the components making up the unit are available as individual items, although two small factory tested sub-assemblies are included in the list.

Always refer to the current Parts List for the parts available.

Solenoid valve—To remove

With the introduction of the anti-roll bar to the rear suspension, and to give greater access to the compliance damper bolts, the solenoid valve and one restrictor fitted to the rear of the suspension sub-frame are transposed and the hydraulic pipework re-routed accordingly. The coloured illustrations (*see Figs. G3 to G6 inclusive*) show the variations to the run of the pipework.

The solenoid valve is fitted to the rear off-side face of the rear suspension sub-frame.

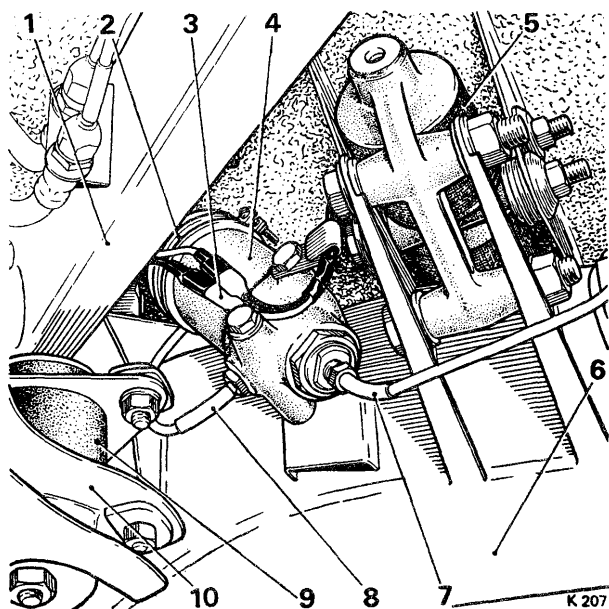
1. Before removing the solenoid valve it is necessary to de-pressurise the systems (*see Section G1—Special Precautions*) and to disconnect the battery.
2. Remove the electrical connections from the solenoid valve (*see Fig. G28*).
3. Remove the three hydraulic pipes and securely blank the pipe ends and the solenoid valve ports. Note the position of each connection to facilitate assembly.
4. Remove the two setscrews securing the valve to the rear suspension cross-member.
5. Remove the solenoid.

Height control solenoid—To dismantle

(refer to Fig. G29)

1. Unscrew and remove the protective cover retaining clips.
2. Remove the rubber protective cover to expose the solenoid end face.
3. Unlock the tab washer and remove the nut; remove and discard the tab washer.
4. Remove the flux plate, carefully withdrawing the two cables (black and green/yellow) from the plate grommets.
5. Note the position of the sealing ring situated immediately behind the plate to facilitate assembly. Remove and discard the old sealing ring.
6. Carefully withdraw the coil from the housing.
7. Remove the spacer.
8. Remove the housing from the solenoid body; remove and discard the sealing ring.
9. From the opposite end of the solenoid, remove the lock-nut and unscrew and remove the valve. Remove and discard the sealing ring.
10. Remove the valve and bobbin assembly from the main bore of the solenoid valve. Collect also the shims which are situated between the faces of the valve and cone valve.
11. Remove the cone valve body from the main bore of the solenoid valve; remove and discard the sealing ring.
12. Remove the cone valve from the valve body and collect the return spring.
13. Wash all non-electrical components in clean methylated spirits and dry with compressed air, not cloths. Wipe clean the electrical components.

Chapter G



**FIG. G28 HEIGHT CONTROL SOLENOID VALVE
IN POSITION**

- 1 Trailing arm
- 2 Solenoid rubber boot
- 3 Solenoid electrical connections
- 4 Solenoid valve body
- 5 Compliance mount
- 6 Rear cross-member
- 7 High pressure inlet
- 8 Pressure outlet to height control and roll restrictor valves (yellow)
- 9 Torque arm mount
- 10 Torque arm

Solenoid valve—To inspect

1. After the thorough cleansing, examine the two valves for correct seating.
2. If leakage is suspected from the seal and joint of the solenoid body and extension, the sub-assembly should be renewed, no attempt should be made to correct the fault.
3. Check the insulation resistance of the coil. The resistance between either lead and the coil measured at 250 volts D.C. must not be less than 2 megohms. Renew the coil if necessary.

**Height control solenoid valve—To assemble
(refer to Fig. G29)**

To assemble the solenoid, reverse the procedure adopted for dismantling, noting the following points.

1. Lubricate each part of the non-electrical components with brake fluid of the correct type (see Chapter D). Keep those faces facing or abutting the electrical components clean and dry.

2. Fit new lubricated sealing rings. Note the position for the sealing ring situated between the coil and flux plate. This sealing ring is to be left dry then cut and positioned suitably to clear the electrical wiring.

3. Using feeler gauges, set the gap Z to between 0.008 in. and 0.011 in. (0,22 mm. and 0,28 mm.) with the cone valve fully seated. The gap is arranged by fitting selective shims at point Y between the mating faces of the cone valve, and the valve and bobbin assembly, prior to fitting the assembly to the housing bore.

4. The nut (with new tab washer) retaining the cone valve body should be torque tightened to between 18 lb.ft. and 20 lb.ft. (2,48 kgm. and 2,77 kgm.).

5. Set the gap X between the opposing faces of the valve and bobbin assembly, and the screw threaded valve to between 0.020 in. and 0.025 in. (0,51 mm. and 0,63 mm.). In order to obtain this setting, carefully screw in the valve, without a sealing ring and lock-nut, until it bears on the valve and bobbin assembly. Further gentle screwing in will seat the cone valve to close the orifice.

(a) Using a dial test indicator or suitable depth micrometer, screw out the valve the required amount, see figure quoted earlier, and scribe accurately, a short line on the end of the valve and body respectively.

(b) Remove the valve, noting the number of turns necessary in order to remove it completely from the bore.

(c) Fit a new lubricated sealing ring to the valve groove, then screw in the valve the required number of turns, aligning the pre-scribed lines accurately.

(d) Fit and torque tighten the lock-nut to the exposed threaded end of the valve to retain it in the set position. The torque tightness figure for this nut should be between 38 lb.ft. and 40 lb.ft. (5,25 kg.m. and 5,53 kg.m.).

6. Ensure that the solenoid protective rubber cover is cleaned and in good condition, if not, renew it and tighten the retaining clips to give good sealing against dirt, etc.

7. Fit blanking plugs to each of the exposed ports as a precaution against dirt, until such time as the solenoid valve is fitted to the car.

Solenoid valve—To fit

To fit the solenoid valve reverse the procedure given for its removal, noting the following points.

1. Torque tighten the two securing setscrews in accordance with the standard values given in Chapter P.

2. After fitting the valve, run the engine to charge the systems. Place on 'fast' height control and check the solenoid and pipes visually for leakage.

Solenoid valve restrictor—To service

Should a fault diagnosis check indicate that a solenoid valve restrictor is blocked or if the system has become contaminated, the solenoid valve restrictors may be removed from the car, dismantled and cleaned.

Solenoid valve restrictor—To remove

The solenoid valve high pressure and low pressure restrictors are fitted to the rear face of the rear suspension sub-frame.

The high pressure restrictor with three pipes (orange sleeved) is fitted to the off-side of the sub-frame close to the solenoid valve (see Fig. G21). The low pressure restrictor is fitted to the near-side of the sub-frame adjacent to the compliance cushions and has four (white sleeved) pipes adjoining it. (see Fig. G22).

1. Place the car on a ramp, de-pressurise the hydraulic systems (see Section G1—Special Precautions) and disconnect the battery which is located in the boot.

2. Disconnect the hydraulic pipes from the solenoid valve restrictor (3 pipes on the off-side restrictor and 4 on the near-side restrictor) and blank off all pipes and ports.

3. Remove the nut and washer securing the restrictor to the sub-frame; remove the restrictor.

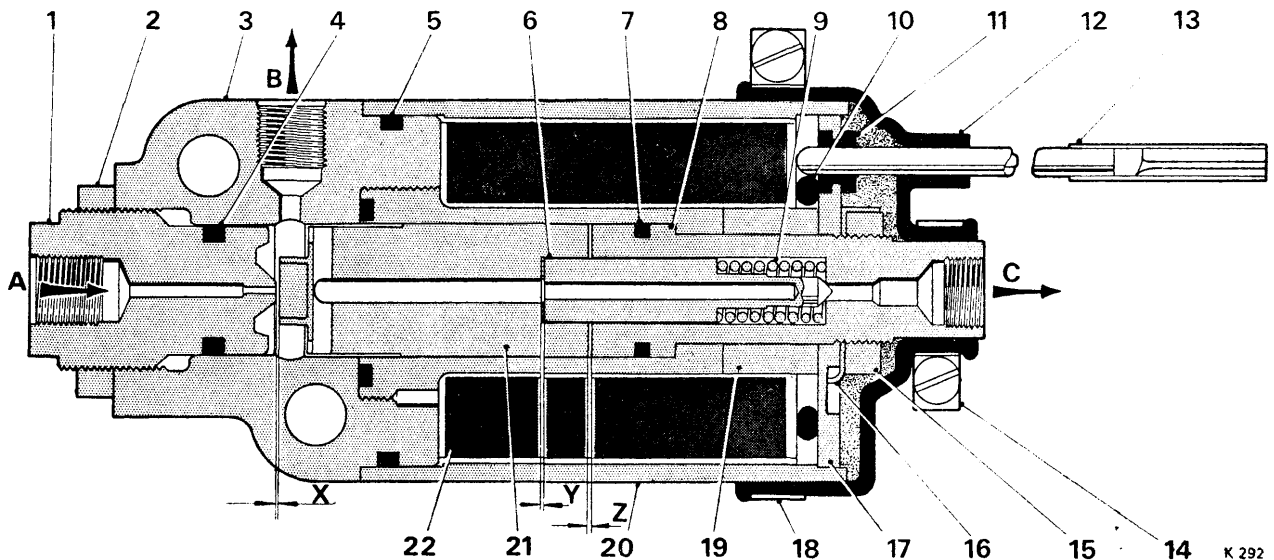


FIG. G29 SECTIONAL VIEW—HEIGHT CONTROL SOLENOID VALVE

- | | |
|---|---------------------------------|
| 1 Valve | 11 Grommet |
| 2 Valve lock-nut | 12 Protective cover |
| 3 Body and extension assembly | 13 Lucar connector |
| 4 Valve sealing ring | 14 Cover retaining clip (small) |
| 5 Body sealing ring (extension sealing ring not accessible) | 15 Lock-nut |
| 6 Cone valve | 16 Tab washer |
| 7 Cone valve body sealing ring | 17 Flux plate |
| 8 Cone valve body | 18 Cover retaining clip (large) |
| 9 Return spring | 19 Spacer |
| 10 Sealing ring (cut and positioned to clear coil wiring) | 20 Housing |
| | 21 Valve and body assembly |
| | 22 Coil |

A High pressure inlet

B Connection to roll restrictor and rear height control valves

C Connection to fluid reservoir

X Gap 0.020 in. to 0.025 in. (0,50 mm. to 0,63 mm.)

Y Shims—suitable thickness to adjust gap Z

Z 0.008 in. to 0.011 in. (0,20 mm. to 0,28 mm.)

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Solenoid valve restrictor—To dismantle and clean

The restrictor should be dismantled and cleaned as follows.

1. Remove the large 0.750 in. (19.05 mm.) A.F. hexagon headed union and the sealing ring located beneath it.
2. Holding one hand over the end, invert the restrictor body and catch the two end plates, restrictor plate and restrictor roller as they emerge from the bore.
3. Clean all parts in methylated spirits and dry with clean compressed air.

Solenoid valve restrictor—To assemble

To assemble the restrictor valve reverse the procedure given for its dismantling, noting the following points.

1. All parts must be scrupulously clean and, on assembly, a new sealing ring, lubricated with clean hydraulic fluid, must be fitted below the hexagon headed union.
2. Fit one of the two end plates then the restrictor plate and restrictor roller, followed by the other end plate. Fit the sealing ring and adaptor, torque tightening it to between 22 lb.ft. and 25 lb.ft. (3.04 kg.m. and 3.45 kg.m.).

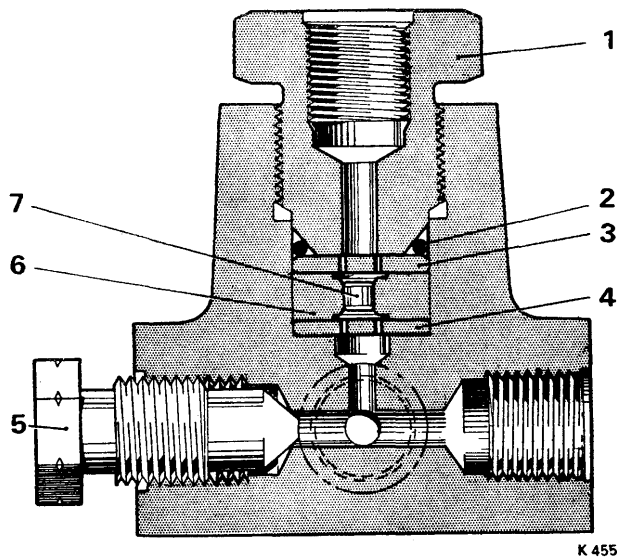


FIG. G30 SOLENOID RESTRICTOR

- 1 Hexagon headed union
- 2 Sealing ring
- 3 End plate
- 4 End plate
- 5 Sealing plug (off-side restrictor only)
- 6 Restrictor plate
- 7 Restrictor roller

3. Fit the sealing plug to the off-side mounted restrictor and torque tighten to between 5 lb.ft. and 7 lb.ft. (0.70 kg.m. and 1.24 kg.m.).

Solenoid valve restrictor—To fit

To fit the solenoid restrictor reverse the procedure given for its removal, noting the following points.

1. All nuts and unions must be torque tightened in accordance with the standard figures given in Chapter P.
2. After removal and fitting the solenoid inlet (right-hand) restrictor, the rear height control rams should be bled (see Section G2—Bleeding the Systems) and the restrictor connections checked for leaks.

Solenoid valve—To test

If either 'slow' or 'fast' height control is not available, the hydraulic system solenoid valve may be checked for serviceability on the car.

1. Run the engine to charge the accumulators. Stop the engine but leave the ignition switched on and listen to the solenoid valve whilst switching the system from 'fast' to 'slow' by disconnecting one of the electrical connections at the solenoid valve. A light click should be just audible from the solenoid valve. If this is not apparent then either the valve is at fault or the electrical circuit is faulty.
2. Check the electrical circuit by removing the two leads from the solenoid valve and connecting a jumper lead and lamp across the two leads. When the ignition is switched on the lamp should be illuminated if the wiring circuit is sound.
3. Remove the jumper lead and lamp and connect one of the wires to the solenoid valve. Connect the jumper lead and lamp between the other solenoid valve terminal and the disconnected wire. If the lamp is illuminated when the ignition is switched on then the solenoid windings are sound. If the windings are faulty the solenoid valve must be changed.
4. If during the initial 'fast'—'slow' height control test a 'hissing' noise was evident from the solenoid valve when slow height control was in operation, it indicates a damaged, high pressure valve seat, and the solenoid valve must be changed.
5. If it has been determined that the solenoid valve is electrically operational, that it clicks correctly when actuated and that it does not 'hiss', but 'fast' height control is still not available, then it is probable that the solenoid valve restrictors are blocked and they should be removed and cleaned.

If it has been evident from tests that a leak is occurring in the system then, to determine whether the solenoid is the cause, proceed as follows.

6. De-pressurise the systems.

7. Disconnect the solenoid return pipe from the solenoid valve (white pipe) and blank off the pipe. Insert a union and a length of pipe into the valve port and place the open end of the pipe in a clean container.

8. With 'slow' height control conditions in operation, i.e. solenoid valve electrical leads disconnected, start the engine and charge the systems. If a flow of

more than 10 c.c. per hour (max.) is emitted into the container the valve must be regarded as faulty.

9. If the electrical leads are now connected and then disconnected, placing the system briefly on 'fast' height control a quantity of fluid should rush out of the valve. It must be noted however that if fluid does not rush out it may be that the solenoid valve is not faulty, but that there is an easier leak path for fluid elsewhere in the system or that the restrictors are blocked.

10. If the valve is placed on 'fast' level and held in this condition, the leakage rate out of the valve into the container must not exceed 10 c.c. per minute.

Section G10

THE HEIGHT CONTROL RAMS

Introduction

Since the introduction of the Rolls-Royce and Bentley T Series cars, there have been three differing piston sealing arrangements of the front and rear height control rams.

At the commencement of production, **three** seals were fitted in the ram housing (*see Fig. G34*), namely the main pressure seal, the secondary seal and the piston wiper seal. On early production cars, after serial numbers SRX 1755 and CBH 1696, the seal arrangement was modified (*see Fig. G37*). The main seal was introduced into the lower groove (formerly occupied by the secondary seal) leaving the upper groove vacant. The seal seepage pipes were discontinued and blanking plugs inserted into the ram seal seepage outlet port and appropriate junction block of the hydraulic system respectively.

Any cars prior to those quoted earlier which require overhaul are modified in a similar manner but on an individual basis. It is not necessary to modify all height control rams to the later arrangement if only one ram is unserviceable.

On later cars, the height control rams fitted to the front and rear of the car though visually appearing to be the same in fact have only one groove and one counterbore machined in them for the necessary seals (main and piston wiper) and no seal seepage outlet port.

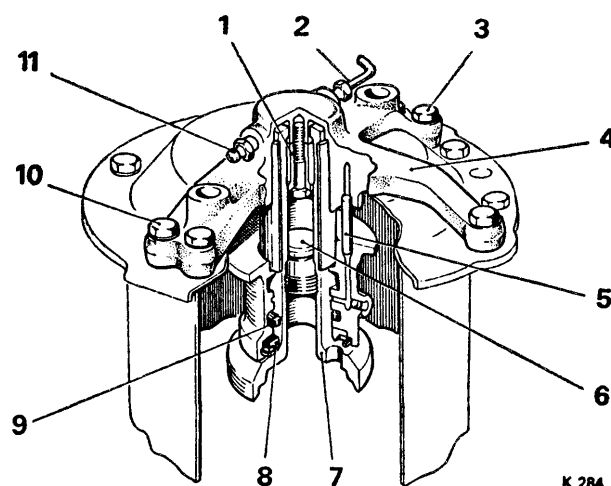


FIG. G31 CUT-AWAY VIEW—FRONT HEIGHT CONTROL RAM—MODIFIED—EARLY CARS

- 1 Travel limiting stop
- 2 Connection to roll restrictor valve
- 3 Extractor screw (item 10)
- 4 'Tee' shaped height control ram cap
- 5 Seal seepage return port (blanked off)
- 6 Ram blanking plug (screwed type)
- 7 Ram piston
- 8 Piston wiper seal
- 9 Main seal
- 10 Extractor screw (item 3)
- 11 Bleed screw

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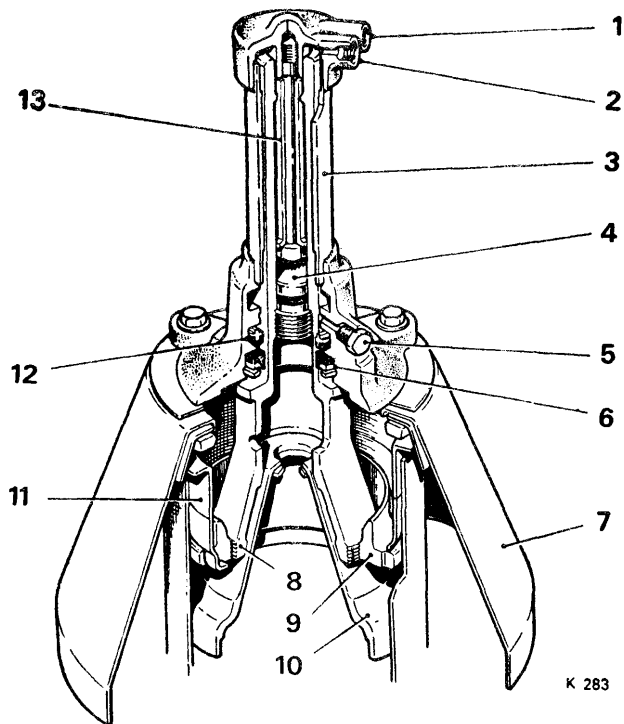


FIG. G32 CUT-AWAY VIEW—REAR HEIGHT CONTROL RAM—MODIFIED—EARLY SALOON

- 1 Port to remote bleed screw
- 2 Inlet port
- 3 Ram housing
- 4 Blanking plug (screwed type)
- 5 Seal seepage port (blanked off)
- 6 Wiper seal
- 7 Rear road spring pot
- 8 Ram piston
- 9 Ram piston lock-nut
- 10 Road spring upper seating and shock damper upper mounting point
- 11 Ram piston lock-nut retainer
- 12 Main seal
- 13 Travel limiting stop

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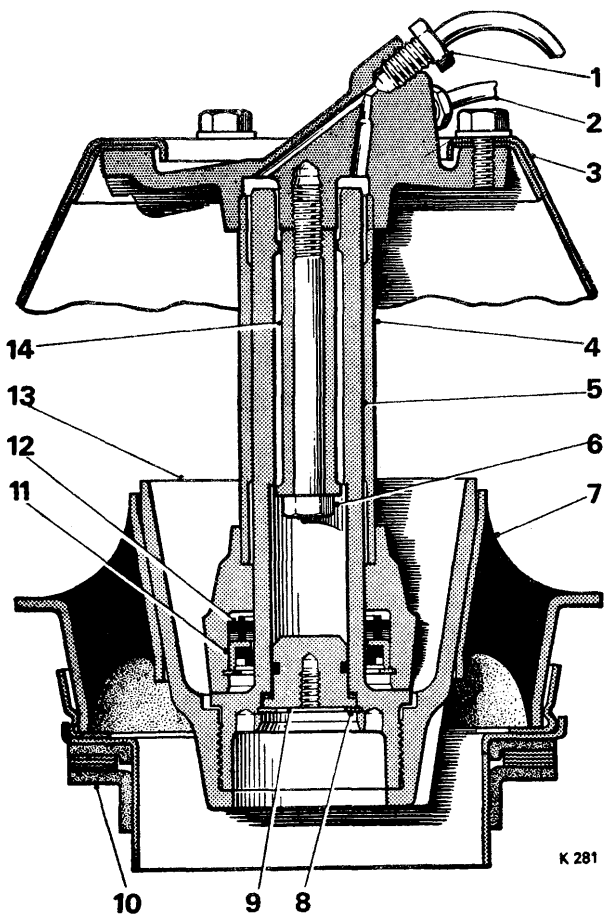


FIG. G33 SECTIONAL VIEW—REAR HEIGHT CONTROL RAM—LATER DROPHEAD COUPE CARS

- 1 Pipe to remote bleed screw
- 2 Inlet port
- 3 Rear road spring pot
- 4 Ram housing
- 5 Ram piston
- 6 Retaining setscrew
- 7 Road spring isolator
- 8 Circlip
- 9 Ram blanking plug (plain type)
- 10 Road spring seating arrangement
- 11 Piston wiper seal (later type)
- 12 Main seal
- 13 Road spring isolator cone
- 14 Travel limiting stop

K 281

On current cars from the following serial numbers, SRH 4129, CRH 4063, SRX 6094 and CRX 6060, a simplified sealing arrangement was introduced (see Fig. G35). Two seals (main and piston wiper) are fitted in a common bore; the wiper seal is of different design and diameter than those of earlier rams.

The height control ram blanking plug of all cars from SRH 3885, CBH 4033, SRX 6018 and CRX 6038 has changed from a screwed type with sealing ring to a plain type with sealing ring, retained by a circlip.

For identification and extraction purposes, the early type screwed plug is provided with a hexagonal recess, the later type plain diameter plug is fitted with a tapped hole.

The rear height control rams of all Drophead Coupé cars are of different external design to suit the body styling (see Fig. G33).

This ram is fitted beneath the stiffened rear shelf which houses the power operated hood when not in use. The internal parts and sealing arrangements of these rams are the same as those of other cars previously described.

Early cars prior to serial numbers SBH 1433 and CRX 1583, were fitted with short stroke shock dampers, identified by the ball joint at their base, having a car height fine adjustment screw arrangement (refer to Chapter H—Suspension), and short stroke rams, the stroke of the ram being determined by the length of the travel limiting stop (see Fig. G31).

When fitting replacement or overhauled rams to cars with **short stroke** dampers, always ensure that the ram is of the correct type with short stroke action.

On **short stroke** rams the stroke extension should be $\frac{3}{4}$ in. (1,9 cm.), on **long stroke** rams, the stroke extension should be 1 in. (2,54 cm.).

To summarise:

(a) It is not permissible to fit a **long stroke** ram when a **short stroke** damper is fitted.

(b) It is permissible to fit a **short stroke** ram to a **long stroke** damper.

(c) Ideally, **long stroke** rams should be fitted to **long stroke** dampers.

(d) Always ensure that when an early type two-groove ram is overhauled, that the seal seepage pipe (white sleeved) is removed and steel blanking plugs are fitted to the exposed ram and connector ports respectively.

Figure G36 shows the method used on **early** saloon cars to secure the rear height control ram piston to the road spring/shock damper isolator.

Figure G37 shows the method used on **later** saloon cars onwards, to secure the rear height control ram piston to the road spring/shock damper isolator. The latter arrangement is much simplified and facilitates ease of disconnection and removal.

Front height control rams—To remove

Access to each ram is under the engine bonnet.

1. De-pressurise the hydraulic systems (see Section G1—Special Precautions).
2. Disconnect the two pipes from the hydraulic ram "T" piece, blanking off immediately on disconnection each exposed pipe or port.

Note Only one pipe is fitted to modified rams, or rams of later cars.

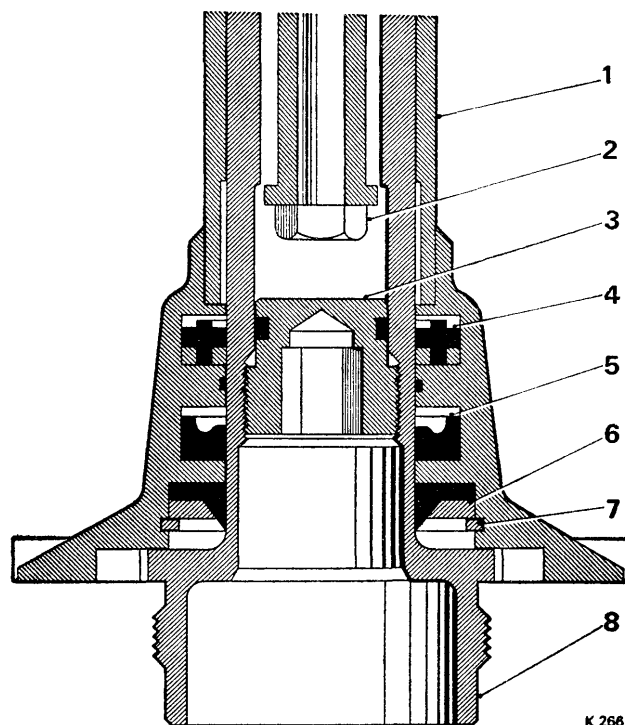


FIG. G34 SECTIONAL VIEW—EARLY SEALING ARRANGEMENT—HEIGHT CONTROL RAMS

- 1 Ram housing
- 2 Retaining setscrew
- 3 Ram blanking plug (threaded type)
- 4 Main seal
- 5 Secondary seal
- 6 Piston wiper seal
- 7 Circlip
- 8 Ram piston

K 266

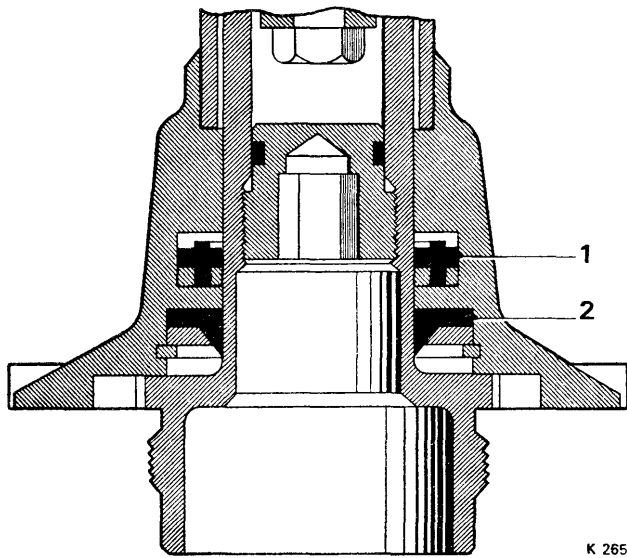


FIG. G35 SECTIONAL VIEW—LATER SEALING ARRANGEMENT—HEIGHT CONTROL RAMS

1 Main seal 2 Piston wiper seal

3. Unscrew and remove the five bolts, nuts and washers which secure the ram to the spring pot.

Note Two of the bolts are provided for removal purposes (*see Fig. G31*) in that they have extended lengths. These bolts are fitted to allow the ram to be raised slowly and evenly thus allowing the road spring isolator beneath to abut the underside of the spring pot. Always remove the two long bolts last, ensuring that they are unscrewed together, one turn at a time.

4. Remove the hydraulic ram from the car.

Front hydraulic ram—To dismantle

1. Grip the ram piston in a vice fitted with jaw protectors. Ensure that the vice jaws contact only the lower part of the piston.

2. Using a suitable piece of hexagon bar or a transmission sump plug spanner, remove the blanking plug fitted in the piston bore. Remove and discard the plug sealing ring.

Note On later cars, a plain diameter sealing plug with sealing ring is fitted. A $\frac{1}{4}$ in. U.N.F. threaded hole is provided in the end of the plug to facilitate extraction. The plug is retained in position by a circlip.

3. Using a suitable box spanner unscrew the travel limiting stop setscrew and withdraw the ram housing, setscrew and travel limiting stop.

4. Grip the ram housing in the protected vice jaws such that the seals are accessible.

5. Remove the circlip and retaining washer then extract the wiper seal.

6. Using a pointed tool, extract and discard the remaining seal(s) from the groove(s), taking care not to damage the piston bore.

Note On **current** cars the remaining seal to be removed is the main pressure seal, which seats in a common bore abutting the wiper seal.

7. Place the piston in a lathe (if available) and, using Corolith grit 320 emery cloth (or equivalent), carefully remove any score marks from the piston. Finally polish using a fine emery polishing cloth, polishing from the body end outwards.

8. Thoroughly wash all parts in clean methylated spirits and dry with compressed air.

Front height control ram—To assemble

1. Smear the new main pressure seal with Molytone C grease or equivalent and fit it into position in the ram housing.

Note (a) On two-groove early type housings and one-groove later type housings it is necessary to compress the main pressure seal with the fingers before feeding it into the bore just beyond the appropriate groove.

Feed the seal back into its groove by using a blunt instrument. Ensure that the flat face of the seal faces the open end of the ram housing.

(b) On the simplified ram seal housing, the seal is inserted directly into the bore, compression is not necessary in order to fit it.

(c) On the two-groove ram housing, the main pressure seal **must** be fitted in the lower of the two, leaving the upper groove vacant.

2. Grease a new wiper seal and fit it into position in its bore at the base of the ram housing. The sealing lip must face the open end of the ram housing. Fit the retaining washer and circlip.

3. Slide the piston into position in the ram housing, taking care not to double-back the wiper seal lip.

4. Fit the setscrew and distance piece and torque tighten the setscrew to between 16 lb.ft. and 18 lb.ft. (2,21 kg.m. and 2,49 kg.m.).

5. Smear the new ram blanking plug seal with Molytone C grease or equivalent and fit it to the plug.

(a) Screw the threaded plug (if fitted) into position and torque tighten to between 60 lb.ft. and 65 lb.ft. (8,30 kg.m. and 8,99 kg.m.).

(b) Press the plain diameter plug (if fitted) into position, and fit the retaining circlip.

Front height control ram—To fit

1. Before fitting the ram to the spring pot, ensure that the white sleeved seal seepage pipe (if fitted) of earlier cars, is removed altogether by disconnecting it from its joint on the appropriate connection block. Fit steel blanking plugs to the exposed ports of the ram and connector.

2. Fit the height control ram by reversing the procedure adopted for its removal, noting the following points.

(a) Care must be taken to ensure that the ram piston locates correctly on the suspension isolator.

(b) The two extractor bolts should be fitted first, and tightened down evenly one turn at a time until the other three shorter bolts can be fitted. Torque tighten all bolts to the standard torque figures.

3. After fitting the height control ram, bleed the height control system as described in Section G2—Bleeding the systems. Check the ram and disturbed pipe connections for leaks.

Rear height control ram—To remove

Saloon cars only

The rear height control rams on saloon cars are located in the boot.

1. Repeat Operation 1 of 'Front height control ram—To remove'.

2. Remove the trim from the forward corners of the boot.

3. Disconnect the hydraulic fluid pipes from the ram body and blank off immediately each port and pipe.

Note Unmodified **early** cars have rams fitted with **three** pipe connections.

Modified **early** cars, and **later** cars have **two** pipe connections.

4. Unscrew the three ram securing setscrews one turn at a time to allow the road spring isolator in the spring pot to lift under road spring pressure until it abuts the underside of the spring pot. When this is achieved, remove the screws completely.

5. Ease the ram body upwards as far as possible to gain access to the ram piston slots, then using the

hook wrench (RH 8051) unlock and unscrew the ram piston from the spring isolator. Remove the ram from the car.

Note On some **early** cars, the ram piston when removed can be seen to have a threaded cone shaped lower end; **later** cars have a short straight threaded extension.

Rear height control ram (all cars)— To dismantle and assemble

The procedure for dismantling, cleaning, polishing, and renewing the seals of rear rams is identical to that given for the front height control rams, including, where necessary, the removal of the seal seepage drain pipe (white sleeved) and blanking off of the ram housing seepage drain port, and also the blanking off of the exposed connector block port. The difference in types of ram centre blanking plugs (threaded and plain) also applies.

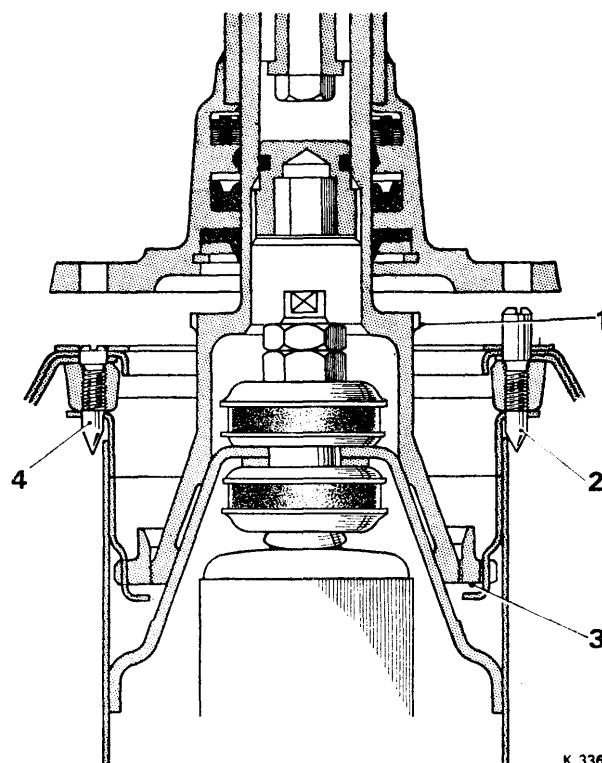


FIG. G36 SECTIONAL VIEW—EARLY LOCKING ARRANGEMENT—REAR RAM PISTON TO ROAD SPRING ISOLATOR

- 1 Spannering slots—ram piston
- 2 Alignment screw (long)—2 off
- 3 Lock-nut—isolator tube
- 4 Alignment screw (short)—1 off

Chapter G

Rear height control ram—To fit

Saloon cars only

To fit the height control ram of saloon cars, reverse the procedure given for its removal, noting the following points.

Early type height control ram with cone shaped piston

1. Insert the special pointed location dowels (RH 7858—2 off and RH 7859—1 off) into the tapping ring in the top of the spring pot. Ensure that the pointed ends locate in the holes in the spring isolator locating flange and that the threaded portions of the screws do not protrude below the bosses in the spring pot tapping ring (see Fig. G36).
2. Enter the ram assembly, locating the flange over the dowels, pull the ram body upward as far as possible on the dowels to enable the hook wrench (RH 8051) to be located in the piston slots.
3. Screw the piston, with the aid of the hook wrench, into the isolator tube lock-nut. Tighten the piston on to the conical part of the spring isolator.
4. Unscrew and remove each location dowel one at a time, and in their places fit the three ram securing setscrews. Tighten the three screws evenly and together to depress the road spring and isolator until

the ram body flange face is fully seated on the spring pot. Torque tighten the setscrews to the standard torque figures quoted in Chapter P.

5. After fitting the height control ram bleed the height control system, as described in Section G2—Bleeding the systems, and check the ram and pipe connections for leaks.

Later type height control ram with short threaded extension

1. Pull the ram body upward as far as possible from the piston to expose the spannering slots.
2. Fit the ram into position on the spring pot, engaging the threads of the piston with those of the road spring isolator.

Note Ensure that the isolator is concentric with the spring pot bore.

3. Using the hook wrench (RH 8051) tighten the piston to the isolator then push the ram body downward as far as possible on to the piston.
4. Fit and torque tighten the three ram securing screws as described in Operation 4 for the early type height control ram, then carry out Operation 5 also.

Rear height control ram—Drophead coupé cars—To remove

Access to the rear height control rams securing setscrews and the feed and remote bleed pipe connections, on drophead coupé cars, is beneath the trim on the body combined hood stowage compartment/parcel shelf.

1. De-pressurise the hydraulic systems (see Section G1—Special Precautions).
2. Repeat Operation 3 of ‘Rear height control rams—To remove—Saloon cars only’.
3. Position the car on a ramp, and with the aid of the special peg spanner and extension bar (RH 8048) inserted through the road spring, unlock, but do not attempt to unscrew fully at this stage, the ram piston from the road spring isolator cone.

Note When unlocking the ram piston from the isolator cone, the spanner must be turned **clockwise**.

Alternatively, after Operation 2, proceed with Operation 4 onwards and separate the ram piston from the isolator cone on the workbench.

4. From the top side of the car, remove the ram securing setscrews.

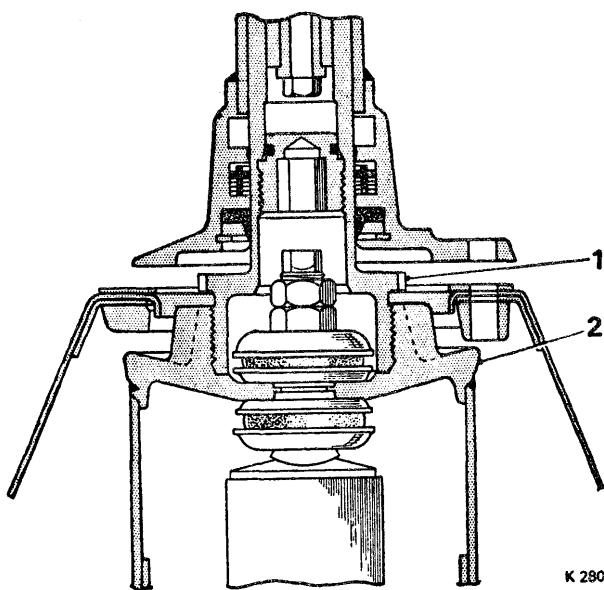


FIG. G37 SECTIONAL VIEW—LATER LOCKING ARRANGEMENT—REAR RAM PISTON TO ROAD SPRING ISOLATOR

- 1 Spannering slots—ram piston
- 2 Road spring isolator—threaded extension

5. Disconnect the shock dampers, disconnect the half-shafts and remove the road spring, etc., of the drophead coupé car as described in Chapter H—Suspension.

Note When removing the road spring from the spring pot, care should be taken because the height control ram and road spring isolator will come down with it as an assembly.

6. Separate the ram assembly from the spring isolator by unscrewing the ram piston from the isolator cone.

Rear height control ram—Drophead coupé cars—To dismantle, To overhaul and To assemble

Refer to the information given earlier for 'Rear height control rams—All cars'.

Rear height control ram—Drophead coupé cars—To fit

Fit the height control ram into position, by reversing the procedure adopted for its removal, noting the following points.

1. Tighten the ram piston to the cone isolator using the special pin spanner and extension (RH 8048) on completion of fitting the ram, road spring, shock damper, etc., assembly to the car. The spanner must be turned **anti-clockwise**.

2. Ensure that the spring isolator seats squarely in its seating on top of the road spring.

3. Ensure that the setscrews securing the height control ram are torque tightened to the standard figures quoted in Chapter P.

4. The pink sleeved pipe (remote bleed) fits to the upper of the two ports, the brown sleeved pipe (from height control valve) to the lower port.

Height control rams—To test

The height control rams should be tested on the car as follows:

The only likely failures on a height control ram are seal failures. If a ram blanking plug seal or main seal of a modified ram or later type ram (two seal type) fails, this will be visually evident as hydraulic fluid will be seen running down the damper casing or the road spring.

To test the main seal of early unmodified rams (three seal type), de-pressurise the systems, remove the seepage return pipe from the ram housing (white pipe) and blank off the pipe. Insert a union and a piece of pipe into the return port and place the open end of the pipe in a container. Disconnect the height control valve operating arm and link from the suspension. Push the arm upward on a rear height control valve, or pull it down on a front height control valve, then, with the gearchange selector in 'Neutral', start the engine.

If there is a continuous flow of fluid into the container the height control ram main seal has failed. Modify the ram to the two seal type as described earlier.

Section G11

BRAKE MASTER CYLINDER

Master cylinder—To remove

1. Place the car on a ramp and remove the under-sheet which covers the pedal linkage assembly.
2. Remove the pipe (green) from the master cylinder, then remove the feed pipe from the rear end of the master cylinder (grey) and blank off the pipe ends and ports.

Note The rearmost pipe is the feed from the rear compartment of the fluid reservoir and consequently has a large head pressure. Therefore, when this pipe is removed it must be blanked off as quickly as possible to minimise any loss of fluid.

3. Remove the two bolts, nuts and washers which secure the master cylinder mounting flange to the rear of the pedal linkage assembly.
4. Slacken the lock-nut on the master cylinder push rod; remove the master cylinder and push rod by unscrewing the push rod from the fulcrum pivot link.

Brake master cylinder—To dismantle

1. Remove the rubber boot from the master cylinder body and push rod.
2. Remove the blanks from the ports.
3. Using circlip pliers, remove the circlip from its location in the master cylinder body.
4. Remove the push rod and its retainer.

5. Remove the plunger, push rod and cut-off valve assembly from the cylinder.

If the seals have completed their 'life' mileage or if either of the seals show signs of deterioration or un-serviceability they should both be removed as follows.

6. Using a small screwdriver, ease the depressed prong of the spring retainer out of its recess, until the spring retainer and cut-off valve stem can be disconnected from the plunger (see Fig. G39).

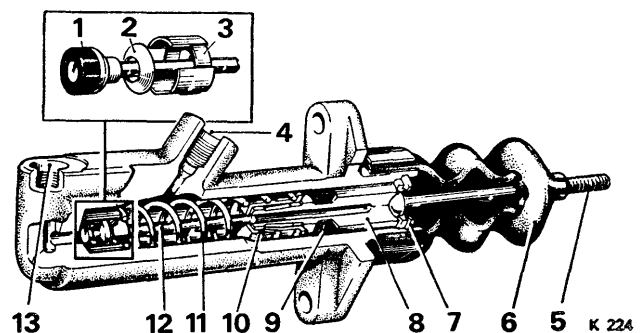


FIG. G38 CUT-AWAY VIEW—BRAKE MASTER CYLINDER

- | | |
|----------------------|---------------------|
| 1 Cut-off valve seal | 7 Retaining circlip |
| 2 Belleville washer | 8 Piston |
| 3 Valve retainer | 9 Piston seal |
| 4 Outlet port | 10 Retainer |
| 5 Operating rod | 11 Spring |
| 6 Sealing boot | 12 Push rod |
| | 13 Inlet port |

Chapter G

7. Remove and discard the large plunger seal.
8. Remove the cut-off valve spring retainer and the belleville washer which is located behind it.
9. Remove and discard the seal.
10. The belleville washer, which spring-loads the cut-off valve, should also be discarded and, since bending the prong on removal of the spring retainer may have weakened it, the retainer also should be discarded.

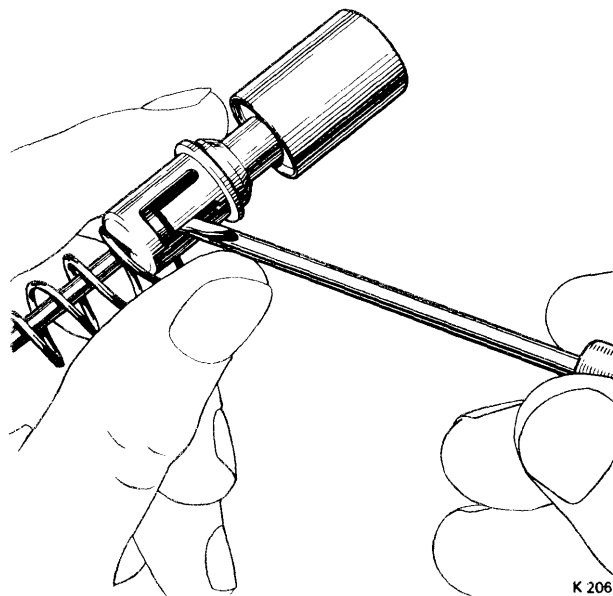


FIG. G39 UNLOCKING THE RETAINER

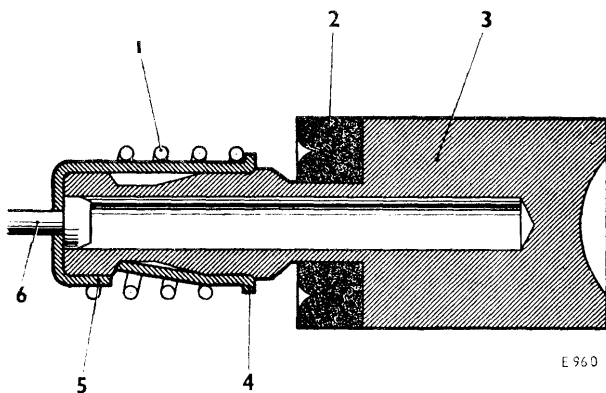


FIG. G40 LOCKING THE RETAINER

- 1 Return spring
- 2 Piston seal
- 3 Piston
- 4 Spring abutment and locking prong
- 5 Retainer
- 6 Connecting rod

Brake master cylinder—To inspect

1. Examine the master cylinder bore for signs of damage or abrasion. Light damage may be removed using fine 'Corolite' tape, lubricated with clean brake fluid of the correct type, but it must be stressed that the good condition of the master cylinder bore is most important and if any doubt exists as to its serviceability, a replacement housing should be fitted.

Note If the master cylinder bore is damaged or marked, this must be borne in mind when inspecting the plunger and seal assemblies for serviceability.

2. Carefully inspect the plunger and cut-off valve assemblies, paying particular attention to the condition of the two rubber seals.
3. The rubber boot should be examined for serviceability, and renewed if necessary.

Brake master cylinder—To assemble

1. Cleanliness is extremely important when assembling the brake master cylinder. All components should be thoroughly cleaned, using methylated spirits, and then dried afterwards with dry, compressed air.
2. Assembly of the whole unit is the reversal of the procedure given for dismantling, noting that the components should be lubricated with clean brake fluid prior to assembly. Renew all discarded items.
3. Care should be taken to ensure that the belleville washer is seated correctly and when the cut-off valve stem and spring retainer have been located on the plunger, the prong on the spring retainer must be depressed into the recess as shown in *Figure G40*.

Brake master cylinder—To fit

1. Fit the master cylinder to the rear of the brake pedal linkage assembly, screwing the stem into the fulcrum pivot link; do not tighten the lock-nut.
2. Tighten both securing nuts to the standard torque figures relative to their size, remove the blanks and fit the pipes.

Brake master cylinder 'ON' stop—To set

1. Refer to Section G15—Brake actuation linkage assembly, for full details.
2. When this setting is correct, tighten the lock-nut on the push rod.
3. After fitting and setting the master cylinder, the hydraulic system for the master cylinder must be bled as described in Section G2—Bleeding the systems.

Section G12

DECELERATION CONSCIOUS PRESSURE LIMITING VALVES

Introduction

Since the introduction of the Rolls-Royce Silver Shadow and Bentley T Series, a modification has been introduced which reduces the brake pedal load necessary to produce any required deceleration; this applies to cars having the following serial numbers.

Standard cars—1899 and onwards.

Coachbuilt cars—1874 and onwards (including numbers 1807 and 1869).

This modification necessitated a revised hydraulic circuit to the rear brake calipers to off-set the increased 'sponge'. The deceleration conscious pressure limiting valve was disconnected from the master cylinder hydraulic circuit and introduced into the high pressure (power braking) circuit, although positionally the valve remained in its original position.

To assist in identifying cars with this modification, the pipes connected to the valve are **blue** coded for the high pressure (power braking) circuit and **green** coded for the master cylinder braking circuit.

It is important to note that before any steps are taken to disconnect or remove the deceleration conscious pressure limiting valve from the high pressure (power braking) circuit, the hydraulic systems are de-pressurised.

Figure G1 of Section G2 gives a diagrammatic layout of the early and later hydraulic circuits.

Pressure limiting valve—To service

The pressure limiting valve is non-adjustable and should not require servicing other than renewing the valve seals at the recommended mileage. Refer to Chapter D—Service Recommendations.

If a valve is found to be faulty, usually indicated by premature rear wheel locking, it should be removed from the car and overhauled, the seals renewed or an exchange unit fitted.

Pressure limiting valve—To remove

1. Place the car on a ramp and remove the under-shield which protects the brake actuation linkage assembly.
2. **If necessary, de-pressurise the hydraulic systems (see Introduction).**
3. Disconnect the two pipes (green or blue coded) from the valve; blank off the pipe ends and ports.
4. Remove the nuts from the upper three bolts which secure the pressure limiting valve and mounting brackets, leaving the bolts in place.
5. Remove the two lower nuts and bolts, the forward one of which is the master cylinder stop.
6. Remove the support bracket and the two distance pieces from the bolts securing the valve, then remove the valve.

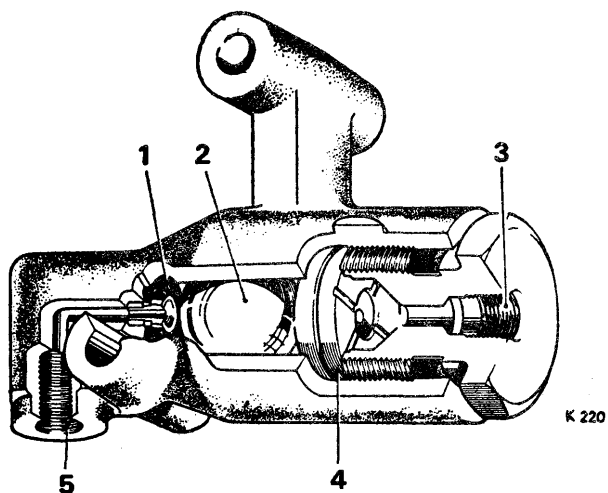


FIG. G41 CUT-AWAY VIEW—PRESSURE LIMITING VALVE

- | | | |
|----------------|---------------|--------------|
| 1 Seal | 2 Steel ball | 3 Inlet port |
| 4 Spacer plate | 5 Outlet port | |

Pressure limiting valve seals—To renew

Remove the pressure limiting valve from the car as described previously.

1. Remove the plug and seal from the valve and then, holding a hand over the open end, invert the valve and catch the ball and spacer.
2. Using an 'Easyout' remove the insert and rubber seal from the bottom of the bore.
3. Fit a new insert and seal, then fit the ball, baffle plate and end plug with a new seal on the plug.
4. Torque tighten the end plug to between 25 lb.ft. and 35 lb.ft. (37 kg.m. and 52 kg.m.).

Pressure limiting valve—To fit

To fit the pressure limiting valve reverse the procedure given for its removal, noting the following points.

1. All nuts must be torque tightened to the standard figure (see Chapter P) and the distance pieces must be fitted after the valve.
2. After fitting the valve, bleed the respective system (see Section G2—Bleeding the Systems).

Section G13

THE BRAKE DISTRIBUTION VALVES

General

Two independent brake fluid distribution valves meter the brake fluid to the braking systems at high pressure. The valves are situated one above the other within the brake actuation linkage assembly and are operated through linkage and a small balance lever connected to the foot brake pedal (*see Fig. G48, Section G15*).

The valves are identical in operation but are not interchangeable due to differing mounting points and pipe arrangement. Corresponding valves of left-hand and right-hand drive cars are identical.

Brake distribution valves—To service

The valves, formerly classified as sealed units and renewed when necessary on a service exchange basis, may now be dismantled and cleaned, although only certain new parts of the valves are available. These parts are limited to the small seal, the return spring and the end plug joint washer. The remaining working parts are subject to very fine limits and are selectively assembled by the manufacturer thus, complete service exchange units are still available when required.

Note The design of the valves is such that a small leak-off occurs between the operating valve and its bore in order to provide adequate lubrication for the 0.0001 in. (0.003 mm.) clearance. This small leakage is visible and takes the form of a small droplet of fluid hanging from the valve base. This is normal.

When deciding whether a valve is leaking excessively, in order to warrant renewal or overhaul, the following points should be taken into consideration.

1. On early cars, those with fluid return pipes from the front and rear height control rams, leak-off can be increased by Service Personnel working on one of the above cars under the following conditions.

The accumulators fully charged and the car set to fast-levelling. Under these circumstances any suspension movements cause pressure in the return line to be increased, resulting in an above normal leak-off past the distribution valve spindle.

2. If the fluid leak-off does not impair the braking efficiency or result in noticeable differences in the level of fluid in the reservoirs, then the valves should be regarded as satisfactory.

Brake distribution valves on the car — To test

1. Place the car on a ramp, isolate the gearchange selector and de-pressurise the systems.

The distribution valves must be checked for correct operation as follows.

2. Insert a Zero lb/sq.in. to 3,000 lb/sq.in. (Zero kg/sq.cm. to 210,92 kg/sq.cm.) pressure gauge and a length of high pressure pipe into the high pressure outlet port of the valve (blue or mauve pipe) or into any convenient junction between the valve and the brake calipers which it supplies. The gauge may be inserted into a brake caliper bleed screw port if desired.

3. Start the engine then depress the brake pedal. The brake line pressure shown on the gauge should be proportional to the load applied to the pedal; for an 80 lb. (36,28 kg.) load on the pedal, the line pressure should be approximately 1,000 lb/sq.in. (70,307 kg/

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sq.cm.). It should also be possible to achieve a maximum line pressure equal to the fully charged accumulator pressure of 2,500 lb/sq.in. (175,77 kg/sq.cm.) for a pedal pressure of approximately 190 lb. (86,18 kg.).

Also, when the brake pedal load is varied continuously, the brake line pressure gauge should vary accordingly, without any marked lag or jerkiness.

4. If the above effort/pressures are not obtainable, or actuation shows marked lag or jerkiness on the gauge, the distribution valve may be considered faulty and must be overhauled or renewed.

Should a system internal leakage investigation, as described under 'Hydraulic accumulator—To test', show a distribution valve to be the cause of loss of accumulator pressure, the actual leakage can be checked as follows.

5. Disconnect the low pressure return line from the distribution valve port (black or white pipe) and blank the end of the pipe to prevent draining of the reservoir.

6. Insert a union and a length of pipe into the distribution valve low pressure port and place the open end of the pipe into a clean container.

7. Start the engine but do not depress the brake pedal.

8. Top-up the reservoir continuously to prevent the pump from drawing air.

Note For the valve to be acceptable, the leakage should not exceed 60 c.c. per hour with the valve in the 'off' position (i.e. brake pedal not depressed) or 50 c.c. per minute with the brake pedal depressed and **held steady** under a load of 45 lb. (20,41 kg.) which is equivalent to a brake line pressure of 500 lb/sq.in. (35,15 kg/sq.cm.). If the valve leaks in excess of these figures it must be overhauled or renewed. Refer also to item 2 of 'Distribution valve—To service'.

Brake distribution valves—To remove

1. Place the car on a ramp and de-pressurise the hydraulic systems as described in Section G1—Special Precautions.
2. Disconnect the battery located in the boot.
3. Remove the self-tapping screws securing the brake actuation linkage aluminium protective cover.
4. Disconnect the electrical leads, then remove the stop lamp switch and bracket situated at the forward end of the linkage abutting the heel of the foot brake pedal.
5. Remove the pipes from the side of each valve and promptly blank off each pipe end and valve port.
6. Remove the nuts and bolts securing each valve into position, then move each valve forward and downward to clear the valve operating linkage.

Brake distribution valve—To dismantle

1. Remove the end plug and sealing washer.
2. Collect the return spring.
3. Carefully remove the valve plunger and collar.
4. Carefully remove and discard the small 'Dowty' seal from the valve body insert bore. **Do not** scratch the valve bore during this operation.
5. Carefully wash all parts in methylated spirits and dry with clean, dry compressed air.

Brake distribution valve—To inspect

1. Carefully examine the fine limit bore of the valve insert and the outside diameter of the valve plunger. Each should be smooth and free from scratches.
2. Lubricate the bore of the valve insert and the valve plunger with clean brake fluid. Carefully fit the valve plunger into the valve insert bore and check for axial wear. There should be hardly any clearance between them, just sufficient clearance to enable the valve to slide freely down the bore.

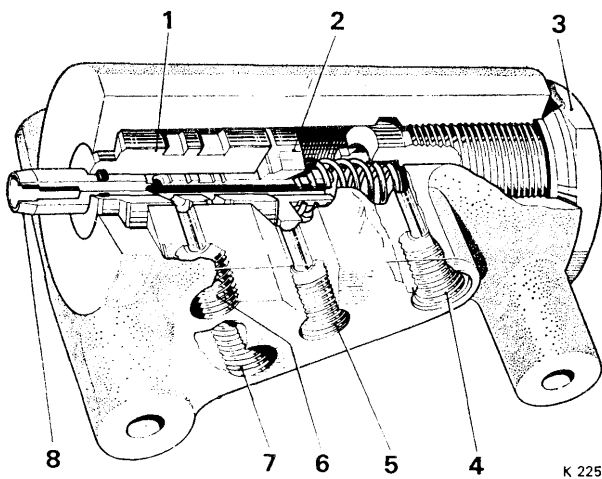


FIG. G42 CUT-AWAY VIEW—BRAKE DISTRIBUTION VALVE

- 1 Valve insert
- 2 Damping collar
- 3 End plug
- 4 Bleed screw port (early cars only)
- 5 Outlet to brake calipers
- 6 Return to fluid reservoir
- 7 Pressure inlet from accumulator
- 8 Valve plunger

3. Re-wash the parts in methylated spirits and air pressure dry as previously stated.

Brake distribution valves—To assemble

1. Carefully fit a new seal into the valve body insert groove, taking great care not to scratch the bore or cause burring on the edge of the groove.
2. Lubricate the bore and valve plunger with clean brake fluid of the correct type (see Chapter D).
3. Carefully fit the valve plunger into the bore until it is fully seated. Fit a new return spring.
4. Fit a new joint washer to the end plug; fit and torque tighten the plug (refer to Chapter P for the torque figure).
5. Check the inward and return movement of the valve plunger. It should be smooth without binding or sticking at any point along its travel.

Brake distribution valves—To fit

In order to fit the brake distribution valves, reverse the procedure adopted for their removal, noting the following points.

1. If a replacement valve is being fitted, remove one of the plastic transportation plugs and allow any fluid from the valve to drain. Re-fit the plug.
2. All blanking plugs should be removed from the valves and pipes immediately prior to them being connected. Do not over-tighten the pipes; this might cause damage to the conical seatings.
3. Fit the stop lamp switch and set as described in 'Stop lamp switch—To set' in Section G15.
4. On completion of fitting the valves, the hydraulic systems must be bled as described in Section G2—'Bleeding the systems'.

Section G14

THE FRONT AND REAR DISC BRAKES

General

Disc brakes are fitted to all four wheels, each front wheel being fitted with two double cylinder calipers (see Fig. G43) and each rear wheel a large four cylinder caliper (see Fig. G44 or G45).

The brake calipers are divided between the two power systems and the master cylinder, providing an integrated braking system in which any of the three systems can operate independently in the event of failure.

Bleed screws are fitted to the inner face of each caliper to facilitate bleeding of both power systems (front brakes only) and power and master cylinder systems (rear brakes only).

The rear brake calipers have small wedge shaped pads hung beneath them which are mechanically operated (refer to Section G16). These hand brake pads, which operate on each side of the rear brake discs, are self-adjusting, but the setting must be physically checked at the specified service intervals (see Chapter D).

Brake pads—To renew

Inspection of all brake pads must be carried out at the specified service intervals (see Chapter D).

The brake pads must be renewed when the pad linings are worn to within $\frac{1}{8}$ in. (3,18 mm.) of the back plate.

Remove the brake pads as follows.

1. De-pressurise the hydraulic systems (see Section G1—Special Precautions) and disconnect the battery.

Note The above operation is not essential for brake pad renewal but is recommended as a safety precaution in case the brake pedal is accidentally depressed whilst the brake pads are removed.

2. Securely chock the rear (front) wheels, then jack up the front (rear) of the car and securely support it on stands. Ensure that the rebound straps of the rear suspension do not support the full suspension load.

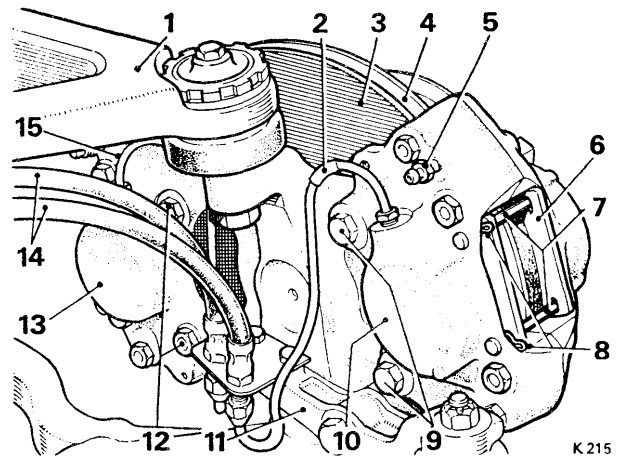


FIG. G43 FRONT BRAKE CALIPERS

- 1 Triangle lever and suspension ball joint—upper
- 2 Caliper feed pipe (blue)
- 3 Brake disc shield
- 4 Brake disc
- 5 Bleed screw
- 6 Brake pad
- 7 Brake pad retaining pins
- 8 Retaining pin spring clips
- 9 Front caliper securing bolts
- 10 Front caliper
- 11 Side steering lever
- 12 Rear caliper securing bolts
- 13 Rear caliper
- 14 Flexible pipe connection from sub-frame
- 15 Caliper feed pipe (mauve)

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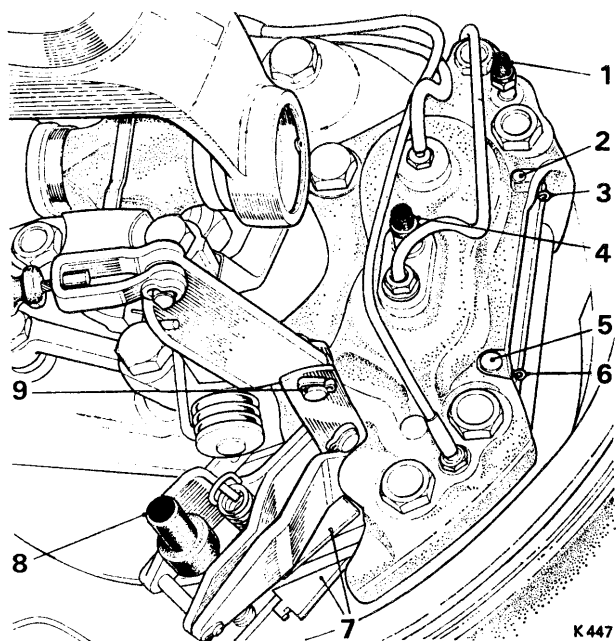


FIG. G44 REAR BRAKE CALIPERS (EARLY CARS)

- | | |
|---------------------------------------|--------------------------|
| 1 Master cylinder circuit bleed screw | 5 Pad locating pin |
| 2 Pad locating pin | 6 Securing clip |
| 3 Securing clip | 7 Hand brake pads |
| 4 Power brake circuit bleed screw | 8 Adjusting ratchet seal |
| | 9 Disconnecting point |

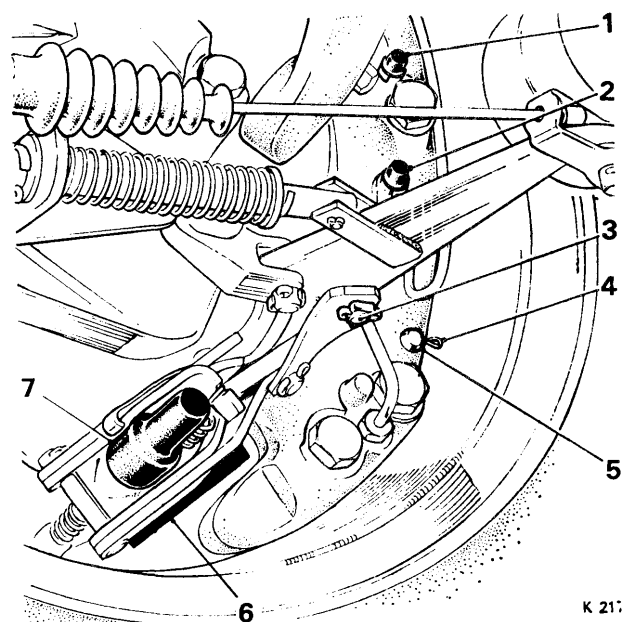


FIG. G45 REAR BRAKE CALIPERS (LATE CARS)

- | | |
|---------------------------------------|----------------------------------|
| 1 Power brake circuit bleed screw | 4 Securing clip |
| 2 Master cylinder circuit bleed screw | 5 Locating pin |
| 3 Disconnecting point | 6 Hand brake pads |
| | 7 Pad adjusting ratchet nut seal |

3. Remove the wheel disc and road wheel.
4. Remove the two spring clips from the brake pad retaining pins (see Fig. G43) then remove the two pins. Collect the anti-rattle spring from the rear brake (if fitted); refer to Figure G47.
5. Remove the brake pads from the calipers; remove the 'D' shaped anti-squeal shims (front wheel calipers only).

Note The brakes must not be re-lined with pads other than those with the specified linings. The only recommended pad materials are Ferodo DC 1 or Mintex M 69.

If the brakes are to be re-lined with pads which have different recommended linings from those previously fitted, the disc faces should be cleaned prior to fitting the new pads. All traces of the old pad material should be removed by hand rotating the disc whilst applying fine emery paper to the faces. Do not emery the faces radially. It must also be stressed that the same type of lining must be fitted to all wheels. Lining material must be the same on all pads fitted.

6. Prior to fitting new pads, inspect the caliper piston dust seals for signs of damage or heat hardening and renew if necessary.

7. Fit the new pads, anti-squeal shims (front wheels only), retaining pins and spring clips, anti-rattle springs (rear wheels only, all cars), ensuring that the clips are located securely, and that the anti-squeal shims fitted to the front wheels are fitted correctly behind the pad back plates with the arrows pointing in the direction of disc rotation (forward movement of the car).

Brake caliper—To remove

1. De-pressurise the hydraulic systems (see Section G1—Special Precautions) and disconnect the battery.
2. Securely chock the front (rear) wheels then jack up the rear (front) of the car and securely support it on stands (refer to Operation 2—Brake pads—To renew).
3. Remove the wheel disc and road wheel.
4. Disconnect the caliper feed pipe(s); securely blank the pipe end(s) and the caliper port(s) against the ingress of dirt.
5. Remove the fitted bolts which secure the caliper to the axle yoke and remove the brake caliper from the car.

6. It is recommended that a distance piece be fitted between the two pads after removing the caliper, to prevent the pistons easing out of the caliper bores.

Brake caliper piston seals—To renew

The brake caliper seals should be renewed at the specified intervals, refer to Chapter D.

The procedure to adopt is as follows.

1. De-pressurise the hydraulic systems (see Section G1—Special Precautions), disconnect the battery and remove the brake caliper as described previously.

2. Remove the brake pads from the brake calipers as described earlier.

3. Remove the split spring ring from around the caliper piston dust seal, then remove the dust seal.

4. Ease the piston carefully out of the bore, taking care not to drop, scratch or damage the piston.

5. Remove the piston seal from the caliper bore.

6. Clean the caliper bore and piston with methylated spirits then dry thoroughly.

7. Immerse the new seal in clean, approved brake fluid (refer to Chapter D), then carefully fit it in the groove in the caliper bore, ensuring that it is correctly seated.

8. Lubricate the piston outside diameter with a small quantity of clean, approved brake fluid, then carefully fit the piston.

9. Fit the dust seal around the piston top, renewing it if necessary, then fit the split spring ring, taking care not to 'pinch' the dust seal with the ends of the ring.

Brake caliper—To fit

Fit the caliper by reversing the procedure given for removal, noting the following points.

1. The securing setscrews **must** be torque tightened to the figures quoted in Chapter P. The blanking plugs should not be removed until immediately prior to connecting the feed pipes.

Note Ensure that the underside of the set-screw heads and the faces onto which they abut are free from contamination, i.e. burrs, paint, etc.

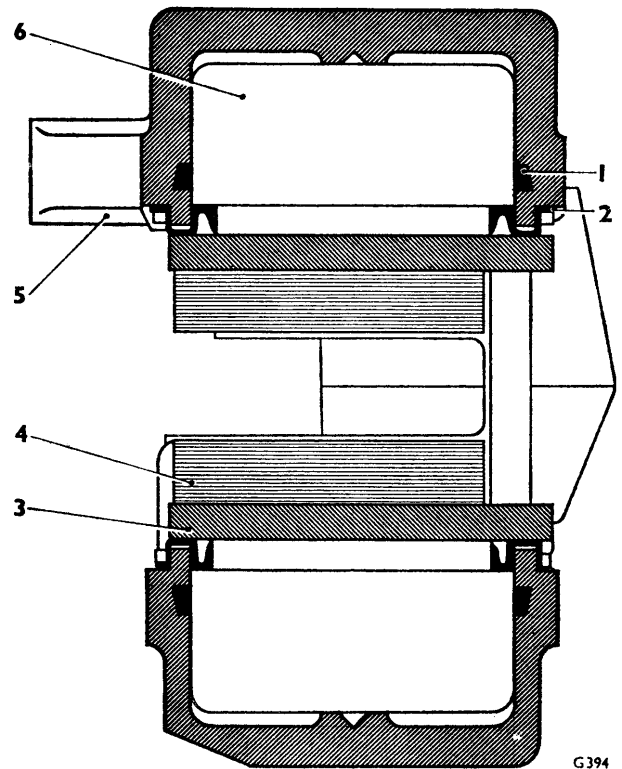
2. Fit the brake pads, then bleed the system(s) as described in Section G2—Bleeding the Systems.

Brake disc—To remove

If the necessity arises to renew a brake disc(s), the procedure to adopt is as follows.

1. De-pressurise the hydraulic systems (see Section G1—Special Precautions) and disconnect the battery.

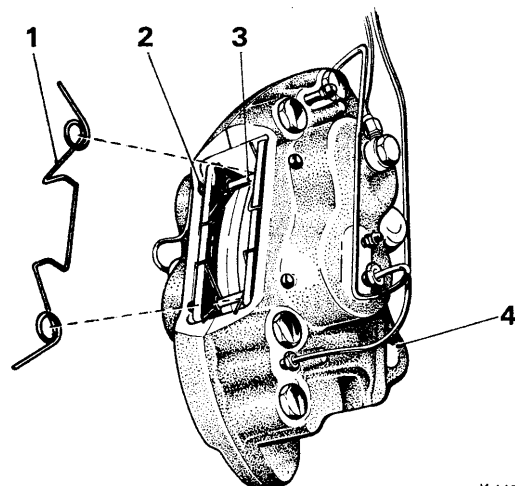
2. Jack up the front or rear of the car as necessary then remove the appropriate wheel disc, road wheel and brake caliper as described previously (refer to Operation 2—Brake Pads—To renew).



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FIG. G46 FRONT BRAKE CALIPER CROSS-SECTION

- 1 Piston seal
- 2 Dirt seal and retaining clip
- 3 Brake pad back plate
- 4 Brake pad lining
- 5 Caliper mounting bosses
- 6 Caliper piston



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FIG. G47 REAR BRAKES ANTI-RATTLE SPRINGS IN POSITION

- 1 Anti-rattle spring (2 off)
- 2 Locating pin securing clip
- 3 Brake pad locating pins
- 4 Rear brake caliper

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3. Remove the front hub or rear hub (see Chapter H for the front hub and Chapter J for the rear hub).

4. To remove the front brake disc, unscrew the twenty setscrews and washers securing the disc to the hub.

5. To remove a rear brake disc, dismantle the hub as described in Chapter J then unscrew the twenty setscrews which secure the disc to the hub.

Brake disc—To fit

To fit the brake disc reverse the procedure given for its removal noting the following points.

1. The securing setscrews must be torque tightened to the standard figures relative to their size (see Chapter P).

2. The hub(s) must be assembled as described in the respective Chapter, H or J.

3. Fit the hub as described in the respective Chapter, H or J.

Pipework—Rear brake calipers

When a bridge pipe (not colour coded) on the rear brakes is disturbed, great care must be taken when fitting it so that it does not get too close to the brake disc. A minimum clearance of $\frac{5}{16}$ in. (0,79 cm.) should be maintained at all times. Refer to Section G3—Hydraulic Systems Pipework and coloured illustrations, as well as *Figures G44 and G45* of this Section, in order to determine the pipe connections of the power and master cylinder circuits to the rear brakes.

On cars with the following numbers a revised hydraulic circuit associated with reduced footbrake pedal effort was introduced.

Standard cars bearing the serial number 1899 and onwards.

Coachbuilt cars bearing the serial number 1874 and onwards, including those cars with serial numbers 1807 and 1869.

Section G15

BRAKE ACTUATION LINKAGE ASSEMBLY

Introduction

The brake actuation linkage (*see Figs. G48 and G49*) is mounted beneath the car just rearward of the toe-board. On **right-hand drive cars** the linkage is positioned just inboard of the body sill, on **left-hand drive cars** the linkage is fitted further inboard, adjacent to the inner side of the body longeron, due to the positioning of the exhaust silencer system.

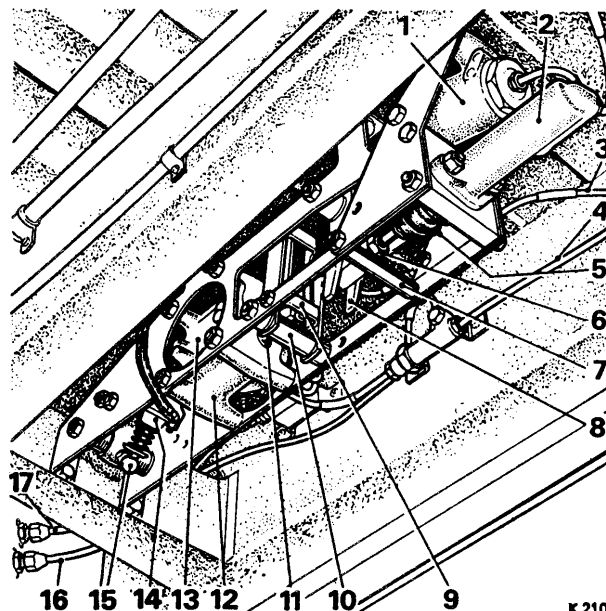
The assembly houses the master cylinder, deceleration conscious pressure limiting valve, brake distribution valves and stop lamp switch.

Since the introduction of the car, there have been certain engineering improvements introduced on the assembly as follows.

On all cars up to serial number 3384, certain pivot points of the assembly (*see Fig. G50*) are retained by spring clips. Later cars from and including this number

FIG. G48 BRAKE ACTUATION LINKAGE IN POSITION (EARLY R.H.D. CARS), (PIVOT PIN RETAINING CLIPS REMOVED)

- 1 Deceleration conscious pressure limiting valve
- 2 Master cylinder
- 3 Pipe—pressure limiting valve to rear brake calipers (green)
- 4 Pipe—lower distribution valve to rear brake calipers (blue)
- 5 Sealing boot—master cylinder
- 6 Lock-nut—master cylinder adjustment
- 7 Master cylinder 'ON' stop
- 8 Master cylinder operating lever
- 9 Distribution valve 'OFF' stop
- 10 Pivot—distribution valve operating lever
- 11 Lower distribution valve plunger
- 12 Lower distribution valve
- 13 Upper distribution valve
- 14 Brake lamp switch
- 15 Brake lamp switch eccentric adjuster
- 16 Pipe—lower distribution valve to front wheel front calipers (blue)
- 17 Pipe—upper distribution valve to front wheel calipers (mauve)



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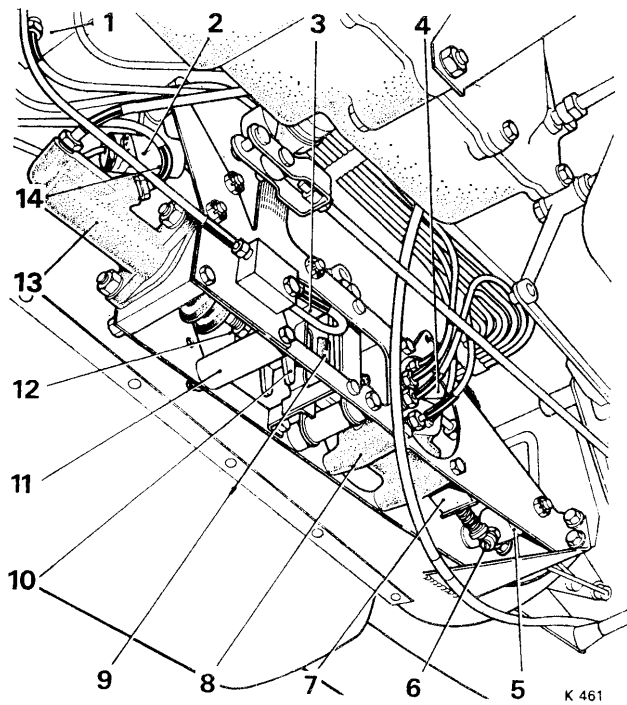


FIG. G49 BRAKE ACTUATION LINKAGE IN POSITION (LATE L.H.D. CARS)

- 1 4-way connection block
- 2 Deceleration conscious pressure limiting valve
- 3 Pipe (blue coded) deceleration conscious pressure limiting valve
- 4 Upper distribution valve
- 5 Brake pedal lever pivot
- 6 Eccentric—Stop lamp adjustment
- 7 Stop lamp switch
- 8 Lower distribution valve
- 9 'OFF' stop
- 10 Master cylinder operating linkage
- 11 'ON' stop
- 12 Master cylinder adjuster
- 13 Master cylinder
- 14 Pipe (green coded) master cylinder

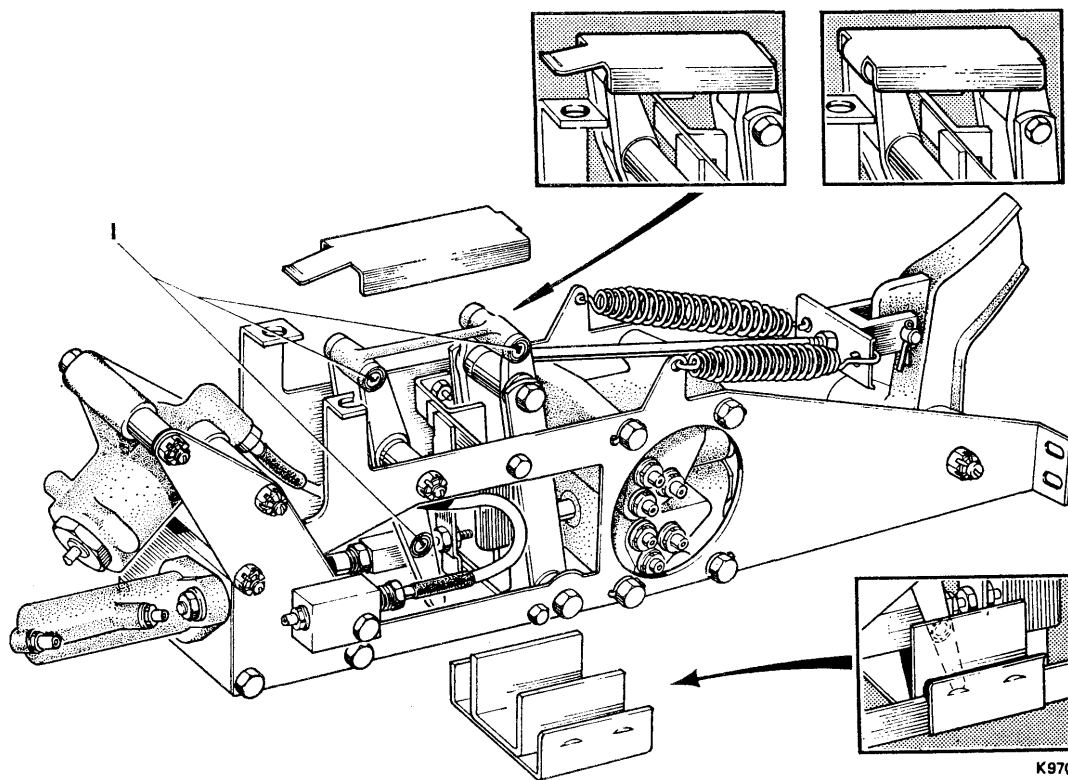


FIG. G50 METHOD OF FITTING LINKAGE RETAINING CLIPS (EARLY CARS)

- 1 Brake linkage pivot pins
- Insets show method of fitting pivot pin retaining clips

have longer pivot pins which are retained by split pins. The distribution valves of all cars are fitted with flush fitting pivot pins but the method of retaining them varies. On early cars prior to serial number 3384 the lower pin is retained by a spring clip; the upper pin does not require retention. On later cars from and including this number, a thin, lipped plate is fitted to each side of both flush fitting pins in order to retain them. Refer to *Figure G51* and insets.

On cars from and including the following serial numbers, 1899 and onwards—Standard cars, 1874 and onwards including 1807 and 1869—Coachbuilt cars, a new footbrake pedal lever was introduced resulting in a higher lever ratio. With the introduction of this lever additional changes were made as follows.

1. An adjustable master cylinder 'OFF' stop due to an increase in pedal free travel.
2. A revised 'ON' stop setting to ensure that the actuation linkage contacts the stop should the master cylinder become inoperative.
3. Additional clearance for the lowered connecting rod between the linkage and heel of the pedal lever.
4. A revised hydraulic systems circuit to the rear brake calipers to offset the increased 'sponge' resulting from the increased pedal leverage (refer to *Fig. G1* of Section G1 and *Figs. G5 and G6* of Section G3). The revised circuit also affects the method of bleeding (refer to Section G2—'Bleeding the hydraulic systems').

Note It is not permissible to fit the increased leverage pedal arrangement to cars produced prior to the number previously mentioned. If necessary, it is permissible to fit the adjustable 'OFF' stop to earlier cars as a means of reducing pedal free travel.

The assembly should not be removed from the car unless it is absolutely necessary as this involves disconnecting a considerable number of pipes involving all three braking systems, with the resultant risk of all systems becoming contaminated.

Brake actuation linkage assembly—

To remove

1. Place the car on a ramp, de-pressurise the hydraulic systems as described under Section G1—'Special Precautions', and disconnect the battery, located in the boot.
2. Remove the undersheet from below the assembly. On left-hand drive cars, detach the speedometer cable from the cover.
3. Uncouple the brake pedal return springs.

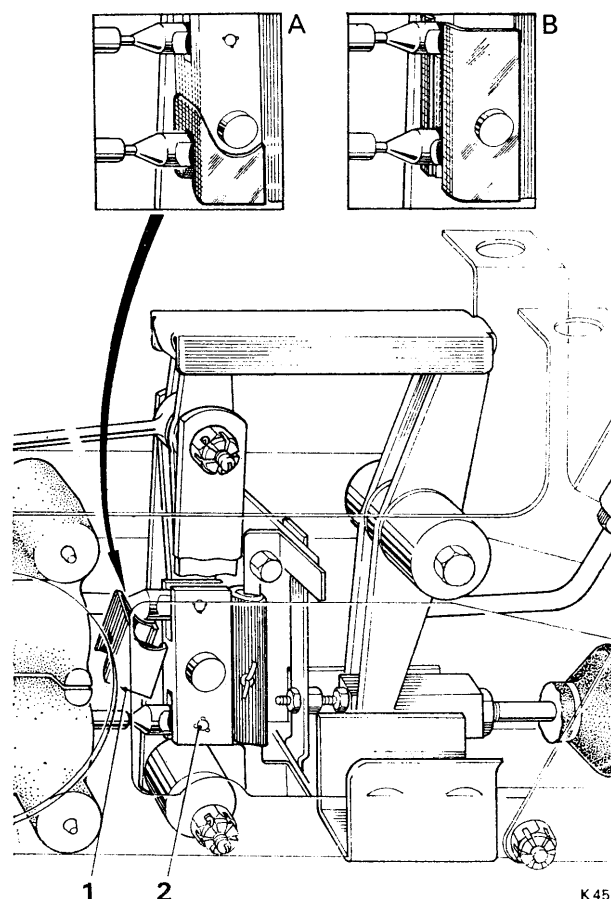


FIG. G51 METHOD OF FITTING THE FULCRUM PIN RETAINING CLIPS—EARLY CARS AND RETAINING PLATES—LATER CARS

- 1 Retaining clip 2 Fulcrum pin (lower)
 Inset A retaining clip position (early cars)
 Inset B retaining plates (2 off) in position (late cars)

4. Release the stop lamp switch and bracket from the side support plate; remove the electrical connections and remove the switch and bracket.
5. Remove the feed pipe from the reservoir to the master cylinder (grey) and remove the outlet pipe from the pressure limiting valve to the rear brake calipers (green, early cars) (blue, later cars); securely blank the pipes and ports.
6. Remove the six hydraulic pipes from the brake distribution valves one at a time, again blanking off all apertures quickly and securely.
7. Remove the brake pedal stem pinch bolt from the upper end of the brake pedal lever and ease the pedal stem out of the lever.
8. Release the side support plates at the forward mounting points, then release the two rear mountings from the floor and lower the assembly from the car.

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Brake actuation linkage assembly—

To fit

To fit the brake actuation linkage assembly, reverse the procedure given for its removal, noting the following points.

1. To facilitate fitting, the assembly may be offered up to the car and the pipe connections made whilst it is supported slightly below its fixed position, it should then be secured to the car body.
2. Torque tighten all nuts, setscrews and pipe unions (refer to Chapter P).
3. When the assembly has been fitted correctly, the master cylinder 'ON' stop, adjustable 'OFF' stop (if fitted), the brake pedal rod and the stop lamp switch must be set (see under appropriate headings in this Section).
4. Bleed the systems as described under Section G2—'Bleeding the systems'.

Brake actuation linkage—To dismantle

The following gives a procedure to adopt in order to remove the lever and linkage from a right-hand drive car, without disturbing the remainder of the assembly. Due to the positional difference of the linkage assembly on left-hand drive cars, it is not possible to partially dismantle it in situ; the complete assembly must be removed from the car and a side plate removed.

Prior to dismantling the linkage, note should be taken of the relative positions of the nuts, bolts and distance pieces.

1. Carry out Operations 1 to 3 inclusive, as given under 'Brake actuation linkage—To remove'.
2. On early cars, remove the brake linkage pivot pin retaining clip from the underside of the linkage assembly.
3. Remove the 'OFF' stop bracket from behind the balance lever which operates the brake distribution valves.
4. Remove the split pin and clevis pin from the operating rod pivot on the brake pedal.
5. Remove the master cylinder 'ON' stop.
6. Slacken the lock-nut on the master cylinder operating rod and unscrew the rod from its pivot.
7. Remove the bolt which supports the master cylinder operating lever between the side support plates. Ease the lever downward to the aperture in the side support plates then remove the distance pieces and tube from the pivot.
8. Repeat Operation 7 on the pivot at the lower end of the distribution valve operating lever.

Note Care should be taken to keep the individual distance pieces with their relative pivots.

9. Ease the levers downward and manoeuvre them from between the side support plates, valves and master cylinder.

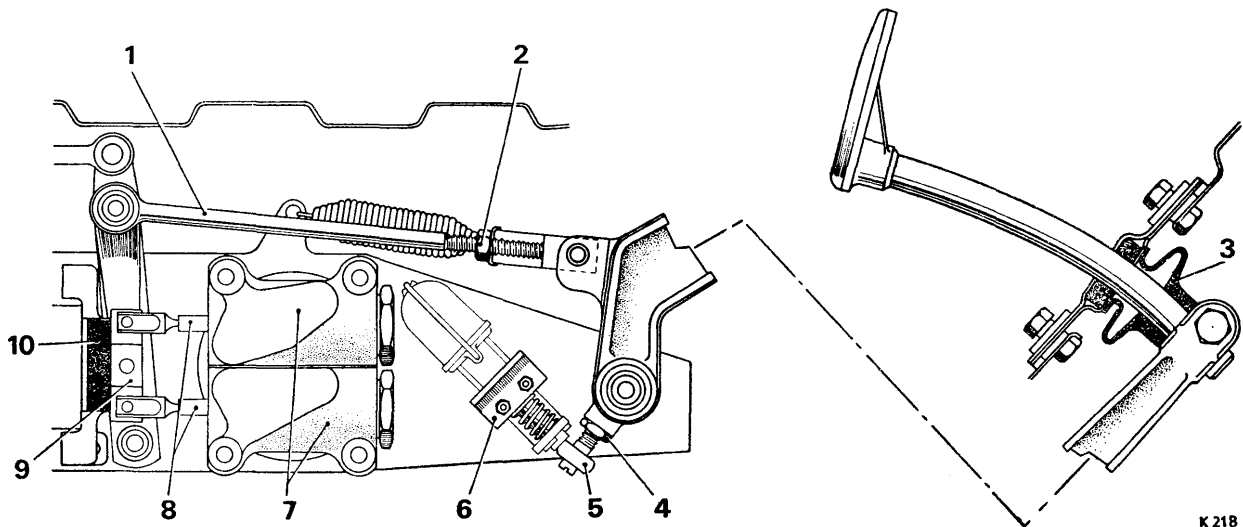


FIG. G52 VIEW OF BRAKE LINKAGE

- | | |
|-------------------------------------|---|
| 1 Brake pedal—linkage operating rod | 6 Stop lamp switch mounting bracket |
| 2 Lock-nut | 7 Brake distribution valves (upper and lower) |
| 3 Pedal seal | 8 Distribution valve plungers |
| 4 Switch adjuster lock-nut | 9 Distribution valves balance lever |
| 5 Eccentric adjuster | 10 Distribution valve 'OFF' stop |

Brake linkage assembly bushes and pivot pins—To renew

1. Remove and dismantle the brake levers from the car as described previously. The levers and pins are clearance fits in the bushes and are quite easily removed.

2. Carefully press bushes requiring renewal out of their locations and replace them with new ones. The bush bores are machined to final size, therefore final reaming or boring is not necessary.

3. **On early cars**, some pivots are flush fitting and are retained by spring clips. If the need arises to renew a pin(s), remove the retaining clip, press out the existing pin(s), then press in the new pin, with the serrations arranged so that they do not align with grooves made by the original pin. The pin(s) should be pressed in to give equal protrusions on each side of the lever.

4. Fit, where necessary, the pin retaining clips.

5. **On later cars**, bearing the serial number 3384 and onwards, some pivot pins have extensions and are retained by split pins. If the need arises to renew a pin(s), remove the split pin from either end of the pivot pin, press out the existing pin, insert the new pivot pin(s) and new split pins.

Brake linkage assembly—To assemble

To assemble the linkage, reverse the procedure adopted for its dismantling, noting the following points.

1. Clean all components prior to assembly and, using an approved grease (see Chapter D), lubricate all pivot points.

2. All bolts and nut must be torque tightened to the standard figures quoted in Chapter P.

3. The linkage should be free to operate when located between the assembly side support plates, without any tight spots or excessive side play.

Brake pedal lever—To remove

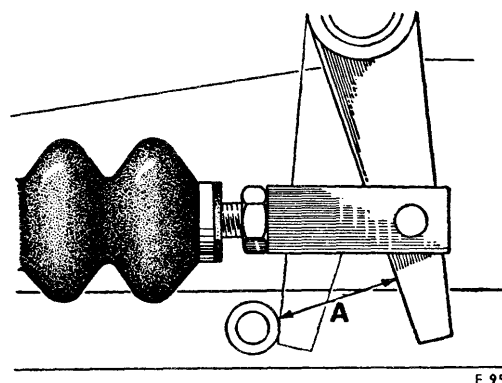
1. Place the car on a ramp and remove the under-sheet below the actuation linkage assembly.

2. Release the two setscrews securing the stop lamp switch bracket to the side support plates; move the switch away from the pedal lever.

3. Unhook the pedal return springs.

4. Remove the split pin and clevis pin from the operating rod pivot on the pedal lever.

5. Remove the brake pedal stem pinch bolt from the top of the lever and ease the pedal stem out of the lever.



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FIG. G53 MASTER CYLINDER SETTING (EARLY CARS)

A 'ON' stop setting

6. Remove the bolt and nut from the pedal lever pivot between the side support plates; remove the lever.

Brake pedal lever—To fit

In order to fit the brake pedal lever, reverse the procedure given for its removal, noting the following points.

1. All nuts must be torque tightened to the standard figures quoted in Chapter P.

2. The pedal lever and the stop lamp switch should be checked and adjusted if necessary (see under appropriate headings in this Section).

Brake linkage assembly

('ON' stop and 'OFF' stop)—To set

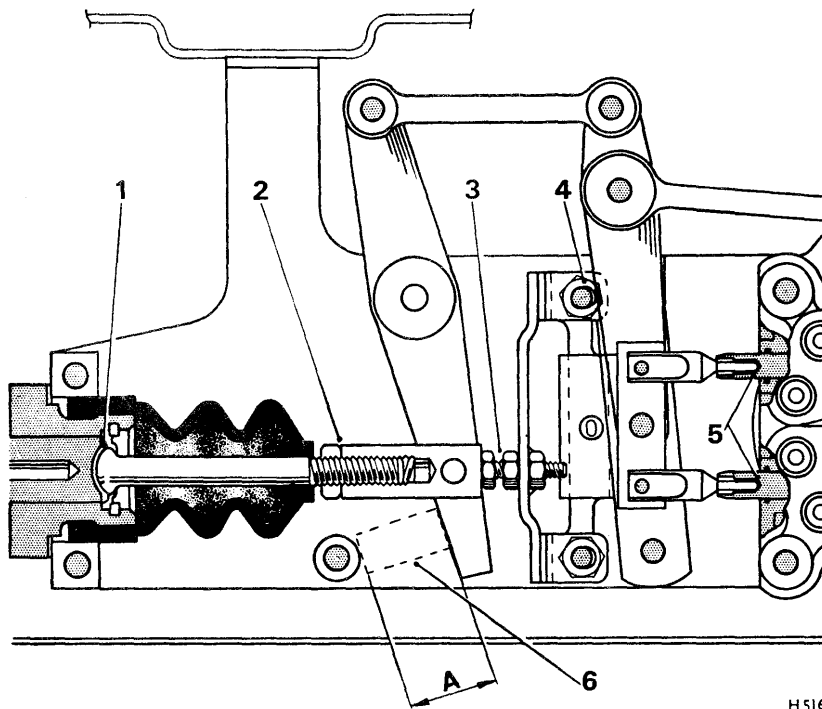
This procedure is to be carried out with the complete assembly in position on the car and must be applied on any occasion in service when either a distribution valve or brake master cylinder is disturbed or renewed.

1. Unscrew the four 2 B.A. bolts which secure the 'OFF' stop bracket to the side support plates sufficiently to enable the bracket to be moved on its slots.

2. Turn the head of the 'OFF' stop screwed adjuster (when fitted) until clearance exists between the screw head and the master cylinder operating linkage (i.e. the master cylinder push rod fully seated against its circlip and retaining washer).

3. Position the correct size distance piece between the 'ON' stop and master cylinder (see Figs. G54 and G55).

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FIG. G54 EARLY ARRANGEMENT—MASTER CYLINDER AND DISTRIBUTION VALVES WITH ADDITION OF ADJUSTABLE 'OFF' STOP

- | | |
|--|---|
| <p>1 0.005 in. to 0.010 in. (0,13 mm. to 0,25 mm.) clearance—push rod</p> <p>2 Adjuster 'ON' stop setting</p> <p>3 Adjuster—reducing master cylinder push rod free travel ('OFF' stop)</p> | <p>4 Elongated holes—adjusting distribution valve push rod clearance</p> <p>5 Zero clearance</p> <p>6 Gauge</p> |
|--|---|

A 1.000 in. minus 0.025 in. (2,54 cm. minus 0,64 mm.)

4. Adjust the master cylinder push rod screwed adjuster until the distance piece is just contacted by the operating lever on one side and the 'ON' stop on the other.

5. Tighten the adjuster lock-nut and remove the distance piece.

Note The 'ON' stop setting should now be correct with the brake pedal in its fully 'off' position.

6. Slide the 'OFF' stop backward or forward along its elongated holes until the distribution valve push rods just contact their seats in the valve spindles (see Figs. G54 and G55). **Do not push the spindles into their respective valves.**

7. With the push rods just contacting the distribution valve spindles as in Operation 6, secure the 'OFF' stop bracket by tightening the four 2 B.A. screws.

8. To remove free play in the master cylinder push rod, screw the 'OFF' stop threaded adjuster (when fitted) until all free play is just eliminated. Turn the

adjuster one quarter of a turn to permit a 0.005 in. to 0.010 in. (0,13 mm. to 0,25 mm.) axial free play (see Figs. G54 and G55) to exist between the master cylinder push rod and piston. Tighten the adjuster lock-nut.

Note 1. The 'OFF' stop with integral adjuster is intended only to reduce pedal free travel which results from master cylinder push rod free travel, and any clearance which exists between the distribution valve spindles and their push rods. This adjuster will not and should not be used to reduce pedal free travel which originates from other sources (i.e. rear brake pad to brake disc clearance, pivot clearance, etc.).

2. Early cars fitted with an 'OFF' stop not having an integral threaded adjuster may be fitted with the later type adjuster from an available kit comprising an 'OFF' stop bracket, 2 B.A. nut and bolt.

Brake pedal operating rod—To adjust (see Fig. G56)

1. Disconnect and remove the brake pedal from the operating lever and remove the convoluted seal situated beneath the toeboard seal.

2. Disconnect the pedal operating lever return spring and stop lamp switch and ensure that the brake actuation linkage is in the 'OFF' position.

3. Disconnect the pedal lever operating rod by removing the split pin and clevis pin.

4. Position the setting template as illustrated in *Figure G56* into the brake pedal operating lever and raise the lever complete with template until it touches the underside of the toeboard seal housing.

5. Adjust the jaw of the lever operating rod until the hole in the rod jaw aligns with the hole in the brake lever.

6. Remove the template from the lever, then connect the rod to the lever by inserting the fulcrum pin and split pin.

7. Tighten the lock-nut on the operating rod and fit the operating lever return spring.

8. Fit the convoluted seal between the brake pedal operating lever and toeboard seal.

9. Insert the brake pedal through the toeboard seal and convoluted seal, to enter the hole provided in the brake pedal operating lever.

10. Fit and tighten the pinch bolt to secure the pedal to the lever.

11. Check that the convoluted seal does not hold the actuation linkage from the required setting and that the brake pedal stem does not foul the seal housing at any point along its travel.

Note Should a car be fitted with a second layer of carpet it is important that it is fitted so that it does not reduce the clearance between the brake pedal pad and the toeboard. If necessary the additional carpet should be cut away in the area beneath the pedal to ensure that the set clearance is not reduced.

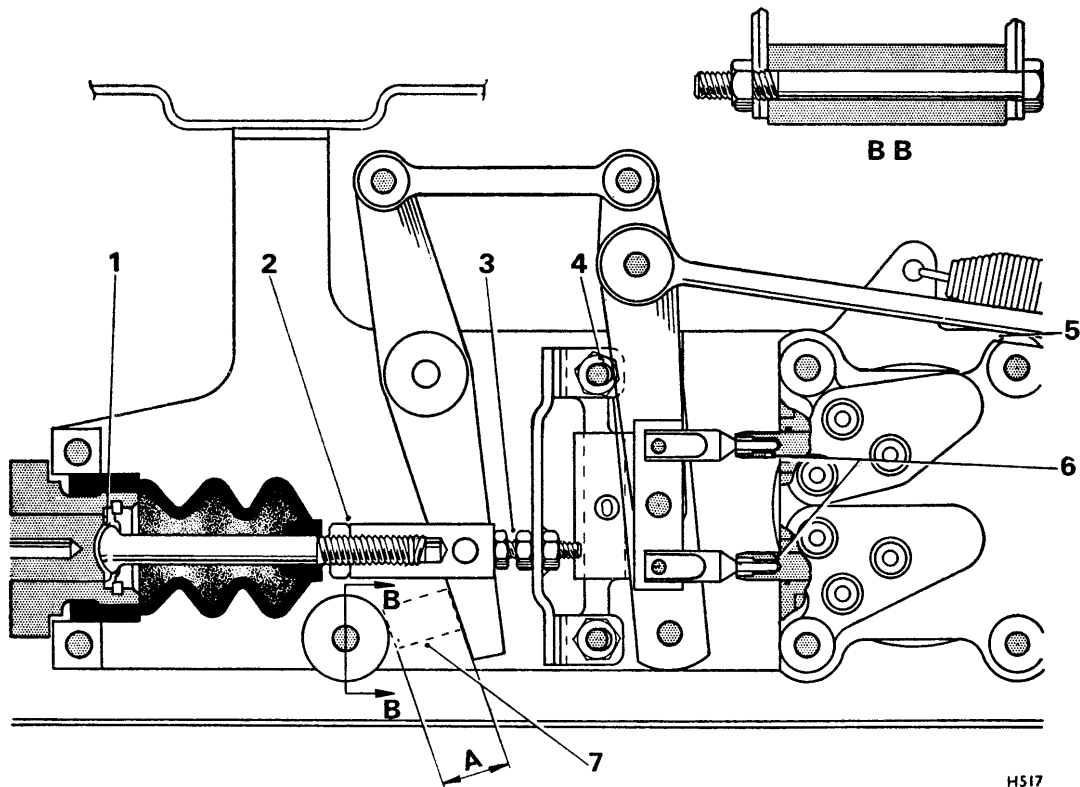


FIG. G55 CURRENT ARRANGEMENT—ADJUSTABLE 'OFF' STOP—MASTER CYLINDER AND DISTRIBUTION VALVES WITH LARGER DIAMETER 'ON' STOP

1 0.005 in. to 0.010 in. (0,13 mm. to 0,25 mm.) clearance—push rod

2 Adjuster—'ON' stop setting

3 Adjuster—reducing master cylinder push rod free travel ('OFF' stop)

4 Elongated holes—adjusting distribution valve push rod travel

5 Zero clearance

6 Groove—upper face of valve

7 Gauge

A 0.800 in. minus 0.025 in. (2,032 cm. minus 0,64 mm.)

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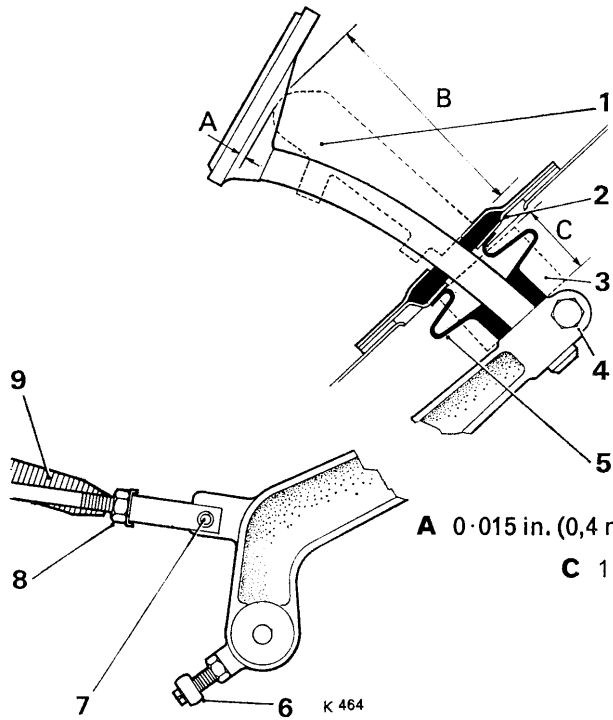


FIG. G56 SETTING THE BRAKE PEDAL AND BRAKE OPERATING LEVER

- 1 Checking template
- 2 Toeboard seal
- 3 Setting template
- 4 Brake lever
- 5 Convoluted seal
- 6 Stop lamp switch adjuster
- 7 Clevis pin
- 8 Lock-nut
- 9 Return spring

A 0·015 in. (0,4 mm.) **B** 4·400 in. to 4·390 in. (11,176 cm. to 11,151 cm.)
C 1·145 in. to 1·150 in. (2,908 cm. to 2,921 cm.)

Brake pedal—To check (see Fig. G56)

1. Using the checking template as illustrated in *Figure G56*, positioned between the underside of the pedal and the toeboard seal, check that there is at least 0·015 in. (0,40 mm.) clearance with the brake actuation linkage in the 'OFF' position.
2. If there is less than 0·015 in. (0,40 mm.) clearance, the brake pedal operating rod will have to be adjusted as already described (see 'Brake pedal operating rod—To adjust').

Stop lamp switch setting—To adjust

When all other adjustments to the brake actuation linkage and brake pedal have been completed, set the stop lamp switch as follows.

1. Ensure that the switch is securely fitted into position between the brake actuation linkage side plate.
2. Unlock the eccentric screw which is fitted to the bottom of the brake pedal lever.
3. Adjust the eccentric to ensure that it contacts the switch in order to operate the brake lamps during **initial** movement of the brake pedal.
4. Tighten the lock-nut to retain the eccentric screw in the set position.

Section G16

THE HAND BRAKE LINKAGE

Introduction

Since the introduction of the Rolls-Royce Silver Shadow and Bentley T Series car, two types of hand brake cable arrangement have been incorporated on early and later right-hand and left-hand drive cars; these are fully illustrated in *Figures G59 to G62 inclusive*.

Briefly, the differences are as follows.

The addition of two pulleys to the front cable run, a longer cranked operating lever at the centre, and a re-positioned return spring.

It will be noticed also that later left-hand drive cars have an identically positioned operating lever to that of right-hand drive cars; the front cable crosses the car forward of the body centre member via the additional pulleys to connect to the hand brake.

The *illustrations G59 to G62* also show the difference in the run of the front hand brake cable between right-hand and left-hand drive cars.

On **all right-hand drive cars**, the forward end of the front cable rises **inboard** of the body right-hand longeron then over two pulleys before connecting to the hand brake handle mechanism. On **all left-hand drive cars**, the forward end of the cable is directed beneath the body left-hand longeron then rises **outboard** of the longeron then over two pulleys to

connect to the hand brake handle mechanism. This difference is due to the positioning of the exhaust system silencer and the footbrake actuation box.

If an early car is returned for service through complaint of excessive hand brake apply load, kits of parts are available comprising low-friction cables, hand brake pads and, if required, the latest type of operating lever. The cable run of any car having new parts fitted remains unaffected.

Hand brake warning lamp

A warning lamp is fitted on the facia to indicate that the hand brake is either 'ON' or 'OFF'.

For the warning lamp to function correctly it is essential that, when the hand brake is pulled 'ON', the microswitch, which operates the warning lamp, is actuated **before** the hand brake reaches the first notch on the ratchet. The microswitch is located at the forward end of the hand brake ratchet assembly and is actuated by one of the ratchet assembly guide rollers.

1. Set the microswitch so that when the hand brake is in the 'OFF' position there is a nominal gap of 0.025 in (0.06 mm.) between the roller and the switch face (*see Fig. G57*).

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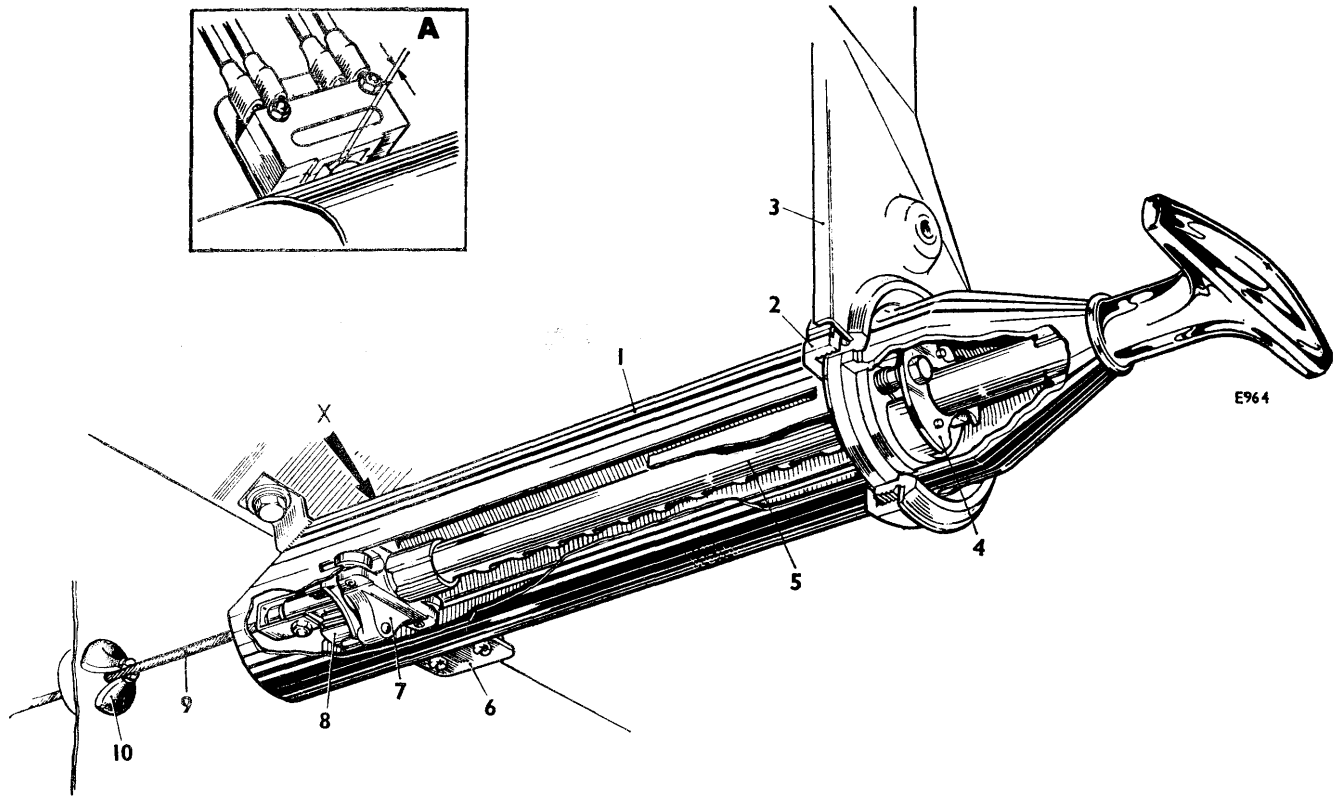


FIG. G57 HAND BRAKE RATCHET ASSEMBLY

- | | |
|-------------------------|---------------------------------|
| 1 Cover tube | 6 Micro-switch mounting bracket |
| 2 Serrated nut | 7 Roller and guide assembly |
| 3 Support bracket | 8 Spring |
| 4 Ratchet pawl assembly | 9 Operating cable |
| 5 Slide rod | 10 Cable seal |

A 0.025 in. (0,6 mm.)

Inset shows view of micro-switch in direction of arrow X.

Hand brake ratchet assembly—To remove

1. Securely chock the road wheels, then release the hand brake to the 'OFF' position.
2. Remove the electrical connections from the microswitch mounted at the lower end of the ratchet cover tube.
3. Release and remove the setscrews securing the upper support bracket to the facia structure.
4. Remove the setscrews securing the lower support bracket.
5. Ease the ratchet assembly downward and remove the hand brake cable from the 'U' piece bolted to the bottom of the operating rod; remove the assembly.

Hand brake ratchet assembly—To dismantle

It is unlikely that the hand brake ratchet mechanism should ever require attention other than occasional

lubrication. If, however, it should require attention, it should be removed from the car as previously described and dismantled as follows.

1. Remove the 'U' sectioned cable retainer from the lower end of the operating rod.
2. Remove the cheese headed screw from the upper end of the cover tube.
3. Unscrew the large locking nut from behind the upper support bracket.
4. Remove the cover tube and nut from the assembly.

Note The roller assembly must be extracted from the cover tube by pulling the assembly to the top of the tube then tipping the tube and carefully manipulating first one and then the other roller out of the slots.

5. Remove the shaft from the upper housing and separate the housing and ratchet components.

6. All assemblies and components should be inspected for signs of wear or damage, paying particular attention to the bushes, ratchet assembly and springs; new parts should be fitted where necessary.

Hand brake ratchet assembly— To assemble

To assemble the ratchet assembly reverse the procedure given for its dismantling, noting the following points.

1. The hand brake ratchet mechanism is 'handed'; a right-hand drive car hand brake lever is turned clockwise from the horizontal position to release it and conversely a left-hand drive car hand brake lever is turned anti-clockwise to release it.

2. The lever is spring-loaded by a coiled spring fitted beneath the roller assembly and located on a pin. This keeps the lever horizontal and the ratchet engaged.

3. The position of the stop plate beneath the coil spring determines whether the hand brake is left or right-handed and therefore care must be taken when assembling the roller assembly, stop plate and spring, to ensure that the hand brake lever is spring-loaded against the direction in which it rotates (see Fig. G58).

4. Care must also be taken when entering the roller and control rod into the cover tube; careful manipulation is necessary and the tube should be tipped at an angle to the control rod, as is the case when removing the roller assembly.

Hand brake ratchet assembly—To fit

To fit the hand brake ratchet assembly reverse the procedure given for its removal, noting the following points.

1. All setscrews should be torque tightened to standard figures (see Chapter P).

2. Care should be taken to ensure that the hand brake cable end is located correctly.

3. Before fitting the rubber boot, remove any existing grease from the rubber boot and ratchet mechanism, then fill the rubber boot with Castrol grease H. 140/59 (colour brown) allowing sufficient air space inside the boot for the adjusting wheel.

Hand brake cables—To renew

Early cars, built prior to car serial number 3264

If a car included in the above group is brought in for service with reported difficult hand brake application (heavy handle load) on complaint from the customer, a new set of low-friction cables, new centre operating lever (if not already fitted) and new hand brake pads may be fitted from the available kits.

The kits available are coded as follows.

Kit 6c Right-hand drive cars	} car serial numbers 1001 to 2138
Kit 6d Left-hand drive cars	
Kit 6a Right-hand drive cars	} car serial numbers 2138 to 3264 inclusive
Kit 6b Left-hand drive cars	

The latter kits comprise a set of cables and new hand brake pads only.

Note The hand brake cable arrangement for left-hand drive cars is symmetrically opposite to that of right-hand drive cars (see Figs. G61 and G62).

Front cable—To remove

1. Disconnect the battery.
2. **On right-hand drive cars only**, remove the electrical relays box (refer to Chapter M). It is not necessary to remove the loom connector plugs from the printed circuit.

3. Remove the hand brake ratchet assembly as described earlier under 'Hand brake ratchet assembly—To remove'.

4. Detach the forward end of the cable from the hand brake ratchet connector.

Remove the seal from the toeboard through which the cable passes, as follows.

5. Remove the circlip retaining the seal in position on the outer side of the toeboard and the two set-screws which secure the seal housing to the engine side of the toeboard.

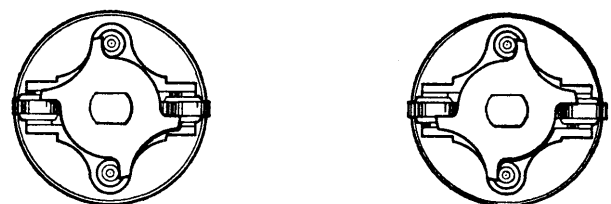
6. Remove and dismantle the two hand brake cable pulleys.

7. Remove the cable securing clips and disconnect the rear of the cable from the centre operating lever. Remove the front cable from the car.

Centre operating lever—To remove

The following operations apply only to cars which may require the later type cranked centre operating centre lever fitted, i.e. cars built prior to serial number 2138.

1. Disconnect the pair of rear cables at the equalising linkage on the centre operating lever assembly.



A

B

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FIG. G58 HAND BRAKE STOP PLATE IN POSITION
A Right-hand assembly B Left-hand assembly

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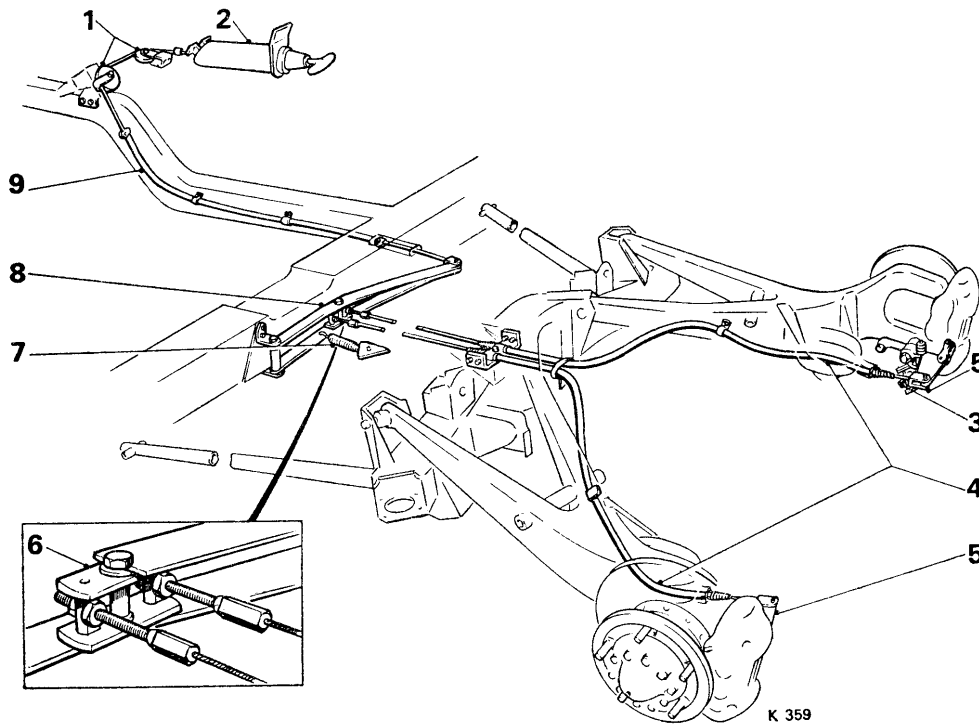


FIG. G59 HAND BRAKE LINKAGE—EARLY R.H.D. CARS

- | | | |
|---------------------------|--|--------------------------|
| 1 Cable pulleys | 4 Hand brake rear cables | 7 Return spring |
| 2 Hand brake | 5 Hand brake operating mechanism | 8 Operating lever |
| 3 Hand brake pad adjuster | 6 Inset—cables equalising linkage length adjusters and cable | 9 Hand brake front cable |

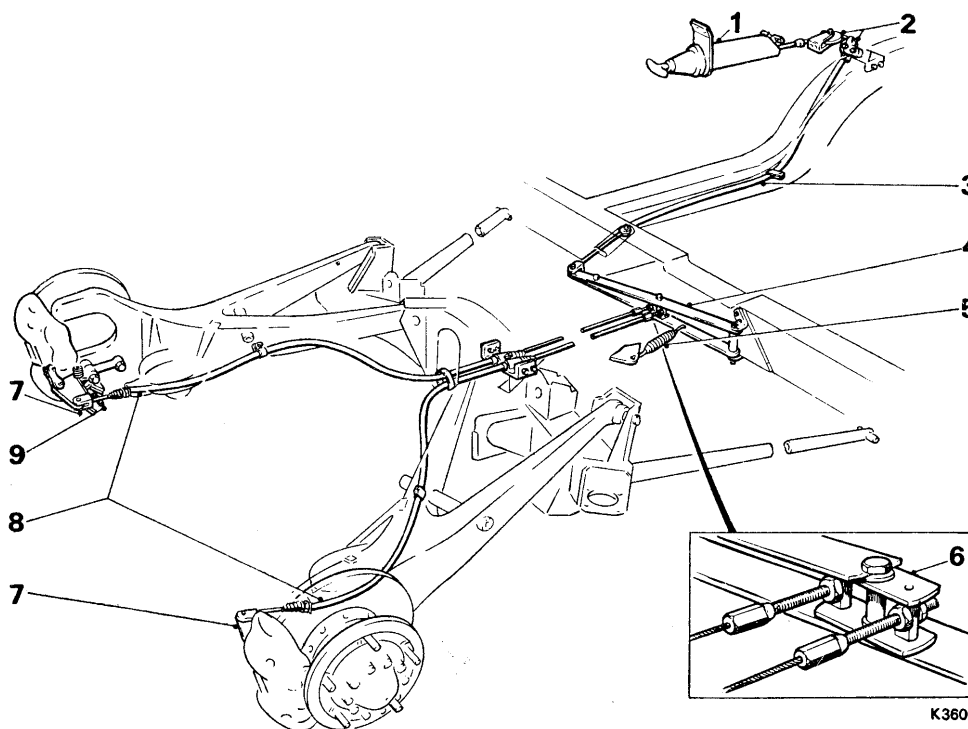


FIG. G60 HAND BRAKE LINKAGE—EARLY L.H.D. CARS

- | | | |
|--------------------------|--|----------------------------------|
| 1 Hand brake | 4 Operating lever | 7 Hand brake operating mechanism |
| 2 Cable pulleys | 5 Return spring | 8 Hand brake rear cables |
| 3 Hand brake front cable | 6 Inset—cables equalising linkage and cable length adjusters | 9 Hand brake pad adjuster |

2. Unscrew the nuts, bolts and setscrews and remove the old centre lever from the car; retain the following items from the old lever.

The nut and bolt which clamps the outer end of the levers, the clevis pin, the return spring and the support bracket bolt (see Fig. G64, inset CC).

Rear cables—To remove

1. Jack-up the rear of the car and remove the road wheels. Support the trailing arms, **do not allow the suspension rebound straps to take the full weight of the rear suspension.**

2. If not previously carried out, disconnect the front end of the rear cables from the centre operating lever at the equaliser.

3. Disconnect the rear end of each cable from the hand brake caliper mechanism.

4. Remove the clips which secure each cable along its run between the centre operating lever and hand brake caliper.

Front cable—To fit

1. Using a 0.375 in. (9.53 mm.) diameter drill, increase the bore diameter of the abutment brackets such that the end fittings of the new cables will fit the brackets.

2. Fit the abutment brackets to each end of the new cable, pass the cable end through the tube in the body underframe cross-member.

3. Tighten the abutment brackets to the cables such that the bolts are nearest to the outside of the car.

4. Temporarily clip the cable into its approximate position and connect it to the centre operating lever.

5. Clean, then lubricate the two pulleys in the following manner. Apply Molytone 265 grease to the pulley centre pivots and Midland Silicones MS 44 grease to the pulley grooves over which the cable passes. Use of any other grease on the pulley groove will have a harmful effect on the inner cable low-friction coating.

6. Check the hand brake ratchet assembly for freedom of movement, then proceed to complete the fitting of the cable, pulleys, hand brake ratchet assembly and toeboard seal by reversing the operations given for their removal.

7. Fit the relay box (if previously removed), reversing the procedure adopted for its removal.

8. Connect the rear end of the front cable to the centre operating lever.

Note This operation is to be carried out after the following Operations 1 to 4 if a new lever is to be fitted.

Centre operating lever—To fit

Refer to introductory note under 'Centre operating lever—To remove'.

1. Assemble and fit the new operating lever to the car as shown in *Figure G64 and inset BB*, utilising the parts retained from the old lever. Ensure that during assembly all pivot points are lubricated with Molytone 265 grease. Also ensure that underseal is removed where necessary from the areas on the member which will accommodate the new lever.

2. Fit the return spring anchor plate to the new position (see Fig. G64, inset AA).

3. Connect the spring to the anchor plate and centre lever.

4. Renew the underseal where necessary on completion of the fitting.

Rear cables—To fit

1. Prior to fitting the new cables, fit the new hand brake pads as described under 'Hand brake pads—To renew'.

2. Fit the new rear cables, reversing the procedure adopted for their removal, noting the following points. Clean and lubricate the hand brake caliper mechanism. Take care not to introduce any sharp bends or twists along their route.

3. Adjust the hand brake cables, referring to 'Hand brake cables—To adjust' for the procedure to adopt.

4. Fit the road wheels, remove the supports from beneath the trailing arms, lower the car and remove the jack.

Note The new hand brake pads require bedding-in. Refer to 'Hand brake pads—To bed-in'.

Hand brake cables—Later cars—To renew

Should the need arise to renew hand brake cables of later cars, those from serial number 3264 onwards, the procedure to adopt is almost identical to that described for early cars, except for the following points.

1. These cars are already fitted with the longer cranked centre operating lever, therefore the information contained earlier for lever replacement does not apply.

2. There are four pulleys to consider when renewing the front cable (see Figs. G61 and G62).

3. On the cars in the above group, the rear cable run and position of the centre operating lever is identical for left-hand and right-hand drive cars.

Hand brake cables—To adjust

The hand brake automatically adjusts itself as wear to the pads takes place (refer to 'Hand brake pads—

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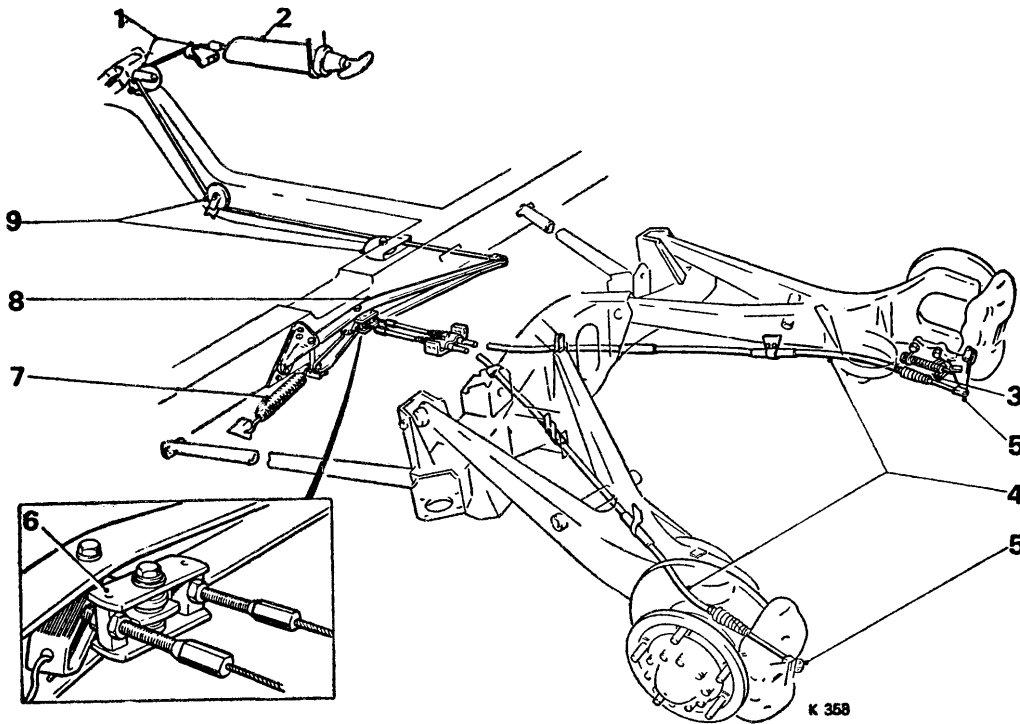


FIG. G61 HAND BRAKE LINKAGE—LATE R.H.D. CARS

- | | | |
|---------------------------|--|-----------------------|
| 1 Cable upper pulleys | 5 Hand brake operating mechanism | 7 Return spring |
| 2 Hand brake | 6 Inset—cables equalising linkage and cable length adjusters | 8 Operating lever |
| 3 Hand brake pad adjuster | | 9 Cable lower pulleys |
| 4 Hand brake rear cables | | |

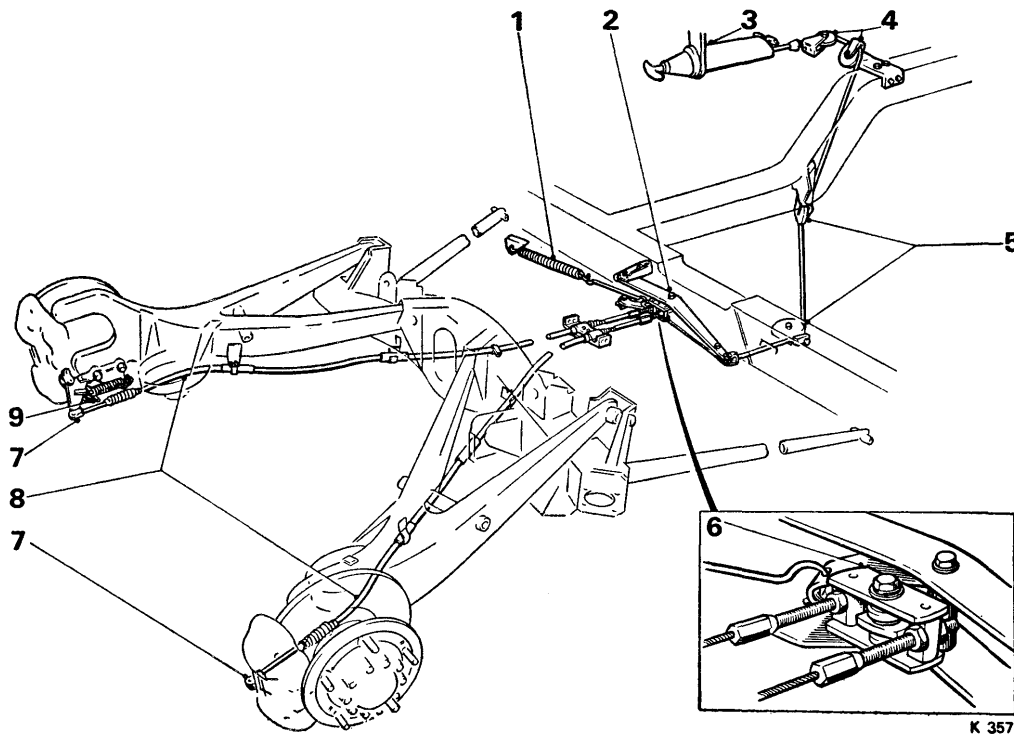


FIG. G62 HAND BRAKE LINKAGE—LATE L.H.D. CARS

- | | |
|-----------------------|--|
| 1 Return spring | 6 Inset—cables equalising linkage and cable length adjusters |
| 2 Operating linkage | 7 Hand brake operating mechanism |
| 3 Hand brake | 8 Hand brake rear cables |
| 4 Cable upper pulleys | 9 Hand brake pad adjuster |
| 5 Cable lower pulleys | |

To set'), and the only other adjustment which may be necessary to the linkage is at the small equaliser lever.

Do not adjust the slack in the rear hand brake cables indiscriminately. When this operation is performed the cables must not be adjusted too tightly.

The procedure is as follows.

1. Hold fully back **both** triangular shaped levers between the ends of the rear cables and the connecting links on the calipers so that the operating levers on the calipers are fully back against their abutments.

If this is not carried out the automatic adjuster on the hand brake will not be able to operate correctly.

2. Ensure that the equaliser of the operating rod lever lies at right angles to the car longitudinal centre line.

3. Take up any excessive slackness in the cables, using the adjusting nuts and lock-nuts provided on the ends of the two rear cables (see Figs. G59 to G62 inclusive).

Hand brake pads—To renew

The hand brake pads should be inspected at the recommended intervals. The pads must be renewed when the friction material has worn to within $\frac{1}{8}$ in. (3.18 mm.) from the back plates.

To renew the hand brake pads proceed as follows.

1. Securely chock the front wheels; release the hand brake to the 'OFF' position.

2. Jack up the rear of the car and place stands under the rear trailing arms. **Do not allow the suspension rebound straps to take the full suspension load.**

3. Remove the rear wheel discs and the rear wheels.

4. Lever the spring steel adjusting prong away from the rubber boot which covers the ratchet wheel; remove the rubber boot (see Fig. G63).

5. With the adjusting prong still held clear, remove the ratchet wheel by unscrewing it anti-clockwise.

6. Move the hand brake operating levers away from the disc, giving access to the pads. Each hand brake pad is retained against its abutment face by a coil spring, one of which is larger and thicker than the other (see Fig. G63).

7. Unhook the coil springs from the operating levers and remove the pads and springs.

8. Fit the spring to the new pads, then fit the pads in position and hook the spring ends over the operating levers.

9. Push both operating levers in towards the disc, then, holding the adjusting prong clear, screw the ratchet wheel onto the reaction rod.

Hand brake pads—To set

1. Screw the ratchet inward until the gap between each pad and the brake disc is 0.003 in. to 0.005 in. then unscrew the ratchet by an amount equivalent to 3 or 4 teeth on the ratchet wheel.

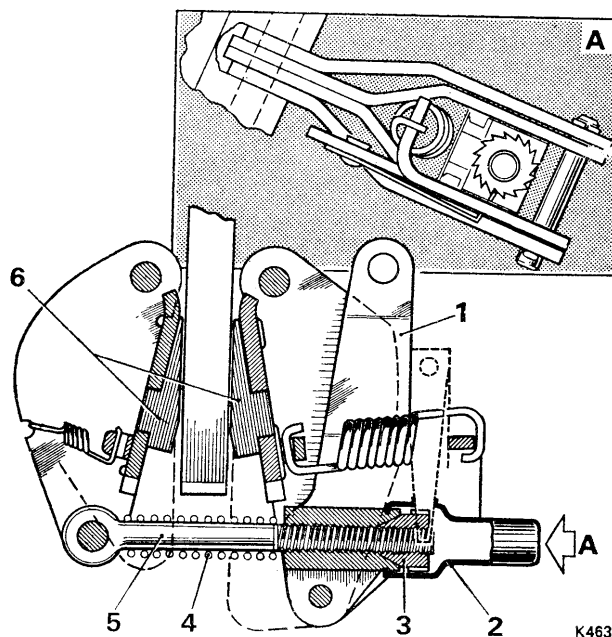


FIG. G63 HAND BRAKE PAD MECHANISM

- 1 Operating lever
- 2 Adjusting ratchet seal
- 3 Ratchet nut
- 4 Reaction rod spring
- 5 Reaction rod
- 6 Hand brake pads and back plates

Inset—View on arrow A, rubber boot removed.

2. When this setting has been obtained, fit the rubber boot over the ratchet wheel and release the adjusting prong, ensuring that the end locates securely in the slot in the rubber boot.

Note The ratchet will automatically adjust the hand brake, as and when necessary, after this initial setting has been carried out, but it is recommended that a check be made of the gap setting at the specified service interval (refer to Chapter D).

Hand brake pads—To bed-in

1. Run the car on the road at approximately 30 m.p.h. (50 k.p.h.) and apply the hand brake firmly for two or three seconds. Release the hand brake.

2. Continue running the car at the above speed and repeat the operation six times, allowing a one-minute interval between each application.

3. On completion and when the brake discs and pads have cooled, manually adjust the hand brake pads to give the required gap setting.

Chapter G

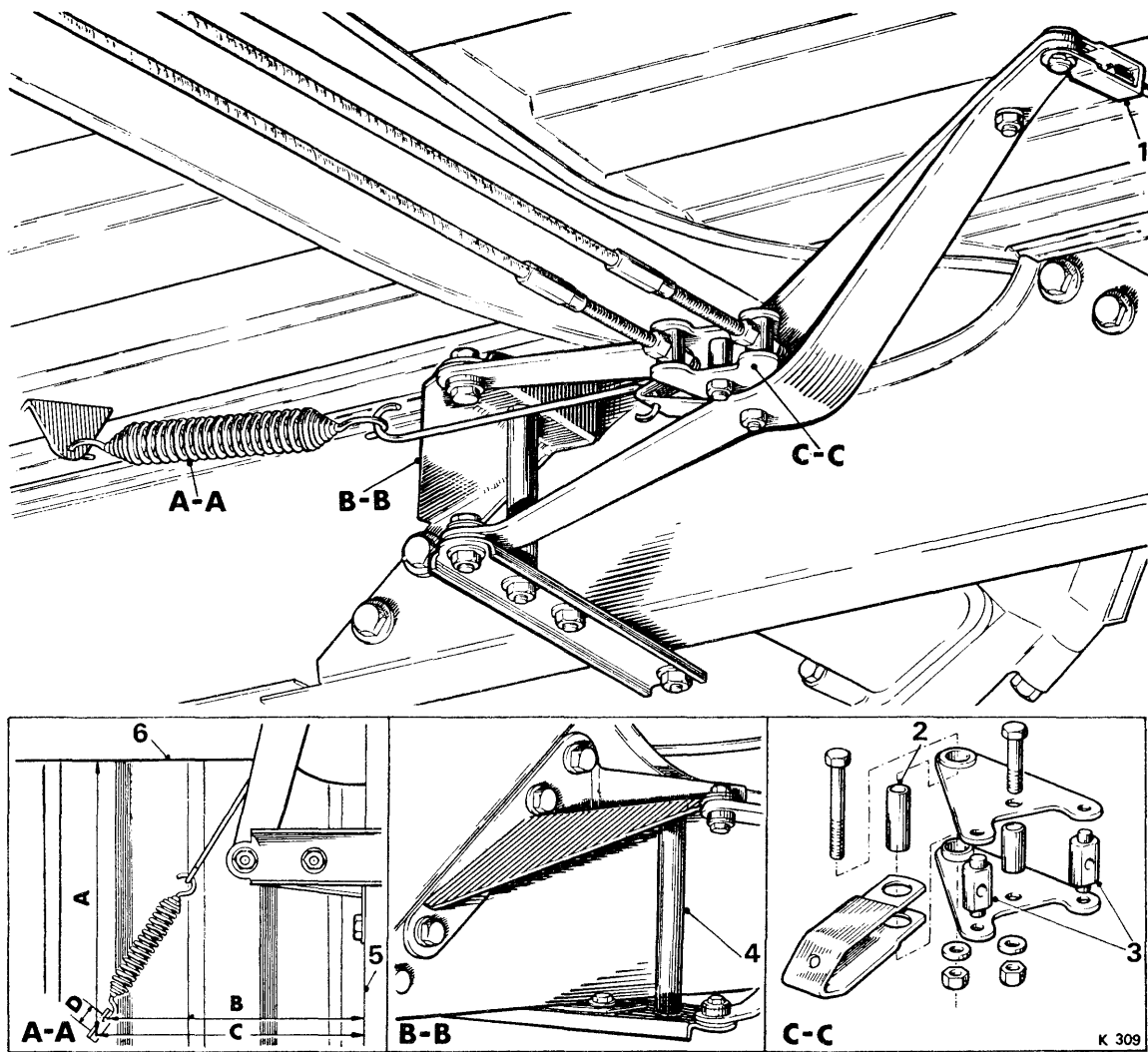


FIG. G64 HAND BRAKE CABLE CONVERSION (EARLY CARS)

1 Front cable connection jaw

3 Trunnions

5 Cross-member

2 Distance piece

4 Original bolt

6 Propeller shaft tunnel edge

A 12·175 in. (30,93 cm.)

B 8·250 in. (20,96 cm.)

C 9·00 in (22,86 cm.)

D 1·40 in. (3,56 cm.)

A-A Inset—Return spring anchorage point positioning

B-B Inset—View of upper and lower pivot bracket

C-C Inset—Exploded view—Equaliser assembly

Section G17

FAULT DIAGNOSIS

Introduction

A number of differing faults, each of which is difficult to diagnose, can cause the 'BRAKE' warning lamps on the instrument panel to illuminate.

To assist in the diagnosis, a systematic check sequence chart has been introduced for the hydraulic circuit associated with each lamp.

The charts are headed 'BRAKE HYDRAULIC CIRCUIT—LEFT-HAND WARNING LAMP' and

'BRAKE AND HEIGHT CONTROL HYDRAULIC CIRCUITS—RIGHT-HAND WARNING LAMP' respectively.

The charts are self-explanatory in nature and consist of main steps situated in the centre of each chart with any additional information shown to the sides.

The checks noted on the charts should be undertaken on every occasion that a hydraulic system fault is encountered.

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**Systematic check sequence chart—
Brake hydraulic circuit**

SYSTEMATIC CHECK SEQUENCE CHART BRAKE HYDRAULIC CIRCUIT

LEFT-HAND WARNING LAMP ILLUMINATED (INTERMITTENTLY OR CONTINUOUSLY)

BEFORE CARRYING OUT THIS SYSTEMATIC CHECK, THE RESERVOIR FLUID LEVEL SHOULD BE CHECKED AND TOPPED-UP IF NECESSARY. THE CAR SHOULD ALSO BE CHECKED UNDERNEATH FOR ANY SIGNS OF LEAKAGE FROM HOSES OR HYDRAULIC UNITS, ETC. IF NO LEAKS ARE APPARENT FROM THIS BRIEF VISUAL CHECK CARRY OUT THE FOLLOWING PROCEDURE.

STEP 1

DE-PRESSURISE THE SYSTEM AND INSERT A PRESSURE CHECKING GAUGE INTO THE FRONT ACCUMULATOR BLEED VALVE TAPPING.

DE-PRESSURISING THE SYSTEM NORMALLY REQUIRES BETWEEN 40 AND 60 PUMPS OF THE BRAKE PEDAL.

STEP 2

START THE ENGINE AND ALLOW IT TO IDLE AT APPROXIMATELY 1000 r.p.m. CAREFULLY OBSERVE THE BEHAVIOUR OF THE GAUGE.

THE CORRECT BEHAVIOUR OF THE GAUGE IS AS FOLLOWS:

THE PRESSURE GAUGE NEEDLE SHOULD BOUNCE BETWEEN 900 lb/sq.in. AND 1000 lb/sq.in. (63.25 kg/sq.cm. AND 70.31 kg/sq.cm.) EITHER IMMEDIATELY, OR AFTER TWO OR THREE FLICKS.

THE PRESSURE RECORDED AT THIS POINT INDICATES THE NITROGEN PRESSURE IN THE ACCUMULATOR SPHERE.

THE NEEDLE SHOULD THEN RISE STEADILY, PULSING AT CAMSHAFT SPEED, TO BETWEEN 2200 lb/sq.in. AND 2500 lb/sq.in. (154.7 kg/sq.cm. AND 175.8 kg/sq.cm.). THE NEEDLE WILL THEN DROP TO BETWEEN 1800 lb/sq.in. AND 2000 lb/sq.in. (126.6 kg/sq.cm. AND 140.6 kg/sq.cm.) AND THEN REMAIN STEADY.

THIS INDICATES THE NORMAL BUILD UP AND CORRECT CUT-OFF POINT OF THE ACCUMULATOR VALVE AND INDICATES THAT THE SYSTEM IS FUNCTIONING CORRECTLY.

SYMPTOM 2(1)

THE PRESSURE GAUGE NEEDLE RISES SLOWLY FROM ZERO, OR BOUNCES UP TO AN INITIAL PRESSURE OF LESS THAN 900 lb/sq.in. (63.25 kg/sq.cm.).

CHARGE THE ACCUMULATOR SPHERE WITH NITROGEN TO THE CORRECT PRESSURE OF BETWEEN 900 lb/sq.in. AND 1000 lb/sq.in. (63.25 kg/sq.cm. AND 70.31 kg/sq.cm.). BEFORE REFITTING THE CHARGING CAP ENSURE THAT THE SEALING RING AND NYLON BALL (IF FITTED) IS INTACT AND NOT DAMAGED IN ANY WAY.

AS DESCRIBED OPPOSITE, THE FIGURE TO WHICH THE GAUGE NEEDLE BOUNCES UP TO INITIALLY, INDICATES THE NITROGEN PRESSURE IN THE ACCUMULATOR SPHERE. IF THE PRESSURE RISES SLOWLY FROM ZERO, PULSING AT ENGINE CAMSHAFT SPEED, IT INDICATES THAT THERE IS NO NITROGEN PRESSURE IN THE ACCUMULATOR SPHERE AT ALL AND USUALLY CAUSES THE LAMP TO BE ILLUMINATED AFTER ONLY A FEW PUMPS OF THE BRAKE PEDAL (BETWEEN 2 AND 5 PUMPS). IF THE NEEDLE BOUNCES UP TO A PRESSURE OF BETWEEN 900 lb/sq.in. AND 1000 lb/sq.in. (63.25 kg/sq.cm. AND 70.31 kg/sq.cm.) THIS MEANS THAT THE NITROGEN PRESSURE IS CORRECT.

SYMPTOM 2(2)

THE LAMP REMAINS ON OR GOES OUT BUT THE PRESSURE DOES NOT BUILD UP CORRECTLY.

SYMPTOM 2(3)

THE WARNING LAMP REMAINS ON AND HYDRAULIC PRESSURE BUILDS UP NORMALLY. THIS SHOWS THAT THE HYDRAULIC SYSTEM IS OPERATING CORRECTLY AND THAT THE FAULT IS IN THE WARNING LAMP CIRCUIT.

CHECK THE WARNING LAMP SWITCH AND ITS ELECTRICAL CIRCUIT

STEP 3

DE-PRESSURISE THE SYSTEMS, REMOVE THE PRESSURE GAUGE FROM THE BLEED VALVE HOLE AND INSERT IT IN THE MAIN OUTLET FROM THE ACCUMULATOR AFTER FIRST REMOVING THE FLEXIBLE HOSE. REFIT THE BLEED VALVE. START THE ENGINE AND OBSERVE THE PRESSURE GAUGE BEHAVIOUR.

THIS ACTION SEPARATES THE ACCUMULATOR FROM THE REST OF THE SYSTEM AND ALLOWS THE ACCUMULATOR AND HYDRAULIC PUMP ON THE ENGINE TO BE CHECKED THOROUGHLY. IF THE PRESSURE IS CORRECT AFTER THIS CHECK, IT MEANS THAT THE FAULT IS NOT IN THE ACCUMULATOR BUT ELSEWHERE IN THE HYDRAULIC SYSTEM.

SYMPTOM 3(1)

PRESSURE DOES NOT BUILD UP AT ALL.

STOP THE ENGINE. CONNECT A BLEED TUBE TO THE BLEED VALVE ON THE ACCUMULATOR, OPEN THE BLEED VALVE, RUN THE ENGINE TO SEE IF FLUID FLOWS OUT. IF FLUID FLOWS OUT, CLOSE THE BLEED VALVE AND CHECK AGAIN. IF PRESSURE STILL DOES NOT BUILD UP, THE HYDRAULIC PUMP IS FAULTY AND MAY REQUIRE OVERHAULING. IF FLUID DOES NOT FLOW OUT, CHECK THAT THE HYDRAULIC PUMP IS NOT AIR LOCKED.

THIS MEANS THAT THE HYDRAULIC PUMP IS NOT FUNCTIONING CORRECTLY BECAUSE EITHER THE PUMP IS AIR LOCKED OR BECAUSE THERE IS DIRT UNDER THE PUMP MAIN DELIVERY VALVE SEAT.

SYMPTOM 3(2)

PRESSURE NOW BUILDS UP NORMALLY AND CUTS OFF AT THE CORRECT PRESSURE.

STEP 4

DE-PRESSURISE THE SYSTEM AND REFIT THE PRESSURE GAUGE INTO THE BLEED VALVE TAPPING. RECONNECT THE FLEXIBLE HOSE AND CONFIRM THAT THE FAULT EXISTS AS AT STEP 2.

SYMPTOM 3(3)

PRESSURE BUILDS UP TO BETWEEN 300 lb/sq.in. AND 1200 lb/sq.in. (21.1 kg/sq.cm. AND 84.4 kg/sq.cm.) BUT WILL NOT INCREASE FURTHER.

STOP THE ENGINE AND REMOVE THE RETURN PIPE FROM BETWEEN THE ACCUMULATOR AND RESERVOIR. BLANK OFF THE HOSE TO STOP THE RESERVOIR FROM DRAINING. CONNECT THE BLEED PIPE TO THE RETURN OUTLET PIPE. RUN THE ENGINE AND CHECK TO SEE IF FLUID RUNS OUT OF THE RETURN PIPE. IF FLUID RUNS OUT OF THE RETURN PIPE BEFORE PRESSURE HAS BUILT UP TO BETWEEN 2200 lb/sq.in. AND 2500 lb/sq.in. (154.7 kg/sq.cm. AND 175.8 kg/sq.cm.), THEN THE MAIN CHARGING VALVE IS BEING HELD OFF ITS SEAT BY DIRT.

THIS CHECK REVEALS THAT THE MAIN CHARGING VALVE IS FAULTY OR THAT AN INTERNAL LEAK IS PRESENT. TO CORRECT THIS FAULT THE ACCUMULATOR VALVE SHOULD BE REMOVED FROM THE ENGINE AND STRIPPED AND CLEANED AS DESCRIBED IN SECTION G6—THE HYDRAULIC ACCUMULATORS.

STEP 5

IN THE MAJORITY OF CASES THE ACTIONS NOTED ABOVE WILL RECTIFY THE FAULT IN THE HYDRAULIC POWER SYSTEMS. IF, HOWEVER, A FAULT STILL EXISTS IN THE BRAKE SYSTEM A CHECK SHOULD BE MADE FOR MAJOR FLUID LEAKS, PAD AND DISC CONDITIONS OR FOR AIR IN THE HYDRAULIC SYSTEM.

IF FLUID DOES NOT RUN OUT OF THE RETURN PIPE AND PRESSURE DOES NOT BUILD UP, OVERHAUL THE ACCUMULATOR VALVE.

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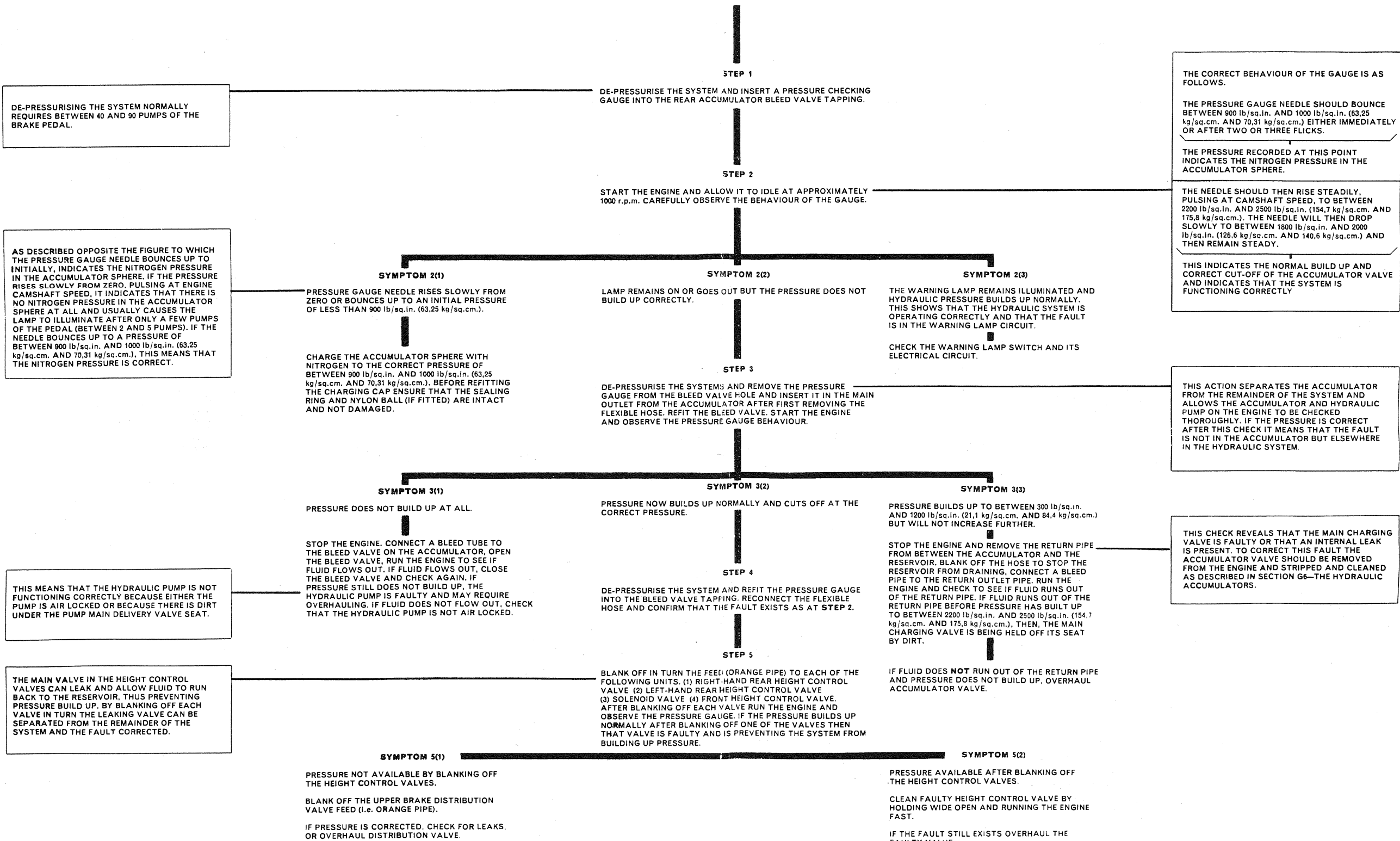
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**Systematic check sequence chart—
Brake and height control hydraulic
circuits**

SYSTEMATIC CHECK SEQUENCE CHART BRAKE AND HEIGHT CONTROL HYDRAULIC CIRCUITS

RIGHT-HAND WARNING LAMP ILLUMINATED (INTERMITTENTLY OR CONTINUOUSLY)

BEFORE CARRYING OUT THIS SYSTEMATIC CHECK, THE RESERVOIR FLUID LEVEL SHOULD BE CHECKED AND TOPPED-UP IF NECESSARY. THE CAR SHOULD ALSO BE CHECKED UNDERNEATH FOR ANY SIGNS OF LEAKAGE FROM HOSES OR HYDRAULIC UNITS, ETC. IF NO LEAKS ARE APPARENT FROM THIS BRIEF VISUAL CHECK, CARRY OUT THE FOLLOWING PROCEDURE.

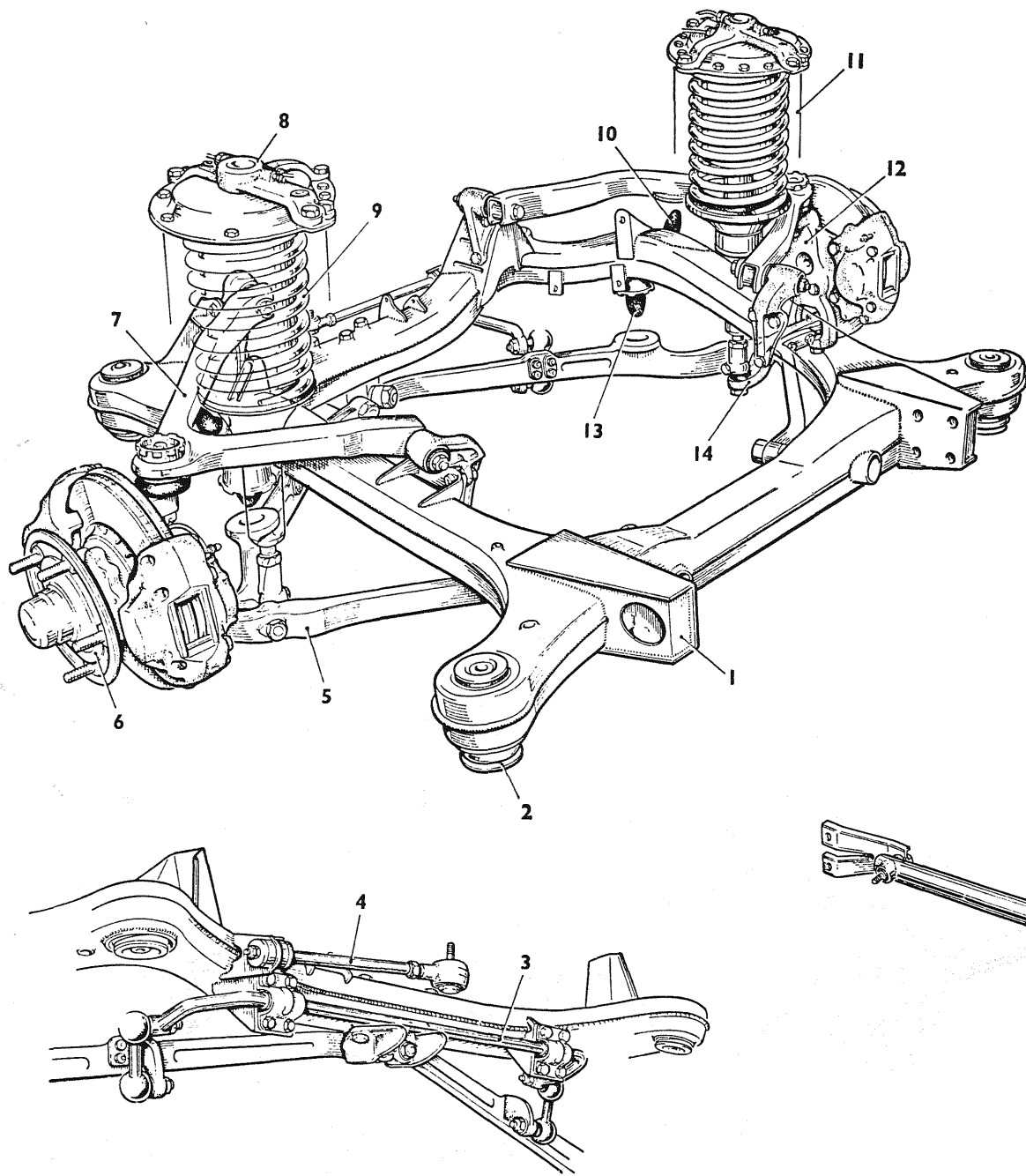


Chapter H

SUB-FRAMES AND SUSPENSION

SECTION	PAGE
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H15 Rear Stabiliser Bar	H47
H16 Accident Damage	H49
H17 Workshop Tools	H55

Fig. H1 Front and rear sub-frame and suspension assemblies



- | | |
|--------------------------------------|---|
| 1 Front sub-frame | 8 Front height control ram |
| 2 Resilient metal (Vibrashock) mount | 9 Front coil spring and damper assembly |
| 3 Front stabiliser (anti-roll) bar | 10 Rebound stop |
| 4 Lateral location (Panhard) rod | 11 Spring pot |
| 5 Lower triangle levers | 12 Yoke/stub axle |
| 6 Front hub units | 13 Bump stop |
| 7 Upper triangle levers | 14 Suspension lower ball joint housing |

- | | |
|--|---|
| 15 Horizontal compliance cushions | 23 Rear height control ram |
| 16 Rear suspension cross-member | 24 Final drive unit and half-shafts |
| 17 Horizontal compliance damper (hydraulic) | 25 Final drive cross-member with rubber bonded metal mounts |
| 18 Suspension cross-member link (radius rod) | 26 Rear hub unit |
| 19 Rebound strap | 27 Trailing arm |
| 20 Bump stop | 28 Resilient metal mounts - rear suspension cross-member |
| 21 Rear coil spring and damper assembly | 29 Torque reaction arm |
| 22 Spring pot | |

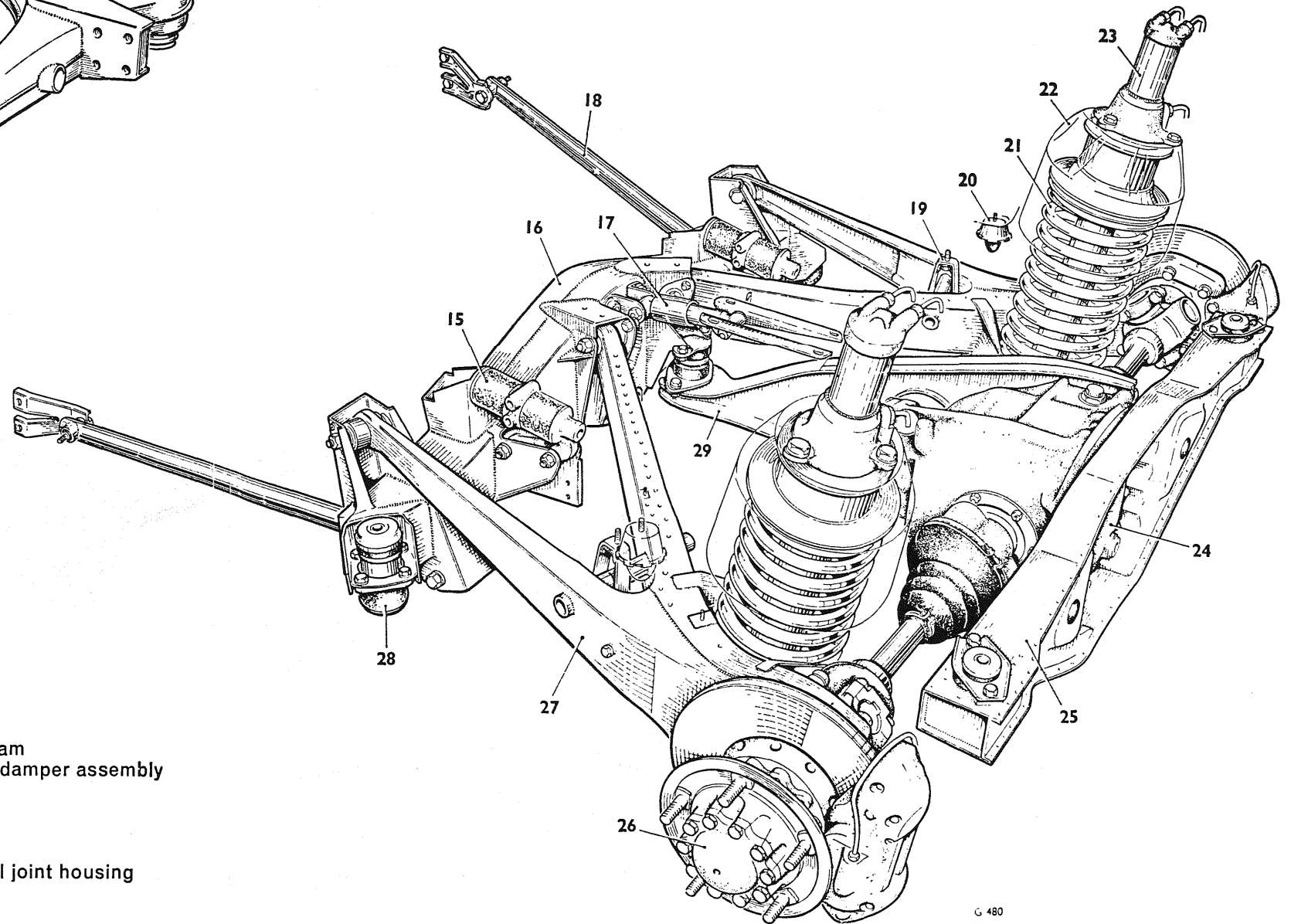


FIG. H1 FRONT AND REAR SUB-FRAME AND SUSPENSION ASSEMBLIES

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SUB-FRAMES AND SUSPENSION

Section H1

SUB-FRAMES AND SUSPENSION

Front sub-frame, engine and transmission— To remove as a unit

1. Disconnect the battery.
2. Remove the bonnet as described in Chapter S – Body.
3. De-pressurise the hydraulic system (*see Chapter G – Hydraulic System*).

4. On cars fitted with refrigeration, release the pressure from the system and disconnect the pipes from the compressor (*see Chapter C – Air Conditioning*).

5. On all cars drain the cooling system. There are three drain points, one at the base of the radiator bottom tank and one on either side of the crankcase.

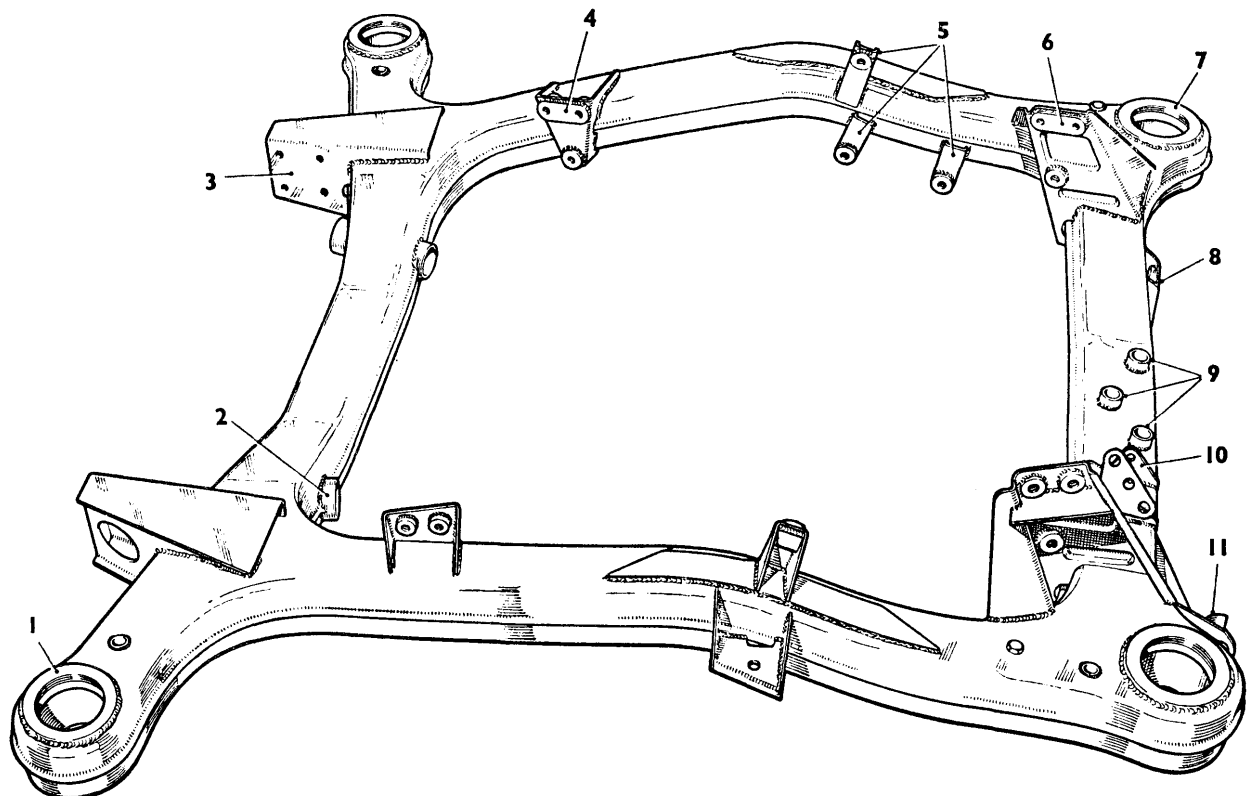
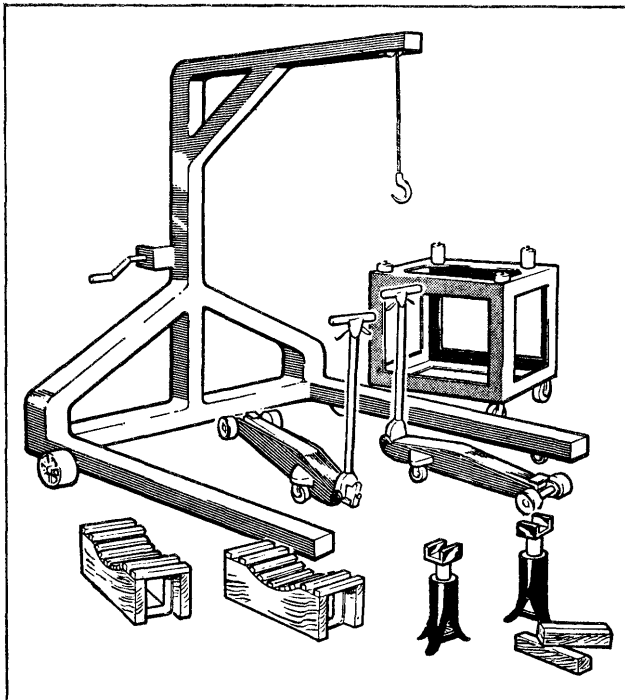


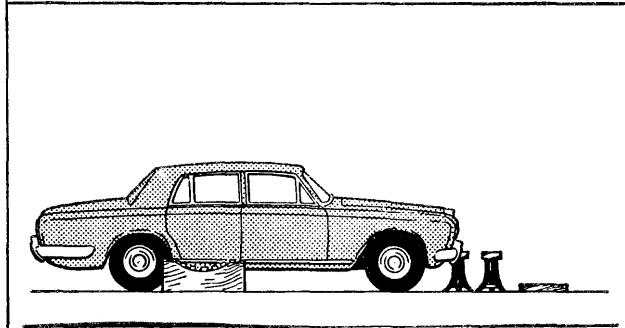
FIG. H2 PICTORIAL VIEW OF FRONT SUB-FRAME

- | | |
|---|---|
| 1 Sub-frame rear mounting points | 7 Sub-frame front mounting points |
| 2 Rear lower triangle levers mounting points | 8 Front stabiliser bar mounting brackets |
| 3 Engine rear mounting brackets | 9 Front lower triangle levers mounting points |
| 4 Upper triangle levers rear mounting brackets | 10 Front height control valve bracket |
| 5 Steering box/idler box mounting brackets | 11 Panhard rod mounting bracket |
| 6 Upper triangle levers front mounting brackets | |

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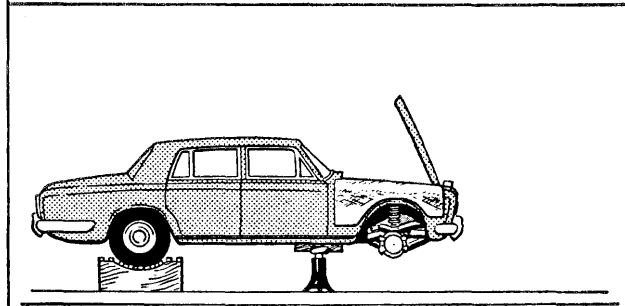


Equipment required—Mobile crane, two hydraulic jacks, two stands, two sill shaped blocks, engine stand and two wooden cradles.



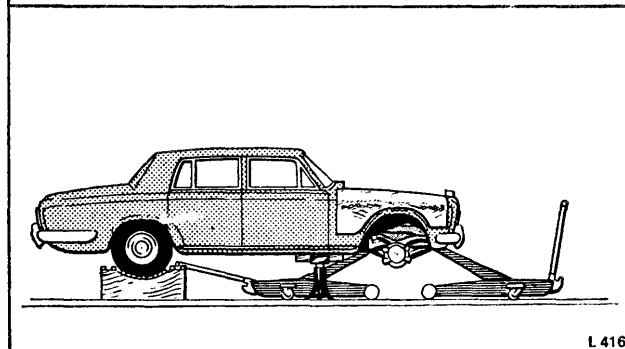
Operations 1 – 10

Disconnect battery, discharge refrigeration and disconnect coolant hoses.



Operations 11 – 14

Place car on wooden cradles and stands.



Operations 32 – 35

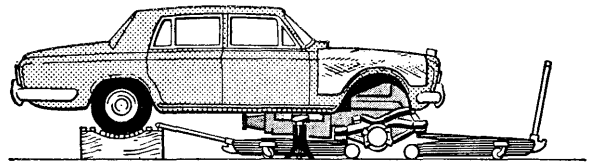
Place hydraulic jacks beneath transmission and lower triangle levers pivot point.

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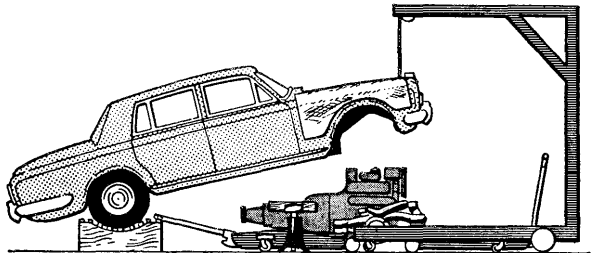
FIG. H3A FRONT SUB-FRAME, ENGINE AND TRANSMISSION REMOVAL

Operations 36 - 37

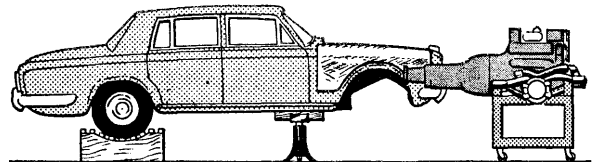
Unscrew and remove sub-frame centre bolts. Check all hoses, etc., are disconnected; then lower jacks simultaneously.

**Operations 38 - 39**

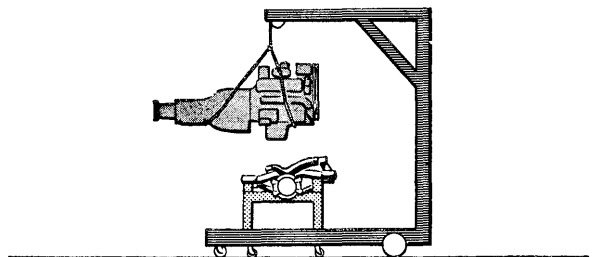
Using crane, lift car body clear of engine, transmission and sub-frame; remove unit from beneath car.

**Operation 40**

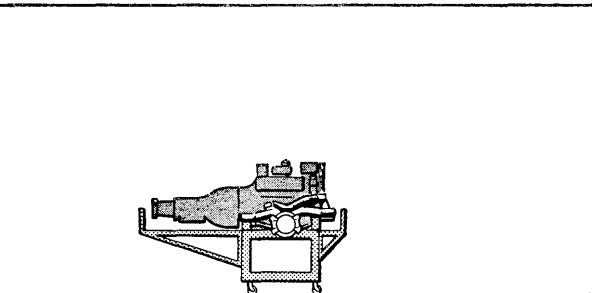
Using crane, lift engine, transmission and sub-frame on to mobile stand.

**Operation 41**

Remove the engine and transmission from sub-frame.

**Operations 4 - 15**

(see *Engine and transmission - To fit to sub-frame.*)



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FIG. H3B FRONT SUB-FRAME, ENGINE AND TRANSMISSION REMOVAL

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6. Remove the air silencer/cleaner hose by releasing the large hose clips at each end and by removing the two setscrews securing the hose bracket to the cylinder head.
7. Blank off the choke butterfly housing and the air silencer/cleaner outlet, to prevent ingress of foreign matter.
8. Disconnect the heater hoses from the cylinder head and remove the hoses from the coolant system.
9. **On cars fitted with torque converter transmission,** disconnect the coolant hose at the outlet connection of the fluid cooler.
10. **On cars fitted with exhaust emission control,** the pipe connecting the air filter of the carburetter weakening device to the 'A' or 'B' bank carburetter float chamber must be disconnected.
11. Using a hydraulic jack, raise the rear of the car sufficiently to place the wooden cradles (see Fig. H3) beneath each rear wheel. Lower and remove the jack.
12. Position the jack head and a piece of hardwood beneath the lower triangle levers pivot point then raise the front of the car.

13. Position a stand fitted with a piece of hardwood (see Fig. H3) beneath the sill just rearward of the front wheel arch.
14. Lower the car onto the stands and remove the jack.
15. **On all cars,** disconnect the exhaust downtake pipes from the manifolds and at the rear of the front silencer box; remove the exhaust.
16. Disconnect the engine electrical system loom at the nine-way socket and plug situated on the right-hand valance plate (see Fig. H5).

Note The importance of cleanliness when working on the hydraulic system cannot be over emphasised.

All connections must be cleaned with **methylated spirit** prior to being disconnected.

All pipes and apertures must be suitably blanked off immediately they are disconnected or exposed.

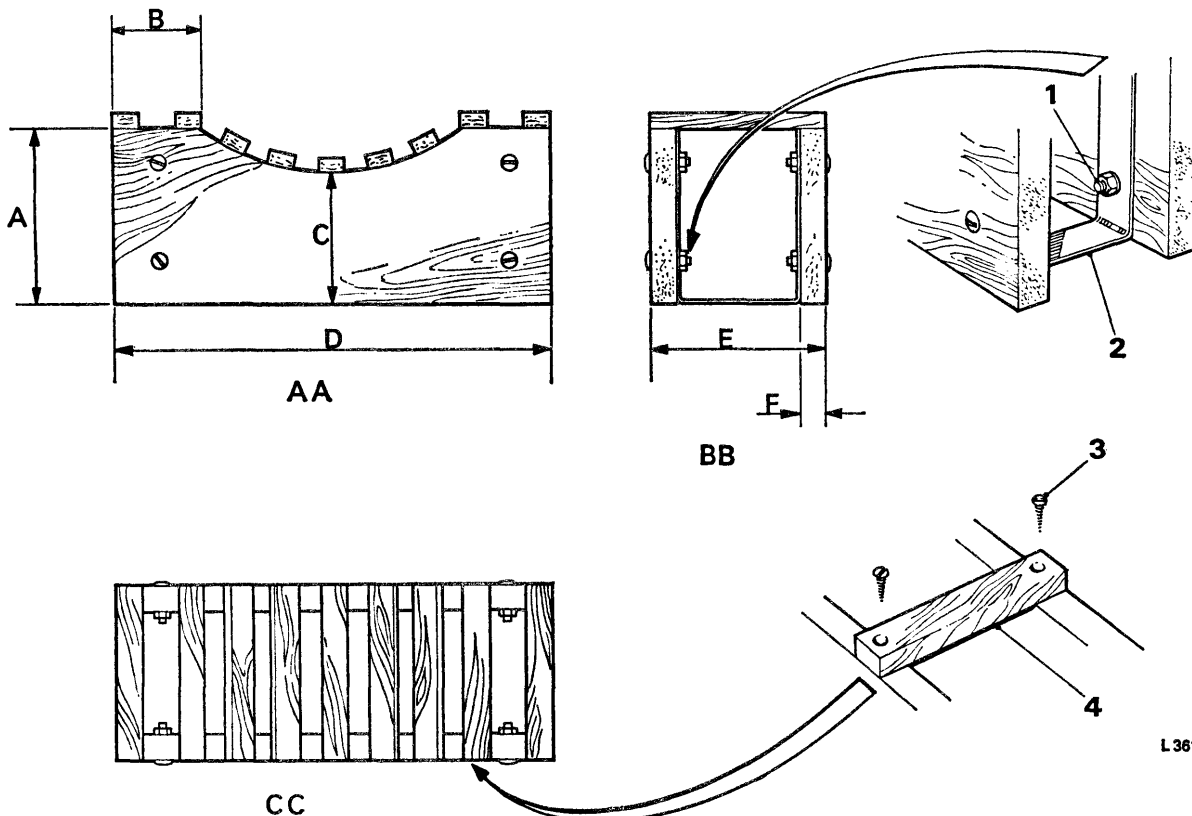


FIG. H4 WOODEN CRADLE DIMENSIONS

A-A Side view	B-B End view	C-C Plan view
A 12 in. (30,48 cm.)	C 9 in. (22,86 cm.)	E 12 in. (30,48 cm.)
B 5 in. (12,70 cm.)	D 36 in. (91,44 cm.)	F 1.50 in. (38,10 mm.)
1 Nut, bolt and washer (8 off)	2 Steel bracing (2 off)	3 Wood screws
4 Cross-piece 12 in. × 1½ in. × 1 in. (30,48 cm. × 38,10 mm. × 25,4 mm.)		

The blanks should be thoroughly cleaned with **methylated spirit** before use and all foreign matter, e.g. grease, oil, paint or grit removed.

The ingress of foreign matter will seriously impair the efficiency of the hydraulic system (see Chapter G – Hydraulic System).

17. Disconnect the pipes between the hydraulic accumulators and the braking and height control systems at the junction on the left-hand body side-member. Blank off the pipes and apertures.

18. Disconnect the hoses between the brake fluid reservoir at the brake pump end of the hose. Immediately blank off the hoses to prevent the hydraulic fluid draining from the reservoir.

19. **On right-hand drive cars**, the two flexible hoses on the right-hand side of the sub-frame for the braking system must be removed.

On left-hand drive cars, these hydraulic pipes are situated on the left-hand side of the sub-frame.

20. **On all cars**, disconnect the low pressure return pipes connecting the accumulators to the hydraulic fluid reservoir. Immediately blank off the pipes and apertures.

21. Disconnect the three flexible hoses on the right-hand side of the front sub-frame cross-member.

22. Disconnect the fuel supply pipes from the fuel pumps, at the point just rearward of the right-hand front wheel arch, then blank off the pipe.

23. Remove the accelerator control rod and tie-bar situated at the rear of 'A' bank cylinder head. The control rod and tie-bar are mounted on the bracket supporting the electrically operated starter switch to the valance.

24. **On cars fitted with the Saginaw steering pump**, disconnect the steering pump fluid cooler pipes; blank off the pipes and apertures.

25. Unscrew and remove the speedometer flexible drive cable from the transmission rear extension.

26. Unscrew and withdraw the multi-pin plug and socket from the transmission gear change actuator motor.

27. Unscrew and remove the nuts and bolts securing the propeller shaft to the transmission output flange; separate the flanges.

28. Unscrew and remove the two nuts and bolts securing the upper part of the steering column to the intermediate link.

29. Release the panhard rod at its inner end by unscrewing the nut from the shouldered bolt; push the rod away from the body bracket.

Note Do not alter the setting of the rod.

30. **On cars between Car Serial Numbers 6000 and 6404**, disconnect the hand brake cable and the hand brake pulleys.

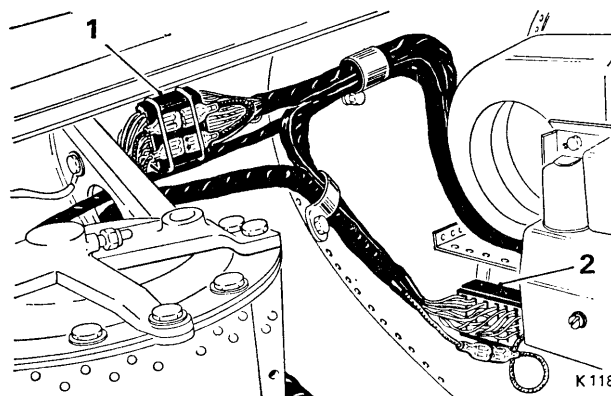


FIG. H5 ENGINE LOOM PLUG AND SOCKET

1 Connector block **2** Connector block

31. Remove the front road springs as described in Section H4 – Front road spring – To remove.

32. Place a hydraulic jack under the lower triangle levers pivot point.

33. Disconnect the battery cable from the starter motor solenoid and from the bracket on the bell housing.

34. Detach the earth strap from the bell housing.

35. Place a second hydraulic jack fitted with a block of hardwood beneath the transmission sump; remove the front wheels.

36. Unscrew and remove the sub-frame centre bolts.

37. Check that all hoses, pipes, etc., are disconnected, then lower **both** hydraulic jacks simultaneously.

38. Using an overhead crane, place a sling through both bonnet hinges and carefully lift the front of the car sufficiently to allow the engine, transmission and sub-frame assembly to be wheeled from beneath the car.

39. Lower the car back onto the stands; remove the slings.

40. Using the overhead crane, lift the engine, transmission and sub-frame onto the special mobile stand (RH 7761).

41. Remove the engine and transmission from the sub-frame as described in 'Engine and transmission – To remove from sub-frame'.

Front sub-frame resilient metal mounts— To fit (with sub-frame, engine and transmission removed)

1. Use the centralising fixture (RH 7846) to centralise each mount in turn, prior to fitting to the sub-frame. This enables the mount centre tube to be

Chapter H

correctly aligned to the corresponding sub-frame mounting point of the body and prevents any side-loading of the mount when the centre bolt is tightened.

2. Fit and torque tighten the new mounts using the special spanner (RH 7774) (*see Chapter P – Torque Tightening Figures*), ensure that the shoulder on the mount abuts the shoulder of the sub-frame mounting points.

Engine and transmission—To remove from sub-frame

The engine and gearbox unit can be removed from the sub-frame by the following procedure.

1. Disconnect the supply hose at the steering box and drain the fluid into a clean container. Slacken or remove the steering pump belts and rotate the pump pulley by hand until all the fluid is pumped out. On completion disconnect the hoses at the steering pump.

2. Place two slings around the engine, one at the front of the crankcase and the other at the rear of the bell housing. Using an overhead pulley, take the weight of the engine and transmission unit with the slings.

3. Remove the bolts and setscrews securing the engine front mounting to the steering box torque arm and the setscrews securing the two rear mountings.

4. Carefully check that nothing impedes the removal of the engine.

5. Lift the engine and transmission out of the sub-frame. If it is found necessary to remove the steering and idler box together with the torque arm as an assembly from the sub-frame, ensure that the positions of the boxes are marked relative to the mounting points on the sub-frame, otherwise vertical adjustment of the boxes will be lost.

Engine and transmission—To fit to sub-frame

1. Fit the pipes to the steering pump, taking care not to over-tighten the pipes at the unions, otherwise damage to the conical seatings may occur, resulting in leakage of fluid.

2. Attach the rear engine mounts and mounting brackets to the engine prior to lowering the engine and transmission into the sub-frame; the bolts should be tightened only when the engine is in position.

3. Remove the cooling fan from the engine.

4. Fit the engine pulleys sighting assembly (RH 7762) to the front of the sub-frame mobile stand.

5. Fit the transmission outlet flange sighting assembly (RH 7763) to the rear of the stand.

6. The front sighting assembly comprises two circular sight pieces, the lower one 6 in. (15,24 cm.) in diameter, aligns with the crankshaft pulley, and the upper one, 1.125 in. (2,85 cm.) in diameter, aligns with the fan extension cone.

7. The rear sighting assembly comprises a circular sight piece 4.625 in. (11,75 cm.) in diameter with a flanged section which fits into the transmission output flange.

8. These two sighting assemblies are used to determine whether the engine and transmission unit are correctly aligned in relation to the front sub-frame and they would show any discrepancy in sub-frame alignment due to accidental damage, etc. When installing the engine in the sub-frame, ensure that any packing piece which may have been removed from beneath the engine mounting foot and stop plate is fitted. For example a 0.125 in. (3,18 mm.) packing piece is fitted if the steering and idler boxes are set below the middle range of adjustment. A packing piece is not necessary if the boxes are set above the mid-position.

9. The engine mounting stop plate should be set to a 0.050 in. (1,270 mm.) gap.

10. Before fitting the sub-frame, engine and transmission assembly to the body and prior to centralising and fitting the mounts, fit four alignment fixtures (RH 7844) to the sub-frame mounting points. The fixtures have holes at their centres corresponding in size to those of the body mounting points (bobbins) within the body underframe. The centre pin of the fixtures is used to align the movable bobbins with the sub-frame mounting points. This bobbin movement is only fractional and is restricted by the size of the hole in the body underframe, immediately beneath the bobbin.

11. It should be noted that if the rear suspension cross-member has not been disturbed, parallel and diagonal dimensions (*see Fig. H28*) may be used to align the front sub-frame to the rear, in conjunction with the above setting, but should the rear suspension cross-member have been disturbed or removed for overhaul purposes it will be necessary to centralise, as near as possible, the sub-frame mount bolts and bobbins to the larger holes of the body underframe mentioned previously.

12. On completion, centralise the new mounts, using the fixture (RH 7846), then fit and torque tighten them in position in the sub-frame using the slotted spanner (RH 7774) to between 125 lb.ft. and 150 lb.ft. (17,28 kg.m. and 20,74 kg.m.).

Note When installing the engine in the sub-frame, ensure that any packing pieces are fitted which may have been removed from beneath the engine mounting feet and stop plates.

Front sub-frame, engine and transmission— To fit as a unit

Reverse the procedure given for removal, noting the following points.

1. When fitting the sub-frame to the body sub-frame mounting points, ensure that the main bearing washer for each mount is in position, together with any additional washers it may have been necessary to fit in order to correct individual differences of the body sub-frame mounting points.

Note It is important that the mounts remain centralised, i.e. concentric within themselves, and that any sideways pre-loading is avoided.

2. Prior to fitting the bolt, ensure that the steady brackets of the rear mounts are in position together with the distance piece. The steady brackets at the front and rear sub-frame mounts must first be secured to the body, after which the mount centre bolts can be torque tightened.

3. Fit the panhard rod so that when the end of the rod attached to the sub-frame is fully tightened, it is possible to slide, without effort, the bolt into the other end of the rod through the body holes and rubber bush.

4. Connect the steering column and ensure that the steering wheel is in the straight-ahead position.

5. Connect the gear change motor multi-pin plug and socket.

6. Connect the speedometer cable.

7. Inspect the brake hoses; renew any hoses showing signs of deterioration, then connect the hoses.

8. Fill the transmission with an approved lubricant (see Chapter D – Lubricants and Chapter T – Torque Converter Transmission).

9. Fit all coolant and heater hoses and tighten the worm drive clips.

10. Connect the power steering system fluid cooler pipes.

11. Fill the steering pump reservoir with fluid.

12. Connect the transmission fluid coolant pipe.

13. Fit and secure the exhaust pipes.

14. Connect the electrical connections.

15. Fill the coolant system – (50% anti-freeze and 50% water).

16. Examine all hose joints for leaks.

17. Connect all refrigeration pipes (if refrigeration is fitted).

18. Charge the refrigeration system (if fitted, see Chapter C – Air Conditioning).

19. Bleed the hydraulic systems (see Chapter G – Hydraulic System).

Front sub-frame resilient metal mounts To remove (sub-frame in position)

1. Place the car on a ramp.

2. Apply the hand brake and chock the rear wheels.

3. Remove the gear range selector thermal cut-out (see Chapter M – Electrical System).

4. Raise the bonnet and place protective covers on the wings.

5. Load the wing troughs with ballast, preferably in sandbag form, of no less than 800 lb. (363 kg.) minimum total weight. (The ballast is required to overcome the action of the road springs to expand when a mount centre bolt is removed).

6. Raise the ramp and position a jack, protected with a hardwood block, beneath a point on the sub-frame near to the mount which is to be renewed, i.e. as near as possible to the mount from the position adjacent to the jig location point. The jack will take the weight of the sub-frame assembly and load of the coil road springs.

7. Remove the nuts and bolts together with the washers and distance pieces from the steady bracket mounting points on the body.

8. Remove the centre bolt from the mount, collect the steady bracket and lower distance piece.

9. Using tube spanner (RH 7774) unscrew and remove the mount assembly.

Note On some early cars when removing the mounts it may be necessary to try the 7-toothed spanner at each engagement position before the correct rotational position is found.

10. Retain the 2.500 in. (6,35 cm.) diameter upper distance piece and any packing washers which may be already in position.

Front sub-frame resilient metal mounts— To fit

1. Centralise the new mount in the fixture (RH 7846), then fit the mount in position and torque tighten, using the tube spanner (RH 7774), to between 125 lb.ft. and 150 lb.ft. (17,28 kg.m. and 20,74 kg.m.).

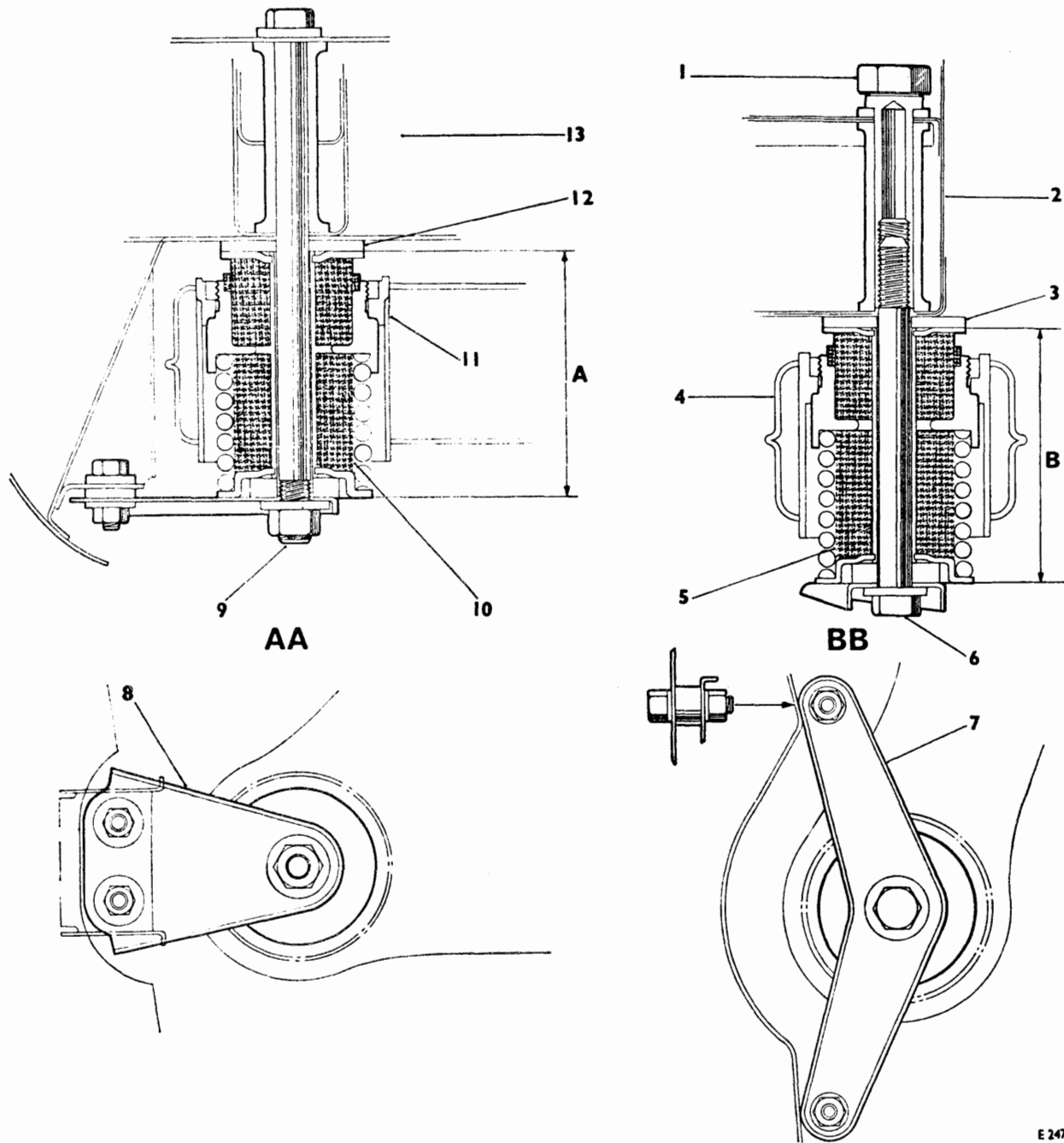
Note It is important that the mount centre is not disturbed when fitting the mount in position in the frame.

2. Fit the steady bracket and lower distance piece in position, then fit but do not tighten the centre bolt. Ensure that the upper washer is in position (see Fig. H6), together with any additional packing washers previously removed.

3. First tighten the steady bracket bolts to the body, then torque tighten the mount centre bolt.

4. Remove the jack and repeat the procedure for the other three mounts if required.

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FIG. H6 FRONT SUB-FRAME RESILIENT MOUNTS

- | | |
|---------------------------------------|---------------------------------|
| A-A Front mount assembly | 5 Resilient metal mount |
| A 4.277 in. (10,864 cm.) | 6 Bolt |
| B-B Rear mount assembly | 7 Steady bracket |
| B 4.483 in. (11,387 cm.) | 8 Steady bracket |
| 1 Extension nut | 9 Bolt |
| 2 Body underframe with bobbin | 10 Resilient metal mount |
| 3 Packing piece | 11 Sub-frame |
| 4 Sub-frame | 12 Packing piece |
| 13 Body underframe with bobbin | |

Section H2

FRONT 'MONITUBE' SHOCK DAMPER AND BALL JOINT

Service

The front 'Monitube' shock dampers are sealed units for which no servicing is required. Should loss of damping effect be evident, the faulty shock damper must be removed and a new unit fitted. The new unit is supplied together with the coil spring seating rings and upper damper securing nut.

Important The front shock damper supports the road spring, it is necessary to compress the spring in order to lift it from its seating before removing the damper.

Shock damper—To remove

1. Position the car on a ramp, apply the hand brake and chock the rear wheels.
2. Remove the gear range selector thermal cut-out (see Chapter M – Electrical System).
3. On cars fitted with front automatic height control, de-pressurise the hydraulic system (see Chapter G – Hydraulic System, Section G1 – Special precautions).
4. On all cars, remove the height control ram from the appropriate spring pot (see Chapter G – Hydraulic System). **Do not remove the spring pot cover.**
5. Position a hydraulic jack and extension fitted with a protective hardwood block beneath the pivot points of the lower front triangle levers, then raise the car.
6. Position suitable blocks to support the shaped wooden beams (RH 8920) placed beneath the sill of the body just rearward of the front wheels (see Fig. H10).
7. Carefully lower the car onto the sill boards.
8. Using the special tool (RH 8030) remove the nut and washer from the top of the damper piston rod.
9. Fit the front height control ram in position but do not secure.

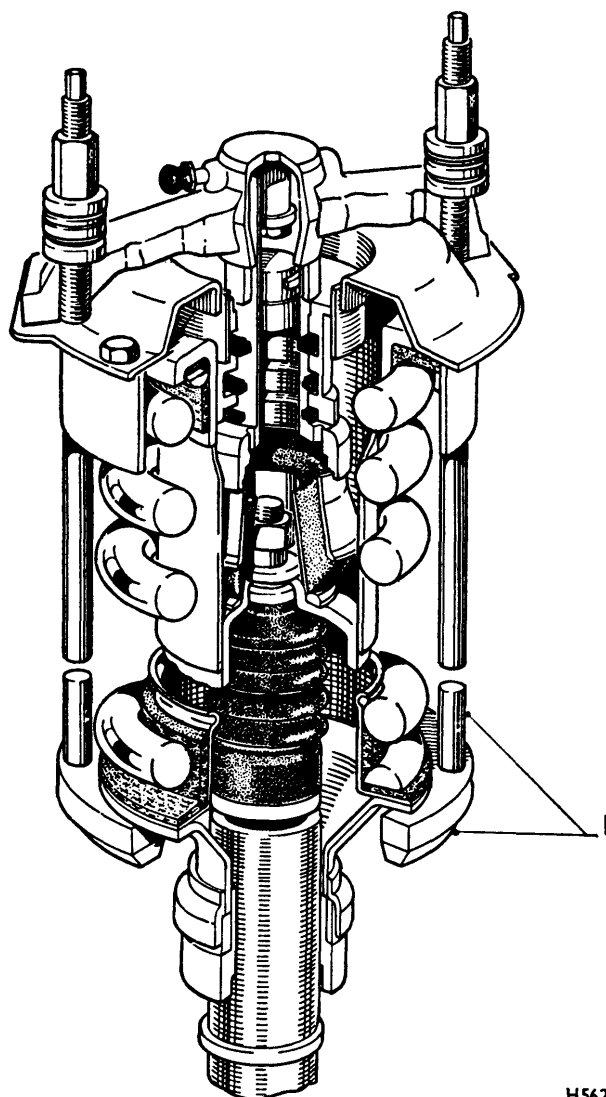


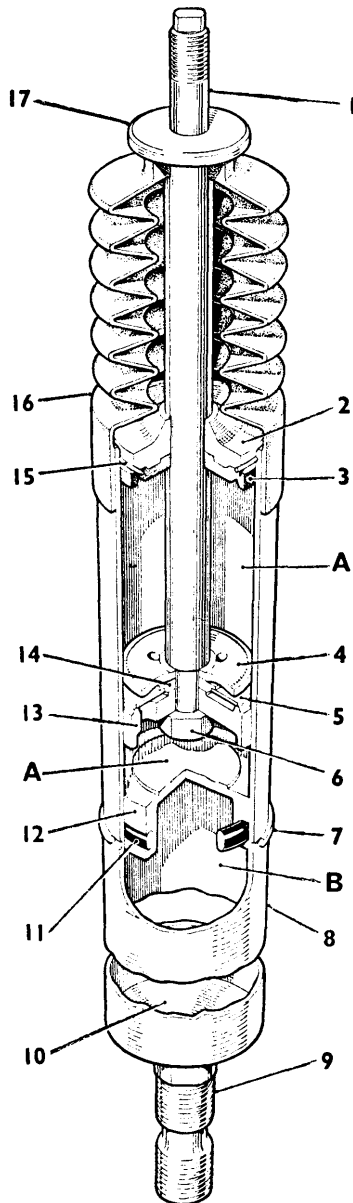
FIG. H7 SPRING COMPRESSING TOOL IN POSITION

1 Compressing tool with long studs and split base plate

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10. Fit the road spring compressing tool (RH 7889) (see Fig. H7) in position. It is most important that each long bolt of the compressor is screwed fully into the base plate of the tool.
11. Secure the halves of the base plate by fitting the $\frac{3}{16}$ in. U.N.F. setscrews provided.
12. Using the nuts, thrust races and special washers



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FIG. H8 'MONITUBE' SHOCK DAMPER

- | | |
|-------------------------|------------------------|
| A Fluid | 8 Outer tube |
| B Gas | 9 Stem |
| 1 Piston rod | 10 Cap |
| 2 Rod guide | 11 Sealing ring |
| 3 Seal | 12 Diaphragm |
| 4 Abutment | 13 Piston |
| 5 Valve | 14 Valve seat |
| 6 Nut | 15 Snap ring |
| 7 Retaining ring | 16 Dust cover |
| | 17 Cap |

- provided, compress the spring sufficiently to enable the split adjusting washers to be removed.
13. Remove the split pin, castellated nut and washer which secures the damper ball pin to the lower triangle levers.
14. Use the extractor tool (RH 8100) to separate the seal between the taper of the damper ball pin and the taper bore of the ball joint housing.
15. Remove the bolt which locates the lower triangle levers adjacent to the lower ball joint lever.
16. Slacken the dowel bolt which serves also to align and secure the lower triangle levers to the lower ball joint lever. The lower ball joint lever will then swivel clear.
17. Push the damper upwards until the ball pin is clear of the mating bore in the lever, then lower the damper from the car by moving it sideways and downwards to clear the lever; retain the split washer(s).

Note Different types of shock damper have been fitted to the front suspension.

(a) **Early cars** have a screwed adjustment of the damper stem into the ball pin housing.

(b) **Later cars** do not have the previous adjustment method, but fine adjustment is achieved by adding distance washers 0.064 in. (1.62 mm.) thick to the existing number of thick washers under the road spring seal.

To determine which type of damper is fitted, a convenient method is to observe the damper lower ball joint. Early dampers have a large lock-nut above the ball joint housing, later dampers having none.

There are different types of dampers to accommodate variable road conditions. Each type of damper is colour coded by a coloured band on the damper surface. Care should be taken to ensure that the correct type of damper is fitted. The colour code for the dampers is given in the following table.

DAMPER IDENTIFICATION

Front	Rear	Use
White	White	All cars including U.S.A. and Canada, except those fitted with heavy duty suspension.
Yellow	Yellow	Cars fitted with heavy duty suspension.

Damper ball joint—To remove

Early cars. If a ball joint is found to be faulty or worn, it is recommended to renew both the shock damper and ball joint with those fitted to later cars.

Later cars. Remove the ball joint by unscrewing the ball joint housing from the damper stem.

At this stage the opportunity should be taken to examine the condition of the damper ball joint as described in 'Damper ball joint - To maintain'.

Front shock damper—To fit

Reverse the procedure given for removal, noting the following points.

1. Fit the new damper and the existing split washer(s) necessary to obtain the correct car height adjustment. Avoid all damage to the damper piston rod.
2. Screw the ball joint onto the damper and tighten the joint.
3. Torque tighten the upper damper securing nut.
4. Torque tighten the castellated nut on the tapered end of the ball pin, if necessary further tighten the nut to enable a new split pin to be fitted.
5. Torque tighten the lower ball joint housing dowel bolt and nut. Torque tighten the nut and bolt securing the housing lever adjacent to the lower triangle levers.

Warning (a) Each shock damper contains **NITROGEN** gas under pressure. On no account should the damper be subjected to undue force of any description. Do not clamp the damper in a vice.

If the spring support has siezed onto the damper, renew the shock damper and spring support.

(b) To render a shock damper safe for disposal, drill a small hole 1.00 in. (25,4 mm.) from the closed end of the outer tube (see Fig. H9). The escaping gas should not be allowed to come into contact with eyes or skin whilst under pressure.

Immediately the hole has been drilled, stand clear and allow the **NITROGEN** gas to disperse to atmosphere.

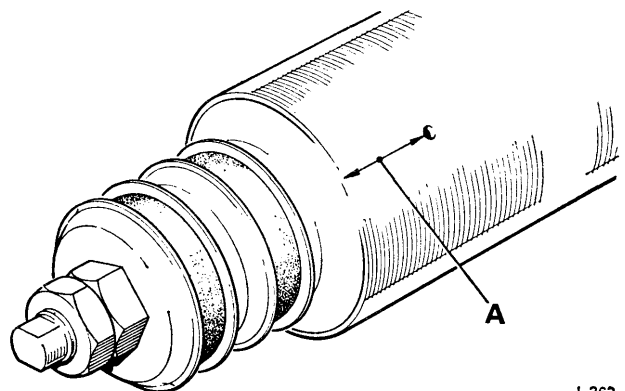
Damper ball joint—To maintain

The ball joint is a sealed unit for which no maintenance is necessary other than to replace the seal. Check the ball joint for wear and play. If it is considered serviceable and only seal replacement is necessary, all parts of the joint visible after the seal

has been removed should be washed in clean petroleum. Do not remove the joint assembly from the housing unless it is necessary to fit a new assembly.

Damper ball joint seal—To fit

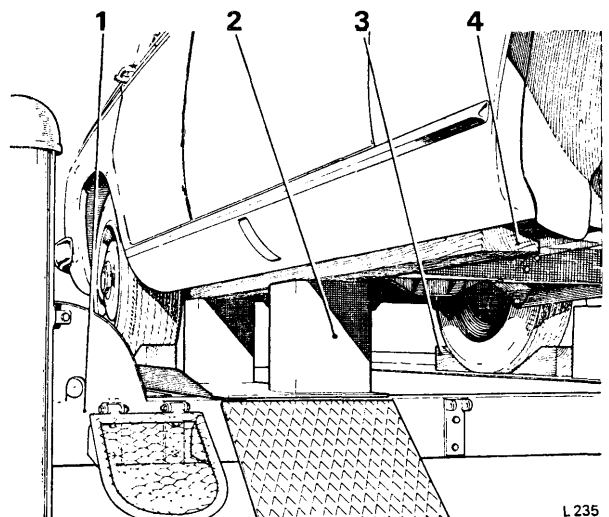
1. With the ball pin removed from the lower ball joint housing, remove the retaining clip and seal.
2. Remove all traces of grease and foreign matter from the visible parts of the joint with a little petroleum applied with a stiff brush. Remove all traces of petroleum with compressed air.
3. Fill the joint housing with the approved Dextra-grease Super G.P. to the level of the face of the



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FIG. H9 DAMPER DISPOSAL

A 1.00 in. (25,4 mm.) from closed end of damper

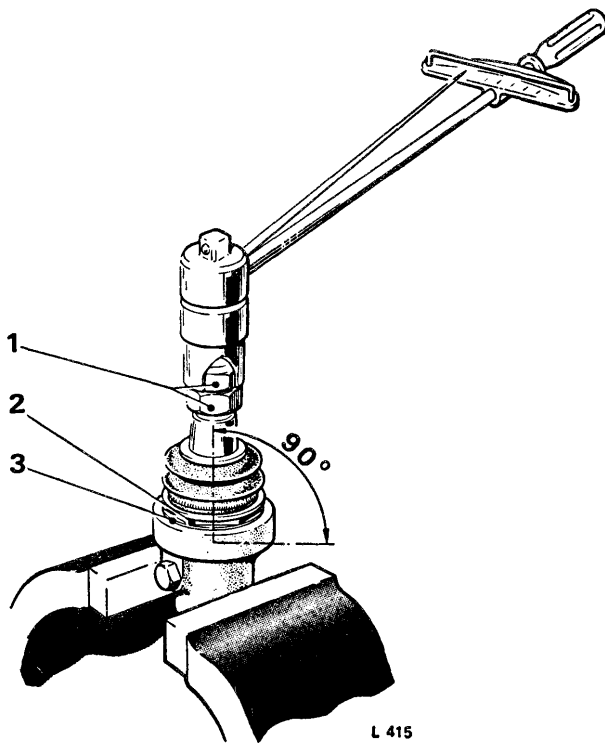


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FIG. H10 METHOD OF SUPPORTING CAR BENEATH SILLS

- | | |
|----------------|--------------|
| 1 Ramp | 3 Chock |
| 2 Wooden block | 4 Sill board |

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**FIG. H11 SETTING DAMPER BALL JOINT
PRE-LOAD**

- 1 Two lock-nuts
- 2 Hexagon (normally used for tightening purposes)
- 3 Shim(s)

housing. Smear the inside of the seal with grease, particularly the hole for the ball pin; fit a new seal and spring clip.

4. Fit the ball joint assembly to the damper lower ball joint housing described in 'Damper ball joint - To fit'.

Damper ball joint—To fit

1. Fit and lightly clamp the ball joint housing in a vice as shown in Figure H11.

2. Fit the ball pin to the housing without any distance pieces and carefully tighten until between 30 lb.in. and 60 lb.in. (0,35 kg.m. and 0,69 kg.m.) is necessary to rotate the ball pin in its housing.

This torque figure should be measured after the ball pin has been rotated through four complete revolutions to bed in with the axis of the ball pin at right-angles to the large hexagon face.

3. Measure the gap between the face of the ball hexagon and the housing.

4. Remove the ball pin and fit adjusting shims equal in thickness to the gap measured previously.

5. Fit the ball pin into the housing and torque tighten the assembly to between 120 lb.ft. and 130 lb.ft. (16,6 kg.m. and 18,0 kg.m.) using the special spanner (RH 7874).

6. Check the torque load necessary to rotate the ball pin as described in Operation 2 and if necessary, adjust by adding or removing shims between the face of the ball hexagon and the housing.

Section H3 UPPER AND LOWER TRIANGLE LEVERS (AND BALL JOINTS)

Lower triangle levers—To remove

1. Place the car on a ramp, apply the hand brake and chock the rear wheels.
2. Remove the gear range selector thermal cut-out (see Chapter M – Electrical System).
3. Compress the road coil spring using the special tool (RH 7889). Disconnect the shock damper at its lower point (see Section H2 – Front 'Monitube' Shock Damper). When disconnecting the damper from the lower triangle lever ball joint housing, **do not** disturb the ball joint or car height adjustment, which is set to the correct height.

4. Support the hub and remove the single setscrew and nut, bolt and washer securing the ball joint housing lever to the triangle levers.

5. Disconnect the track rod outer ball joint from the side steering lever secured to the hub, using the special extractor (RH 8080).

6. Remove the large nut securing the lower rear triangle lever to the bearing pin. Flats are provided on the pin to enable a spanner to be used to prevent rotation while unscrewing the nut.

7. Remove the triangle lever. Remove the front triangle lever as described in Operation 6 (see Fig. H12).

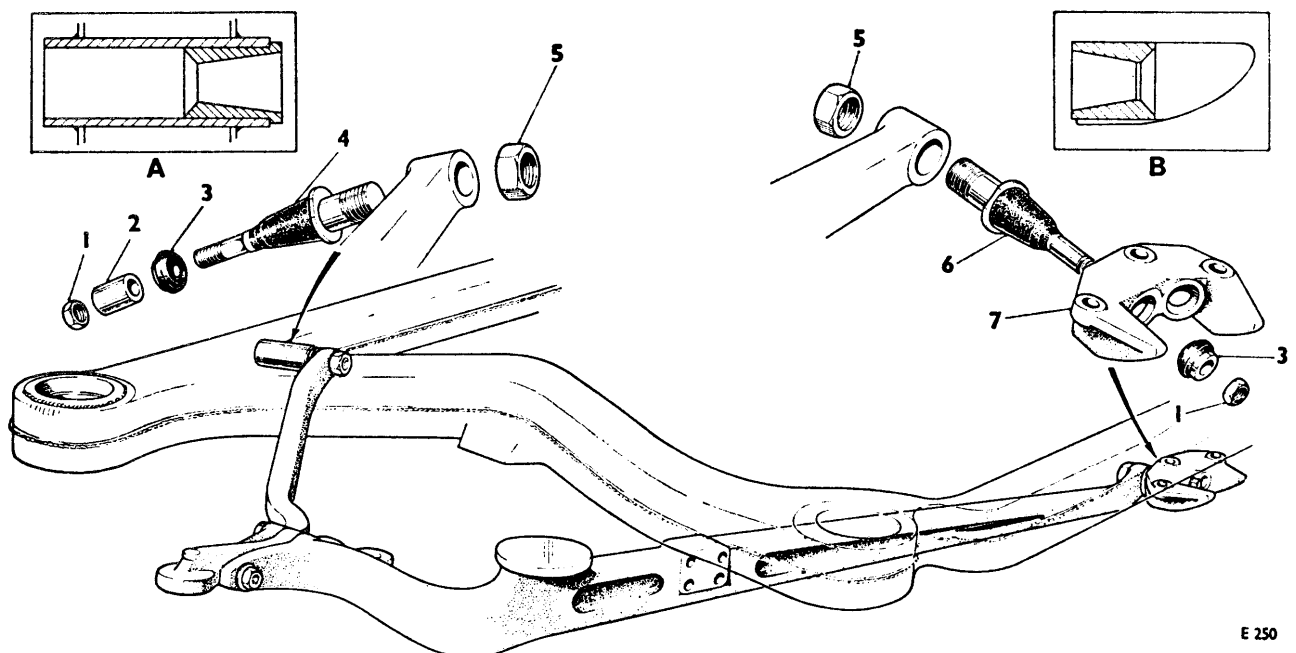


FIG. H12 LOWER TRIANGLE LEVERS MOUNTING POINTS

- | | |
|-----------------------------------|--|
| 1 Nut | 5 Nut |
| 2 Distance piece | 6 Rubber bonded steel bearing pin |
| 3 Rubber bonded steel washer | 7 Front mounting bracket |
| 4 Rubber bonded steel bearing pin | A Inset – section through rear mounting point |
| | B Inset – section through front mounting bracket |

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8. Remove each rubber bonded steel bearing pin together with its rubber bonded steel washer.

Lower triangle levers—To fit

Reverse the procedure given for removal, noting the following points.

1. Fit the bearing pins to their mountings on the sub-frames and torque tighten the nuts to between 42 lb.ft. and 45 lb.ft. (5,81 kg.m. and 6,22 kg.m.).

2. The nuts for securing the triangle levers should be fitted but not torque tightened until the car assumes 'showroom' condition (see Section H8 – Suspension settings).

3. With the car in 'showroom' condition slacken the nuts slightly to allow the rubber to 'relax', then torque tighten the nuts to 150 lb.ft. (20,74 kg.m.).

4. After fitting the triangle levers to the sub-frame fit the hub unit.

Note With the car standing on a smooth level surface carry out the suspension checks (see Section H8 – Suspension settings).

Lower triangle levers ball joint assembly—To remove

1. With the hub unit removed from the front suspension, remove the split pin and nut securing the ball joint assembly to the front stub axle yoke.

2. Using the extractor tool (RH 8100) separate the seal between the tapered end of the ball joint and the stub axle yoke.

3. Remove the ball joint lever from the yoke.

4. Unscrew and remove the ball pin assembly from the lever using the special tool (RH 7813); retain the adjusting washers.

5. Thoroughly clean the ball joint housing.

Lower triangle levers ball joint assembly—To fit

The ball joint is supplied as a complete unit together with seal and packed with lubricant.

1. Fit the ball joint assembly to the ball joint housing lever **without** the adjusting washer; the conical face of the ball pin should just abut the conical seating of the lever.

2. Carefully torque tighten the ball joint until a torque of 35 lb.in. to 75 lb.in. (0,42 kg.m. to 0,83 kg.m.) is required to rotate the ball assembly. This measurement should be taken after four complete revolutions of the ball pin, using the special fixture (RH 7811) which is designed for use with a spring balance, it ensures also that the ball joint remains at 90° to its seating, in order to obtain the desired figures.

3. The remaining gap should then be measured and a suitable adjusting washer(s) selected.

4. Remove the joint and fit the adjusting washer(s).

5. Fit the joint and torque tighten to between 250 lb.ft. and 300 lb.ft. (35 kg.m. and 42 kg.m.), using the special spanner (RH 7813).

6. Fit the fixture (RH 7811) and check the torque load required to rotate the ball assembly (see Operation 2). Adjust if necessary.

Note During these operations the ball joint sealing boot should remain in position and must not be disturbed or damaged.

Ball joint seals—To fit

If any of the ball joint seals are perished or cracked, while the ball joint itself is in good condition, it is permissible to renew the seals only. Remove all foreign matter prior to fitting the new seal from visible parts of the joint assembly with a little petroleum applied with a stiff brush. Remove all traces of petroleum with compressed air.

The upper ball joint can be cleaned in position. After cleaning, lubricate the joints with an approved grease in the following manner.

1. Fill the joint housing of the lower ball joint to the level of the joint face and also smear the inside of the seal, particularly in the area of the hole for the ball pin, with an approved grease (e.g. Dextragrease Super G.P.).

2. Fit the seal and connect the ball joint to the yoke. Care should be taken when fitting the seal spring ring that the seal is not damaged.

Upper triangle levers—To remove

1. Support the front hub assembly and remove the nut securing the upper triangle lever ball joint assembly to the stub axle yoke.

2. Separate the seal between the stub axle yoke taper bore and taper pin of the upper triangle lever ball joint assembly, using the extractor (RH 8100).

3. Support the upper triangle levers.

Note The ball joint housing will remain attached to the stub axle yoke and to the hub unit.

4. Remove the triangle levers and cantilever brackets as an assembly (see Fig. H13). The cantilever brackets are secured to the sub-frame by setscrews.

5. Retain any adjusting washers (shims) fitted between the levers and the sub-frame brackets.

Note Castor and camber settings are obtained by selective fitting of adjusting washers (shims) between the cantilever bracket of the upper triangle lever bearing pin and the sub-frame (see Fig. H13).

6. Remove the nuts securing the bearing pins to the triangle levers, remove the pins.

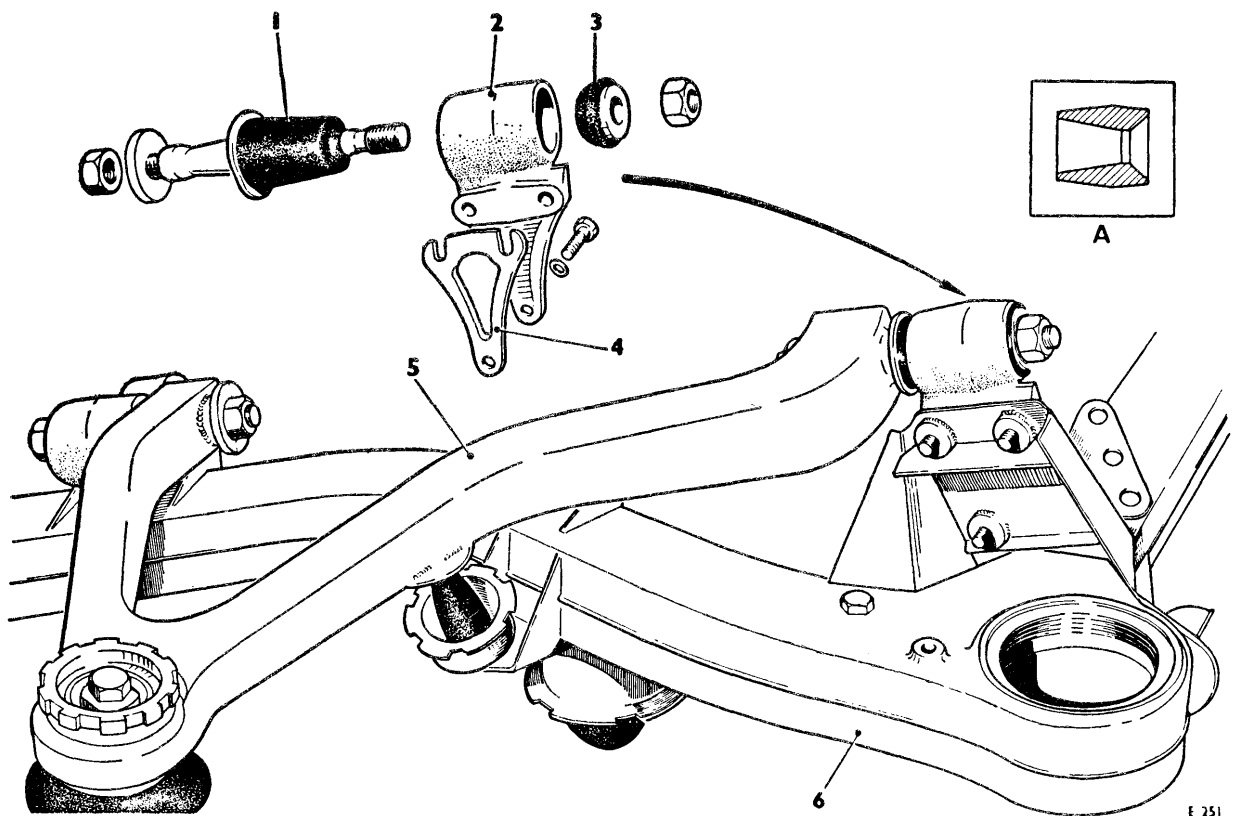


FIG. H13 UPPER TRIANGLE LEVERS MOUNTING POINTS

- | | |
|-----------------------------------|---------------------------------|
| 1 Rubber bonded steel bearing pin | 4 Shim - caster/camber settings |
| 2 Cantilever bracket | 5 Upper triangle levers |
| 3 Rubber bonded steel washer | 6 Front sub-frame |
- A Inset - section through cantilever bracket

Upper triangle levers—To fit

Reverse the procedure given for removal, noting the following points.

1. Ensure that the existing castor/camber setting adjusting washers (shims) are fitted. A check must be carried out on completion of the work, when the car is in 'showroom' condition.
2. Fully torque tighten the nuts securing the bearing pins to the cantilever brackets to between 42 lb.ft. and 45 lb.ft. (5,81 kg.m. and 6,22 kg.m.).
3. Fit but do **not** torque tighten the triangle lever retaining nuts to the bearing pins until the suspension is fully assembled and the car assumes its 'showroom' condition.
4. When the car is in this condition, slacken the nuts slightly and then torque tighten to 150 lb.ft. (20,74 kg.m.).

Ball joint assembly—To remove

1. Remove the upper triangle levers as described under 'Upper triangle levers - To remove'.

2. Using the special tool (RH 7775) unlock and remove the slotted nut.

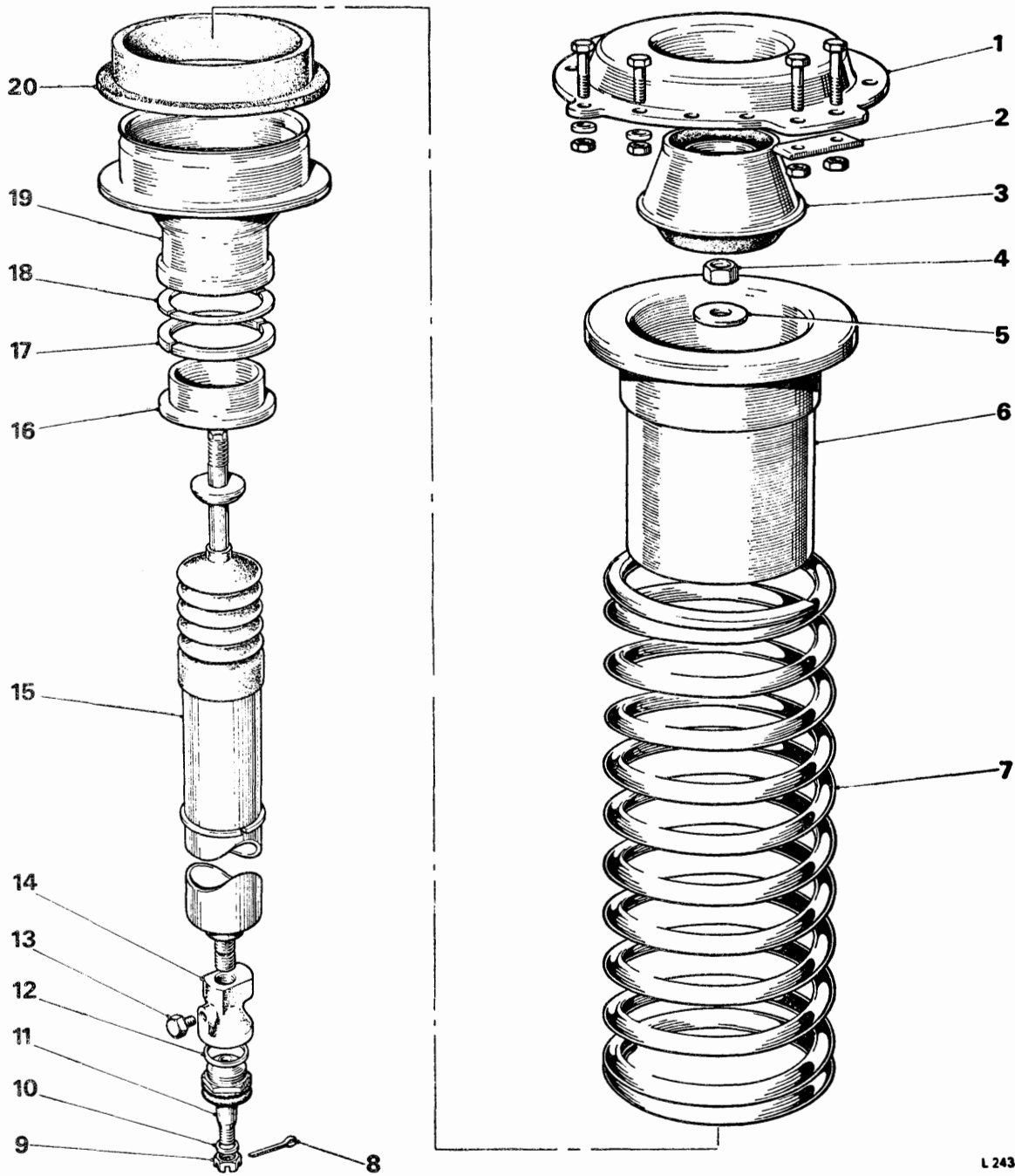
3. Using the special tool (RH 7768) press out the ball joint assembly from the triangle lever.

Ball joint assembly—To fit (see Fig. H13)

1. Using a new sealed ball joint assembly unit complete with seal and lubricant, fit the special tool (RH 7768) around the ball joint and clamp it together.
2. Fit the triangle lever to the ball joint and using the special tool (RH 7768), press the triangle lever squarely on to the ball joint until the triangle lever boss abuts the shoulder of the ball joint.
3. Remove the tool and torque tighten the slotted nut using the special tool (RH 7775) to between 150 lb.ft. and 175 lb.ft. (20,74 kg.m. and 23,5 kg.m.).

Note Care should be taken to avoid damaging the joint sealing boot.

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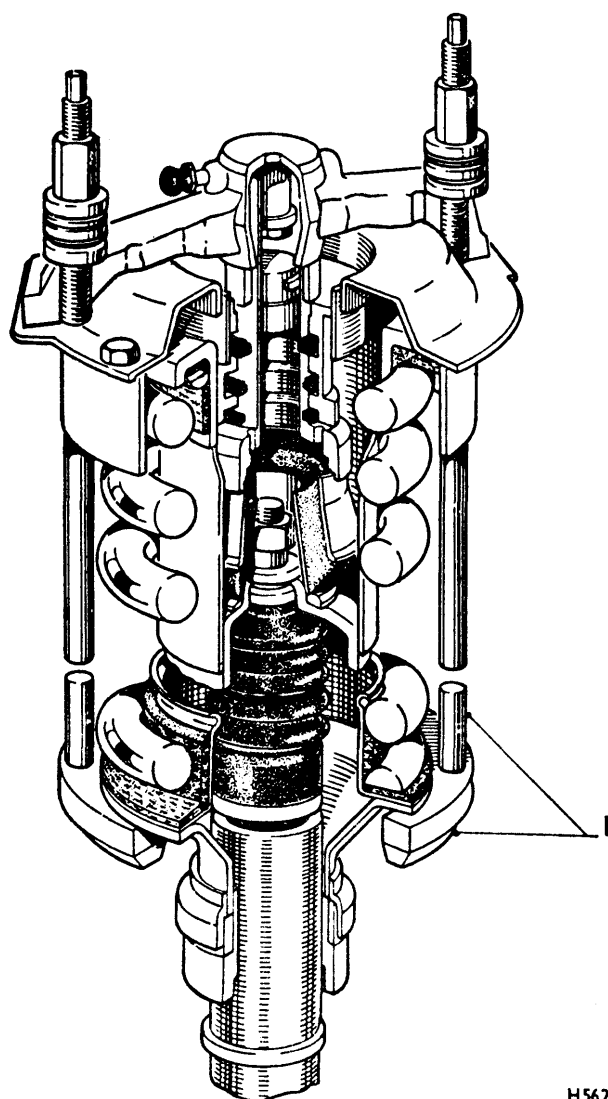
FIG. H14 EXPLODED VIEW FRONT ROAD SPRING

- | | |
|---------------------------|--------------------------------|
| 1 Spring pot cover plate | 11 Ball joint |
| 2 Clamping plate | 12 Ball joint adjusting washer |
| 3 Isolator - coil spring | 13 Plug |
| 4 Nut - damper | 14 Ball joint housing |
| 5 Heavy washer | 15 Shock damper |
| 6 Spring support assembly | 16 Damper sleeve |
| 7 Spring | 17 Distance pieces |
| 8 Ball joint split pin | 18 Adjusting washers |
| 9 Castellated nut | 19 Spring support assembly |
| 10 Heavy washer | 20 Canvas spring seating |

Section H4 FRONT ROAD SPRINGS

Front road spring—To remove

1. Position the car on a ramp, apply the hand brake and chock the rear wheels.
2. Remove the gear range selector thermal cut-out (see Chapter M - Electrical System).
3. On cars fitted with front automatic height control, de-pressurise the hydraulic system (see Chapter G - Special precautions).
4. Position a hydraulic jack and extension, fitted with a wood block beneath the pivot points of the lower front triangle levers; raise the front of the car.
5. Position suitable blocks, to support the shaped beams (RH 7820) beneath the sills of the body just rearward of the front wheel arches.
6. Lower the car until the weight is supported on the sill beams.
7. Fit the road spring compressing tool (RH 7889) into position (see Fig. H15). It is important that each long bolt of the compressor is screwed fully into the base plate of the tool.
8. Secure the halves of the base plate using the $\frac{1}{8}$ in. U.N.F. screws provided.
9. Using the nuts, thrust races and special washers provided with the tool, compress the spring sufficiently to enable the split adjusting washers to be removed.
10. Remove the split pin, castellated nut and washer which secures the damper ball pin to the lower triangle levers.
11. Using the special extractor tool (RH 8100) separate the seal between the taper of the damper ball pin and the ball pin housing.
12. Unscrew the setscrews around the top of the height control ram and cover plate, then disconnect and blank off the hydraulic pipe from the ram (cars fitted with front automatic height control only).
13. Remove the assembly from the car by moving it upwards and out through the top of the spring pot.
14. Position the assembly in the compressing tool (RH 7909) and decompress the spring so that the special tool (RH 7889) can be removed.
15. Examine the condition of the isolator and spring seating, if the isolator has been contaminated by oil or



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**FIG. H15 SPRING COMPRESSING TOOL
IN POSITION**

1 Compressing tool with long studs
and split base plate

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brake fluid and shows signs of swelling, or if the bonded rubber is parting from the inner or outer cones, they should be renewed.

16. If the damper is to be removed, when the assembly is removed from the compressing tool, remove the height control ram and cover plate.

17. Unscrew and remove the nut and washer from the top of the damper piston rod using the special tool (RH 8030); remove the damper from the spring.

Front road spring—To fit

Reverse the procedure given for removal, noting the following points.

1. Fit new spring seatings and spring isolator if necessary.

2. Ensure that the correct split adjusting washer(s) are used if the original spring is fitted. If a new spring is fitted, fit the split washer(s) supplied with the new spring.

3. Care should be taken to avoid any side loading when fitting the damper which could result in damage to the seal or any damage to the piston rod.

4. It is important that the front rebound stops are in position when fitting the road spring. Avoid over-travelling the suspension ball joints to prevent damage to the joint seals.

5. After fitting the damper and spring, place the car on a level surface and 'bounce' the front end to allow the spring to bed-in.

6. Check the car height and steering geometry as described in Section H8 – Suspension Settings.

Note The circlip which is fitted to the front dampers carries the lower spring support sleeves. When assembling these sleeves, liberally coat the mating surfaces of the sleeves and dampers with an approved grease. This will assist fitting and any subsequent removal of the sleeves.

Section H5 FRONT HUBS

Front hub—To remove (see Fig. H16)

1. Apply the hand brake and chock the rear wheels.
2. Remove the gear range selector thermal cut-out, as described in Chapter M – Electrical System.
3. Carefully position a jack beneath the front lower triangle lever pivot points at the centre of the car; a hardwood block should be placed between the jack head and the pivot points before raising the car.
4. Remove the combined wheel disc/hub cap, and slacken the road wheel nuts, but do not remove the road wheel.
5. Raise the car and place suitable blocks to support the sill boards (RH 7820) beneath the body sills. In addition, place supports beneath the outer ends of the front lower triangle levers.
6. Remove the wheel nuts and road wheel(s).
7. Using a screwdriver inserted between the lip of the hub dust cover and the hub flange, prise off the dust cover. Care must be taken when removing the dust cover to avoid damaging the earthing contact inside the cover.
8. Remove the sealing band split pin, castellated nut and keyed washer from the stub axle. It will be necessary to break the sealing band in order to remove it from the split pin.

Note The right-hand stub axle has right-hand threads, the left-hand stub axle left-hand threads.
9. The brake disc is secured to the hub by setscrews, therefore it will be necessary to remove the brake calipers in order to withdraw the hub from the stub axle. (See Chapter G – Hydraulic System).
10. Withdraw the hub from the stub axle complete with bearings and grease retainer.
11. Retain the chamfered distance piece.
12. Place the hub on a suitable working surface; inspect the brake disc and pads of the brake calipers for wear or scoring.
13. Ensure that the brake disc setscrews are torque tightened to the correct figure (see Chapter P – Torque Tightening Figures).

Front hub—To fit

1. Fit the distance piece, with the chamfered edge leading, onto the stub axle to abut the shoulder adjacent to the yoke.

2. Position the hub onto the stub axle, fit the key washer, then finger tighten the castellated nut sufficiently to remove any hub end-float.

3. Using a dial test indicator mounted adjacent to the brake disc, measure the run-out of the disc at the maximum radius possible; this must not exceed 0.007 in. (0,178 mm.) total indicator reading.

Note The reading obtained is a measure of the tolerances of all the components and if the run-out figure exceeds this measurement, dismantle the hub and brake disc to investigate the cause of the run-out.

4. If the run-out figure is within limits, remove the hub from the stub axle and pack the hub with approximately 1½ oz. (42,64 gm.) of the approved grease. The grease should be liberally smeared on the bearings and on the inner wall of the hub so that it is not disturbed when the hub is fitted to the stub axle.

5. Fit the hub, key washer and castellated nut.

6. Using a 0.004 in. (0,102 mm.) feeler gauge inserted between the outer bearing and key washer, or a suitable dial test indicator equipment, tighten the castellated nut sufficiently to grip the feeler gauge lightly or to give a reading of 0.002 in. to 0.006 in. (0,051 mm. to 0,152 mm.) end-float on the dial test indicator.

Continuous rotation of the hub is essential during this operation to ensure that the taper rollers seat correctly.

7. When the correct end-float is obtained, unscrew the castellated nut to align the nearest slot in the nut with the nearest hole in the stub axle.

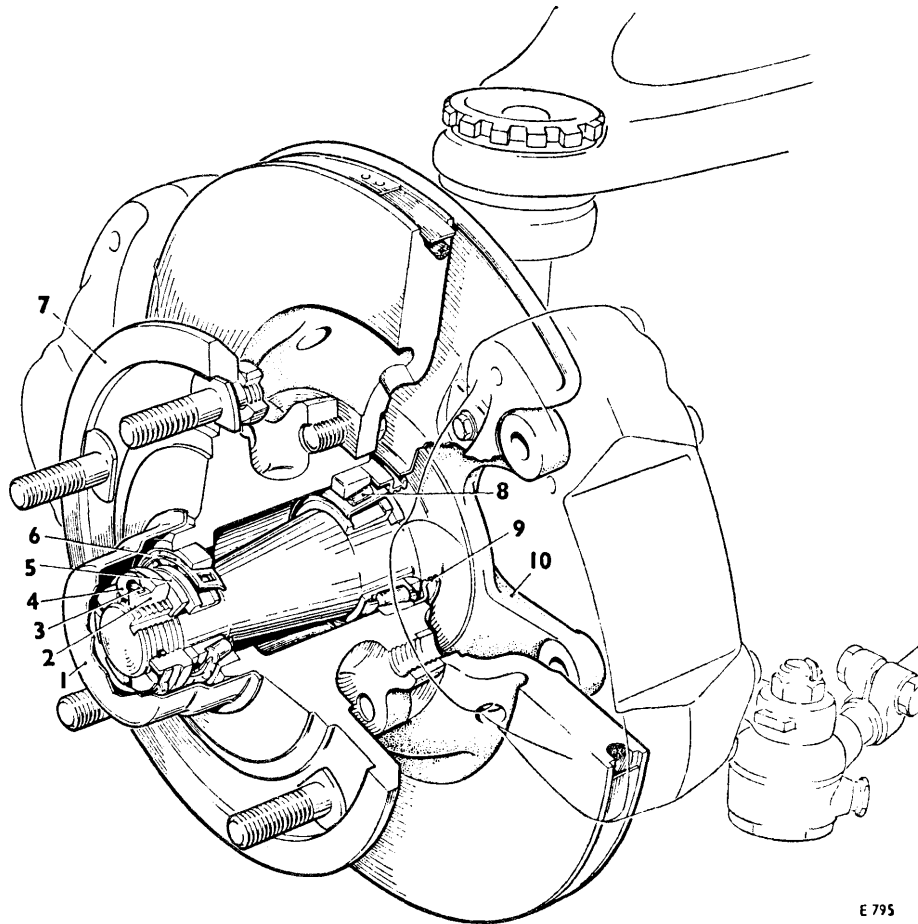
8. Measure the end-float by either of the two methods, and select a suitable key washer to give the correct end-float.

Note Key washers are provided in thicknesses of 0.138 in. and 0.140 in. (3,51 mm. and 3,56 mm.). Incorrect setting of the bearings, either too slack or too tight will result in premature bearing wear.

9. Fit a new split pin and sealing band. Bend back the split pin legs and crimp the ends of the sealing band to lock the nut in position.

10. Smear approximately ½ oz. (14,21 gm.) of the approved grease into the base of the dust cover. Fit the dust cover by tapping into position on the hub with a nylon hammer. Whilst fitting this cover, ensure that the earthing strip is in the correct position to make contact with the stub axle end face.

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FIG. H16 CUT-AWAY VIEW FRONT HUB

- | | | |
|--------------------------|-------------------------------------|-------------------------------------|
| 1 Dust cover | 4 Split pin | 8 Inner taper roller bearing |
| 2 Castellated nut | 5 Keyed distance piece | 9 Acme threaded seal |
| 3 Sealing band | 6 Outer taper roller bearing | 10 Stub axle/yoke |
| | 7 Hub | |

11. To fit the brake calipers, reverse the procedure given for removal. Ensure that the disc faces are free from foreign matter, e.g. grease or oil, etc.

12. Fit the road wheel; screw on the wheel nuts but do not tighten.

13. Lower the car from the jack and supports and fully tighten the road wheel nuts to the torque figure given in Chapter P – Torque Tightening Figures.

14. Fit the wheel disc/hub cover plate.

Front hub—To dismantle

1. Remove the hub.
2. Lift out the bearing inner race from the outer bearing.
3. Using a screwdriver prise the grease retainer from the inner end of the hub and lift out the inner race of the inner bearing.

Note Each grease retainer is clearly marked 'Off-side Right-hand' or 'Near-side Left-hand' to ensure that they are fitted to the correct side of the car.

4. Using a soft metal drift, drive out the outer races of the inner and outer taper roller bearings.

5. Thoroughly clean the hub and any components to be refitted.

Front hub—To assemble

1. Press the new bearing outer races squarely into the hub with the smaller end of the taper bore leading. Ensure that the races are fully seating on the rear shoulders of the hub.

2. Lubricate the new inner races and roller cages with the approved grease and fit them to the mating outer races in the hub.

Note When fitting bearings to more than one hub at a time, ensure that each bearing set remains separate from the other set, as all bearings are supplied in matched sets.

3. Press the correct grease retainer squarely into position in the hub until the leading edge abuts the bearing outer race.

Section H6 PANHARD ROD

Panhard rod—To remove (see Figs. H17 and 18)

1. Place the car on a ramp.
2. Apply the hand brake and chock the rear wheels.
3. Remove the gear range selector thermal cut-out as described in Chapter M – Electrical System.
4. Remove the full nut and half nut from the outer

end of the rod; retain the large washer and polyurethane pad.

5. Remove the shouldered bolt, nut and washer securing the bushed inner end of the rod to the central mounting bracket; withdraw the rod from the car.

6. Inspect the polyurethane pads (see Fig. H17) and rubber-bonded metal bush for deterioration and, if necessary, renew.

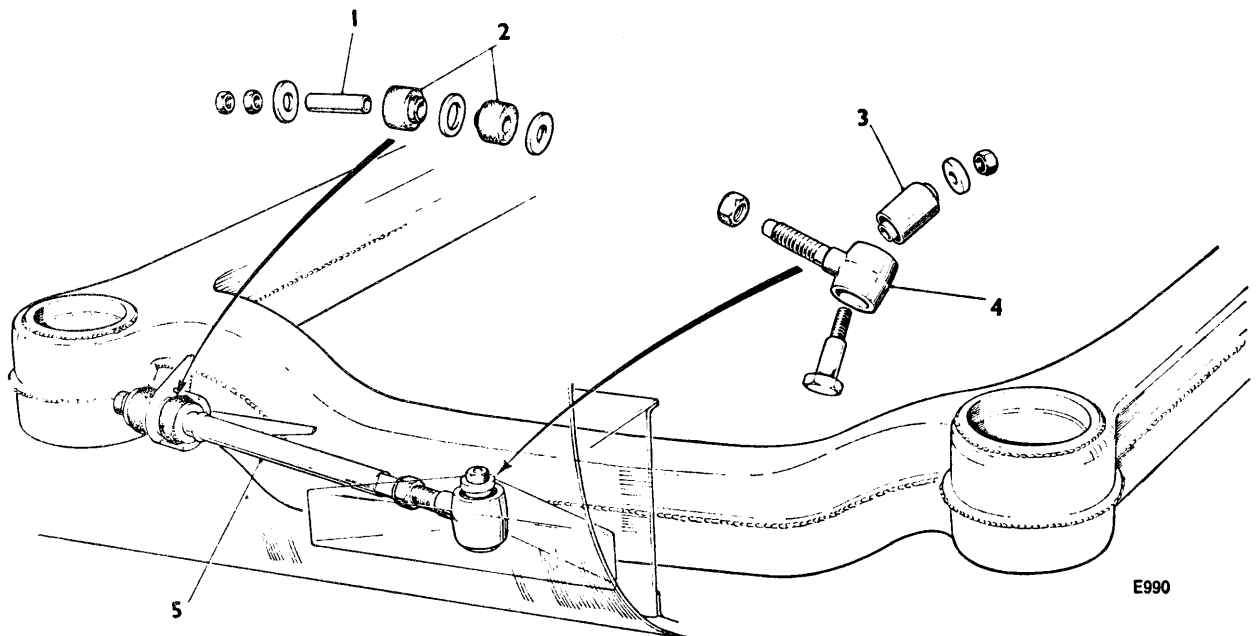


FIG. H17 EXPLODED VIEW PANHARD ROD

- 1 Distance piece
- 2 Polyurethane pads
- 3 Rubber-bonded metal bush
- 4 Bush housing
- 5 Panhard rod

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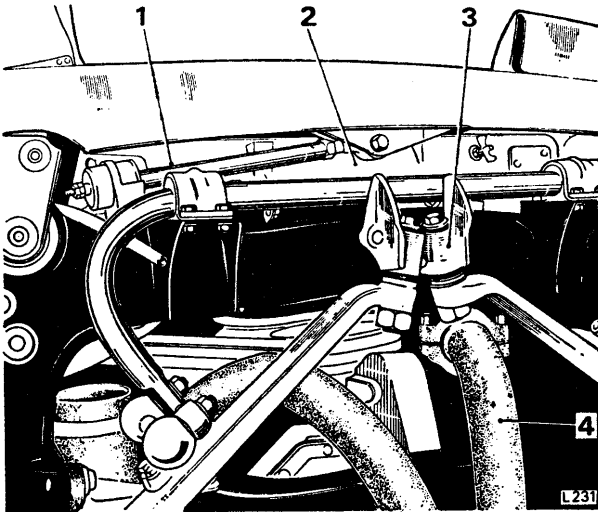


FIG. H18 PANHARD ROD IN POSITION

- 1 Panhard rod
- 2 Radiator bottom tank
- 3 Lower triangle levers inner pivots
- 4

7. When renewing the bush, ensure that it is pressed into position so that the outer sleeve is flush with the ends of the extension piece bore.

Panhard rod—To fit

To fit the rod, reverse the procedure given for removal, noting the following points.

1. The length of the rod must be adjusted after the end of the rod has been fitted to the front of the sub-frame and fully tightened.
2. Adjust the inner end of the rod using the extension piece so that the centre bolt passes through the body (and rubber-bonded metal bush) quite freely.
3. After adjusting the rod, push the bolt upwards into position.
4. Fit the washer, and torque tighten the nut.
5. Torque tighten the nut on the outer end of the rod; fit and tighten the lock-nut.

Note If the rod has been removed to renew the polyurethane pads it is necessary to adjust the length of the rod.

Section H7 FRONT STABILISER BAR

Front stabiliser bar—To remove (see Fig. H19)

1. Unscrew and remove the nuts and washers securing the links to the bar and brackets.
2. Using the special tool (RH 8019) separate the seal between the tapers of the links and the adjoining rod and brackets.
3. Disconnect the control link fitted between the

stabiliser bar and the front height control valve. Do not alter the length of this link.

4. Unscrew and remove the setscrews and washers from the two securing brackets.
5. Remove the brackets and rubber bearing bushes.
6. Remove the stabiliser bar from the suspension.

Note Cars after Serial Number 7400 and onwards are not fitted with a front height control valve.

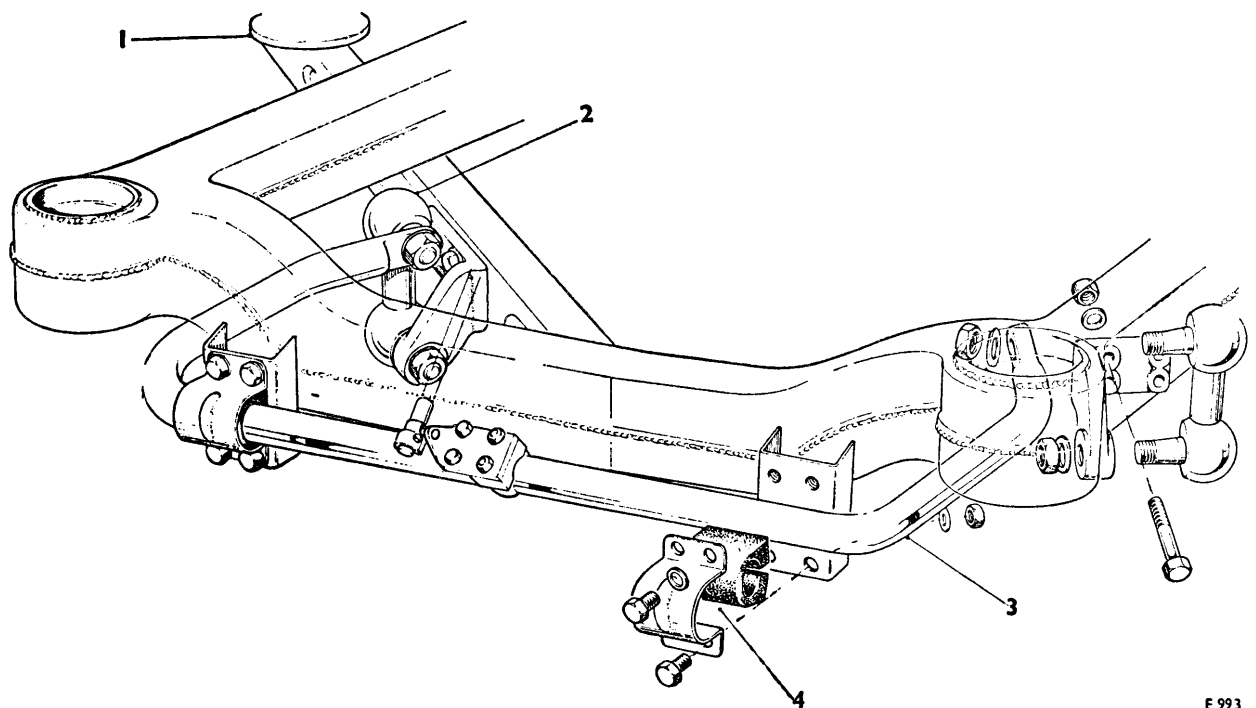


FIG. H19 EXPLODED VIEW FRONT STABILISER BAR

- 1 Lower triangle lever
- 2 Link
- 3 Stabiliser bar
- 4 Rubber bush

Chapter H**Front stabiliser bar—To fit**

Reverse the procedure given for removal, noting the following points.

1. Before fitting the original rubber bearing bushes and links, inspect the rubbers for signs of perishing and renew if necessary.
2. For levelled car height settings and setting the height control valve (if fitted) when reconnecting the control link, refer to Chapter G – Hydraulic System.

Note Great care must be taken when manually operating the front height control valve due to the close proximity of the engine cooling fan. When the engine is running the valve operating link must not be pushed upward too far or a foul will occur between the valve operating lever and the engine cooling fan.

Cars after Serial Numbers SRH 6004 and onwards and Coachbuilt cars CRH 5011 and onwards are fitted with a front stabiliser bar of increased diameter.

Note This modification is **not** fitted to cars built for use in the U.S.A. or Canada, or to cars fitted with heavy duty suspension.

This necessitates a corresponding increase in the size of the bearing bush and securing brackets. A special washer is fitted under the head of the setscrews securing the bracket and longer setscrews have been fitted. The front height control valve (if fitted) clamp brackets, clamp and 'U' bolt have been modified to accommodate the increased diameter rod.

Note This modification is **not** fitted to cars built for use in the U.S.A. or Canada, or to cars fitted with heavy duty suspension.

Section H8 SUSPENSION SETTINGS

Suspension settings—'Showroom' condition

Car height front—To check

The car height is the distance measured between points '1' and '2' in Figure H20. This vertical height must be checked whenever the suspension has been disturbed, e.g. whenever a coil road spring has been renewed or replaced. This height can be checked only if the car rear height is approximately correct.

There are two conditions of car height. Each condition is separately checked.

The first condition is the 'showroom standing height', this term applies when the car is stationary with the engine switched off, unladen and the automatic height control system discharged.

The second condition is the 'levelled height', this term applies when the car is fully laden, the engine running and the automatic height control system fully charged. This height remains constant regardless of the number of occupants and/or luggage.

The second condition requires the car height check to be carried out with the automatic height control system operating. This condition is described in Chapter G Hydraulic System.

Preparation

In addition to discharging the automatic height control system (*see Chapter G - Hydraulic System*), the car must be standing on a smooth level surface and the tyres inflated to the recommended pressures.

Cars with front automatic height control system fitted.

1. The car must be ballasted at the centre of the front seats with 150 lb. (68 kg.) weight, fully topped up with lubricant, coolant and 10 gallons (45,46 litres) of fuel in the fuel tank and with the tools in the luggage compartment.

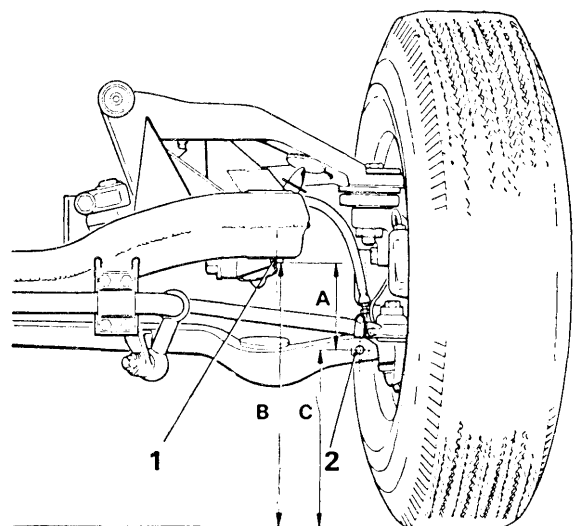
Cars without front automatic height control system.

All cars after Car Serial Numbers SRX 7404, DRX 7416 and LRX 7378 have no front automatic height control system.

The car must be ballasted with 300 lb. (136 kg.) equally divided between the two front seats, fully topped up with lubricant and coolant and 10 gallons (45,46 litres) of fuel in the fuel tank and the tools in the luggage compartment.

2. Measure the height from the level surface on which the car stands to the faces of the machine fixture locating pads under the front sub-frame.

This height should be between 3.400 in. and 3.650 in. (8,64 cm. and 9,27 cm.).



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FIG. H20 FRONT CAR HEIGHT CHECKING POINTS

- A** 3.525 in. \pm 0.125 in. (8,96 cm. \pm 0,318 cm.)
1 Measurement to bolt centre
2 Measurement to sub-frame boss

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Car height—To adjust

On early cars an adjustment of up to 0.46 in. (11,57 mm.) can be obtained by means of the screwed adjuster at the bottom of each front shock damper.

1. Unlock the lock-nut (*see Fig. H14*).
2. Hold the bottom of the damper with a spanner.

Note A total movement of 0.312 in. (7,94 mm.) is available at the bottom of the damper. This movement is limited by the shoulders of the damper stem abutting the roll pins of the ball adjuster. Do not attempt to force the screwed adjuster beyond the limits imposed by the pins or damage to the damper stem threads will occur. Further adjustment to the car height can be obtained as follows.

1. By selection increase or decrease the thickness of the split washer fitted around the shock damper beneath the road spring seating (*see Fig. H14*). Split packing washers are available in the following thicknesses: 0.250 in. (6,35 mm.), 0.500 in. (12,70 mm.), 0.750 in. (19,10 mm.) and 1.00 in. (2,54 cm.).
2. Do not fit washers totalling more than 1.00 in. (2,54 cm.) thickness.

To adjust the height by fitting packing washers, fit the road spring compressor tool (RH 7789) to the spring pot and compress the spring to lift it and its seating from the damper collar.

3. Refer to Section H2 – Front 'Monitube' shock damper and ball joint, for initial preparation.

4. The selected packing washers used in conjunction with the screwed adjuster will enable the required car height to be obtained.

Note A packing washer 0.250 in. (6,35 mm.) thick gives a change in car height of 0.37 in. (9,40 mm.). After setting the front and rear height, the second condition should be carried out referring to Chapter G – Hydraulic System.

5. On later cars there is no adjustment by means of the screwed adjuster at the bottom of the shock damper. Fine adjustment is obtained by inserting washers 0.064 in. (1,63 mm.) thick to those already fitted beneath the road spring seat. Ensure that the smallest packing washers are fitted to the top of the assembly so that the spring retains them in position.

Front wheel toe-in—To adjust

Check the toe-in as follows.

1. Place the car on a level surface and the steering wheel in the straight-ahead position.
2. Remove the gear range selector thermal cut-out as described in Chapter M – Electrical System.
3. Move the car forward not less than half a revolution of the front wheels, then take a first reading using optical alignment equipment.

4. Move the car forward a further half a revolution of the front wheels and take a second reading. The true toe-in is the average of the two readings.

Note Moving the car backward instead of forward will give an incorrect reading.

The toe-in should be between 0.062 in. and 0.141 in. (1,575 mm. and 3,57 mm.) with the car in a 'levelled' or 'showroom' condition. If the toe-in setting is incorrect the following procedure should be used.

5. Disconnect a track rod outer ball joint from the side steering lever using the special extractor tool (RH 8080), then slacken the pinch bolt from the outer end of the track rod and screw the track rod inward or outward as necessary.

Note To obtain the correct setting if more than **one** complete turn of the track rod end is necessary to obtain the desired adjustment, the number of turns must be divided equally between both track rod ends in order to retain the steering wheel straight ahead position.

6. When the adjustment is completed re-tighten the pinch bolt, lock-nuts and track rod end.

7. Re-check the toe-in as described in Operations 3 and 4.

Castor and camber angles— Preparation—To adjust

The Castor and Camber angles must be checked at the same time as adjustment of one affects the other

1. Set the front wheels on turntables and the rear wheels on suitable turntables or blocks of the same height.

2. With the car at 'levelled' or 'showroom' height, using suitable spirit level gauge equipment which fits directly to the stub axle, raise the car and fit the gauge.

Castor and camber angles—To adjust

Using a suitable gauge check the castor and camber angles, following the instructions provided with the gauge.

To correct the castor angle, add or remove shims as required, between the upper triangle lever cantilever bracket and the sub-frame. The correct castor angle is given in the table. The shims are available in varying thicknesses and are slotted for ease of removal and fitting. The thicknesses are 0.032 in. (0,79 mm.), 0.064 in. (1,588 mm.) and 0.128 in. (3,25 mm.).

The camber angle will alter as the castor angle is adjusted.

Carry out the following procedure for both sides of the car.

Check the camber angle of each wheel, which should be $1^\circ +$ or $-\frac{1}{4}^\circ$ and may be directly read from the gauge. If the camber angle is incorrect it will be necessary to adjust the castor angle by selective fitting of the shims described earlier, until both the castor and camber angles are within the correct limits.

The maximum difference allowed between both sides of the car for both the castor and camber angles is $\frac{1}{4}^\circ$.

Front Suspension Data	Cars produced prior to Car Serial Numbers SRH 3349 CRH 3449	Cars produced after Car Serial Numbers SRH 3349 CRH 3449
Camber Angle	1° Negative $\pm \frac{1}{4}^\circ$	1° Negative $\pm \frac{1}{4}^\circ$
Castor Angle	$1\frac{1}{2}^\circ$ Positive $\pm \frac{1}{4}^\circ$	3° Positive $\pm \frac{1}{4}^\circ$
Pivot Pin Inclination	$6\frac{1}{2}^\circ$	$6\frac{1}{2}^\circ$
Toe-in	0.062 in. to 0.141 in. (1,57 mm. to 3,58 mm.)	0.062 in. to 0.141 in. (1,57 mm. to 3,58 mm.)

Lock and stop adjustment (see Fig. H21)

After checking the castor and camber angles, and before moving the car from the turntables it is advisable to check the angles of full steering lock. The angles should be 41° inside lock and $33\frac{1}{2}^\circ$ outside lock. If any of the angles are too great, packing pieces must be added to the ends of the lower triangle levers.

1. If the right-hand wheel outside lock or the left-hand wheel inside lock is too great, add packing pieces to the right-hand lower triangle lever.
2. If the left-hand wheel outside lock or the right-hand wheel inside lock is too great, add a packing piece to the left-hand lower lever. There are three packing pieces available, 0.032 in., 0.048 in. and 0.064 in. (0,794 mm., 1,191 mm. and 1,588 mm.) thick. The smallest of the three should be selected first when adjusting.

Lock stop packing—To fit (see Fig. H21)

1. Remove the nut and washer.
2. Clear the abutment faces, ensuring that they are free from foreign matter, e.g. grit, grease or oil.
3. Fit the lock stop packing.
4. Fit and torque tighten the nut and washer.

Track rod ball joint relative height— To adjust

The steering geometry is designed to ensure that the alignment of the front wheels is contained within the prescribed limits during vertical oscillation of the front suspension. Adjustment to maintain these limits can be obtained by raising or lowering the steering and idler boxes on the sub-frame mounting points (see Fig. H22). Incorrect settings may cause increase in car 'shake' or the steering to wander during high speed driving. Castor and camber angles must be corrected before any adjustment is attempted.

Note On early production cars it is necessary to fit both the steering and idler boxes at the top of their slots when this check is carried out in order to approximate the necessary setting.

1. Lock the steering cross-beam in the straight-ahead position with the special clamping fixture (RH 8015), then position the front wheels on small turntables to permit lateral movement and to cope with any alteration of track.
2. Place sufficient ballast to the front of the car to move the suspension 2.00 in. (5,08 cm.) towards the bump stops.

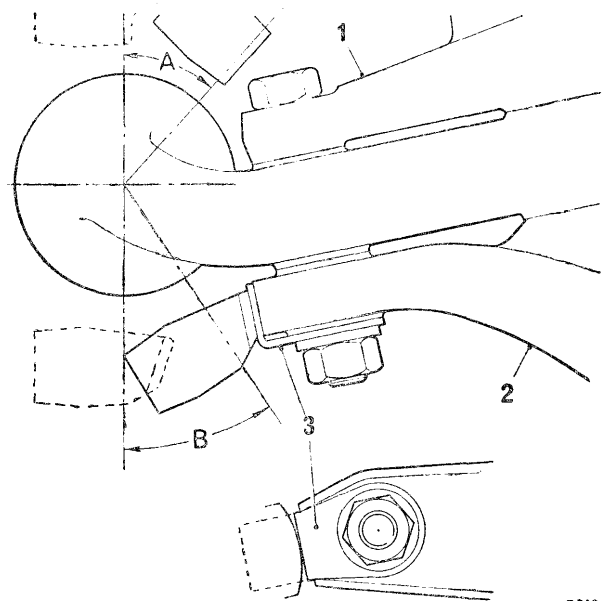


FIG. H21 STEERING LOCK STOP PACKING PIECE

- 1 Rear lower triangle lever
- 2 Front lower triangle lever
- 3 Packing piece
- A 41° inside lock
- B $33\frac{1}{2}^\circ$ outside lock

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3. Position a hydraulic jack beneath the central pivot point of the lower triangle levers and fit a hardwood block to the jack head.

4. Raise the jack until contact is just made with the pivot pin.

5. Remove one of the front wheel disc/hub caps and unscrew three of the wheel nuts; fit the three special nuts of the mirror support plate.

6. Fit the mirror support plate (RH 7839) to the special nuts so that the mirror bar is at its lowest position; secure the plate using the three wheel nuts.

7. Fit the mirror to the bar.

8. Fit the telescope to the special mounting bracket (RH 7840) which fits into the body sill at the jacking point.

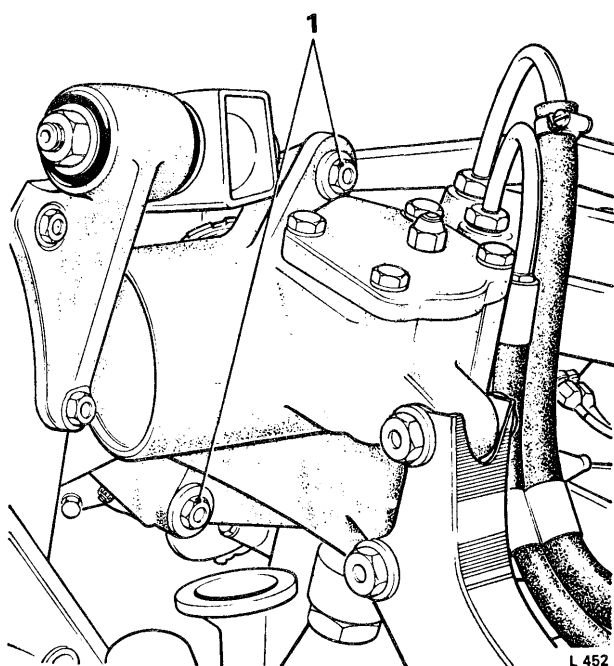
9. Adjust both the mirror and the telescope until the measurement marks are centralised when viewed through the telescope.

10. Note the reading on the scale attached to the telescope, no further adjustment must be made to the mirror.

11. Raise the car with the jack approximately 5.00 in. (12,7 cm.), i.e. 3.00 in. (7,6 cm.) above the car front height then adjust the telescope to align with the marks on the mirror. Note the reading.

The toe-in for one wheel is the difference between the two readings.

Note From rebound to bump the difference in readings should be less than 0.050 in. (1,27 mm.) and more toe-in should be present at rebound than at bump.



**FIG. H22 STEERING BOX MOUNTING/
ADJUSTING POINTS**

1 Adjusting points - 2 shown, 1 hidden

If the difference in reading is excessive and there is more toe-in at rebound (rebound is the downward movement of the suspension and bump is the upward movement of the suspension), lower the steering box or idler box on the slotted holes as appropriate and make a further check.

Alternatively, if there is more toe-in in the bump position, raise the steering or idler boxes.

12. Raising or lowering a steering or idler box on its slots adjusts the height of the track rod inner ball joint adjacent to it but doing so also affects the height of the opposing track rod inner ball joint. Therefore it is recommended that the following procedure be adopted to obtain the desired setting for each wheel.

13. Position a screw jack under the appropriate side of the steering box torque arm and raise the jack to just abut the arm. Release, but do not remove the three securing bolts of the steering or idler box and the securing bolts at each end of the torque arm.

14. Raise or lower the jack head the necessary amount, then tighten the securing bolts of the box.

15. Before attempting adjustment to the other side of the car, clamp a dial test indicator to a height gauge and obtain a reading on the indicator from a level surface to the base of the track rod inner ball pin, then zero the indicator. Remove the gauge and indicator, then proceed to adjust the height of the opposing steering or idler box in a similar manner to that described earlier.

16. On completion, tighten the box securing bolts, then, using a different height gauge and dial test indicator, check the height of the adjacent track rod inner ball pin from the level surface, obtain a reading and zero the dial.

17. It is now necessary to make final adjustment to the height of the steering and idler boxes in turn until zero reading is obtained on each indicator, situated at the base of the track rod inner ball joints.

18. On completion, torque tighten the steering and idler box mounting bolts and the torque arm securing bolts.

19. It may be advantageous for future reference, to mark the positions of the steering and idler boxes relative to the sub-frame.

20. Remove the ballast and optical equipment and the steering levers clamping fixture.

21. If the idler box and steering box are set below the mid-point in their adjustment slots, fit a 0.125 in. (3,18 mm.) packing piece between the engine front mounting foot and the stop plate situated on the steering box and idler box torque arm.

22. Check the toe-in and adjust if necessary.

Section H9

BUMP AND REBOUND RUBBERS

Bump and rebound rubbers—To remove (see Fig. H23)

1. Place the car on a ramp.
2. Apply the hand brake.
3. Chock the rear wheels.
4. Remove the gear range selector thermal cut-out as described in Chapter M – Electrical System.
5. Raise the ramp.
6. Remove the nut retaining the rubber to the sub-frame, using the special 'C' spanner (RH 7849 or RH 7850) fitted in the slots provided in the outer lip of the rubbers.
7. Remove the rubber.

Bump and rebound rubber—To fit

Reverse the procedure given for removal.

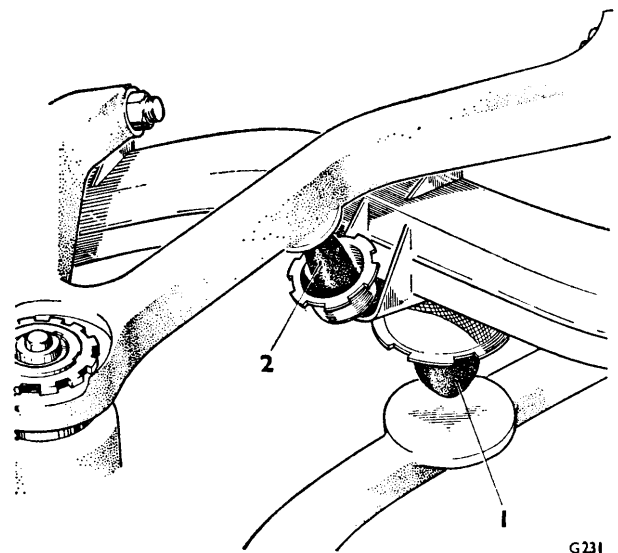
Bump and rebound rubbers—Types

The rebound rubbers are the smaller of the two and are fitted to all models of Silver Shadow and Bentley T Series cars.

The bump rubbers are the larger of the two and come into two categories.

- A — Conical rubber pad fitted to all cars other than cars fitted with heavy duty suspension.

- B — Conical rubber pad, greater in length and flat topped, fitted to cars with heavy duty suspension.



**FIG H23 BUMP AND REBOUND RUBBERS
IN POSITION**

- 1 Bump rubber
2 Rebound rubber

Chapter H

Section H10

TRAILING ARMS AND MOUNTING POINTS

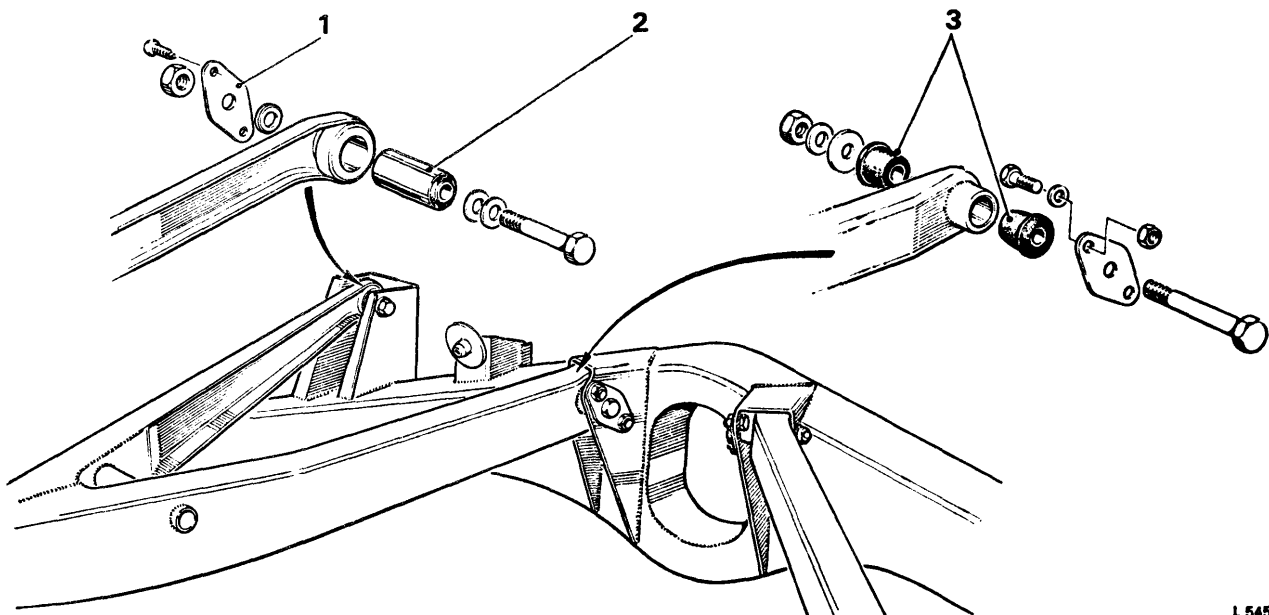
Camber and toe-in settings

There are two methods of fitting the trailing arms to the rear cross-member and setting the camber and toe-in.

The first method of setting the components utilises various checking equipment, including squares, rule and height gauges, etc.

The second method requires the use of the special fixture (RH 7854), in addition, optical toe-in and gravitational camber setting equipment is needed.

The settings can only be achieved using either of the two methods. Although the camber and toe-in can be checked on the car, it is not possible to adjust them without removal of the cross-member and trailing arms from the car (*see Section H11 – Rear cross-member*).



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FIG. H24 TRAILING ARM MOUNTING POINTS

1 Locking plate

2 Rubber-bonded metal bush

3 Cone-shaped rubber-bonded metal bushes

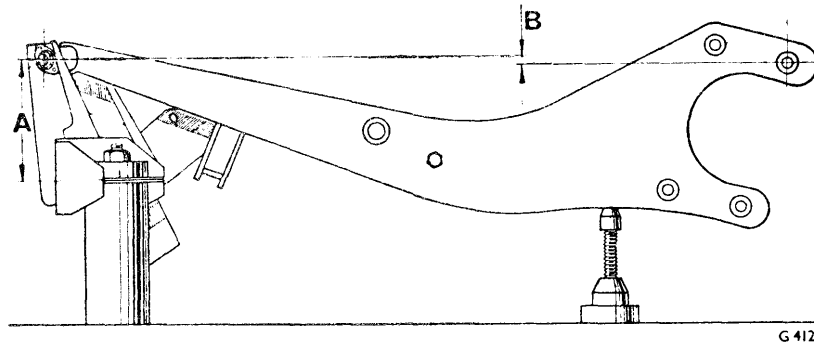


FIG. H25 ALIGNING THE TRAILING ARMS TO THE SUSPENSION CROSS-MEMBER (NORMAL RIDE) PRIOR TO SETTING CAMBER AND TOE-IN

A 5.312 in. (13,492 cm.)

B 0.269 in. (6,83 mm.)

Trailing arms—To set (without the fixture) Camber—To set

1. Place the cross-member on a surface table, locating suitable cubes under the cross-member resilient metal mounting platform to ensure that the cross-member is in the vertical plane.

2. Mount the trailing arms and set the arms in the 'normal ride' position (see Fig. H25).

3. Tighten the centre bolt of the inner bush and the bolts of the locking plate. Leave the centre bolt of the outer bushes 'nipped' only.

4. In addition, the centre line between the cross-member mounting points should be marked along the surface table, in order that accurate measurements can be taken between the hub unit mounting tubes of the trailing arms.

5. Using an accurate square or gravitational camber setting equipment, check each trailing arm for Zero $\pm \frac{1}{4}^\circ$ negative camber. The trailing arms must be within $\frac{1}{4}^\circ$ of each other. 'Nip' the trailing arm mounting bolts.

Note The square or gravitational camber setting equipment must abut the outer faces of the hub unit mounting tubes of the trailing arms.

Toe-in—To check

1. Using a flat rule placed across the hub mounting tubes to give the equivalent of the diameter of the road wheel, 17.0 in. (43,18 cm.), and with the aid of a square positioned 8.5 in. (21,6 cm.) from the centre line of the hub unit mounting tubes, measure the distance from the base of the square to the centre line on the table (see Fig. H26).

2. Repeat the measurement from the other end of the rule.

3. Compare the measurement from each end of the rule to the centre line.

4. Adjust the trailing arm outer mounting point to the cross-member by moving and tightening the centre bolt until the toe-in for one road wheel is between $\frac{1}{2}$ in. (0,794 mm.) and zero. (The locking plate must be in position on the outer bolts). Adjustments to the toe-in will alter the camber, so it is necessary to re-adjust both camber and toe-in until a satisfactory position is obtained.

5. Repeat the procedure for the other trailing arm until a satisfactory reading of camber and toe-in for both road wheels is obtained.

The maximum permissible difference between toe-in for both sides of the car is 0.015 in (0,381 mm.).

6. On completion, torque tighten all the centre bolts, repeat the checks, then loosely attach the outer locking plates into position.

7. The outer locking plate is locked into position by two self-tapping screws. Use the locking plate as a template while drilling the 0.156 in. (3,97 mm.) diameter holes in the cross-member bracket for the self-tapping screws.

8. Fit the screws into each locking plate.

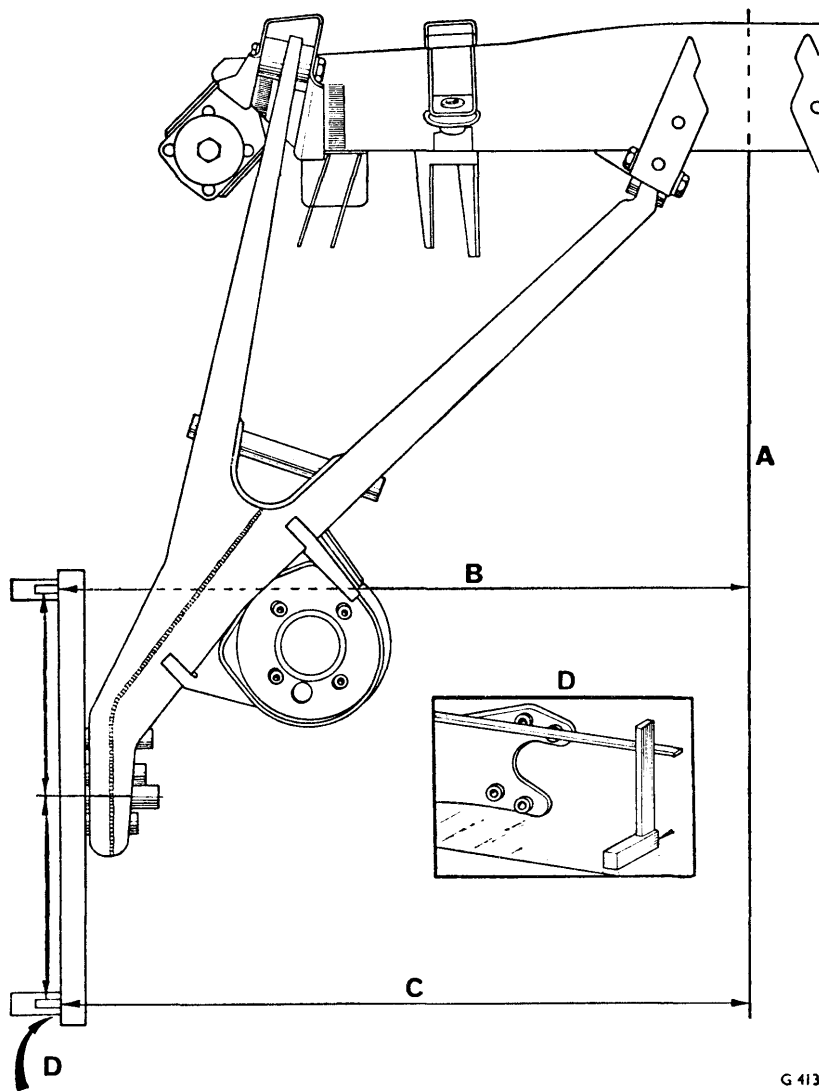
Trailing arms—To set (using the fixture)

1. Attach the trailing arms to the cross-member and seat the assembly on the trailing arm setting fixture (RH 7854). The fixture automatically sets the trailing arms to car 'normal ride' position relative to the cross-member.

2. Tighten the inner mounting centre bolts and the inner mounting locking plates.

Note The fixture must be set upon a surface table, or alternatively, set up such that it is level (adjustable feet are provided on the fixture for this purpose) in order that the gravitational equipment may be used.

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FIG. H26 METHOD OF CHECKING TOE-IN—REAR SUSPENSION

A Centre Line (marked on surface table)
B and C Horizontal measurements from base of square to centre line

D Inset showing position of rule to square
E and F 8.500 in. (21,6 cm.) about wheel centre

3. From this point toe-in and camber settings may be achieved using the method previously described, or by using the gravitational alignment gauge for camber, locating on the four boss faces or by locating directly on the hub if fitted temporarily.

4. If the hub is fitted, a slave wheel rim can also be fitted, thus a conventional optical alignment gauge may be used to give a toe-in reading between the trailing arms.

5. The toe-in reading is taken using the image of the telescope reflected from the mirror set at the

mid-point of the fixture, thus giving half the total toe-in reading. (Using the mirror set at this point ensures eventually a total toe-in reading equidistant about the car centre line). The trailing arm is adjusted accordingly as described in 'Trailing arms - To set (without the fixture)' and the procedure repeated for the other trailing arm, using the opposite side of the double sided mirror.

6. Tighten and lock the trailing arm outer bolts into position as described in 'Trailing arms - To set (without the fixture)'.

Section H11

REAR CROSS-MEMBER

Cross-member resilient metal mounts

—To remove

It is possible to remove the mounts one at a time with the cross-member in position without disturbing suspension settings or hydraulic components, etc.

1. Position the car on a ramp.
2. Apply the hand brake and chock the rear wheels.
3. Remove the gear range selector thermal cut-out as described in Chapter M – Electrical System.
4. Fit a screw-jack, with a hardwood block fitted to the jack head, beneath the rear cross-member as near as possible to the mounting points.
5. Adjust the screw-jack to support the cross-member at this point.
6. Position ballast (sandbags) in the boot of the car to overcome the action of the road springs, whilst the resilient metal mount is removed.

Note The ballast will maintain the correct distances between the mount cross-member mounting point and the faces of the upper and lower sill brackets.

7. Place a piece of wood between the cross-member and the body heel board to prevent the cross-member from tilting forward.
8. Remove the centre-bolt and nut from the mount, then remove the lower steady bracket from the sill. Unscrew and remove the setscrews from the central mounting flange of the mount.
9. Remove the resilient metal mount.

Cross-member resilient metal mounts

—To fit

Reverse the procedure given for removal, noting the following points.

1. Load the new mount by supporting it on the central flange and pressing the mount lower face upward sufficiently to enable a split ring packing (RH 7848) 0.234 in. (5.94 mm.) thick to be fitted between the upper main cushion top cup and the limiting cushion which encircles the main cushion (see Fig. H27). Care must be taken not to bend the central flange.

2. Centralise the mounting in the special fixture (RH 7847) so that the radial run-out of the cylindrical portion of the central pressing does not exceed 0.025 in. (0.64 mm.). Ensure that the two upper and one lower abutment washers are fitted as shown in Figure H27.

3. Fit and torque tighten the mount to the cross-member mounting point (see Fig. H27) and ensure that the cross-member is not disturbed.

4. Fit and secure the lower steady bracket, finger tighten the mount centre bolt.

5. Torque tighten the mount centre bolt (see Chapter P – Torque Tightening Figures).

6. Remove the split packings and the wooden wedge from between the cross-member and body heel-board.

Repeat the procedure for the other mount if necessary.

Cross-member and trailing arm assembly

—To remove

If the car has suffered accident damage, and the rear suspension and cross-member have been removed for thorough inspection, it is necessary to disconnect

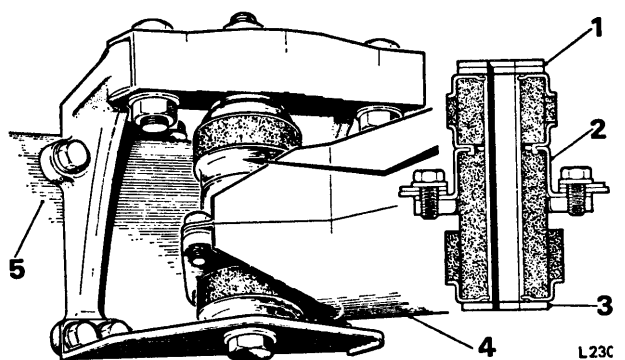


FIG. H27 REAR SUSPENSION CROSS-MEMBER MOUNT

- 1 Abutment washers
- 2 Resilient metal mount
- 3 Abutment washer
- 4 Suspension cross-member
- 5 Body sill

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and remove all units of the suspension, e.g. rear hub units to facilitate the removal of the cross-member and trailing arms assembly from beneath the car.

1. Place the car on a ramp and chock the front wheels.
2. Remove the gear range selector thermal cut-out as described in Chapter M – Electrical System.
3. De-pressurise the hydraulic system as described in Chapter G – Hydraulic System.
4. Disconnect and remove the rear portion of the exhaust system.
5. If fitted, remove the rear stabiliser bar (see Section H15 – Rear Stabiliser Bar).
6. Remove the rear road wheels and hubs (see Chapter J – Final Drive).
7. Remove the damper and spring as described in Section H12 – Rear ‘Monitube’ shock damper and Section H13 – Rear road springs. It is important to disconnect the damper at its lower end before removing the rebound strap to avoid possible damage to the damper piston rod through overtravel.
8. Disconnect the hand brake cables from the cable mounting points on the trailing arms.
9. Disconnect the torque arm from the cross-member.
10. Remove the propeller shaft (see Chapter F – Propeller Shaft).
11. Disconnect the flexible hydraulic pipes either at the junction on the cross-member, or alternatively at the point where they join the body underframe (see Chapter G – Hydraulic System).
12. Remove the supplementary hydraulic compliance damper (if fitted); refer to ‘Horizontal compliance cushions and damper – To remove’, in this Section.

13. Remove the resilient metal horizontal compliance cushions; refer to ‘Horizontal compliance cushions (resilient metal type) – To renew’.

14. Disconnect and remove the tubular links.
15. Support both sides of the cross-member; remove the steady bracket and centre bolt of each mount.
16. Lower the cross-member and trailing arms assembly.

Cross-member and trailing arm assembly –To fit

1. Fit and set the trailing arms to the rear suspension cross-member as described in Section 10 – Trailing arms and mounting points.
2. Fit the horizontal compliance cushion assemblies to the cross-member as described in ‘Horizontal compliance cushions (resilient metal type)’ of this Section.
3. Load the vertical resilient metal mount by supporting it on its central flange and pressing the mount lower face upward sufficiently to enable a split ring packing (RH 7848) 0.234 in. (5.94 mm.) thick, to be fitted. This split ring should be fitted between the upper main cushion top cup and the limiting cushion which encircles the main cushion. Care must be taken not to bend the central flange.
4. Centralise the mounting in the special fixture (RH 7847) so that the radial run-out does not exceed 0.025 in. (0.64 mm.).
5. Repeat the procedure for the other vertical mount; fit the mounts to the cross-member.
6. Ensure that the tubes of the bridge pieces of the cross-member mounting points on the body are free to move, otherwise it will not be possible to manoeuvre the cross-member into position without side loading the mounts.

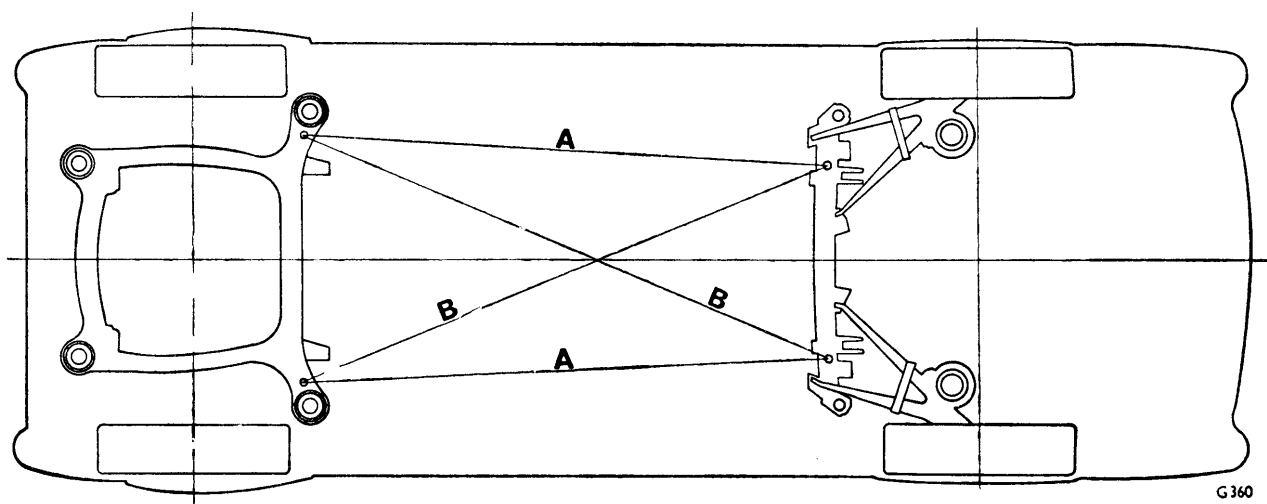


FIG. H28 METHOD OF ALIGNING SUB-FRAMES

A Measurements to be equal with 0.062 in. (1.59 mm.)

B Measurements to be equal within 0.062 in. (1.59 mm.)

7. Support the cross-member and trailing arm assembly by jacks at four points, two adjacent to, but not beneath the mounting points and two beneath the outer ends of the trailing arms.

8. Raise the cross-member into position with two abutment washers fitted to each mount. Locate each mount by threading the centre bolts, fitted with the steady brackets and lower abutment washer, through the mounting points (see Fig. H27).

9. Ensure that the mounts are not disturbed radially and that the cross-member remains vertical.

10. When the cross-member is raised to within 0.125 in. (3.18 mm.) of its final position, align it to the front sub-frame by manoeuvring and measuring the longitudinal and diagonal distances between the front sub-frame and cross-member (see Fig. H28).

11. Raise the cross-member to abut the bridge pieces.

12. Locate and secure the steady brackets to the body sills, then torque tighten the mount centre bolts.

13. Fit and tighten the cross-member links to the cross-member and sill mounting points.

14. Fit the compliance cushions whilst the packing pieces (RH 7848) are still in position, as described in 'Compliance cushions assembly - To fit', on page H36.

15. Fit the supplementary compliance hydraulic damper (if fitted).

16. Fit the propeller shaft (see Chapter F - Propeller Shaft).

17. Fit the torque arm to the cross-member (see Chapter J - Final Drive).

18. Fit the rear 'Monitube' shock dampers and road springs (refer to Section H12 and H13 respectively).

19. Fit the hubs and road wheels (refer to Chapter J - Final Drive).

20. Fit the exhaust system.

21. Fit the hand brake cables.

22. Fit the hydraulic pipes (refer to Chapter G - Hydraulic System).

Cross-member links—To maintain

Check the condition of the bushes when the rear suspension is removed from the car. If they are not considered serviceable, fit new link assemblies and bushes.

Horizontal compliance cushions and dampers

Two types of horizontal compliance cushions and damper are fitted, the resilient metal type and the hydraulic type (see Fig. H31).

The hydraulic damper is not fitted to cars having the Torque Converter Transmission.

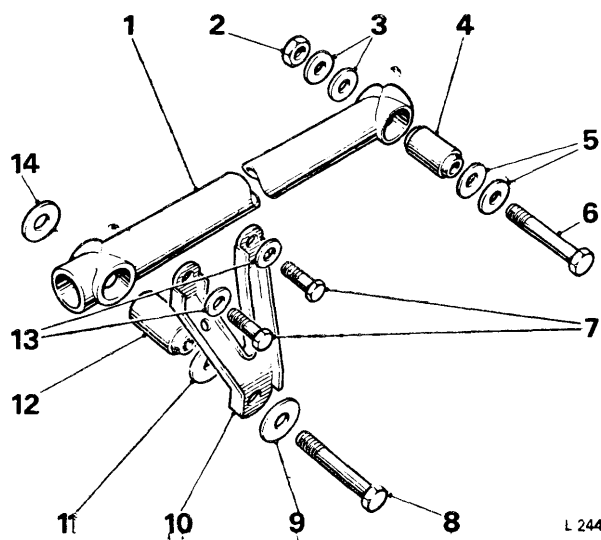


FIG. H29 EXPLODED VIEW—TUBULAR LINKS

1 Tubular link	8 Setscrew
2 Nut	9 Washer
3 Washers	10 Bracket
4 Bush	11 Washer
5 Washers	12 Bush
6 Bolt	13 Washers
7 Setscrews	14 Washer

Horizontal compliance cushions (resilient metal type)—To fit—rear cross-member removed from car

1. Assemble the centre abutment block, rear cushion and rear abutment bracket, by securing with a $\frac{5}{16}$ in. U.N.F. slave setscrew passing through the forged bracket and screwing into the centre abutment block.

2. Tighten the screw until the length of the rear cushion is between 1.990 in. and 2.010 in. (5,055 cm. and 5,105 cm.).

3. Fit the assembly to the cross-member together with the front cushion.

Pre-load the front cushion by using a $\frac{5}{16}$ in. U.N.F. slave setscrew. Screw the setscrew into the centre abutment block until it is possible to fit the rear abutment bracket to the cross-member bracket (see Fig. H31).

Note The rear abutment bracket is secured to the cross-member by two bolts, nuts and washers.

4. Remove the slave setscrew from the front cushion **only**. This is important as once the cross-member is fitted to the body the slave setscrew is inaccessible. The rear slave setscrew should remain in position until later.

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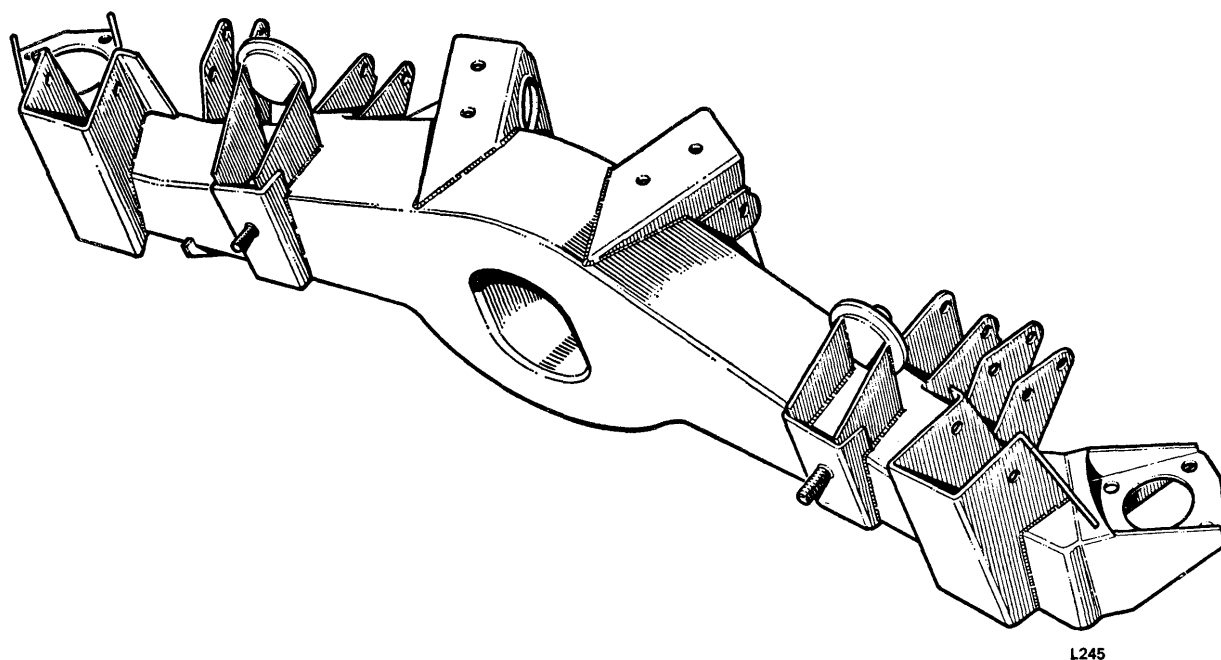


FIG. H30 VIEW OF REAR SUSPENSION CROSS-MEMBER

5. Repeat the procedure for the other compliance cushions and trailing arms.

After the rear cross-member, trailing arms and links have been fitted, fit the compliance cushions assembly to the body as follows.

Compliance cushions assembly—To fit

1. With the split packing pieces still in position in the rear cross-member resilient metal mounts, fit packing pieces as necessary between the centre abutment blocks and body brackets on the seat pan (see Fig. H31). The number of packing pieces is determined by the visible gaps, packing pieces are supplied in two thicknesses.

2. Fit the clamping plates to the outside of the body brackets. Fit the two securing bolts through the clamping plates, body brackets, packing pieces and central abutment block.

3. Fit and torque tighten the nuts, then repeat the procedure for the other horizontal compliance cushion assembly.

4. Remove the slave setscrew from each compliance cushion assembly and the split packing pieces from the cross-member main resilient metal mounts when the car is standing on its road wheels.

Horizontal compliance cushions (resilient metal type)—To renew

With rear cross-member in position on the car

In the case of accident damage to the mounting brackets it is necessary to remove the cross-member.

1. Fit a slave setscrew $\frac{5}{16}$ in. U.N.F. through the rear abutment bracket of one of the horizontal compliance assemblies and tighten sufficiently to compress the rear cushion to approximately 2.000 in. (5,08 cm.).

Note In order to fit the slave setscrew it may be necessary to raise the body. For this purpose, place the special sill beams (RH 7820) between the inner body sill and the jack.

If the cushions have collapsed, it will be necessary to move the top of the cross-member rearward until the 2.000 in. (5,08 cm.) required is obtained. To do this wedge pieces of wood between the cross-member trailing arm outer mounting brackets and the body heel-board.

2. From the other compliance cushion assembly situated at the opposite end of the cross-member, remove the rear abutment, central abutment block and cushions. Retain the packing pieces.

3. Fit a new rear (long) cushion and central abutment bracket to the rear abutment bracket, then, using a slave setscrew, compress the cushion until it is 2.000 in. (5,08 cm.) in length.

4. Fit the short cushion to the front abutment bracket on the cross-member, followed by the central abutment block assembly.

5. Fit and tighten the bolts to secure the rear abutment bracket to the cross-member.

6. Fit the packing pieces, previously removed, to their respective positions on each side of the central

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abutment block, then fit and tighten the two bolts, using clamping plates to secure the compliance cushion assembly to the body bracket.

Do not remove the slave setscrews at this stage.

7. Remove the rear abutment bracket, rear cushion and centre block with slave setscrew as an assembly from the remaining compliance cushion assembly; remove the front cushion.

8. Using the slave setscrews to compress the rear cushion to 2.00 in. (5.08 cm.) in length, fit new cushions and the abutment pieces to the cross-member and body brackets as described in 'Compliance cushions assembly - To fit'.

9. Remove the slave setscrews from each compliance cushion assembly, the wooden wedge between the cross-member and heel-board, sill beams (RH 7820) and jacks.

Horizontal compliance damper (hydraulic)

—To remove

The hydraulic compliance damper should be renewed with the cross-member in position in the car as follows.

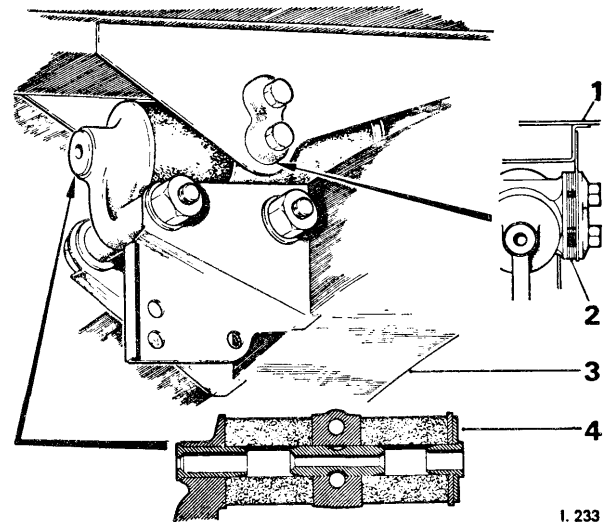
1. Remove the nut from the bolt securing the damper to the cross-member bracket.
2. Withdraw the bolt and retain the small washers.
3. Remove the nut from the bolt securing the damper to the seat pan floor brackets.
4. Withdraw the bolt and retain the small washers.
5. Withdraw the damper front end mounting point from its brackets on the cross-member and retain the two heavy washers.
6. Withdraw the damper rear-end mounting point from its brackets on the seat pan floor and retain the four heavy washers.

Note The rubber bushes are an integral part of the damper, and need not be renewed during the life of the damper.

Horizontal compliance damper (hydraulic)

—To fit

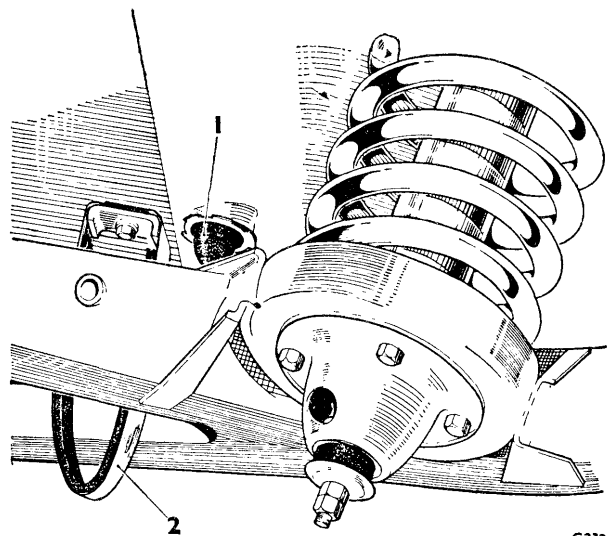
1. Fit the two heavy washers to the faces of the damper front-end mounting point and slide it between the brackets on the cross-member.
2. Fit the bolts, nuts and washers, and finger tighten.
3. Fit the four heavy washers to the faces of the damper rear-end mounting point and slide it between the brackets on the seat pan floor. It will be necessary to compress the damper slightly to align the holes in the mounting bracket with the hole in the damper mounting point.
4. Fit the bolt, nut and washer.



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FIG. H31 HORIZONTAL COMPLIANCE CUSHIONS

- 1 Body underframe
- 2 Packing pieces
- 3 Rear suspension cross-member
- 4 Sectional view compliance cushions assembly



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FIG. H32 BUMP STOP AND REBOUND STRAP

- 1 Bump stop
- 2 Rebound strap

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5. Torque tighten the securing bolts.

Note The body brackets, positioning the damper relative to the cross-member, have been set to a dimension of between 5.745 in. and 5.805 in. (14,59 cm. and 14,75 cm.), measured between the damper mounting bolt centres. **This dimension must be maintained.**

Bump rubber and rebound strap**Bump rubber—To remove (see Fig. H32)**

1. Unscrew the bump rubber using special spanner (RH 7849).

Bump rubber—To fit

Reverse the procedure given for removal.

Rebound strap—To remove (see Fig. H32)

1. Unscrew and remove the rebound strap securing setscrews.
2. Open the jaws of the rebound strap and pull downwards.

Rebound strap—To fit

Reverse the procedure given for removal, noting the following points.

1. Care should be taken when fitting the rebound straps, that they do not 'rub' against the trailing arm stop tube.
2. Lubricate the rebound strap with a suitable rubber lubricant.

Section H12

REAR 'MONITUBE' SHOCK DAMPER

Shock damper—To remove

Cars prior to Car Serial Numbers SRH 4168, CBH 4106, SRX 6122 and CRX 6102.

Access to the upper nuts securing the damper is from the underside of the rear height control ram located on the top of the road spring housing within the luggage compartment. The lower retaining nuts are situated immediately beneath the road spring lower housing.

Remove the damper as follows.

1. Position the car on a ramp and chock the road wheels.
2. De-pressurise the hydraulic systems (*see Chapter G - Hydraulic System*).

Remove a height control ram as follows.

3. Remove the trim from the corners of the luggage compartment.
4. Remove the pipes from the height control ram body and blank off each pipe and port.
5. Remove the screws securing the height control ram.

Note The three setscrews must be released progressively and evenly.

6. Fit three suspension assembly alignment screws (2 long - RH 7858 and 1 short - RH 7859) through the control ram setscrew holes and screw directly into the road spring housing. The short screw fits into the hole to the rear of the ram, i.e. the front hole when viewed from the luggage compartment. The screw extensions should pass through the spring housing and enter alignment holes in a location flange integral with the coil spring isolator tube.

7. Raise the ram body sufficiently to enable the spanner (RH 8051) to be fitted to the slotted part of the ram piston. Unscrew the ram piston from the spring isolator tube nut. Leave the alignment screws in position to facilitate assembly.

8. Unlock and remove the damper upper lock-nut; remove the full nut and the upper rubber bush and retainers.
9. Support the damper lower retaining plate; remove the four securing setscrews.

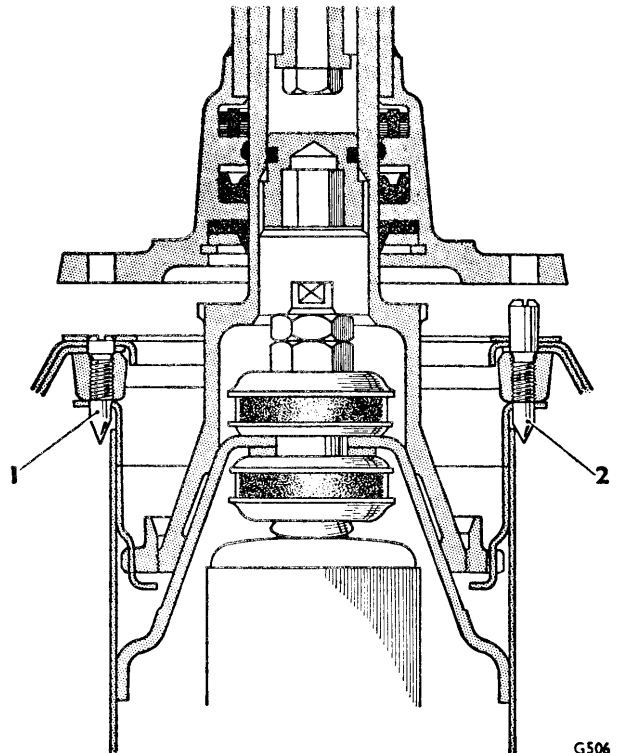
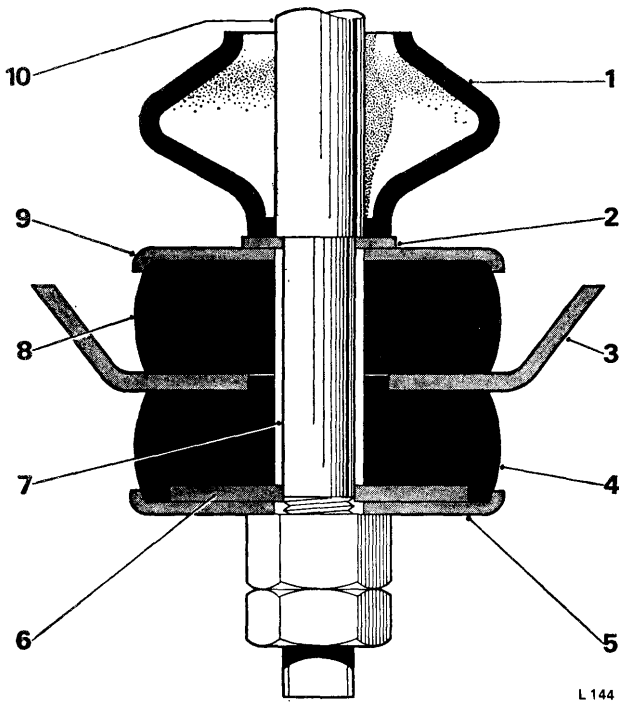


FIG. H33 METHOD OF ALIGNING HEIGHT CONTROL RAM AND SUSPENSION COMPONENTS

- 1 Short alignment screw (1 off)
2 Long alignment screw (2 off)

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FIG. H34 DAMPER LOWER MOUNT

- 1 Rubber boot
- 2 Abutment washer
- 3 Support bracket
- 4 Bush
- 5 Cup washer
- 6 Lower abutment washer
- 7 Distance piece
- 8 Bush
- 9 Cup washer
- 10 Damper spindle

10. Allow the damper to extend by supporting and lowering the retaining plate from the trailing arm spring housing; withdraw the damper with retainer from the centre of the road spring.

11. Remove the lock-nut and full nut from the lower end of the damper; remove the rubber bushes, retainers, and retaining plate.

12. Collect the remaining rubber and retainer from the top of the damper.

Shock damper—To fit

Fit the damper by reversing the procedure given for removal, noting the following points.

1. Ensure that the rubber bushes and retainers are fitted to each side of the damper securing points and that the retainers for the rubbers seat correctly at the securing points.

2. At the upper and lower ends of the damper, fit and tighten the full nut and lock-nut. The top of the

lock-nut must be level with the top of the damper stem thread (see Fig. H33).

3. When fitting the height control ram, position the ram outer body to just seat at the top of the longer assembly alignment screws.

4. Use the spanner (RH 8051) to torque tighten the ram piston to the road spring isolator tube nut to between 80 lb.ft. and 90 lb.ft. (11,1 kg.m. and 12,4 kg.m.); lower the ram outer body onto the spring housing.

5. Remove one alignment screw at a time, fitting the correct setscrew in its place. Finally, progressively tighten the ram securing screws.

6. Bleed the hydraulic system as described in Chapter G – Hydraulic System.

Shock damper—To remove

Cars after Car Serial Numbers SRH 4168, CBH 4106, SRX 6122 and CRX 6102.

1. Repeat the Operations 1 to 5 previously described in 'Cars prior to Car Serial Numbers SRH 4168, CBH 4106, SRX 6122 and CRX 6102. Shock damper – To remove'.

2. Raise the ram body sufficiently to enable the special spanner (RH 8051) to be fitted to the lugs on the ram piston; unscrew the ram piston from the isolator.

3. Unlock and remove the damper upper lock-nut; remove the full nut, the rubber bush and retainer.

4. Support the damper lower bracket and remove the four setscrews.

5. Allow the damper to extend by supporting and lowering the retaining plate from the trailing arm spring housing, then withdraw the damper and bracket from the centre of the road spring.

6. Remove the lock-nut and full nut from the lower end of the damper; remove the rubber bushes, retainers and 'O' ring.

7. Collect the remaining rubber bush, retainer and 'O' ring from the top of the damper.

Shock damper—To fit

Fit the damper by reversing the procedure given for removal, noting the following points.

1. Ensure that the rubber bushes, 'O' rings and retainers are fitted correctly and are in good condition.

2. At the upper and lower ends of the damper, fit and tighten the full nuts and lock-nuts so that the top of the lock-nut is level with the top of the damper stem thread (see Fig. H33).

3. Using the special spanner (RH 8051), torque tighten the ram piston to the isolator to between 100 lb.ft. and 150 lb.ft. (13,8 kg.m. and 20,7 kg.m.). Release the ram outer body onto the spring housing, then progressively tighten the ram securing screws.

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The special spanner (RH 8051) is used also to align the road spring, damper and isolator to the height control ram.

4. Bleed the hydraulic system as described in Chapter G – Hydraulic System.

For cars produced prior to Car Serial Numbers SRH 4168, CBH 4106, SRX 6122 and CRX 6102, a modified type of rear shock damper mounting is available.

The mounting utilises larger and slightly softer mounting rubbers, these should be fitted in the event of complaints of rear suspension noise. The material required for this Operation can be obtained in Modification Kit No. 5; refer to Parts List.

Lower mounting—To fit (see Fig. H34)

Reverse the procedure given for removal, noting the following points.

1. Fit the original special abutment washer to the damper lower spindle.
2. Fit a large cup washer and a bush to the spindle, then fit the original distance piece.
3. Fit the damper lower support bracket.
4. Fit the bush and washer, then a second cup washer.
5. Fit the nut and lock-nut.
6. Fit the damper support bracket to the car.
7. Repeat the procedure on the remaining rear damper.

Note When fitting a new damper it is most important that the special abutment washer supplied with the damper assembly is fitted to the damper stem. Under no circumstances use an ordinary $\frac{7}{16}$ in. (11,11 mm.) plain washer in place of the special abutment washer.

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REAR ROAD SPRINGS

Coil road springs are fitted to the rear suspension and are supplied with packing pieces to compensate for minor variations in spring load during manufacture. The packing pieces, 0.048 in. (1,19 mm.) thick, may be fitted at either end of the spring adjacent to the rubber/canvas seatings. The maximum number of packing pieces which can be fitted to any one spring is twenty.

Note Rear suspension springs with a higher rate than standard springs are fitted to cars destined for countries in which difficult terrain may be experienced.

These springs are fitted in conjunction with the damper marked with a yellow paint band as described in Section H12 – Rear ‘Monitube’ shock dampers.

On all cars, a rear spring of slightly increased poundage is fitted to the driver’s side of the car.

Road spring—To remove

1. Place the car on a ramp and chock both sides of the front wheels.
2. Remove the gear range selector thermal cut-out as described in Chapter M – Electrical System.
3. De-pressurise the hydraulic system (*see Chapter G – Hydraulic System*). Remove the height control ram and rear damper as described in Section H12 – Rear ‘Monitube’ shock dampers.
4. Disconnect the height control valve linkage at the trailing arm mounting points.
5. When removing the left-hand side rear spring, it will be necessary to remove the exhaust system from the mounting point immediately behind the body centre member.
6. Remove the setscrew securing the rebound strap to the underside of the body floor (*see Fig. H32*).
7. Disconnect the hand brake cable at two points.
 - (a) The first pivot point on the hand brake mechanism of the rear brake calipers.
 - (b) The support bracket integral with the trailing arm.
8. Disconnect the half-shafts at the outer ends and secure them to the final drive cross-member with strong cord. Do not pull the ball and trunnion joints outward.

9. Position a hydraulic jack with an extension and a hardwood block on the jack head centrally beneath the final drive casing. Carefully raise the car until the road wheels are just about to clear the ramp.

10. Position support blocks and the sill boards (RH 7820) beneath the body sills, forward of the rear wheels.

Note Care must be taken while work is being carried out on the car **not** to leave the car jacked so high that the wheels clear the ramp, otherwise damage may result around the trailing arm mounting points or the height control ball pin brackets.

11. Prise the bottom end of the spring from its seating on the trailing arm, taking care not to damage the lower rubber/canvas seating. Remove the spring and isolator assembly from the road spring housing.
12. Collect the rubber/canvas seating and packing pieces.
13. Remove the lower spring seating from the trailing arm.

Road spring—To fit

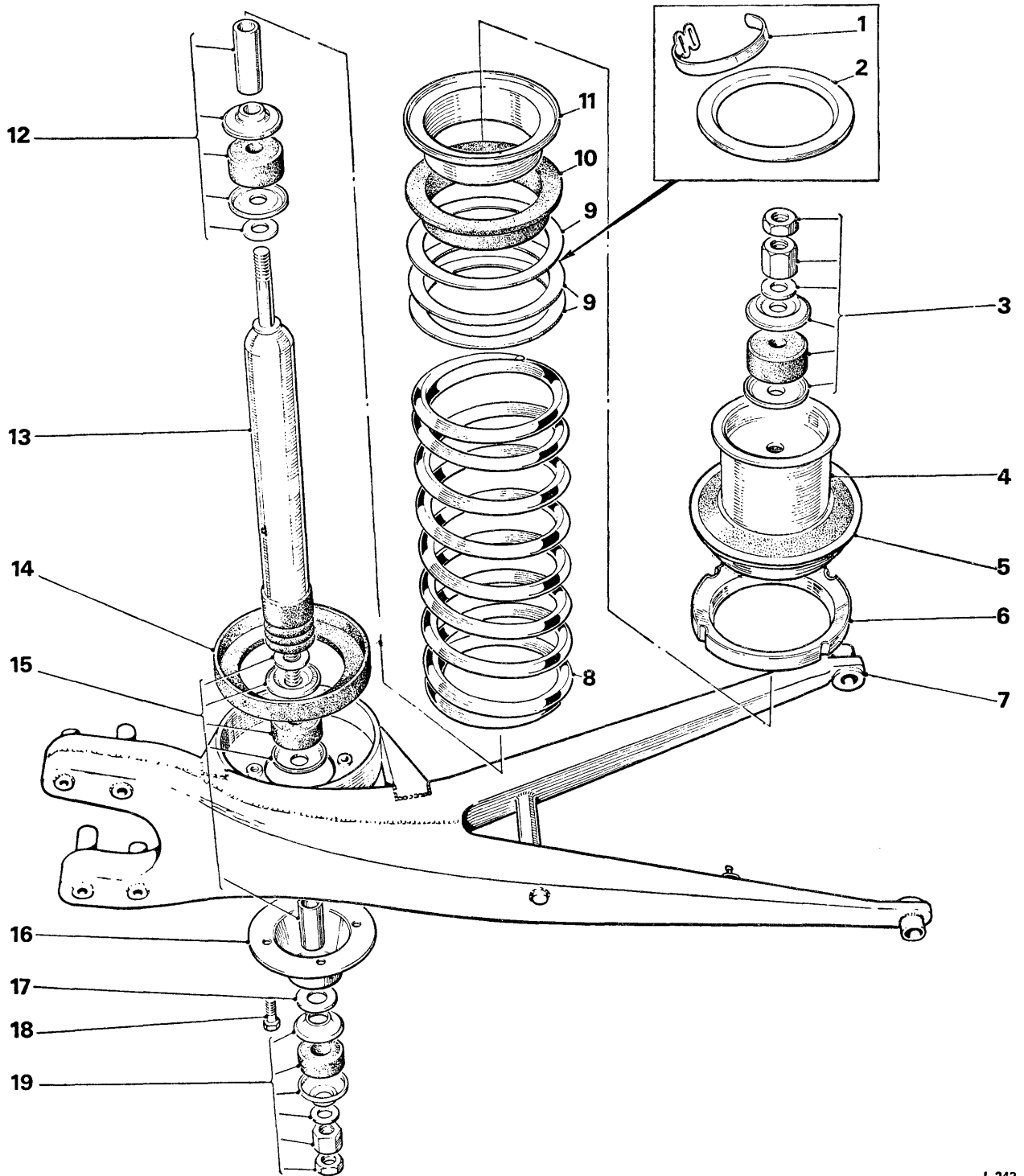
Carefully reverse the procedure given for its removal, noting the following points.

1. Ensure that the rubber/canvas seatings and the rubber isolator are in good condition; renew if necessary.
2. If six, or less, spring packings are to be fitted with the spring, ensure that a spring upper seating of standard size, i.e. 0.750 in. (1,80 cm.) in depth, is fitted to the top of the spring and that a standard spring lower seating is fitted to the base of the spring. Divide the packings equally between the top and bottom and seat them between the rubber/canvas seatings and the coil spring. If an odd number of packings are fitted, fit the greater number of packings to the top. This will facilitate adjustment to the car height when it may be necessary to adjust the number of packing pieces at the base of the spring.
3. If spring selection indicates that seven or more packings should be fitted with the spring, fit the special short rubber/canvas seating, i.e. 0.250 in. (6,35 mm.), to abut the spring upper housing. Fit the packings, then fit the standard rubber/canvas seating on the top of the spring (*see Fig. H35*).

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FIG. H35 EXPLODED VIEW REAR ROAD SPRING AND COMPONENTS (Early Cars)

- | | | | |
|---------------------------------------|---------------------|----------------------------------|----------------------------------|
| 1 Clip | 5 Cone | 11 Spring seat | 16 Damper bracket |
| 2 Canvas spring seat | 6 Isolator retainer | 12 Upper mount components | 17 Packing piece |
| 3 Damper upper mount nuts and rubbers | 7 Trailing arm | 13 Shock damper | 18 Setscrews (4) |
| 4 Isolator and cone | 8 Spring | 14 Canvas seat | 19 Damper lower mount components |
| | 9 Adjusting washers | 15 Damper lower mount components | |
| | 10 Canvas seat | | |

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4. To prevent the packings from moving during assembly, they should be clipped together using thin pipe clips at three equi-spaced points; the length of clip required is determined by the number of packings to be fitted.

Note When using the extra spring seating, it must be remembered that the seating is approximately equal to the thickness of two packings. To allow for this, remove two packings from the number originally indicated during spring selection.

5. The standard rubber/canvas seating is used at the base of the spring and further fine adjustment to car rear height can be made by fitting up to three packings between the spring base and spring lower seating (*see Section H14 – Car height – Rear*).

6. A maximum of twenty packings is permissible to be used with any one spring.

7. Fit the spring, spring isolator and packing pieces into position.

Note On early cars, the top flange of the spring isolator is provided with holes to engage the three alignment screws which are

fitted to the spring housing. These ensure correct alignment between the road spring and isolator and the ram.

8. Pass the damper through the spring and lock it in position at the top end only (*see Section H12 – Rear ‘Monitube’ shock dampers and Figures H33 and H34*).

Fit the ram to the isolator and spring housing as described in Section H12 – Rear ‘Monitube’ shock dampers.

Note It is most important to ensure that the correct securing setscrews are fitted to the ram.

9. Lower the car to enable the rebound straps to be fitted; connect the lower end of the damper to the trailing arm spring seating.

10. Ensure that the half-shaft universal couplings are seated correctly when fitted to the hub yokes and that the bearing retaining straps are seated correctly in the slots provided in the bearing caps.

11. With the car standing on a level surface, check the car height and make the necessary adjustments (*see Section H14 – Car height – Rear*).

Section H14

CAR HEIGHT — REAR

Introduction

The car rear height is the vertical height of point 'B' above point 'A' (see Fig. H36). This must be checked whenever the rear suspension is disturbed, e.g. whenever a coil spring is removed.

Note The height can be checked accurately only if the car front height is approximately correct.

There are two conditions of car height. Each condition is separately checked.

The first condition is the 'showroom standing height', this term applies when the car is stationary with the engine switched off, unladen, and the automatic height control system discharged.

The second condition is the 'levelled height', this term applies when the car is fully laden, the engine running and the automatic height control system fully charged. This height remains constant regardless of the number of occupants and/or luggage.

The first condition, the subject of this Section, should be carried out with the automatic height control system inoperative, i.e. either with the hydraulic system completely discharged or with the height control system valve linkages disconnected and moved to the discharge positions (down at the rear, up at the front).

The second car height condition is checked with the automatic height control system operating; this condition is described in Chapter G – Hydraulic System.

Preparation

Preparation of the car for the height check is described in Section H8 – Suspension Settings.

To check the rear height measure the height from the level surface on which the car stands, to the rearmost bottom bolt which secures the forged brackets of the rear suspension cross-member to the body sill (see Fig. H36). This height should be between 0.625 in. and 0.875 in. (15,875 mm. and 22,225 mm.) less than the distance from the level surface to the rearmost bottom bolt which secures the rear hub assembly to

the trailing arm. The maximum permissible difference in height between each side of the car is 0.187 in. (4,76 mm.).

If the 'showroom' height condition is incorrect at the rear, add or remove spring packings as necessary. One packing piece makes approximately 0.065 in. (1,67 mm.) difference to the car height. The packing pieces are described in Section H13 – Rear road springs.

'Showroom' height—To adjust

To adjust the 'showroom' height, proceed as follows.

1. Place the car on a ramp and chock the front wheels.
2. De-pressurise the hydraulic systems (see Chapter G – Hydraulic System).
3. Disconnect the damper at the lower end.
4. Disconnect the height control valve linkage at the trailing arm mounting points.
5. Remove the rear section of the exhaust system. Disconnect it at the joint situated immediately behind the body centre member.
6. Remove the setscrew securing the suspension rebound strap to the body floor.
7. Disconnect the hand brake cable at the first pivot point on the hand brake mechanism of the rear brake calipers and at the support bracket integral with the trailing arm.
8. Disconnect the half shafts at the outer joints and secure them to the final drive cross-member with strong cord. Do not pull the ball and trunnion joints outward.
9. Position a hydraulic jack with an extension centrally beneath the final drive casing. Fit a hardwood block on the jack head, then raise the car until the wheels are just about to clear the ramp. Position support blocks and the special sill boards (RH 7820) beneath the body sills forward of the rear wheels.

Note While work is being carried out on the car, care must be taken **not** to leave the car jacked too high so that the wheels clear the ramp, otherwise damage may result to the trailing arm mounting points or the height control ball pin brackets.

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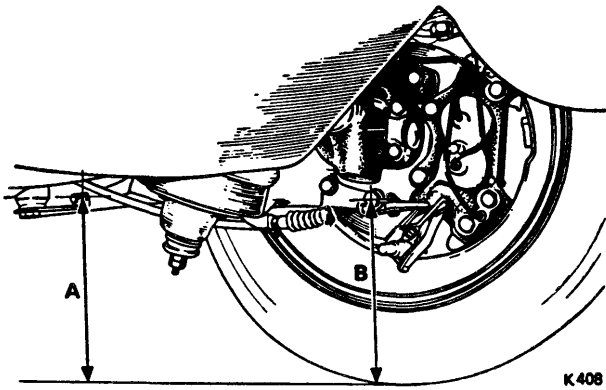


FIG. H36 CAR HEIGHT CHECKING POINTS—REAR

- A** Datum to centre of forging securing bolt
B Datum to centre of axle yoke securing bolt

10. Push the damper operating rod upward as far as possible into the spring, then wedge it in position using a lever inserted through the coils of the spring and beneath the rod. Take care not to bend the rod during this operation.

11. Raise the spring vertically from its lower seating, then fit or remove packing pieces as necessary between the spring and rubber/canvas seating.

Note Do not fit more than **three** packings to the bottom of the spring to correct the car height; if more than three are required they must be fitted to the top of the spring.

12. Instructions for removing the spring and for fitting the upper packing pieces are described fully in Section H13 – Rear Road Springs.

13. Re-check the car height.

Section H15 REAR STABILISER BAR

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Cars from Car Serial Number SRH 4258 and onwards, and CRH 5011 and onwards, are fitted with a rear stabiliser bar.

Convertible models, cars exported to U.S.A. and Canada, and those fitted with Heavy Duty type suspension do not have a rear stabiliser bar fitted.

Rear stabiliser bar—To remove (See Fig. H37)

1. Unscrew, but do not fully remove, the reach nut which secures the link to the trailing arm.
2. Using a hammer and soft metal drift placed behind the link, separate the seal between the link taper and the trailing arm.
3. Remove the reach nut and repeat Operations 1 and 2 on the other link.
4. Remove the setscrews and washers from the two brackets.

5. Remove the brackets, rubber bearing bushes and the stabiliser bar.

6. If it is necessary to remove the link from the stabiliser bar, repeat the procedures given in Operations 1, 2 and 3.

Rear stabiliser bar—To fit

To fit the rear stabiliser bar, reverse the procedure given for removal, noting the following points.

1. If it is intended to fit the original rubber bearing bushes and links, examine their condition and renew if necessary.

Note If the rear stabiliser bar does not require removal, no maintenance is necessary, except to check that all securing setscrews and nuts are tight at all times.

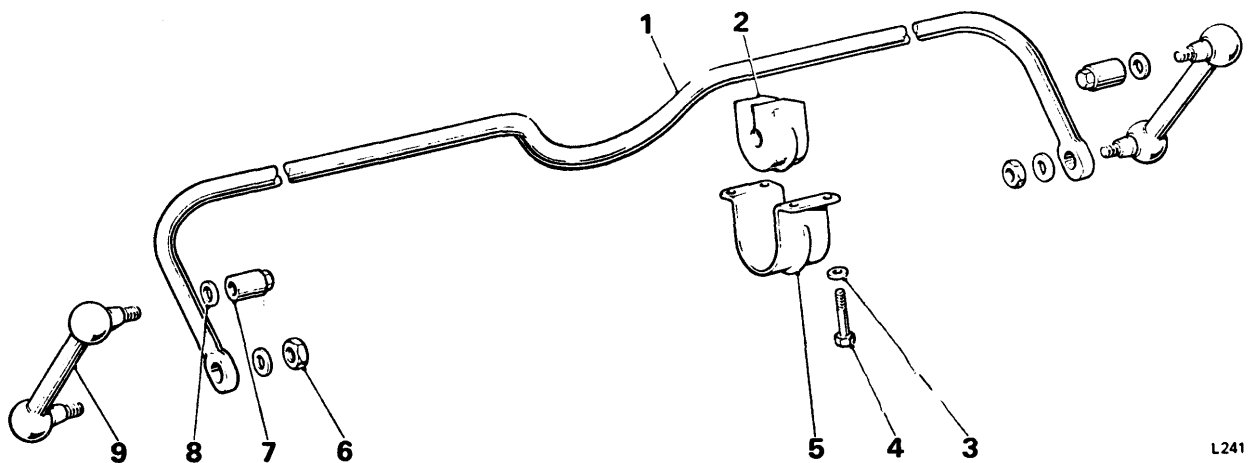


FIG. H37 EXPLODED VIEW REAR STABILISER BAR

- | | |
|-------------------|----------------------|
| 1 Stabiliser bar | 6 Nut |
| 2 Rubber bearing | 7 Reach nut |
| 3 Washer | 8 Washer |
| 4 Setscrews | 9 Link bolt assembly |
| 5 Bearing bracket | |

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Section H16 ACCIDENT DAMAGE

The dimensioned illustrations in this Section are provided to assist in assessing accident damage to the front sub-frame, suspension components and rear suspension.

If it is suspected that the front sub-frame is damaged, it will be necessary to remove the sub-frame, front suspension, engine and transmission as one unit.

To make the necessary checks refer to Section H1.

Components such as triangle levers may be removed individually (*see Section H3*), then checked and compared with appropriate illustration in this Section.

If damage to the rear cross-member or trailing arm is suspected, it will be necessary to remove them as a unit before checks can be carried out.

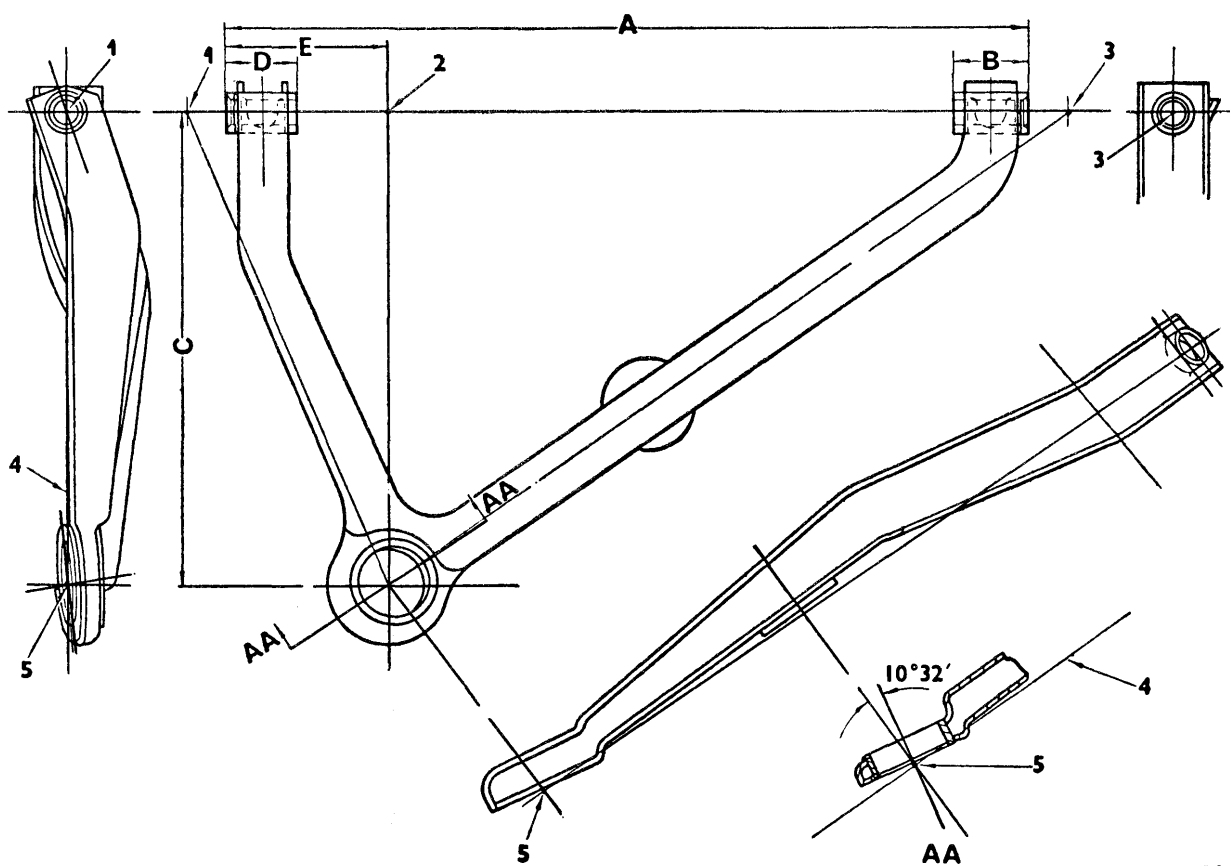
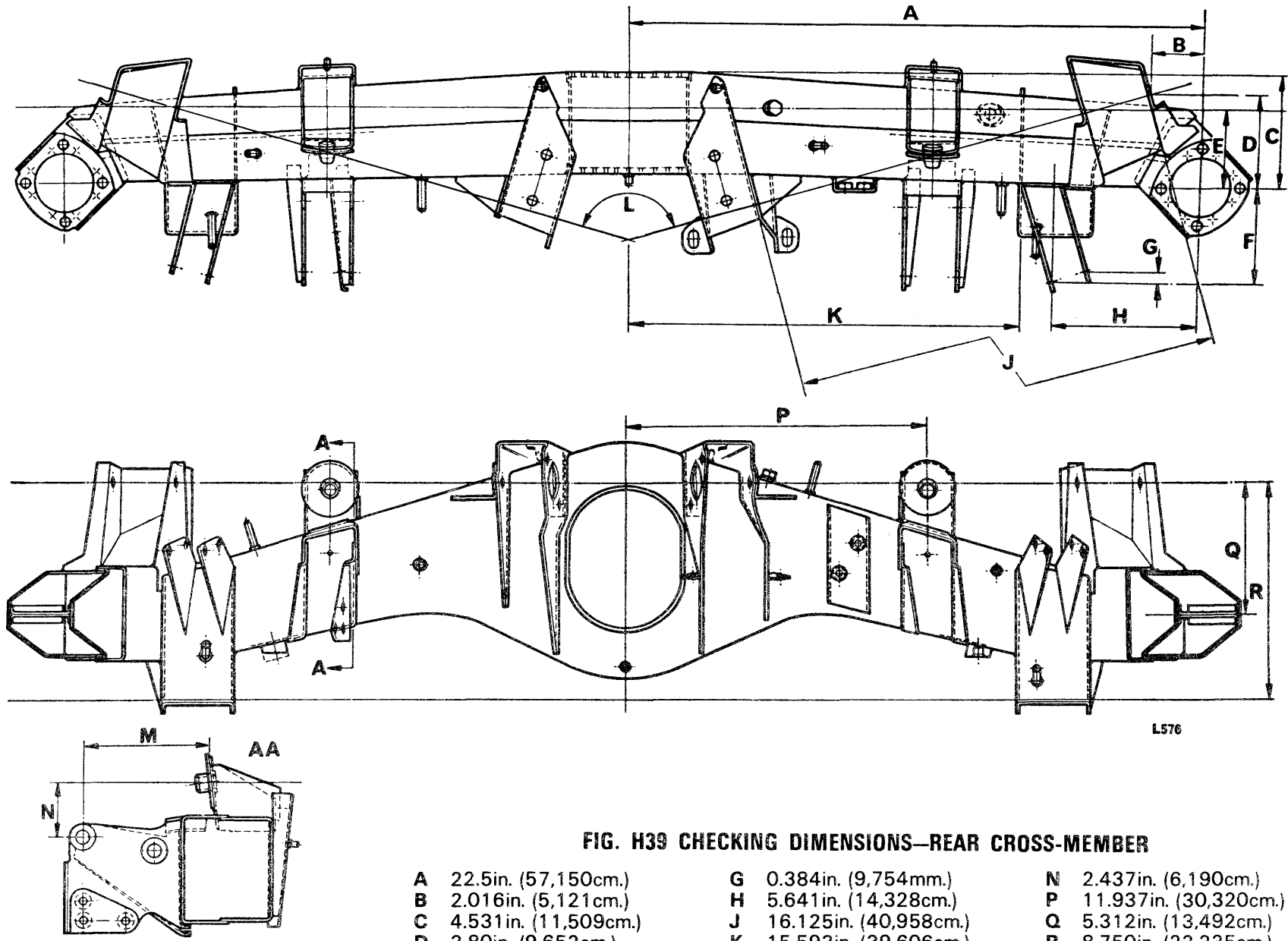


FIG.H38 CHECKING DIMENSIONS—UPPER TRIANGLE LEVERS

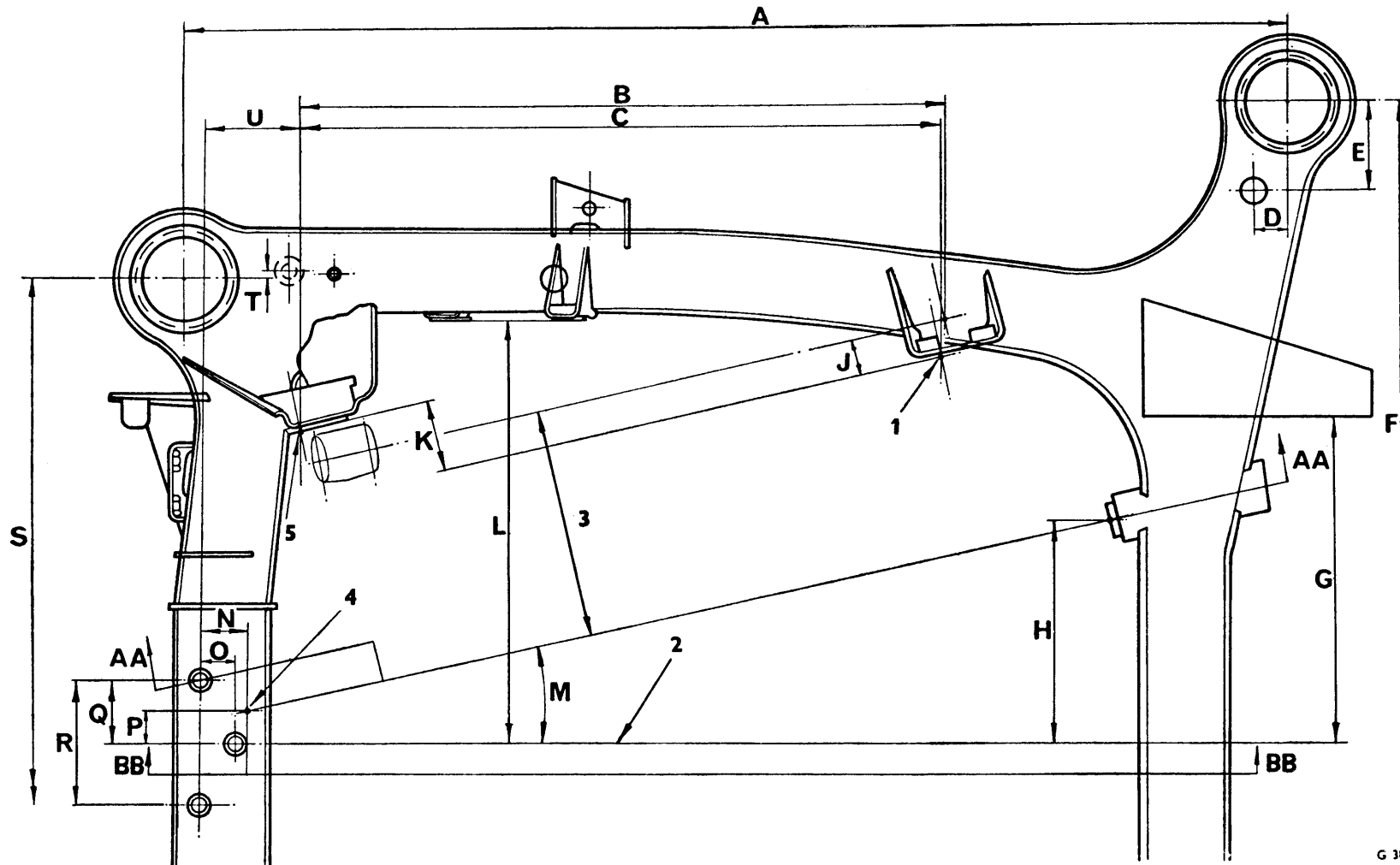
A	19.725in. (50,101cm.)	1	Point A
B	1.725in. (4,381cm.)	2	Point B
C	11.800in. (29,972cm.)	3	Point C
D	1.725in. (4,381cm.)	4	Reference line DB
E	4.000in. (10,160cm.)	5	Point D



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FIG. H39 CHECKING DIMENSIONS—REAR CROSS-MEMBER

A	22.5in. (57,150cm.)	G	0.384in. (9,754mm.)	N	2.437in. (6,190cm.)
B	2.016in. (5,121cm.)	H	5.641in. (14,328cm.)	P	11.937in. (30,320cm.)
C	4.531in. (11,509cm.)	J	16.125in. (40,958cm.)	Q	5.312in. (13,492cm.)
D	3.80in. (9,652cm.)	K	15.593in. (39,606cm.)	R	8.750in. (22,225cm.)
E	3.25in. (8,255cm.)	L	147° 36'		
F	3.625in. (9,208cm.)	M	4.956in. (12,588cm.)		



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FIG. H40 CHECKING DIMENSIONS—FRONT SUB-FRAMES

A	37.832in. (96,093cm.)	H	7.727in. (19,627cm.)	P	1.062in. (2,697cm.)	1	Point D
B	21.990in. (55,855cm.)	J	1.333in. (3,386cm.)	Q	2.075in. (5,271cm.)	2	Centre line
C	21.945in. (55,740cm.)	K	2.40in. (6,096cm.)	R	4.150in. (10,541cm.)	3	Parallel axes
D	1.125in. (2,858cm.)	L	14.187in. (36,035cm.)	S	31.00in. (78,740cm.)	4	Point E
E	4.125in. (10,478cm.)	M	12° 30'	T	0.312in. (7,925mm.) centres	5	Point C
F	43.406in. (110,251cm.)	N	1.500in. (3,810cm.)	U	3.440in. (8,738cm.)		
G	11.250in. (28,575cm.)	O	1.125in. (2,858cm.)				

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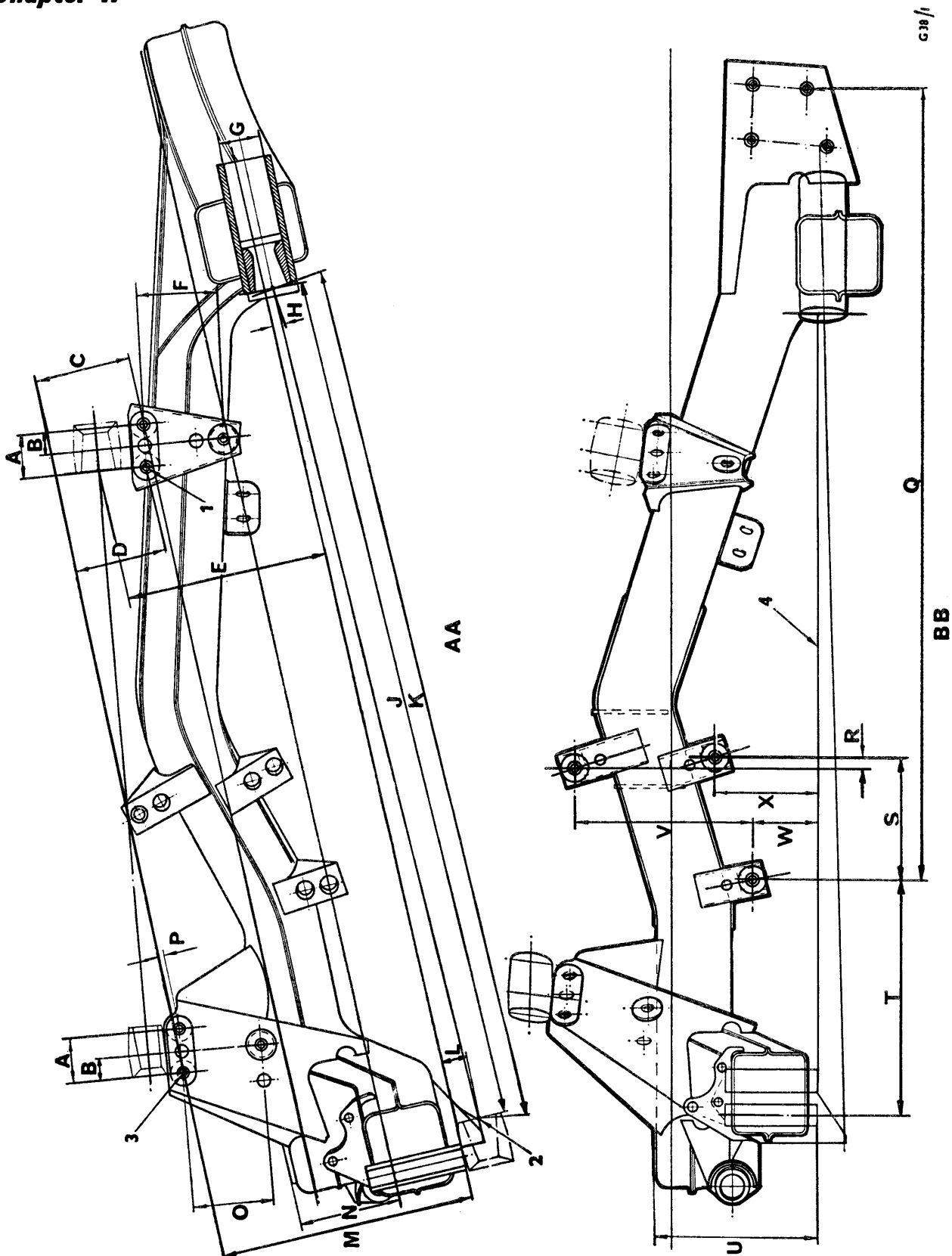
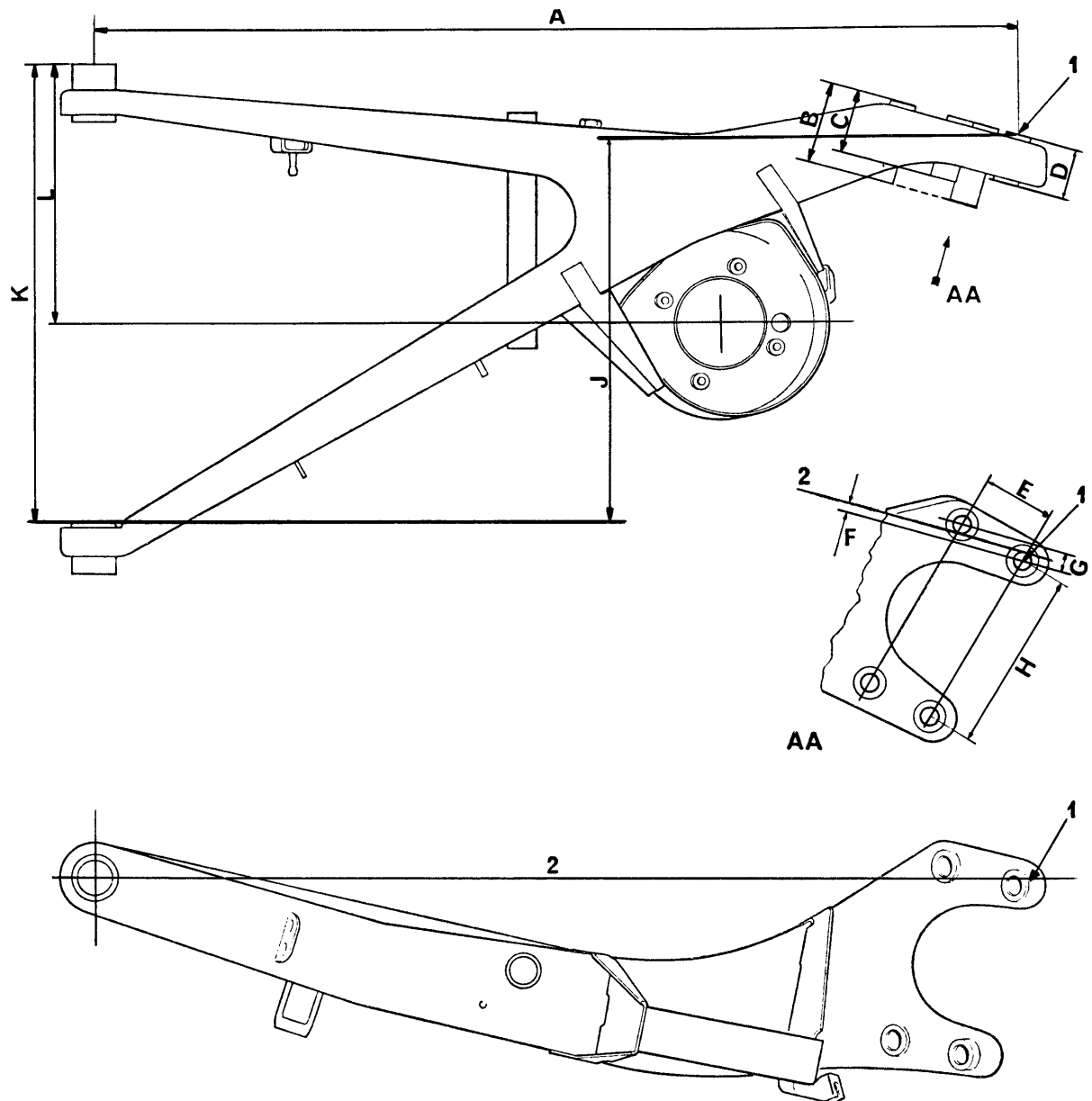


FIG. H41 CHECKING DIMENSIONS—FRONT SUB-FRAME

A 1.500in. (3,810cm.)	H 0.319in. (8,10mm.)	P 0.217in. (5,512mm.)	W 2.475in. (6,286cm.)
B 0.750in. (1,905cm.)	J 30.810in. (78,257cm.)	Q 31.141in. (79,098cm.)	X 3.600in. (9,144cm.)
C 3.81in. (9,677cm.)	K 30.800in. (78,232cm.)	R 0.406in. (10,312mm.)	1 Point D
D 3.593in. (9,126cm.)	L 0.812in. (20,63mm.)	S 4.400in. (11,176cm.)	2 Point E
E 7.388in. (18,766cm.)	M 9.246in. (23,485cm.)	T 8.525in. (21,654cm.)	3 Point C
F 2.875in. (7,303cm.)	N 3.531in. (8,969cm.)	U 6.156in. (15,636cm.)	4 Datum line Z
G 1.484in. (3,77cm.) dia.	O 2.875in. (7,303cm.)	V 6.468in. (16,428cm.)	

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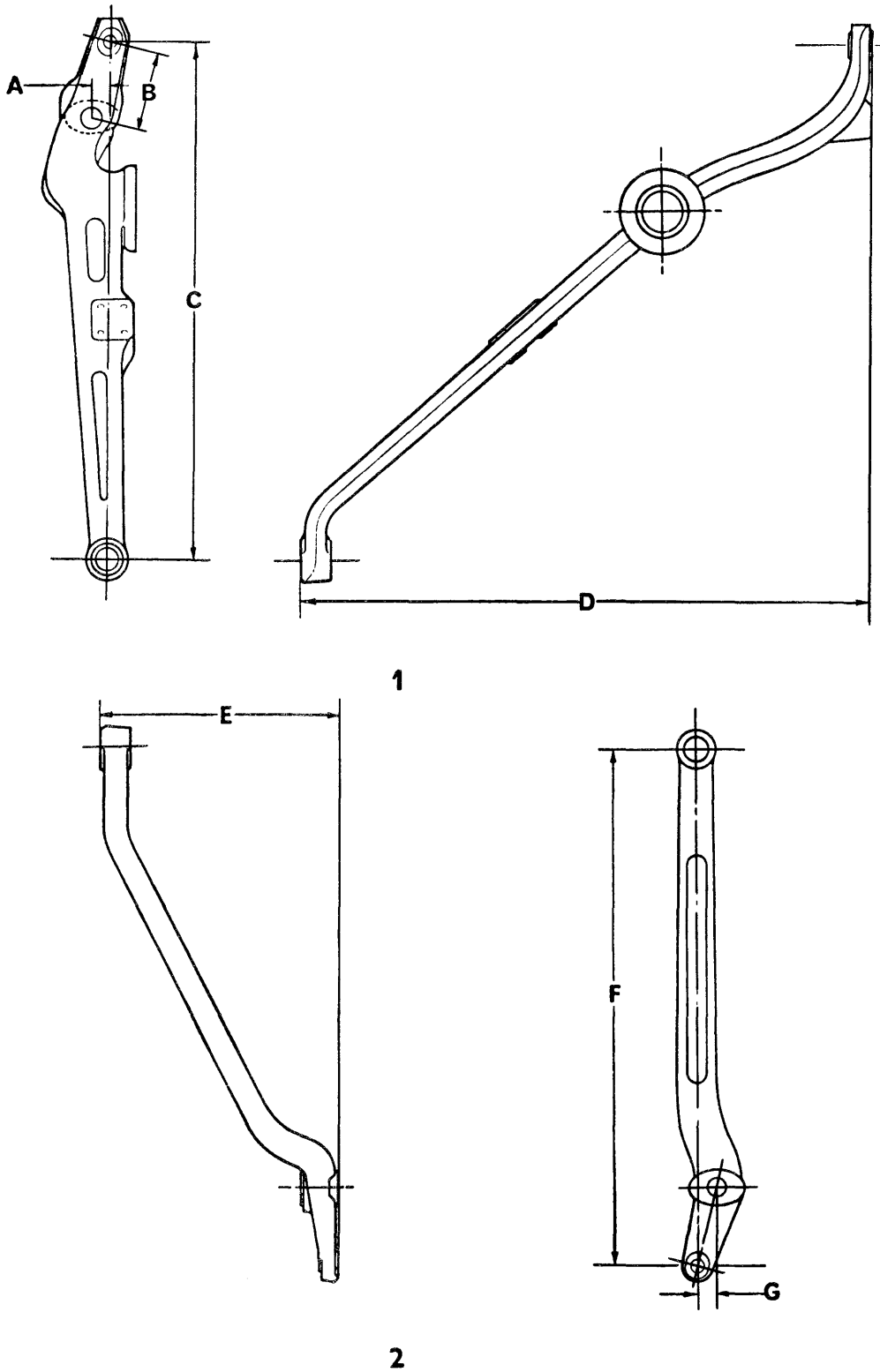


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FIG. H42 CHECKING DIMENSIONS—RIGHT-HAND TRAILING ARM

A	32.445in. (82,410cm.)	H	6.325in. (16,066cm.) centres
B	2.737in. (6,952cm.)	J	13.150in. (33,401cm.)
C	2.112in. (5,365cm.)	K	16.050in. (40,767cm.)
D	1.612in. (4,095cm.)	L	9.171in. (23,294cm.)
E	2.500in. (6,350cm.) centres	1	Point Y
F	0.269in. (6,83mm.)	2	Datum line P
G	0.647in. (1,643cm.)		

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FIG. H43 CHECKING DIMENSIONS—FRONT AND REAR LOWER TRIANGLE LEVERS

A 0.650in. (1,651cm.)	D 20.238in. (51,405cm.)	G 0.650in. (1,651cm.)
B 2.812in. (7,143cm.)	E 8.337in. (21,176cm.)	1 Lower triangle lever—rear
C 18.50in. (46,990cm.)	F 18.50in. (46,990cm.)	2 Lower triangle lever—front

Section H17

WORKSHOP TOOLS

The following is a list of special tools to be used when servicing or overhauling the front and rear sub-frame and suspension. General tools are not listed as these can be obtained locally.

FRONT SUB-FRAME			
<i>Tool No.</i>	<i>Description</i>	<i>Tool No.</i>	<i>Description</i>
RH 7761	Mobile stand	RH 7846	Resilient metal mount centralising fixture
RH 7762	Engine and transmission/gearbox alignment fixtures	RH 7849	'C' spanner
RH 7763		RH 7850	'C' spanner
RH 7768		RH 7874	Box spanner
RH 7774	Extraction and insertion tool – ball joint	RH 7889	Retainer – front road springs
RH 7775	Slotted tube spanner	RH 7909	Compressing tool – front road springs
RH 7811	Slotted spanner – upper triangle lever	RH 8015	Locking fixture
RH 7813	Torque checking fixture	RH 8019	Extractor
RH 7820	Spanner – open ended	RH 8030	Box spanner and locking bar
RH 7839	Body sill boards	RH 8080	Extractor
RH 7840	Support plate with extension nuts	RH 8100	Extractor
RH 7840	Fixture		
RH 7844	Alignment fixture – 4 off per sub-frame		

REAR SUB-FRAME			
<i>Tool No.</i>	<i>Description</i>	<i>Tool No.</i>	<i>Description</i>
RH 7847	Resilient metal mount centralising fixture	RH 8016	Extractor beam
RH 7848	Split packing ring	RH 8017	
RH 7849	'C' spanner	RH 8018	
RH 7854	Alignment fixture	RH 8048	Special pin spanner and extension bar
RH 7858	Alignment screws (long) – 2 off	RH 8051	Hook wrench
RH 7859		Alignment screw (short) – 1 off	



Workshop Manual

**Rolls-Royce Silver Shadow
(including Long Wheelbase Saloon)
Rolls-Royce Corniche
Bentley T Series
and Bentley Corniche**

Up to and including car serial number 30000

Volume 2

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Chapter J

THE FINAL DRIVE

**(Comprising The Final Drive Unit, Half-shafts,
Final Drive Crossmember and Rear Hubs)**

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Chapter J

THE FINAL DRIVE

Section J1

THE FINAL DRIVE UNIT

Overhaul

Final drive unit—To remove

1. Place the car on a ramp and securely chock the road wheels.
2. Disconnect the battery, located in the boot.
3. Remove the drain plug from the final drive casing and allow the lubricant to drain into a clean container. Slacken the filler plug to speed up draining operation. It is advisable to carry out this operation when the unit is warm, immediately after the car has completed a run. After draining, clean and fit the drain plug with a new aluminium washer.
4. Remove the pinch bolts from the mounts supporting the rear section of the exhaust system; support the pipe and remove the clamp bolts from the joint clamp. Separate the joint and remove the exhaust system rear section.
5. Disconnect the propeller shaft from the differential pinion flange by removing the four bolts and nuts.
6. Disconnect the half-shaft outer universal joints from the hubs by removing the eight clamping set-screws; remove the four clamps. To uncouple the joints ease the half-shafts inwards.

Note To perform Operations 5 and 6 it may be necessary to jack up a rear wheel and rotate it in order to gain access to all the necessary nuts and bolts.

7. Support the half-shafts to prevent excessive strain being imposed on the neoprene seals of the ball and trunnion joint. Place hardwood block beneath trailing arm, as near to the hub as possible, to prevent excessive strain being imposed on the rebound straps.
8. Place a jack under the final drive casing to support it.
9. Release the torque arm front mount from the rear suspension sub-frame by removing the two lower bolts and nuts which secure the torque arm flange to the mount lower support plate (*see Fig. J13*).
10. Remove the sixteen nuts and washers securing the final drive unit to the cross-member noting the position of the eight special interlocking washers. Support the half-shafts, ease the final drive unit away from the cross-member and lower it from the car.

Note If the final drive unit is not to be dismantled, fit and tighten the four rear cover retaining nuts and washers adjacent to the two dowels.

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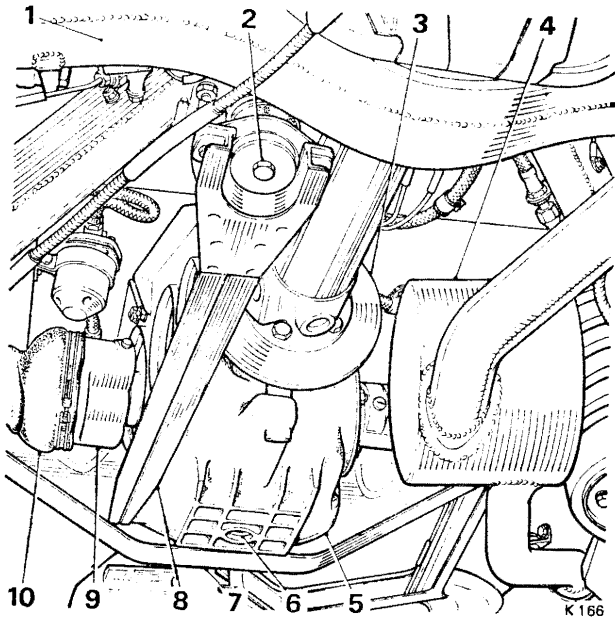


FIG. J1 FINAL DRIVE UNIT—IN POSITION

- 1 Rear suspension sub-frame
- 2 Torque arm front mount
- 3 Transmission damper
- 4 Modified exhaust swirl chamber
- 5 Final drive unit
- 6 Final drive drain plug
- 7 Final drive cross-member
- 8 Torque arm
- 9 Ball and trunnion joint
- 10 Convolute seal

Final drive unit—To dismantle

It should be noted that exchange final drive units, less half-shafts, are available for Service replacements.

It must be noted also that crown wheel and pinion gears are supplied as lapped pairs and as such, they must not be separated or fitted independently.

1. Carry out Operations 1 to 10, inclusive, of 'Final drive unit—To remove'.
2. Remove the right-hand half-shaft assembly, remove the distance piece, and the three Belleville washers and adjusting washer from behind the housing.
3. Remove the left-hand half-shaft assembly and remove the large adjusting washers fitted between the housing and the large crown wheel bearing.
4. Remove the large cover from the rear of the housing.

5. Remove the nuts and washers from the bearing cap on each side of the crown wheel and differential assembly (see Fig. J3).

6. Remove the two bearing caps, and lift the crown wheel and differential assembly from the casing.

Note (a) The crown wheel and differential assembly cannot be lifted directly out of the final drive casing, but must be removed by lifting the crown wheel slightly, then moved away from the pinion and carefully past the pinion nose bearing bridge.

(b) Precautions should be taken during Operation 5 to ensure that the two large taper roller bearing tracks do not fall off, as this could result in damage to the rollers or tracks.

7. Remove the four setscrews which secure the pinion housing to the front flange of the casing and insert extractor screws into the two tapped holes in the pinion housing flange.

8. Place the casing in an oven having a temperature of approximately 80°C (176°F) for approximately one hour.

9. Remove the casing from the oven and extract the pinion housing using the two extractor screws, taking care to turn the screws evenly and together.

10. Remove the two socket headed screws, the two retaining nuts and washers, and remove the pinion nose bearing.

Crown wheel and differential assembly—
To dismantle

1. Remove the bearing outer tracks.
 2. Remove the twenty nuts, washers and bolts securing the crown wheel to the differential housing; remove the crown wheel.
 3. Unlock and remove the eight setscrews securing the differential housing end cap; remove the cap, splined pinion gear and adjusting washer.
 4. Remove the nut and long setscrew which runs through the centre of the split trunnion pin; remove the trunnion pins, bevel gears and dished thrust washers (see Fig. J2).
 5. Remove the splined pinion gear and adjusting washer from the other end of the housing.
- Note** All washers should be attached to their appropriate gears to ensure that they are fitted in their original positions.

If it is necessary to renew the large taper roller bearings, they should be pressed off the differential housing and end cap.

6. Wash all parts thoroughly and dry with compressed air.

7. Thoroughly inspect all components for wear or damage marks and renew any defective items. The adjusting washers, excluding the dished thrust washers behind the bevel gears, should all be flat and parallel. Ensure that all bearing surfaces and bores are free from damage, pitting or burrs and that all gears are free from damage or excessive wear.

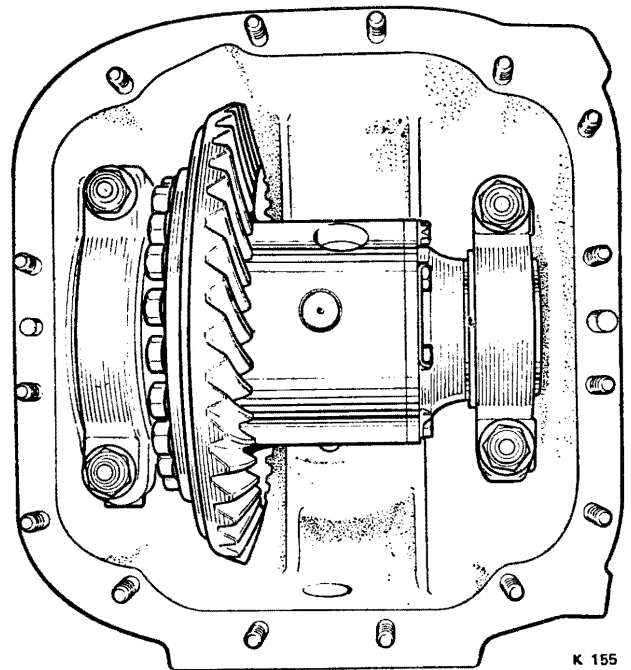
Crown wheel and differential assembly— To assemble

Prepare the washed and inspected parts, complete with any new or replacement parts, for assembly which is a careful reversal of the dismantling procedure as follows:

1. If new taper roller bearings are to be fitted, they must be pressed squarely on to the diameters on the end of the differential housing and end cap noting that, the larger of the two bearings is fitted to the housing and that both bearings are fitted correctly against their abutment faces (see Fig. J9).

2. If the adjusting washer positions are not known or if new pieces are being fitted the following procedure is recommended for assembling the differential housing as described in Operations 3 to 6 inclusive.

3. Fit the splined bevel pinion into the end of the differential housing without an adjusting washer behind the head.

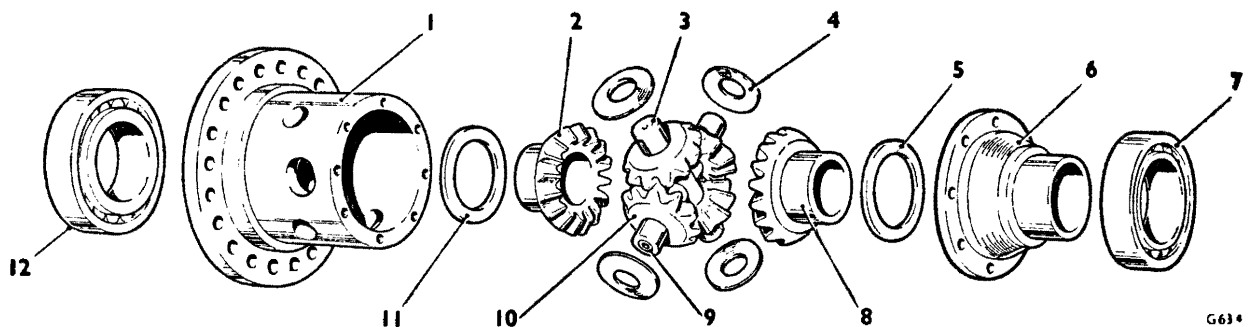


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FIG. J3 DIFFERENTIAL HOUSING AND CROWN WHEEL IN POSITION

4. Fit the trunnion pins, dished washers and bevel gears; the long bolt and nut which connects the split trunnion pin should be torque tightened to between 8 lb. ft. and 10 lb. ft. (1,10 kg.m. and 1,38 kg.m.).

5. Push the splined pinion gear into mesh with the bevel gears as far as possible and measure the distance from the end of the differential housing to the end face of the bevel gears.



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FIG. J2 DIFFERENTIAL HOUSING—EXPLODED VIEW

- | | | |
|-----------------------------|--------------------------------|-------------------------|
| 1 Differential gear housing | 5 Adjusting washer | 9 Split trunnion pin |
| 2 Splined bevel pinion | 6 Differential housing end cap | 10 Differential gears |
| 3 Trunnion pin | 7 Taper roller bearing | 11 Adjusting washer |
| 4 Dished thrust washer | 8 Splined bevel pinion | 12 Taper roller bearing |

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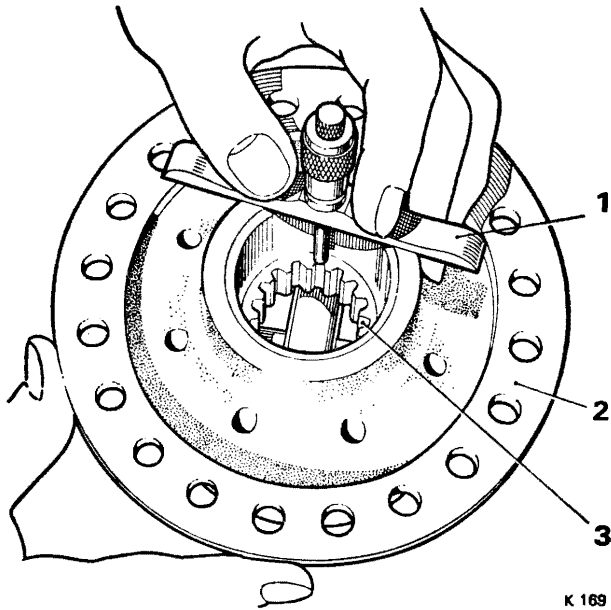


FIG. J4 SPLINED BEVEL PINION MEASUREMENT

- 1 Micrometer
- 2 Differential gear housing
- 3 Splined bevel pinion

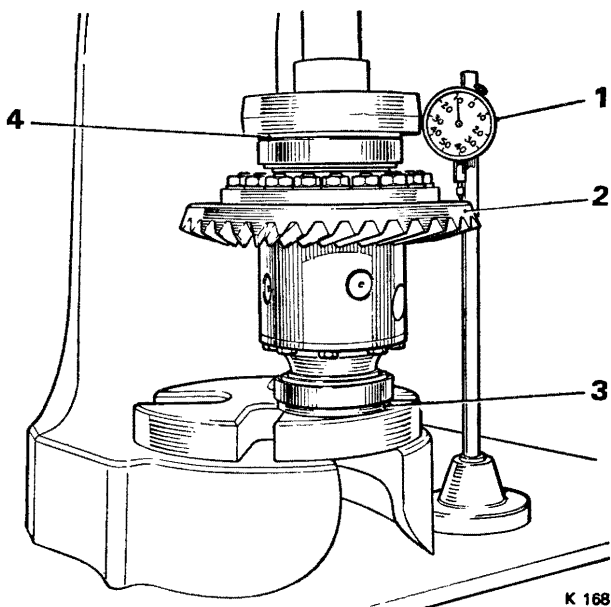


FIG. J5 CHECKING THE CROWN WHEEL FOR TRUTH

- 1 Dial test indicator
- 2 Crown wheel and differential housing assembly
- 3 Adjusting washer
- 4 Adjusting washer

6. Pull the gear back out of mesh as far as possible and again measure from the end of the housing to the end of the gear (see Fig. J4).

The difference between these two measurements will give the nominal size of adjusting washer required behind the gear head.

7. Dismantle the gears and then assemble them with the correct adjusting washer fitted behind the bevel pinion.

Adjusting washers are available in a range from 0.084 in. to 0.116 in. (2.13 mm. to 2.94 mm.) in 0.002 in. (0.05 mm.) increments and they must be fitted with the chamfer and the oil grooves against the back face of the gear.

8. Rotate the gears to ensure that they are perfectly free, but without backlash, if necessary vary the thickness of the adjusting washer.

9. Fit the housing end cap and the other splined bevel pinion and repeat Operations 3 to 7, inclusive, to determine the thickness of the adjusting washer required.

Note When the unit is assembled correctly the gears should run freely without tight spots and without backlash.

10. When the differential gears are correctly set, lock the setscrews securing the differential housing end cover by turning over the washer tabs.

11. Fit the crown wheel to the end of the housing and torque tighten the setscrews to the standard figures relative to size (see Chapter P).

12. Check the crown wheel for axial run-out.

Any convenient method may be employed to check this, e.g. on a mandrel between the centres, but one method which may be used is described in Operations 12 to 14, inclusive.

13. Place the roller bearing outer tracks in position, and stand the assembly on one end in a press with an adjusting washer fitted to each bearing (see Fig. J5).

14. Apply light pressure and, using a dial test indicator, check the run-out of the crown wheel; the run-out should not exceed 0.002 in. (0.05 mm.).

15. If the run-out exceeds this figure different crown wheel positions relative to the differential housing should be tried until the run-out is within the 0.002 in. (0.05 mm.) limit.

Pinion housing—To dismantle

- 1. Remove and discard the 'O' ring fitted to the pinion housing.
- 2. Unlock and remove the nut securing the pinion flange and damper; remove the flange using the

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special hydraulic ram (RH 8017) and special extractor beam (RH 8033).

3. Remove the pinion oil seal and the oil flinger fitted behind it.

4. Place the housing in a press with the pinion gear downward and the housing lower end firmly supported and carefully press the pinion out of the housing.

5. Collect the adjusting washers from the pinion shank and the taper roller bearing from the housing.

6. If new taper roller bearings are to be fitted, the outer tracks must be removed from the housing, using a soft drift and a hammer, taking care to avoid damage to the bearing locating bores.

7. The large roller bearing should be removed from beneath the pinion head using a press and the special tool (RH 7863).

8. Wash all parts thoroughly in paraffin and dry with compressed air.

9. Inspect all parts for serviceability, and any showing damage, pitting or excessive wear should be renewed.

Pinion housing—To assemble

Prepare the washed and inspected parts, complete with any new or replacement parts for assembly, as follows.

1. Lightly lubricate all components paying particular attention to the roller bearing races.

2. If new bearings are being fitted, carefully press the outer tracks into the housing and the large roller bearing on to the pinion, ensuring that the bearings are square and right up to their abutment faces.

3. Enter the pinion into the housing then fit the two adjusting washers on to the pinion shank (see Fig. J6).

Note On cars produced from car numbers SRH 4231-Standard cars, CRH 5003-Coachbuilt cars and 5RX 6159-cars built to meet the American Federal Safety Standard Requirements, a spacer is fitted to the final drive pinion between the large roller bearing and the adjusting washers (see Fig. J6).

The two washers determine the pre-load on the pinion bearing and it is important that the washers are free from defects and are **flat and parallel** to within 0.001 in. (0.025 mm.).

If the pinion assembly bearings have not been renewed, the original washers may be used. If new

bearings have been fitted, experience has shown that washers whose combined thickness amounts to between 0.270 in. and 0.280 in. (6.85 mm. and 8.89 mm.) should give the best initial setting.

4. Support the pinion and housing and press the upper bearing on to the pinion shank until it abuts the adjusting washers.

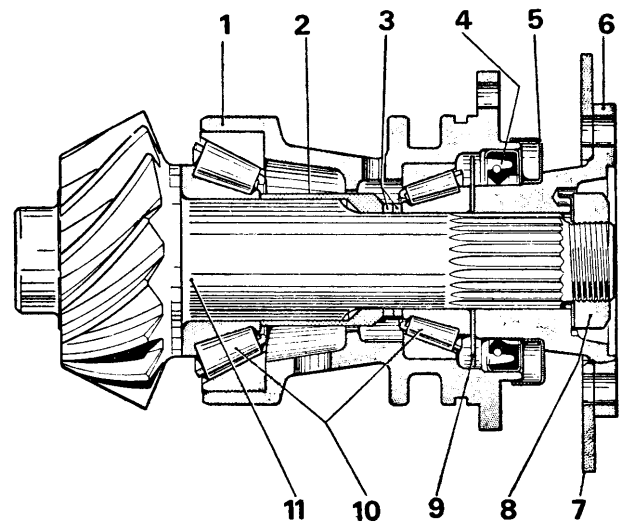
5. Fit the oil flinger and a new seal to the housing with the front face of the seal just flush with the face of the housing and the seal lip pointing inward.

6. Fit the transmission damper to the pinion flange and enter the flange into the housing, taking care not to damage the seal, and fit the lock washer and nut.

7. Tighten the nut to a torque figure of between 275 lb. ft. and 300 lb. ft. (38 kg.m. and 41.46 kg.m.) locking the pinion flange using the special tool (RH 7862). Do not turn over the tab of the lock-washer.

8. Rotate the pinion several times in both directions then check the pre-load.

The pre-load on the pinion bearings when the housing is out of the final drive casing should be

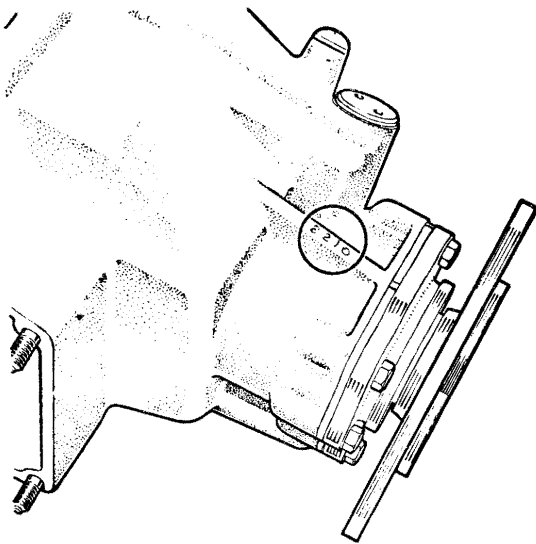


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FIG. J6 PINION HOUSING CROSS-SECTION

- 1 Pinion housing
- 2 Spacer (if fitted)
- 3 Pre-load adjusting washers
- 4 Oil seal
- 5 Shield
- 6 Pinion flange
- 7 Damper
- 8 Pinion flange nut
- 9 Oil flinger
- 10 Taper roller bearings
- 11 Pinion

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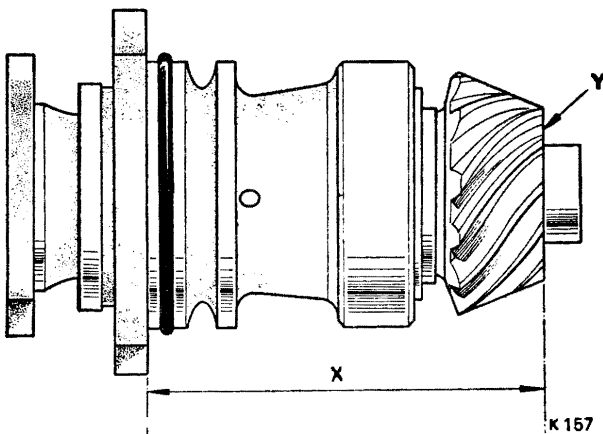


K 156

FIG. J7 STAMPED DIMENSION ON FINAL DRIVE CASING

between 8 lb. in. and 10 lb. in. (0,092 kg.m. and 0,115 kg.m.) and this is best checked using a spring balance pulling on a bolt inserted into one of the holes in the pinion flange.

Note The holes in the pinion flange are 1.875 in. (4,762 cm.) away from the centre of the pinion and therefore if this method is used the spring balance reading should be between 4.3 lb. and 5.3 lb. (1,949 kg. and 2,403 kg.).



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FIG. J8 PINION HOUSING MEASUREMENT

X Dimension between housing and pinion gear

Y Dimension etched on pinion gear face

The spring balance reading obtained to initially rotate the pinion will be high. It is the lower steady reading when the pinion is rotating, which indicates the pre-loading.

9. If the pre-load is not correct the pinion must be extracted from the housing and the adjusting washers changed as necessary to obtain the correct reading.

Adjusting washers are available in a range from 0.105 in. to 0.110 in. (2,66 mm. to 2,79 mm.) and 0.110 in. to 0.160 in. (2,79 mm. to 4,06 mm.) in 0.001 in. (0,025 mm.) and 0.005 in. (0,127 mm.) increments respectively.

Reducing the combined thickness of the washers will increase the pre-load and increasing the thickness will reduce it but, it must be noted that very small changes to the thickness of the washers has a marked effect on the pre-load figure.

10. When the pinion has been pre-loaded correctly, turn over the tab on the lock-washer fitted under the pinion flange retaining nut.

Final drive unit—To assemble

To assemble the final drive unit reverse the procedure given for dismantling ensuring that the crown wheel and pinion are in their correct relative positions and that there is the correct amount of backlash between the two gears.

All parts must be cleaned thoroughly prior to assembly and all bearings, other than new ones, lubricated.

1. Before commencing to assemble the final drive unit, the stiffening bar (RH 8032) should be fitted to the final drive casing.

2. Partly screw four $\frac{3}{8}$ in. U.N.F. studs into the threaded holes in the front of the final drive casing. It is sufficient to fit these studs by hand as they serve only as location pegs for the pinion housing.

3. If the pinion nose bearing was removed from the casing previously, fit the bearing, and the two socket headed retaining screws, nuts and washers.

Note the dimension stamped on the cast rib, just above the front flange of the final drive casing (see Fig. J7).

4. Place the differential casing in an oven at a temperature of 80°C (176°F) for approximately 1 hour.

5. Carefully measure from the back face of the pinion housing front flange to the face of the pinion gear, adjacent to the nose bearing diameter (dimension X Fig. J8).

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6. Add this figure to the dimension etched on the rear face of the pinion gear (*dimension Y Fig. J8*).

The figure stamped on the front of the final drive casing, which was noted previously, must now be subtracted from the total of X and Y and the resulting dimension gives the thickness of the split adjusting washer which must be used between the pinion housing flange and the casing, to place the pinion in the correct position.

Thickness of washer = $X + Y - A$.

Note The above measurements must be taken carefully and accurately.

Split adjusting washers are available in a range from 0.100 in. to 0.149 in. (2,54 mm. to 3,784 mm.) in 0.012 in. (0,304 mm.) increments and are marked with a letter to denote the size. Both halves of the washer to be fitted must have the same letter marked on them.

7. Remove the casing from the oven and fit the split adjusting washers over the studs.

8. Fit a new 'O' ring to the pinion housing and insert the housing into the casing as far as possible.

Note The pinion housing has one off-set hole and can therefore only be fitted in one position. It is advisable to establish this position before entering the housing into the casing.

9. Remove the four locating studs, fit the four retaining setscrews and tighten them progressively and evenly. The setscrews should be finally tightened in accordance with the standard figures, relative to the size, given in Chapter P.

10. When the casing has cooled the pinion pre-load should be checked, using the same method as described under 'Pinion housing—To assemble', Operation 8;

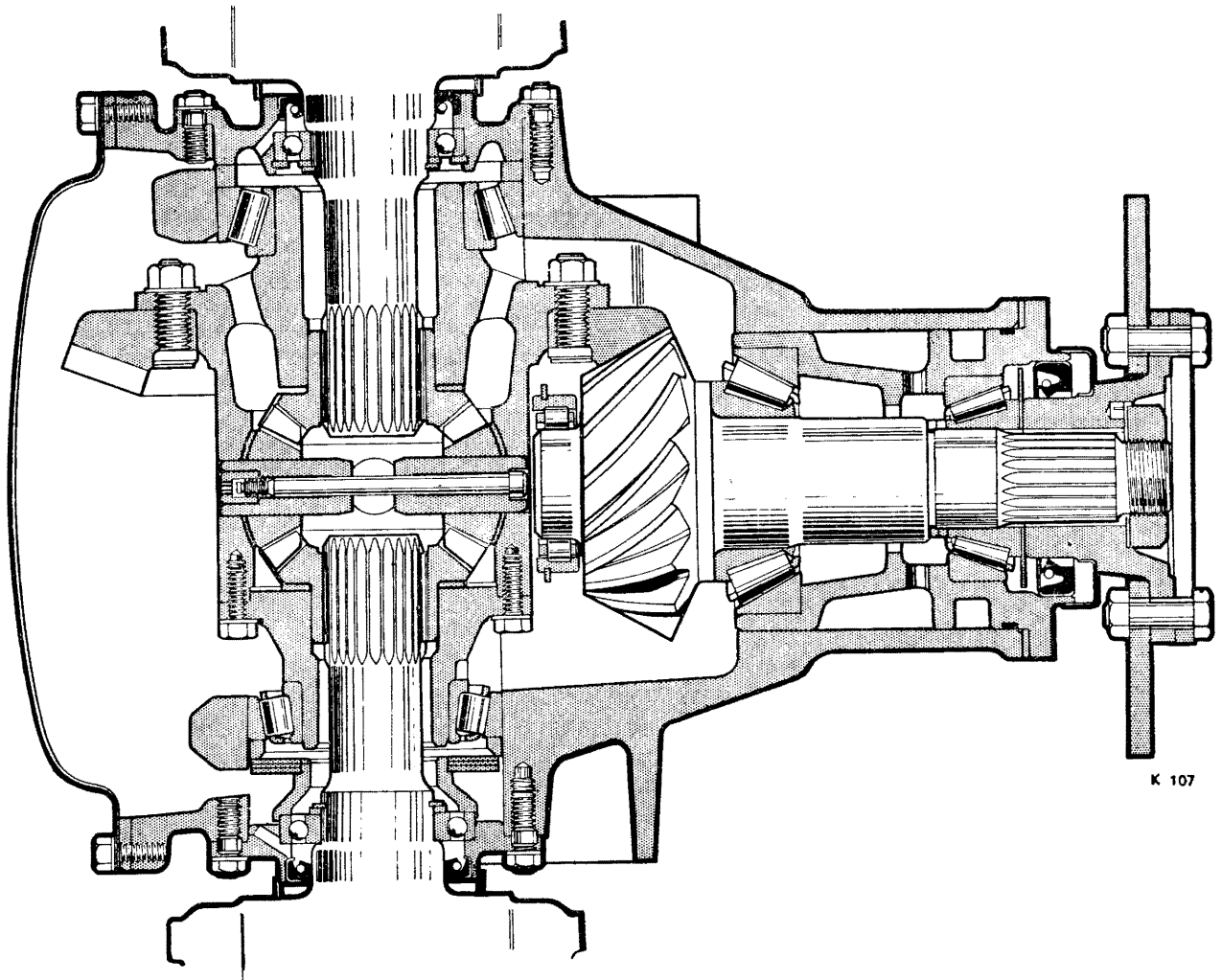


FIG. J9 CROSS-SECTION—FINAL DRIVE UNIT

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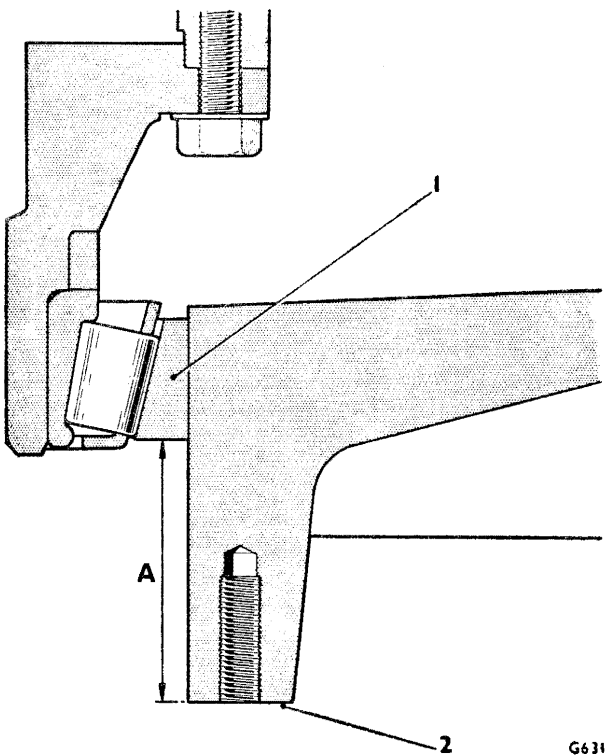


FIG. J10 MEASUREMENT—CASING FLANGE TO BEARING

- A** Measurement flange to bearing
1 Bearing outer track
2 Final drive casing flange

the reading should not exceed 30 lb. in. (0,346 kg.m.) when the housing is fitted to the final drive casing.

Note If the method previously described is used, the corrected maximum reading, allowing for the flange bolt hole being 1.875 in. (4,76 cm.) from the pinion centre, is 16 lb. (7,25 kg.).

11. Examine the crown wheel and note the backlash figure etched on the back face.
12. Carefully fit the crown wheel and differential assembly in position; fit the bearing caps, but do not tighten the nuts.
13. If the two final drive side housings are still connected to the half-shafts, remove the retaining circlips and remove the housings from the shafts.
14. Fit the adjusting washer with the chamfered face outward, three Belleville washers with the convex side outward, distance piece and housing to the right-hand side of the final drive casing, and progressively tighten the housing securing nuts.

Note The housing has an off-set hole and can be fitted in one position only.

15. Fit the two adjusting washers behind the crown wheel bearing and fit the left-hand side housing. Progressively tighten the housing nuts whilst rocking the crown wheel back and forth to ensure that there is still backlash between the gears.

16. Mount a dial test indicator on the final drive casing with the indicator pad on the flank of a crown wheel tooth.

17. Zero the indicator and rock the crown wheel back and forth noting the backlash.

18. The backlash should be checked at twelve positions around the crown wheel and an average reading taken. This figure should conform to the backlash figure etched on the crown wheel.

19. If it does not conform, the thickness of the washers behind the crown wheel bearing must be varied to obtain the correct reading.

These washers are available in a range from 0.111 in. to 0.129 in. (2,819 mm. to 3,27 mm.) in increments of 0.002 in. (0,050 mm.) and it can be assumed that 0.001 in. (0,025 mm.) variation in the thickness of the adjusting washer will make a difference of 0.001 in. (0,025 mm.) to the backlash.

20. If necessary, to obtain the desired results, grind equal amounts from each side of the washer taking great care to ensure that, after grinding, the washer is still flat and parallel to within 0.001 in. (0,025 mm.).

21. When the backlash is correct, remove the side housing and fit it to the half-shaft.

22. Fit the complete assembly to the final drive casing after applying a light coating of SQ 32M jointing compound to the joint faces of the casing and housing.

23. Remove the right-hand housing, distance piece, Belleville washers and adjusting washer.

24. Accurately measure the distance from the casing flange to the taper roller bearing outer track (see Fig. J10).

25. Place the housing, distance piece and Belleville washers in the checking jig (RH 7861) and tighten the jig end pieces until the Belleville washers are flat (see Fig. J11).

26. Using feeler gauges, measure the distance between the housing flange face and the top of the two pins on the gauge. The result, added to the nominal pin height marked on the gauge gives the distance from the side housing to the Belleville washer.

27. Subtract this dimension from the dimension previously taken between the casing flange and taper bearing; the result gives the thickness of the adjusting

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washer which must be fitted between the belleville washers and the bearing, to give the correct pre-load.

Adjusting washers are available in a range from 0.200 in. to 0.260 in. (5.08 mm to 6.60 mm.) in increments of 0.010 in. (0.254 mm.). Washers may be lightly ground to obtain the correct dimension but if this is done, equal amounts must be removed from each side and the washer must be kept flat and parallel.

28. Fit the right-hand side housing to the half-shaft.

29. Fit the correct washer with the chamfered side outward. Fit the three belleville washers, convex side outward, fit the distance piece, housing and half-shaft assembly after applying a light coating of SQ 32M jointing compound to the flange faces.

30. Tighten the housing securing nuts progressively and evenly and finally torque tighten them in accordance with the standard figures, relative to size, given in Chapter P.

31. Torque tighten the nuts securing the two large bearing caps in accordance with the standard figures given in Chapter P.

32. Remove the stiffening bar (RH 8032), fit the gasket and end cover. Fit and tighten the four nuts and washers adjacent to the two dowels, if the final drive unit is not being fitted to the car immediately. These nuts should remain in place until the final drive unit is being fitted to the final drive cross-member.

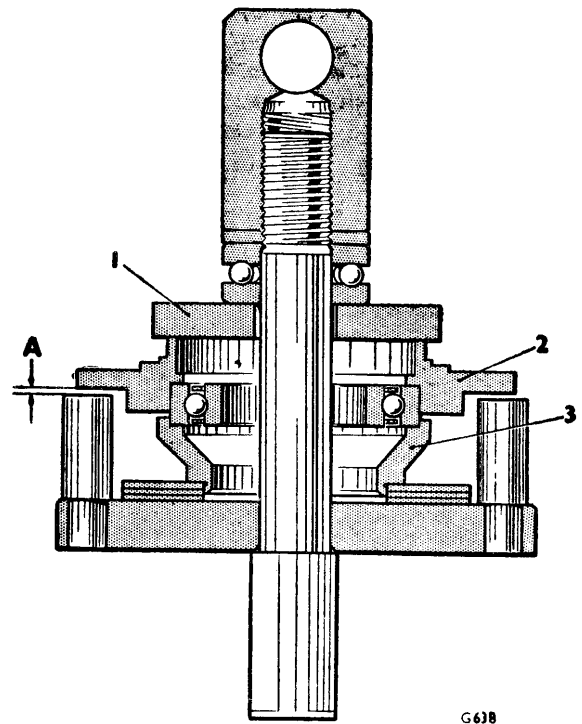


FIG. J11 BELLEVILLE WASHER SETTING

- A Measured gap
- 1 Tool RH 7861
- 2 Final drive side housing
- 3 Distance piece—Belleville washers

Final drive unit—To fit

To fit the final drive unit reverse the procedure given for removal noting the following points.

1. The half-shafts must be supported when offering up the final drive unit to the car.
2. Remove the four nuts and washers retaining the final drive rear cover.
3. Offer up the final drive unit to the final drive cross-member and fit the sixteen nuts and washers, taking care to position the eight interlocking washers correctly. These eight washers fit beneath the plain nuts and washers at each corner pair of studs with the fingers correctly interlocked (see Fig. J12).
4. Care must be taken to ensure that the half-shaft outer joints are located correctly in the hubs and that the caps are correctly fitted, so that the retaining strap on the joint is located in the recess in the cap.
5. The propeller shaft and pinion flanges must be cleaned before being bolted together.

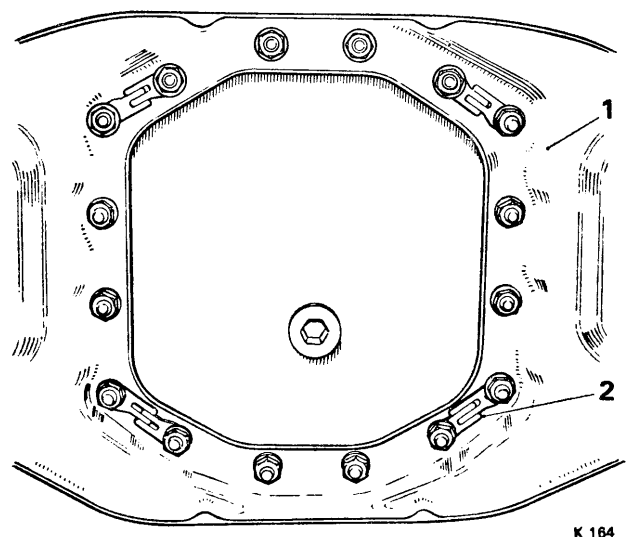


FIG. J12 FINAL DRIVE END COVER

- 1 Final drive cross-member
- 2 Interlocking washers

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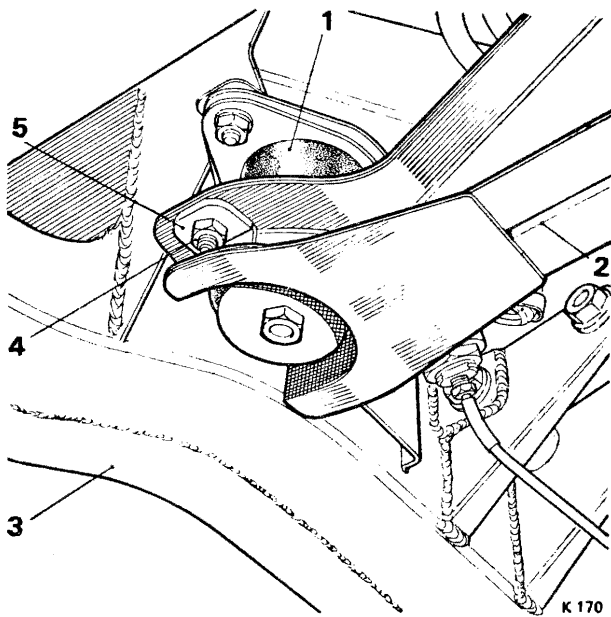


FIG. J13 TORQUE ARM FRONT MOUNT

- 1 Rubber mount
- 2 Torque arm
- 3 Rear suspension cross-member
- 4 Torque arm securing setscrews
- 5 Heavy duty washers

6. When refitting the rear section of the exhaust system, care must be taken to obtain a good pipe run. The exhaust mounts must be 'set' to allow for system expansion (see Chapter Q—'Exhaust System').

Torque tighten all bolts and nuts in accordance with the standard figures, relative to size, given in Chapter P of this Manual.

7. After fitting the final drive unit, remove the plug in the rear cover and fill the axle with one of the recommended lubricants up to the level of the plug (approx. 4½ pt., 2.55 litres).

8. Fit the filler plug with a new aluminium washer.

Torque arm—To remove

Removal of the torque arm can be carried out without disturbing the final drive unit.

1. Place the car on a ramp and securely chock the road wheels.
2. Disconnect the battery which is located in the boot.

3. Remove the two nuts, bolts and heavy duty washers securing the torque arm to the mount on the rear suspension cross-member (see Fig. J13).

4. Remove the six nuts and washers which secure the torque arm to the final drive casing; remove the torque arm.

5. Inspect the torque arm mount on the rear suspension cross-member for failure or softening of the rubber and renew if necessary.

6. When a torque arm has been removed from a car it should be cleaned and visually inspected for serviceability.

Torque arm—To fit

Fit the torque arm by reversing the procedure given for removal noting the following points.

1. All nuts and bolts must be torque tightened to conform with the standard figures given in Chapter P.
2. It is essential that the heavy duty washers are fitted to the front mount (see Fig. J13).

Pinion flange oil seal—To renew

The pinion flange oil seal may be renewed without disturbing the final drive unit.

1. Place the car on a ramp and securely chock the road wheels.
2. Disconnect the battery, located in the boot.
3. Remove the four bolts and nuts securing the propeller shaft to the pinion flange.
4. Remove the four bolts and nuts securing the propeller shaft front flange to the transmission output flange.
Ease the propeller shaft forward and downward sufficiently for the rear flange to be clear of the final drive pinion flange. It is not necessary to remove the propeller shaft completely.
5. Turn back the locking tab on the pinion nut lock washer and remove the nut, using the locking tool (RH 7862). Remove and discard the lock washer.
6. Using the hydraulic ram (RH 8017) and special extractor beam (RH 8033), remove the pinion flange.
7. Using a lever, or a simple extractor, remove the oil seal from the pinion housing.

8. Fit a new oil seal, ensuring that it is fitted squarely, with the lip pointing inward and the front face of the seal just flush with the front face of the housing (see Fig. J6).

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9. Clean and fit the pinion flange and damper, fit a new lock washer and the nut, and using the locking tool (RH 7862) tighten the nut to between 275 lb. ft. and 300 lb. ft. (38 kg.m. and 41,5 kg.m.). Turn over the locking tab.

10. Connect the propeller shaft at both ends (see Chapter F—Propeller shaft and universal joints).

Transmission damper—To remove

1. Carry out operations 1-6 as listed under 'Pinion flange oil seal—To renew'.

2. Remove the transmission damper from the pinion flange.

3. Clean and inspect the damper for serviceability and renew if necessary.

Transmission damper—To fit

Fit the transmission damper to the final drive pinion flange by reversing the removal procedure.

1. Carry out Operations 9 and 10 of 'Pinion flange oil seal—To renew'.

Note When the transmission dampers were first introduced they took the form of a viscous damper, but a change was made on production to the present plate type damper. If a viscous damper is damaged and is to be replaced the later plate type damper will be supplied as a spare, and should be fitted. The change to the plate type damper was made commencing with car numbers SRH 3380—Standard cars, and CRH 3490—Coachbuilt cars.

It is not possible to fit either damper to cars not previously embodying them unless the necessary changes are made to the exhaust system.

i.e. the shortened swirl chamber and modified run of the intermediate exhaust pipe (see Fig. J1).

A new pinion flange having a spigot machined on it to locate the damper is also required, plus longer propeller shaft to pinion flange attachment bolts.

Section J2

FINAL DRIVE HALF-SHAFTS

Overhaul

Half-shaft—To remove

The half-shafts can be removed from the car with the final drive unit in position.

Exchange half-shaft assemblies are available, complete with ball and trunnion joint, seal and Hardy Spicer joints.

If a half-shaft is to be removed and an exchange assembly fitted, proceed as follows.

1. Place the car on a ramp and securely chock the road wheels.
2. Disconnect the battery which is located in the boot.
3. Disconnect the outer universal joint from the hub by removing the four setscrews and the two clamps (*see Fig. J14*); it may be necessary to jack up the wheel and rotate the half-shaft to gain access to all the setscrews.
4. Ease the shaft inward to disengage the joint; support the shaft to avoid excessive strain on the ball and trunnion joint seal. One convenient method of doing this is to suspend the shaft on a piece of cord or wire looped round the final drive cross-member.

5. Remove the six nuts and washers securing the bearing housing to the side of the final drive casing; tap the housing around its circumference with a soft headed mallet to 'break' the joint then ease the housing out of the casing and remove the half-shaft assembly.

Note When removing a right-hand (off-side) half-shaft great care must be exercised when withdrawing the housing owing to the location of the belleville washers and distance piece behind it (*see Fig. J9*). As the housing is eased away from the final drive casing, a slim rod or screwdriver should be inserted to prevent the possibility of the belleville washers falling down into the final drive casing.

When handling the half-shaft assembly, both ends should be supported. Do not carry the shaft holding one end only or place the joint in any position, where both ends are not supported. Also the shaft should not be placed with the ball and trunnion joint body downward otherwise oil may be lost through the small breather hole in the centre of the splined shaft.

6. After removal of the half-shaft, the final drive casing must be securely blanked off to prevent the ingress of dirt.

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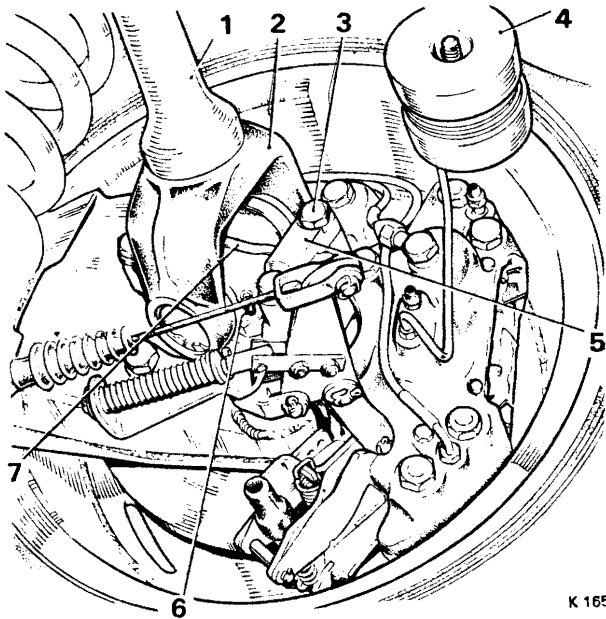


FIG. J14 HARDY SPICER OUTER JOINT

- 1 Half-shaft outer end
- 2 Hardy Spicer universal assembly
- 3 Bearing cap retaining setscrew
- 4 Harmonic damper
- 5 Bearing Cap
- 6 Grease nipple
- 7 Retaining strap, Hardy Spicer races

Half-shaft—To dismantle

1. Remove the circlip and washer retaining the ball and trunnion joint body and housing and remove the housing from the splined shaft.
2. Remove the drain plug from the joint housing and drain the oil from the housing (each joint holds approximately 150 c.c. of S.A.E.90 EP lubricant); after draining, clean and refit the plug.
3. Release the large clip, securing the convoluted seal to the joint body.
4. Position the shaft with the drain plug horizontal, ease the seal over the edge of the body and carefully withdraw the ball and trunnion assembly, taking care when handling the shaft not to dislodge the button assemblies.
5. Remove the trunnion buttons, adjusting washers, bearing outer races and needle rollers from the trunnion pin (see Fig. J15). Keep each assembly separate from the other and note from which side of the pin each assembly has been removed.

6. Whilst dismantled, the trunnion bearing assemblies should be lubricated and wrapped in greaseproof paper for protection.

7. If the Hardy Spicer outer joint is to be removed, clean any paint or dirt away from the yoke eyes, and using circlip pliers remove the circlip retainers.

8. Hold the half-shaft horizontally and using a hide mallet, shock drive the bearing races from their locations (see under 'Hardy Spicer joint—To remove').

Care must be taken to avoid damage to the lip seals.

9. Thoroughly clean the half-shaft and visually inspect the shaft bearing bores and trunnion pin for signs of damage, cracks or surface flaws.

10. Inspect the ball and trunnion joint seal for serviceability; if necessary it should be renewed.

Ball and trunnion joint seal—To renew

If a ball and trunnion joint seal requires renewal, the half-shaft and trunnion assembly must be removed from the car.

1. Carry out Operations 1 to 4 inclusive of 'Half-shaft—To remove'.

2. Remove the trunnion buttons, adjusting washers, rollers and retainers from the trunnion pin as described previously, under 'Half-shaft—To dismantle'.

3. The trunnion pin must be pressed out using pressing equipment capable of exerting a pressure of up to 15 ton/sq. in.

Heat must not be used for this operation.

4. Remove the pin and remove the joint seal.

5. Fit a new seal to the shaft and press the trunnion pin into position.

The trunnion pin must be pressed in squarely and the length of pin which protrudes from each side of the shaft must be equal to within 0.006 in. (0.152 mm.).

If the original pin and the bore are in good condition and the minimum pressing load of 2½ ton/sq. in. can be achieved, the **original** pin may be used again, if not it is recommended that a new trunnion pin is fitted.

6. After renewing the seal the half-shaft should be assembled as instructed under 'Half-shaft—To assemble'.

Half-shaft—To assemble

The half-shaft should be assembled by reversing the procedure given for dismantling, noting the following points.

1. Thoroughly clean all components before assembly.

2. When assembling the Hardy Spicer universal joint onto the half-shaft, the needle roller bearings should be fitted in the retainers and smeared with Retinax A grease (see under 'Hardy Spicer joint—To fit').

Note It is important not to pack too much grease on the rollers or in the retainers as this could result in damage to the lip seals on assembly.

3. Assemble the trunnion bearings, and buttons onto the trunnion pin, but at this stage do not fit the adjusting washers under the trunnion button heads.

4. Using a micrometer, carefully measure the dimension over the trunnion buttons.

5. Measure the dimension between the outer circumferences of the two outer bores in the joint housing in which the buttons locate.

6. The difference between these two dimensions gives the amount which must be taken up by adjustment, but it is **essential** that this figure is divided by two and washers of equal thickness fitted under each button.

7. The adjustment should be carried out by fitting shim washers under the trunnion buttons to obtain a fit of 0.0005 in. (0.013 mm.) tight to 0.0005 in. (0.013 mm.) slack in the joint housing.

Shim washers are available for this purpose in a range from 0.012 in. to 0.023 in. (0.304 mm. to 0.584 mm.) in 0.001 in. (0.025 mm.) increments.

8. Fit the correctly adjusted trunnion assembly into the joint body then ease the neoprene seal over the body and tighten the two seal clips, ensuring that the small end of the seal is located correctly on to the machined diameter of the half-shaft.

Note When the half-shaft has been fitted to the car the seal should be inspected, whilst the car is at its normal standing height, to ensure that the seal convolutions are not 'crimped' or strained. If they are, the position of the seal on the half-shaft should be adjusted slightly to correct this.

9. Remove the drain plug from the joint housing and inject 150 c.c. of S.A.E. 90 EP oil into the joint and refit the plug.

10. Fit the half-shaft as instructed under 'Half-shaft—To fit'.

Half-shaft—To fit

Fit the half-shaft by reversing the procedure given for removal, noting the following points.

1. If an exchange shaft is being fitted, this is supplied suitably blanked and protected. Remove the protective covering from the joint body splines and also remove the cover on the breather hole in the end of the splined shaft.

All traces of protective material **must** be removed.

2. Remove the drain plug from the joint body and inject 150 c.c. of S.A.E. 90 EP oil into the joint; fit the plug.

3. Remove the circlip and washer from behind the bearing housing on the old shaft and fit the housing, washer and circlip to the new shaft.

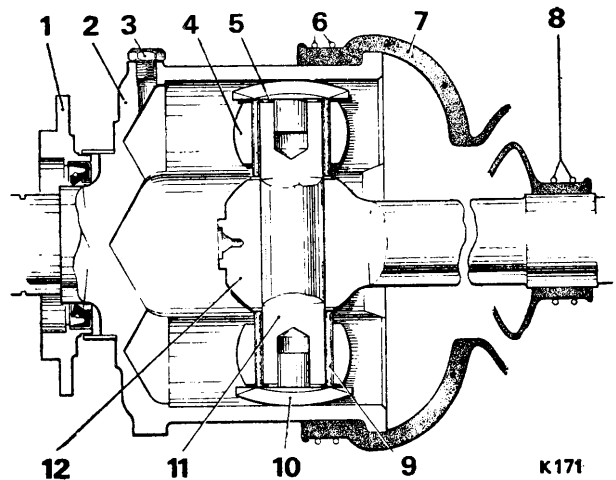


FIG. J15 HALF-SHAFT BALL AND TRUNNION JOINT

- 1 Final drive side housing
- 2 Ball and trunnion joint body
- 3 Drain plug
- 4 Needle roller race
- 5 Adjusting washer
- 6 Seal clip
- 7 Joint seal
- 8 Seal clip
- 9 Needle rollers
- 10 Trunnion button
- 11 Trunnion pin
- 12 Half-shaft knuckle end

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4. Fit the new shaft to the car noting that, if it is a right-hand (off-side) half-shaft, care must be taken when entering the housing and splined shaft to ensure that the Belleville washers and distance piece are not dislodged and that they are located correctly (see Fig. J9).

5. The housing which fits on the side of the final drive casing has one off-set hole and can be fitted one way only. Therefore, the holes should be aligned as the housing is offered up.

6. Care should be taken when fitting the outer universal joint to the hubs to ensure that the joint is located correctly and the caps fitted correctly.

Note It is essential that the bearing retaining strap is located correctly in the slot provided for it in the bearing cap.

7. Torque tighten all bolts and nuts in accordance with the standard figures given in Chapter P.

Hardy Spicer joint—To remove

Should the need arise in Service to renew a Hardy Spicer joint proceed as follows.

1. Place the car on a ramp and securely chock the road wheels.
2. Disconnect the battery, located in the boot.
3. Remove the complete half-shaft assembly as described under 'Half-shaft—To remove', Operations 1 to 6 inclusive.
4. Remove any paint or dirt from around the circlips in the Hardy Spicer yoke eyes and, using circlip pliers, remove the circlips.
5. Hold the shaft carefully, so that both ends are supported and excessive strain is not put on the convoluted seal, and using a hide mallet, shock drive the races from the yoke eyes.

Hardy Spicer joint—To fit

Fit a Hardy Spicer universal joint by reversing the procedure given for removal.

1. Ensure that the bores in the yoke are clean and in good condition, and lightly grease the rollers after locating them in the retainers. Each bearing retainer is fitted with 38 roller bearings.
2. Fit the cross-piece, minus the retainers and roller bearing assemblies, hold the cross-piece central, and push the roller bearing retainers into the yoke bores just far enough to enable the circlip retainers to be fitted.
3. Fit the circlips.
4. Fit the half-shaft to the car as described under 'Half-shaft—To fit'.
5. Grease the Hardy Spicer joint at the nipple provided.

Note If the Hardy Spicer joint is of the early type without a grease nipple fitted, remove the small plug and fit a normal, straight ball-ended type nipple with a 0.125 in. (3.18 mm.) B.S.P. thread.

Output shaft oil seal—To renew

The oil seals on the ball and trunnion joint shaft are located in the housings on each side of the final drive unit and can be renewed with the final drive unit in position.

1. Remove the complete half-shaft assembly as described previously, carrying out Operations 1 to 6

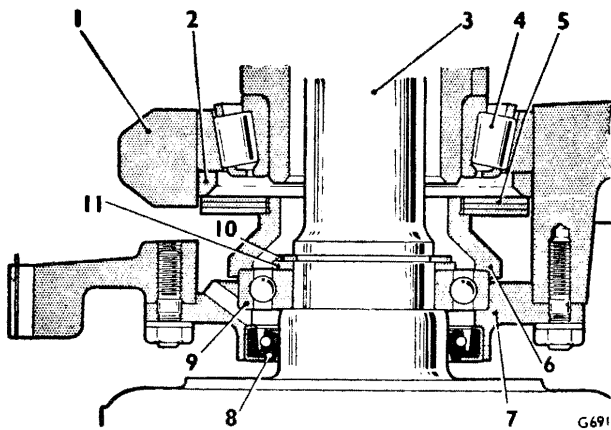


FIG. J16 CROSS-SECTION—FINAL DRIVE SIDE HOUSING

- 1 Differential housing bearing cap
- 2 Adjusting washer—Belleville washers
- 3 Ball and trunnion joint splined shaft
- 4 Taper roller bearing
- 5 Belleville washers
- 6 Distance piece—Belleville washers
- 7 Final drive side housing
- 8 Ball and trunnion joint shaft oil seal
- 9 Ball and trunnion joint shaft bearing
- 10 Retaining circlip
- 11 Retaining washer

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inclusive, of 'Half-shaft—To remove'. If it is a right-hand half-shaft which is being removed, care should be taken to ensure that the Belleville washers, located behind the right-hand housing, do not drop into the final drive casing.

2. Remove the circlip and washers located on the ball and trunnion joint shaft behind the housing and bearing and remove the housing from the shaft.

3. Remove the seal from the housing.

4. Fit a new seal, ensuring that it is fitted squarely in its locating bore and with the seal lip pointing inward, away from the half-shaft.

5. Fit the housing to the shaft; place the washer in position behind the bearing and fit the circlip, ensuring that it is correctly located in the groove (see Fig. J16).

6. Fit the half-shaft assembly as described previously, carrying out Operations 1 to 7 inclusive, of 'Half-shaft—To fit'

Output shaft bearing—To renew

The output shaft bearing, located in the housing on each side of the final drive unit should be renewed as follows.

1. Remove the half-shaft assembly from the car as described previously, carrying out Operations 1 to 6 inclusive, of 'Half-shaft—To remove'.

2. Remove the circlip and washer from the ball and trunnion joint shaft and remove the housing from the shaft.

3. Left-hand housings have a circlip fitted in the housing to retain the bearing. Remove this circlip.

4. Remove the bearing from the housing using a mandrel or drift; take care not to damage the oil seal.

5. Clean and inspect the housing bore and lightly stone out any marks or burrs.

6. Fit a new bearing ensuring that it is fitted squarely and up to its abutment face (see Fig. J16).

7. If it is a left-hand housing, fit the circlip and locate it correctly in the groove in the housing.

8. Fit the housing to the ball and trunnion joint shaft, fit the washer and circlip.

9. Fit the half-shaft assembly to the car as described previously, carrying out Operations 1 to 7 inclusive, of 'Half-shaft—To fit'.

Section J3

THE FINAL DRIVE CROSS-MEMBER

Overhaul

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Final drive cross-member—To remove

Normally, the final drive cross-member should not require removal but, should the necessity arise, remove it as follows.

1. Follow the procedure laid down under 'Final drive unit—To remove', carrying out Operations 1 to 10 inclusive.

2. Unscrew and remove the two large nuts and heavy duty washers from the cross-member mount centre bolts and lower the cross-member from the car.

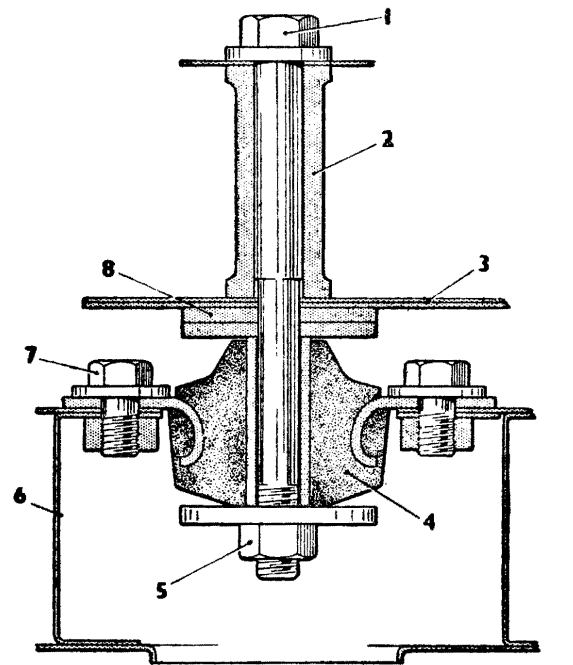
Note It may be necessary to lift the carpet in the boot floor and hold the bolt heads whilst removing the nuts.

If the final drive unit is not to be separated from the cross-member they may be removed together as a unit.

Final drive cross-member mount—To remove

1. To remove a final drive cross-member mount, remove the cross-member as described previously, or detach and lower the cross-member at least 6 in. (15,24 cm.).

2. Remove the two setscrews securing the mount support plate to the upper face of the cross-member then lift the mount from its location (*see Fig. J17*).



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FIG. J17 FINAL DRIVE CROSS-MEMBER MOUNT

- 1 Mount securing bolt
- 2 Distance tube
- 3 Body member
- 4 Cross-member mount
- 5 Securing nut and washer
- 6 Final drive cross-member
- 7 Mount securing bolts
- 8 Heavy duty washers

Chapter J

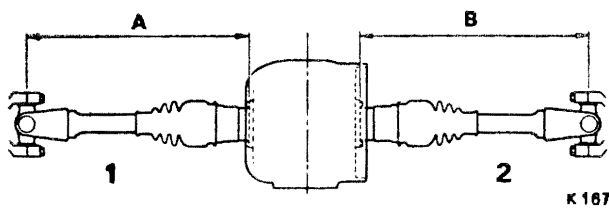


FIG. J18 FINAL DRIVE POSITION CHECK

- 1 Left-hand half-shaft
- 2 Right-hand half-shaft
- A Smaller dimension
- B Greater dimension

Final drive cross-member mount—To fit

Fit the cross-member mount, reversing the procedure given for removal.

1. Torque tighten the two securing setscrews in accordance with the standard figures, relative to size, given in Chapter P.

Final drive cross-member—To fit

Fit the final drive cross-member, reversing the procedure given for removal.

1. Torque tighten the nuts on the mount centre bolts (see Chapter P for standard figures) and whilst tightening the mounts, check from underneath to ensure that the mounts are centrally positioned to the hole in the cross-member.

2. Fit the final drive unit as instructed under 'Final drive unit—To fit', carrying out Operations 1 to 8, with the exception of Operation 4, the half-shafts being left disconnected from the yokes but supported.

3. With the final drive unit fitted to the cross-member, a check must now be made to ensure that the final drive is centrally positioned.

4. Measure from the face of the hub yoke, on which the universal joint bearing cap fits, to the face of the final drive side housing on each side of the car (see Fig. J18).

Note These measurements should be taken rear of the half-shaft line as they are difficult to take from the front of the axle.

The dimension obtained between the right-hand hub and right-hand side housing should be 0.175 in. (4.44 mm.) **greater** than the dimension obtained on the left-hand side, as viewed from the rear of the car.

5. If the final drive position is not correct, slacken the nuts securing the mount and move the cross-member in the appropriate direction.

This is best accomplished by gently levering the cross-member whilst at the same time tapping the heads of the mount centre bolts. Access to the bolt heads is gained by lifting the carpet on the floor of the boot.

It must be stressed that if Operation 5 is performed, extreme care must be taken to ensure that the cross-member mounts are still central to the hole in the cross-member before finally tightening the nuts.

6. Connect the half-shafts to the hub yokes.

Section J4

REAR HUBS, STUB AXLES AND DRIVE-SHAFTS

Overhaul

Rear hub bearings—To renew Hub unit—To remove

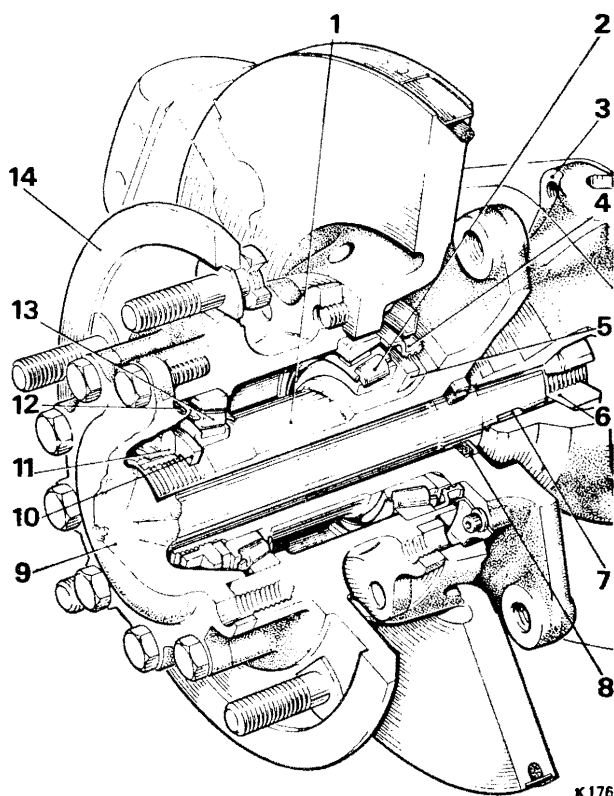
1. Position the car on a ramp and securely chock the front wheels.
2. Disconnect the battery, located in the boot.
3. Remove the wheel disc and loosen but do not remove the wheel nuts.
4. Using a hydraulic jack with an extension piece and a hardwood block positioned beneath the final drive differential casing, raise the rear of the car until the wheels just clear the ramp.
5. Position blocks and the sill beams (RH 7820) beneath the body sills. Place screw jacks beneath the trailing arms of the car.
6. Lower the hydraulic jack from beneath the final drive differential casing allowing the car to rest on the sill beams and supports.
7. Remove the rear road wheels and place supports beneath the brake discs.
8. Disconnect the handbrake linkage from the brake calipers (see Chapter G—Hydraulics for method and special precautions to be taken).
9. Remove the setscrews which secure the bearing caps to the yoke at the half-shaft universal joint. Separate the universal joint from the hub yoke by moving the half-shaft inward towards the final drive differential unit i.e. moving the ball and trunnion joint further into its housing.

10. Using a length of strong cord or covered wire, secure the half-shaft to the final drive cross-member. This will prevent possible damage to the shaft when the hub unit is removed.
11. Steady the hub unit then remove the setscrews securing the stub axle flange to the trailing arm. Note the position and length of each setscrew to facilitate assembly. Collect the brake linkage bracket which is secured by two of the setscrews.
12. Remove the **hub unit** from the car.

Hub unit—To dismantle

1. Remove the setscrews securing the brake calipers to the hub axle flange; remove the calipers.
2. Remove the large nut securing the yoke to the drive-shaft.
3. Using the extractor beam (RH 8016), in conjunction with the hydraulic ram (RH 8017) and extractor bolt (RH 8018), remove the yoke from the tapered drive-shaft and collect the key.
4. Remove the setscrews securing the outer end of the drive-shaft to the hub. Withdraw the drive-shaft from the hollow stub axle.
5. Unlock and remove the shrouded nut, and remove the key washer from the stub axle.
Remove the hub, complete with bearings, from the stub axle; collect the chamfered distance piece.

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**FIG. J19 CUT-AWAY VIEW OF REAR HUB,
STUB AXLE AND DRIVE-SHAFT**

- 1 Hollow stub axle
- 2 Inner taper roller bearing
- 3 Yoke
- 4 Acme threaded seal
- 5 Distance piece
- 6 Nut
- 7 Key
- 8 Felt seal with retainer
- 9 Drive-shaft
- 10 Keyed adjusting washer
- 11 Shrouded nut
- 12 Seal
- 13 Outer taper roller bearing
- 14 Hub

6. Remove the outer bearing inner race. Using a soft metal drift, drive out the inner bearing together with the grease retainer.

7. Drive out the outer bearing.

8. Remove the felt seal and retainer from the stub axle counterbore.

9. With the hub dismantled, inspect the disc brakes and the pads of the rear brake calipers for wear or damage. Ensure that the brake disc securing setscrews are correctly torque tightened to standard figures as given in Chapter P. If a brake disc is to be removed, refer to Chapter G—Hydraulics.

10. Thoroughly clean all hub components which are to be fitted.

Hub unit—To assemble

1. Collect all cleaned parts to be assembled together with any new or replacement parts.

2. Press new bearing outer races into the hub, smaller end of the taper bore leading, and ensure that the leading faces abut the shoulders of the hub counterbore.

3. Pack the hub with approximately 2 oz. (71 gm.) of the approved grease; the grease must be smeared on the inner wall of the hub so that it will not be disturbed when the hub is fitted to the stub axle.

4. Lubricate the new inner races with the approved grease and fit them to their respective outer races.

5. Fit the hub inner bearing inner race, press the Acme threaded grease retainer into position; the leading edge must abut the bearing outer race.

Note When renewing the bearing of more than one hub at the same time, always retain the inner race and roller cage, together with the outer race as supplied in the Manufacturer's sealed package. The inner and outer races are matched sets, and should not be fitted separately.

It should also be noted that the grease retainers are marked 'L.H.—N.S.' and 'R.H.—O.S.' dependent upon the side of the car to which they are fitted.

6. Fit the distance piece, chamfered edge leading, on to the stub axle to abut the shoulder.

Hub unit—To fit

1. Position the hub on the stub axle and fit the hardened key washer and a new shrouded nut.

2. Tighten the nut just sufficiently to remove any bearing end float, then, using a dial test indicator mounted adjacent to the brake disc, measure the run-out of the disc at the maximum possible radius.

Run-out must not exceed 0.007 in. (0.178 mm.) total indicator reading as this is a measure of the stack tolerance of all the components. If the run-out exceeds

Chapter J

this figure, it will be necessary to dismantle the hub and brake disc to investigate the cause of the run-out.

3. After checking the run-out, slacken the shrouded nut, then, using a feeler gauge placed between the outer bearing and key washer, to give between 0.002 in. (0,05 mm.) and 0.004 in. (0,10 mm.) bearing end float, tighten the nut sufficiently to grip the feeler gauge lightly.

Alternatively, use suitable dial test indicator equipment secured to the stub axle to obtain the required end float.

Continuous rotation of the hub is essential during this operation to ensure that the taper rollers seat correctly in the outer races.

4. Peen the shroud of the nut to locate in the grooves of the stub axle; remove the feeler gauge or alternative dial test equipment.

Note Incorrect setting, exerting a load on the bearing or giving excess end float, will promote premature bearing wear.

The remaining operations for fitting the rear hub unit are a careful reversal of the procedure given for its removal and dismantling, noting the following points.

5. Fit a new rubber 'O' ring onto the drive-shaft applying a small amount of grease to the ring before fitting it.

6. Fit a new felt seal and retainer into the stub axle. Apply a small amount of grease to the felt seal.

7. Fit the key to the drive-shaft taper and torque tighten the yoke retaining nut using the torque spanner (RH 8014) and socket (RH 8026).

Note Cars produced prior to car numbers SRX 1916—Standard cars, and CRX 1937—Coachbuilt cars, require the yoke retaining nut to be tightened to between 450 lb. ft. and 475 lb. ft. (62,21 kgm. and 65,66 kgm.). Cars produced after the above numbers require the yoke retaining nut to be tightened to between 500 lb. ft. and 525 lb. ft. (69,40 kgm. and 72,58 kgm.).

The increased torque figure applies only to the cars following the numbers quoted and on no account should the yoke retaining nuts on earlier cars be tightened to the increased torque figure.

8. When connecting the half-shaft universal joint to the hub unit yoke ensure that the joint seats correctly in the yoke and that the bearing cap setscrews are torque tightened in position.

9. When connecting the brake linkage and brake feed pipes, refer to Chapter G—Hydraulics, for special precautions to be taken.

10. Fit the road wheel and remove the supports from beneath the body and trailing arms by jacking up the car beneath the final drive differential casing.

11. Lower the jack, tighten the wheel nuts and fit the wheel disc.

Section J5

DIMENSIONAL DATA

FINAL DRIVE UNIT	
Backlash—pinion to crown wheel	Etched on crown wheel
Backlash—differential housing pinions	Nil
End float—differential housing pinions	Nil
Crown wheel run-out (maximum)	0.002 in. (0,05 mm.)
Differential housing—trunnion diameters	0.7497 in.—0.750 in. (19,036 mm.—19,05 mm.)
Differential housing pinions—bore diameters	0.7505 in.—0.751 in. (19,05 mm.—19,075 mm.)
Differential housing and end cap—bearing locating diameters	2.002 in.—2.0025 in. (50,85 mm.—50,863 mm.) 2.62725 in.—2.6275 in. (66,732 mm.—66,738 mm.)
Differential housing bearings—bore diameters	2.000 in.—2.0005 in. (50,8 mm.—50,812 mm.) 2.625 in.—2.6255 in. (66,675 mm.—66,687 mm.)
Differential housing bearings—outside diameters	3.500 in.—3.501 in. (88,9 mm.—88,925 mm.) 4.250 in.—4.251 in. (107,950 mm.—107,975 mm.)
Final drive casing—differential housing bearing locating bores	3.501 in.—3.5015 in. (88,925 mm.—88,938 mm.) 4.251 in.—4.252 in. (107,975 mm.—108,0 mm.)
Final drive casing—pinion housing locating diameters	4.150 in.—4.1505 in. (105,410 mm.—105,422 mm.) 4.162 in.—4.1625 in. (105,715 mm.—105,73 mm.)
Pinion housing—locating diameters	4.1525 in.—4.153 in. (105,473 mm.—105,486 mm.) 4.164 in.—4.1645 in. (105,765 mm.—105,778 mm.)
Pinion shaft—bearing locating diameters	1.37625 in.—1.3765 in. (34,956 mm.—34,963 mm.) 1.75125 in.—1.7515 in. (44,581 mm.—44,588 mm.)
Pinion bearings—bore diameters	1.375 in.—1.3755 in. (34,925 mm.—34,937 mm.) 1.750 in.—1.7505 in. (44,450 mm.—44,462 mm.)
Pinion housing—pinion bearing locating diameters	2.8423 in.—2.8433 in. (72,294 mm.—72,319 mm.) 3.748 in.—3.749 in. (95,199 mm.—95,224 mm.)

Pinion bearings—outside diameters	2.8438 in.—2.8448 in. (72,232 mm.—72,257 mm.) 3.750 in.—3.751 in. (95,250 mm.—95,275 mm.)
Pinion—splined diameter	1.5988 in.—1.602 in. (40,609 mm.—40,690 mm.) over 0.1575 in. (4,000 mm.) dia. rollers
Pinion—nose bearing locating diameter	1.5167 in.—1.5172 in. (38,524 mm.—38,534 mm.)
Final drive casing—pinion nose bearing bore diameter	2.4402 in.—2.4407 in. (61,981 mm.—61,993 mm.)
Pinion nose bearing—outside diameter	2.44045 in.—2.44095 in. (61,997 mm.—61,999 mm.)
Pinion nose bearing—running clearance	0.0005 in.—0.0015 in. (0,027 mm.—0,038 mm.)
FINAL DRIVE HALF-SHAFTS	
Side housing—bearing locating bore	2.6242 in.—2.62445 in. (66,649 mm.—66,672 mm.)
Bearing—side housing—outside diameter	2.6240 in.—2.6245 in. (67,056 mm.—67,068 mm.)
Bearing—side housing—bore diameter	1.4997 in.—1.5002 in. (37,863 mm.—38,105 mm.)
Ball and trunnion joint shaft—bearing diameter	1.49975 in.—1.500 in. (38,093 mm.—38,10 mm.)
Ball and trunnion joint—trunnion pin bore	0.9751 in.—0.9754 in. (24,767 mm.—24,775 mm.)
Ball and trunnion joint—trunnion pin diameter	0.97745 in.—0.97765 in. (24,838 mm.—24,889 mm.)
Trunnion pin—minimum pressing load	2½ tons/sq. in.
Ball and trunnion joint—spherical ball diameter	1.7490 in.—1.7495 in. (44,424 mm.—44,437 mm.)
Ball and trunnion joint—spherical ball bore	1.2135 in.—1.2140 in. (30,832 mm.—30,835 mm.)
Needle rollers (29 off)—diameter	0.1180 in.—0.1182 in. (2,997 mm.—3,002 mm.)
Ball and trunnion joint—spherical ball locating bores	1.750 in.—1.751 in. (44,450 mm.—44,475 mm.)

Section J6

WORKSHOP TOOLS

Tool Number	Description
RH 7861	Pre-loading jig—Belleville washers—Final drive R.H. side housing
RH 7862	Locking tool—Pinion flange
RH 7863	Extractor—Bevel pinion bearing
RH 8014	Torque wrench—0 lb. ft. to 600 lb. ft.—Hub yoke nut
RH 8016	Extractor beam When used in conjunction with RH 8017 and RH 8018 will extract the tapered yoke from the hub drive-shaft. When used in conjunction with RH 8017, RH 8020, RH 8021 and RH 8022 the extractor beam can be used to remove the rear tapered roller bearing from the final drive pinion.
RH 8017	Hydraulic ram To be used in conjunction with RH 8016, RH 8018, RH 8020, RH 8021 and RH 8022 as detailed above. When used in conjunction with extractor beam RH 8033 will extract the final drive flange from the pinion.
RH 8018	Extractor bolt 2 See RH 8017 for uses.
RH 8020	Separator See RH 8017 for uses.
RH 8021	Extractor bolt 2 See RH 8017 for uses.
RH 8022	Pressure pad See RH 8017 for uses.
RH 8026	Socket head $1\frac{1}{8}$ in. A/F To be used in conjunction with RH 8014.
RH 8032	Stiffening bar—Final drive casing
RH 8033	Extractor beam See RH 8017 for uses.

Chapter K

FUEL SYSTEM AND CARBURETTERS

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Chapter K

FUEL SYSTEM AND CARBURETTORS

Section K1

FUEL SYSTEM

For details of components related to the Emission Control Systems refer to Chapter U.

Fuel tank—Early cars—To remove (see Fig. K1)

The following procedures apply to cars prior to Car Serial Numbers SRH 7694, CRH 7812, DRH 7770 and LRX 7482.

1. Disconnect the battery leads.
2. Remove the carpet and underlay from the luggage compartment.
3. Remove the fuel gauge unit cover from the fuel tank, then disconnect the leads from the unit.
4. Remove all dirt from around the drain plug, then, using the special adaptor and spanner from the tool kit, remove the plug and drain the fuel into a storage container.
5. Disconnect the fuel pipe line at the tank outlet union.
6. Disconnect the fuel tank breather pipe at the filler tube connection.
7. Remove the rubber hose connected to the filler pipe.
8. Unscrew and remove the nineteen setscrews and washers which secure the fuel tank to the floor of the luggage compartment.
9. Lift and remove the fuel tank from its location in the luggage compartment floor.

Fuel tank—Early Cars—To fit

To fit the fuel tank, reverse the procedure given for its removal noting the following points.

1. Ensure that the rubber hose is connected to the filler pipe after the fuel tank has been fitted into position.
2. Lubricate the fuel tank drain plug with Rocol Marlube Moly 51 or its equivalent, then fit and tighten the plug.
3. Fit the underlay to the luggage compartment floor as originally fitted using Aquaseal 1665 or similar sealing compound.

Fuel tank—Late cars—To remove

The following procedures apply to cars from Car Serial Numbers SRH 7694, CRH 7812, DRH 7770, LRX 7482 and onwards.

1. Carry out Operations 1 to 7 inclusive described under Fuel tank—Early cars—To remove.
2. Disconnect the spring clips and remove the rubber vent tube hoses from the two connections positioned on top of the fuel tank (see Fig. K2).
3. Unscrew the two worm drive clips and remove the convoluted rubber hose connected to the filler tube adaptor.
4. Lift and remove the fuel tank from its location in the luggage compartment floor.

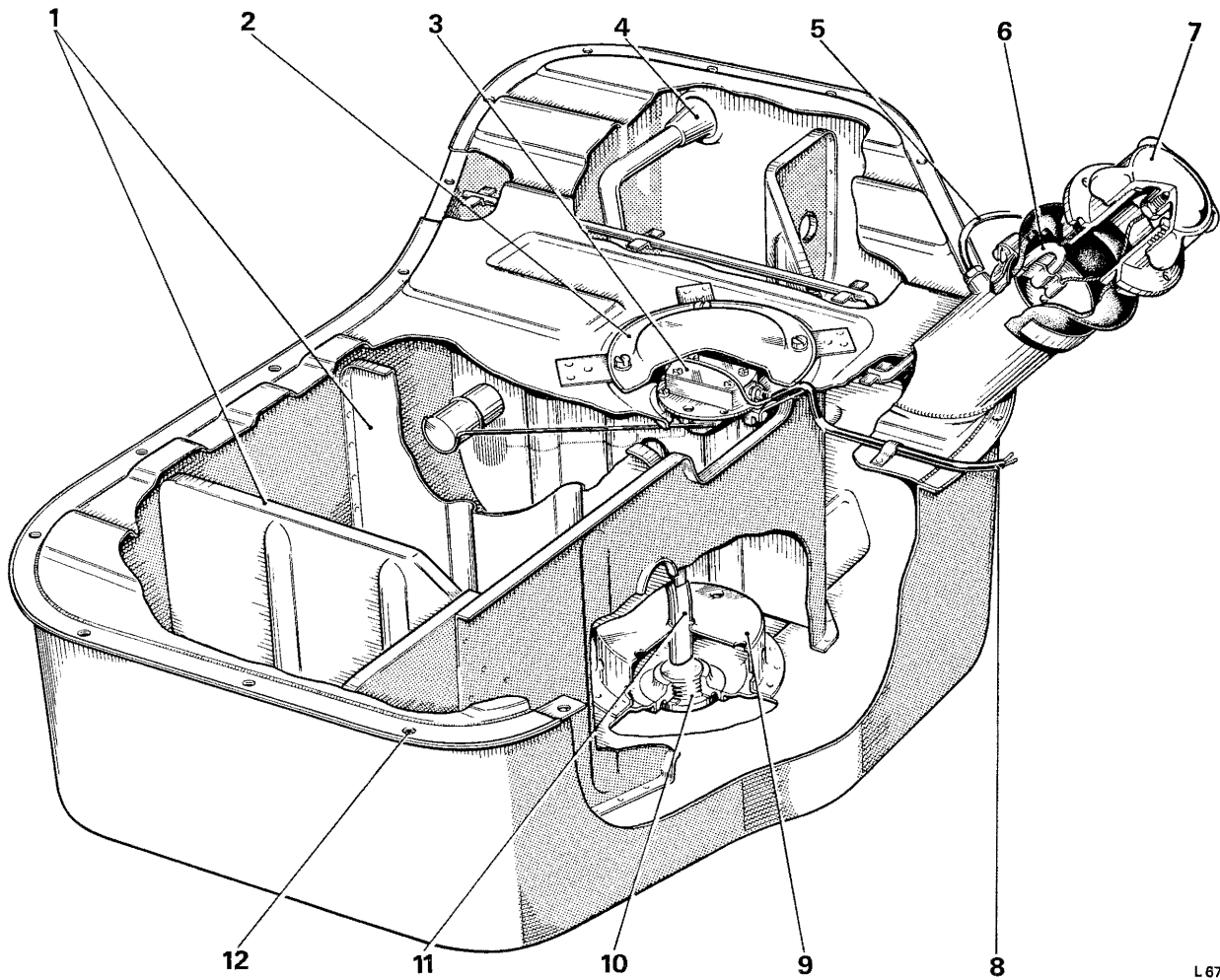
Fuel tank—Late cars—To fit

To fit the fuel tank, reverse the procedure given for its removal noting the points described in Fuel tank—Early cars—To fit.

Replacement fuel tank

The following procedures apply to cars prior to Car Serial Numbers SRH 7694, CRH 7812, DRH 7770 and LRX 7482.

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FIG. K1 CUT-AWAY VIEW OF FUEL TANK (Early cars)

- | | | |
|---|------------------------------------|------------------------------------|
| 1 Anti-surge baffles | 5 Fuel tank breather pipe | 9 Anti-surge tower |
| 2 Cover—electric fuel gauge | 6 Air-lock bleed pipe | 10 Fuel tank drain plug |
| 3 Electric fuel gauge unit with float in half-full position | 7 Filler cap | 11 Fuel feed pipe |
| 4 Fuel feed pipe outlet union | 8 Electrical lead—fuel level gauge | 12 Securing setscrew location hole |

Chapter K

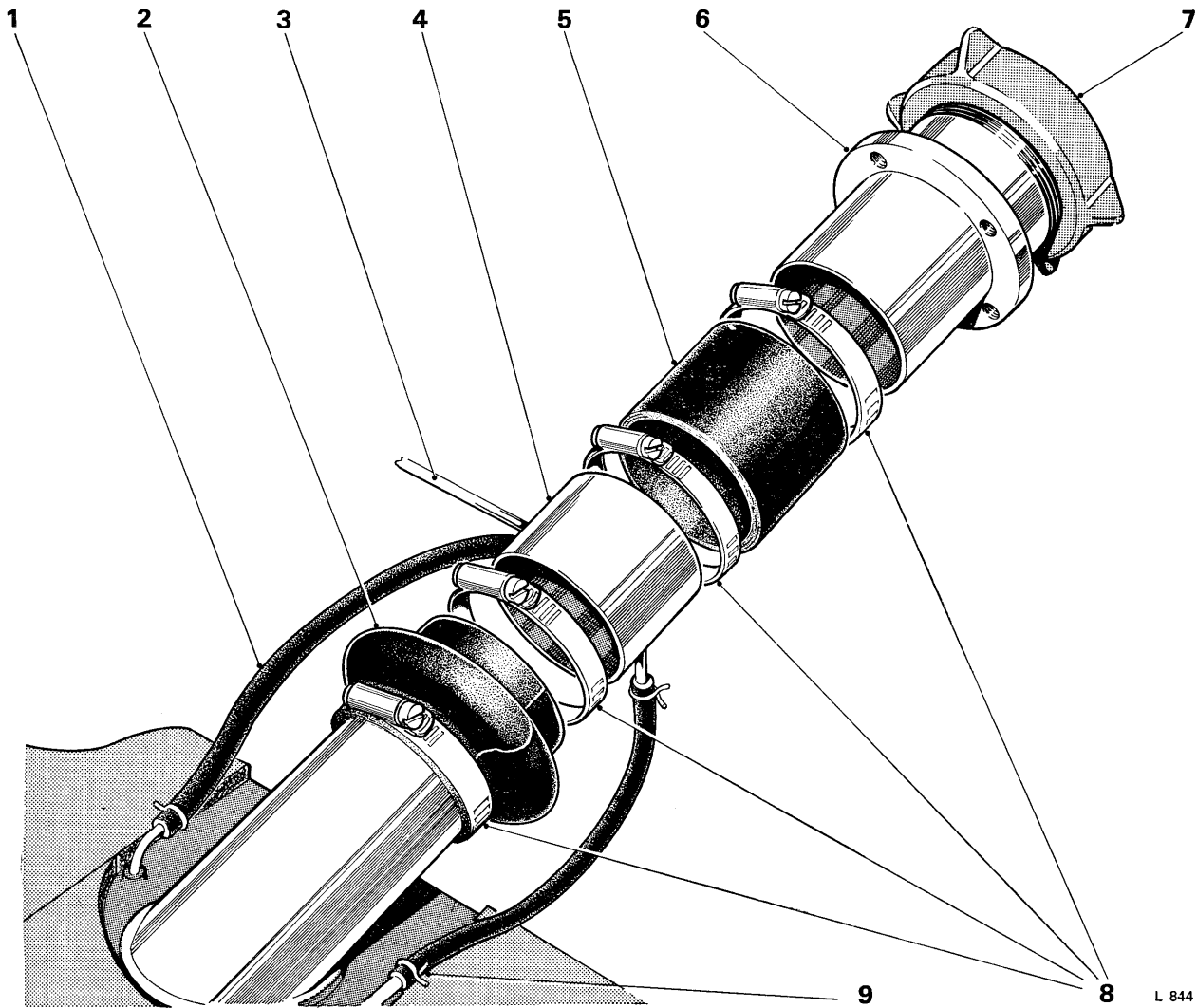


FIG. K2 ARRANGEMENT OF THE FILLER TUBE ADAPTOR

- | | | |
|---|-----------------------------|--------------------|
| 1 Vent tube hoses | 4 New filler tube adaptor | 7 Filler cap |
| 2 Convoluted hose | 5 Upper fuel resistant hose | 8 Worm drive clips |
| 3 Adaptor for existing diameter vent pipe | 6 Filler tube | 9 Spring clips |

If an early type fuel tank is to be changed, the latest type will be supplied as a replacement.

The latest type of fuel tank has a modified internal breather arrangement and the following operations describe the procedure necessary for modification of the filler neck assembly to enable the tank to be fitted.

1. Carry out Operations 1 to 9 inclusive described under Fuel tank—Early cars—To remove.

2. Using a new gasket fit the electric fuel gauge unit to the new tank. Six 3 B.A. screws will be required to secure the unit to the new tank and not four 3 B.A. screws and two 2 B.A. screws as on the previous tank.

3. Fit the new tank into the luggage compartment and secure with the 19 existing setscrews and washers.

4. Place a worm drive clip over each end of the convoluted hose and fit the hose to the filler neck of the fuel tank (*see Fig. K2*). Do not tighten the clips at this stage.

5. Fit the new filler tube adaptor to the convoluted hose ensuring that the adaptor connection for the existing vent pipe is facing towards the front of the car (*see Fig. K2*).

6. Place a worm drive clip over each end of the new fuel resistance rubber hose; fit the rubber hose between the new filler tube adaptor and the neck of the filler tube.

7. Position the upper and lower hoses and the filler tube adaptor as shown in Figure K2; tighten the four worm drive clips.

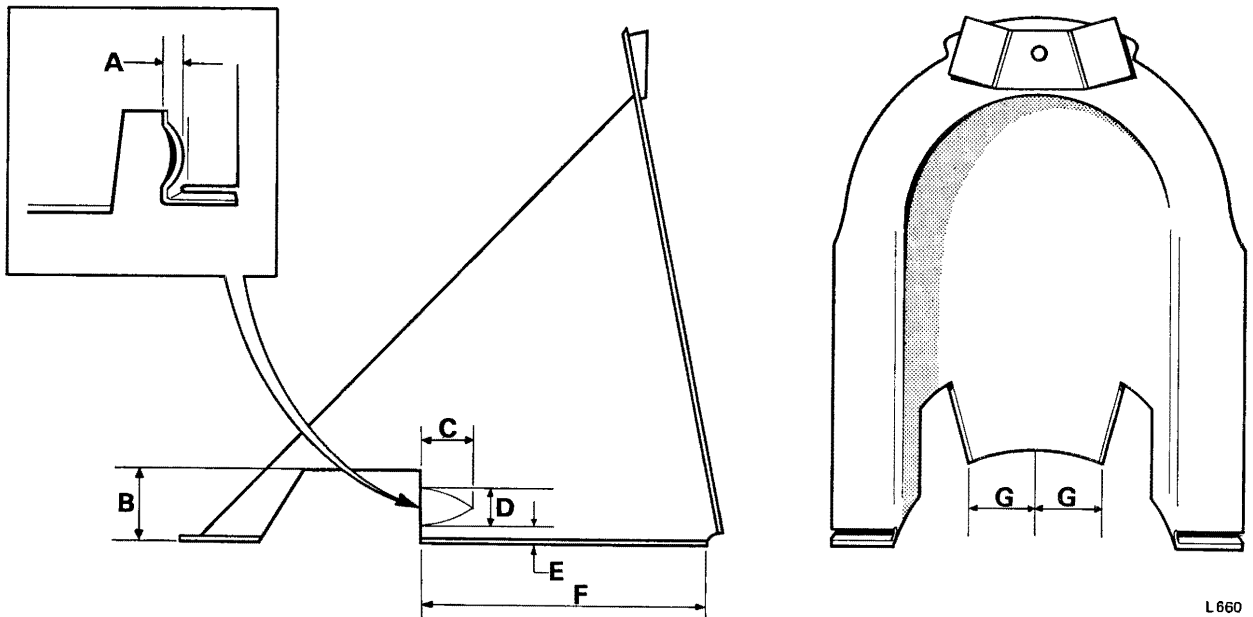


FIG. K3 DIMENSIONS OF THE CUT-AWAYS ON THE FILLER TUBE COVER

A 0.250 in. (6,35 mm.)	C 0.625 in. (15,87 mm.)	E 0.250 in. (6,35 mm.)	G 1.250 in. (3,17 cm.)
B 1.00 in. (25,40 mm.)	D 0.500 in. (12,70 mm.)	F 4.00 in. (10,16 cm.)	

8. Connect the two new vent hoses from the fuel tank vent tubes to the vent connections on the filler tube adaptor as shown in Figure K2. Secure the hoses with spring clips.

9. Connect the existing $\frac{1}{8}$ in. (3,17 mm.) diameter vent pipe to the filler tube adaptor and the fuel outlet pipe to the fuel tank.

10. Connect the electrical leads to the fuel gauge unit; fit and secure the cover over the unit.

11. Lubricate the fuel tank drain plug with Rocol Marlube Moly 51 or its equivalent; fit and tighten the plug.

In order to provide clearance for the fuel tank vent tubes it will be necessary to modify the filler tube cover as follows.

Carefully turn back, but do not cut, the bottom $1\frac{1}{2}$ in. (3,81 cm.) of carpeting to allow two cut-aways to be made in the cover as shown in Figure K3.

The following points should be noted when modifying and fitting the cover.

1. The dimensions shown in Figure K3 are only given as a guide and additional relieving may be necessary to ensure a satisfactory fit when the cover is secured in position.

2. The vertical edge of the cut-away (see arrow in Fig. K3) should clear the metal portion of the tank vent tubes when the cover is in position.

3. To prevent chafing of the flexible vent hoses, the vertical edge of each cut-away should be re-shaped slightly as shown in Figure K3 inset.

4. After finally securing the cover in position stick down the carpeted trim on the cover using upholstery solution.

5. Fit the underlay to the luggage compartment floor as originally fitted using Aquaseal 1665 or similar sealing compound.

6. Fit the carpet to the luggage compartment floor.

7. Connect the battery leads.

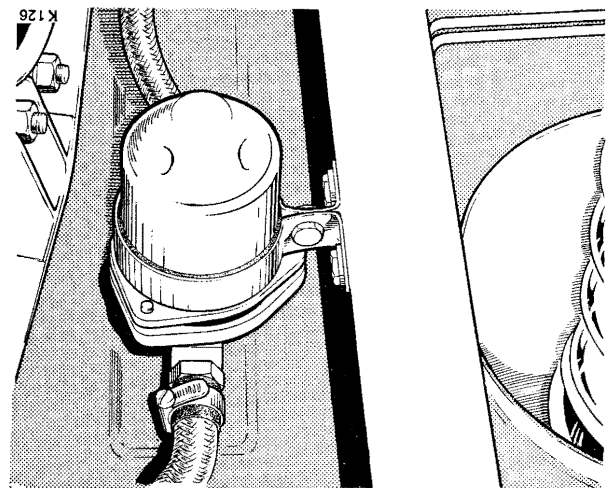


FIG. K4 REAR FUEL FILTER

Chapter K

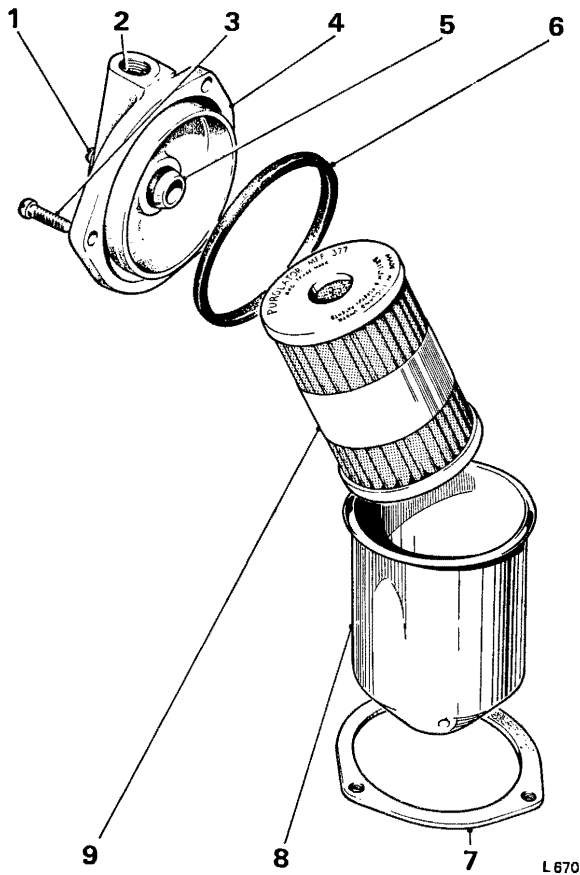


FIG. K5 EXPLODED VIEW OF REAR FUEL FILTER

- 1 Air vent
- 2 Fuel outlet connection
- 3 Setscrews—top cover to filter bowl retaining ring
- 4 Top cover
- 5 Filter retainer and fuel outlet
- 6 Rubber sealing ring
- 7 Filter bowl retaining ring
- 8 Filter bowl
- 9 Fuel filter

Rear fuel filter element—To renew
(see Fig. K5)

1. Disconnect the battery leads.
2. Loosen the worm drive clips on each side of the top cover and remove the inlet and outlet pipes. Blank off the pipes to prevent loss of fuel.
3. Remove the two setscrews securing the filter mounting bracket and lower the filter from the car. Take care not to spill any fuel.
4. Unscrew the three setscrews and remove the filter bowl from the top cover taking care not to spill any fuel.
5. Remove and discard the filter element after first noting the position in which the new element is to be fitted (see Fig. K5).
6. If water is present in the fuel filter, the fuel tank should be drained. On early cars, four S.B.N. inhibitors should be placed in the tank.
7. Carefully clean all fuel filter components in paraffin.
8. Fit the new element, then fit the filter bowl to the top cover tightening the three setscrews evenly.
9. Fit the fuel filter to the floor stiffener and secure with the two setscrews.
10. Remove the blanks from the ends of the inlet and outlet pipes. Fit and secure the pipes to the top cover.
11. Connect the battery leads.
12. After fitting the rear fuel filter, switch on the ignition to operate the fuel pumps and remove air from the fuel pipes.
13. Switch off the ignition and inspect the external surface of the filter bowl for any signs of fuel leakage.

Section K2

FUEL PUMPS

Fuel pump failure

In the United Kingdom all faulty pumps are reconditioned by the manufacturer only; it is therefore necessary to replace a faulty unit with a new or reconditioned unit.

In all other countries, a new or reconditioned pump should be fitted; if this is not possible, parts can be obtained and the fault rectified as described in Section K6—Fault Diagnosis.

All reconditioned pump units and parts are obtainable through the Parts Department at Crewe.

Reconditioned fuel pump units

S.U. reconditioned fuel pump units are of the short barrel type and incorporate all the latest design features. The pump mounting studs are either of B.S.F. or U.N.F. thread form, but the correct nuts will be supplied with each pump. Nuts from other pumps should not be fitted unless the thread form is known to be the same as the stud thread on the reconditioned pump.

Neither inlet or outlet unions are supplied with reconditioned pumps. These parts should be removed from the faulty pump unit before its return to Rolls-Royce Limited.

Fuel pump—To remove (see Fig. K6)

1. Disconnect the battery leads.
2. Remove the inlet pipe from the top cover of the rear fuel filter. Blank off the pipe. This will prevent siphoning of the fuel from the tank.
3. Disconnect the delivery and feed pipes from the fuel pump.
4. Remove the stone guards surrounding the pump.
5. Remove the rubber covers from each end of the pump to reveal the electrical terminals.
6. Disconnect the following electrical leads.
 - (a) the supply lead from the inner pump terminal
 - (b) the earth lead and the lead to the radio interference suppressor.
 - (c) the connecting lead to the outer pump terminal.
 - (d) the earth lead and the suppressor lead from the outer pump.

7. Disconnect the two breather pipes from the nipples on either side of the pump body.

8. Remove the four nuts and washers securing the pump unit to the mounting bracket on the body member.

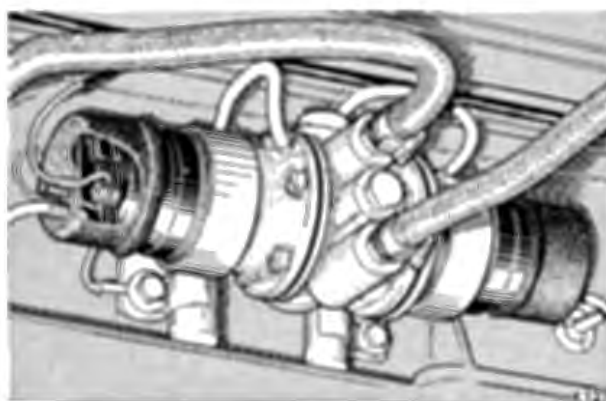


FIG. K6 FUEL PUMPS WITH STONE GUARDS REMOVED

Solenoid housing and diaphragm— To remove (see Fig. K7)

The fuel pumps on present production cars are fitted with a moulded nylon armature guide plate in preference to the eleven brass rollers.

The nylon guide plate can be fitted in place of the brass rollers and will therefore be supplied for all spares.

If it is necessary to replace or reset a diaphragm on a fuel pump fitted with a nylon guide plate, it is important that the guide plate is removed first. Ensure that the guide plate is not distorted when assembling the pump.

1. Remove the six setscrews which secure the solenoid housing, using a thick bladed screwdriver to avoid damaging the screw heads.

2. Remove the earthing screw from the solenoid housing.

3. Withdraw the solenoid housing, together with the diaphragm and spindle assembly, from the pump body.

4. **Fuel pumps fitted with brass rollers.** Remove the diaphragm and spindle assembly by holding the

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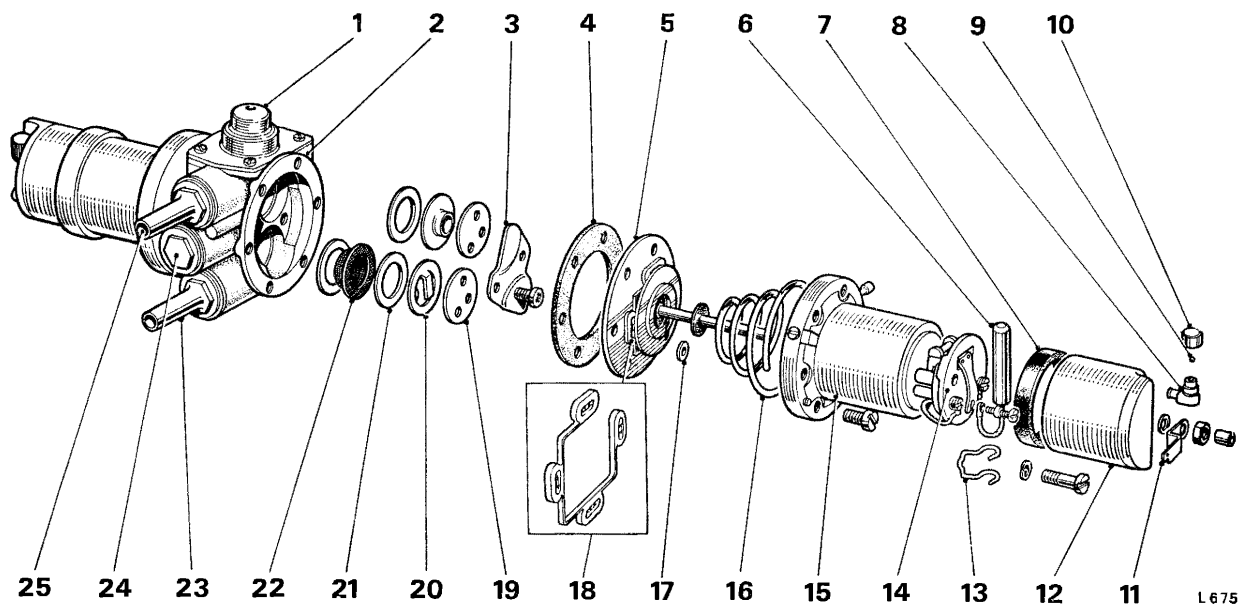


FIG. K7 EXPLODED VIEW OF FUEL PUMPS

- | | | |
|--------------------------|------------------------------|-------------------------------|
| 1 Air bottle cover | 9 Valve ball | 18 Nylon armature guide plate |
| 2 Pump body | 10 Ventilator cap | 19 Valve cover |
| 3 Clamping plate | 11 Lucar connection | 20 Valve assembly |
| 4 Joint washer | 12 End cover | 21 Sealing washer |
| 5 Diaphragm | 13 Condenser clip | 22 Filter |
| 6 Condenser | 14 Rocker and blade assembly | 23 Inlet connection |
| 7 End cover sealing ring | 15 Solenoid housing | 24 Plug |
| 8 Ventilator valve | 16 Armature spring | 25 Outlet connection |
| | 17 Roller (eleven off) | |

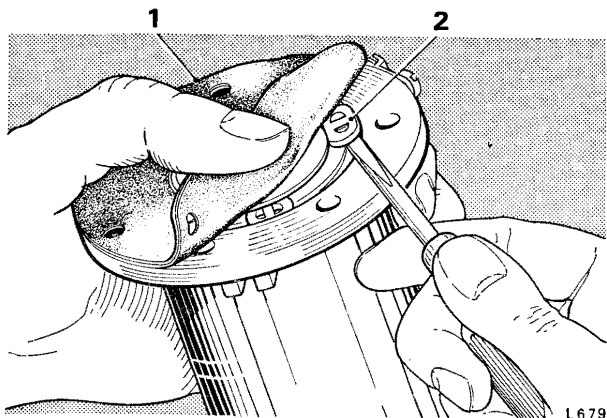


FIG. K8 REMOVING THE NYLON ARMATURE GUIDE PLATE

- 1 Diaphragm
- 2 Nylon guide plate

diaphragm and unscrewing it anti-clockwise until the armature spring pushes the diaphragm away from the solenoid housing. It is advisable to hold the housing over the bench so that the eleven brass rollers are not lost.

Fuel pumps fitted with nylon armature guide plates. Turn back the edge of the diaphragm to expose the two end lobes of the nylon guide plate. Gently probe the two end lobes of the guide plate free from the recess into which they fit (see Fig. K8); remove the guide plate.

Remove the diaphragm and spindle assembly by holding the diaphragm and unscrewing it anti-clockwise until the armature spring pushes the diaphragm away from the solenoid housing.

5. The diaphragm and spindle are serviced as a unit and should not be separated.

6. Repeat operations 1 to 5 inclusive on the remaining pump.

7. **Fuel pumps fitted with brass rollers.** Wash all parts in clean paraffin and dry thoroughly. Inspect the diaphragm and brass rollers. A new diaphragm assembly should be fitted if damage or deterioration is apparent.

The spherical ends of the rollers should be examined for damage. If the rollers are damaged and considered unsatisfactory, a nylon armature guide plate will be supplied as a replacement.

Fuel pumps fitted with nylon armature guide plates. Wash all components in clean paraffin and dry

thoroughly. Inspect the diaphragm assembly and nylon armature guide plate for damage or deterioration; renew if necessary.

8. Before assembling the pump release the spring blade retaining screw in the contact breaker sufficiently to ensure that pressure is not applied to the tungsten points and outer rocker. If pressure is applied at this point during assembly, the correct setting of the diaphragm cannot be obtained.

Solenoid housing and diaphragm—To fit

1. When assembling the pump all cork and fibre washers, gaskets and rubber 'O' rings should be renewed.

2. Place the armature spring in the solenoid housing with the large diameter toward the solenoid.

3. Before fitting the diaphragm, ensure that the impact washer is fitted to the armature. This is a small neoprene washer which fits into the armature recess.

4. Fit the diaphragm by inserting the spindle into the hole in the solenoid and screwing it into the threaded trunnion in the centre of the rocker assembly.

5. Screw in the diaphragm until the rocker will not 'toggle over'. This must not be confused with 'jamming' the armature on the solenoid housing internal steps.

6. **On fuel pumps fitted with brass centralising rollers**, fit the eleven rollers by turning back the edge of the diaphragm and dropping the rollers into the solenoid recess. The pump should be held rocker end downwards to prevent the rollers from falling out.

7. Fit the contact blade and adjust the finger settings by inserting a feeler gauge between the rocker finger and solenoid housing. If necessary, bend the stop finger to obtain a gap of between 0.065 in. and 0.075 in. (1.65 mm. and 1.90 mm.). Carefully remove the contact blade.

8. Hold the solenoid housing assembly in an approximately horizontal position and firmly, but steadily push in the diaphragm spindle. Unscrew the diaphragm, alternatively pressing and releasing, until the rocker just 'toggles over'.

9. To set the diaphragm, unscrew to the nearest hole and then unscrew a further four holes (two-thirds of a complete turn). The diaphragm is now correctly set.

10. **On fuel pumps fitted with brass centralising rollers**, press the centre of the armature and fit the retaining fork at the back of the rocker assembly. This is necessary to prevent the rollers from falling out when the solenoid housing is placed on the bench prior to fitting the body. It is not intended to stretch the diaphragm before tightening the body screws.

For fuel pumps fitted with nylon armature guide plates carry out Operations 11 to 13 inclusive.

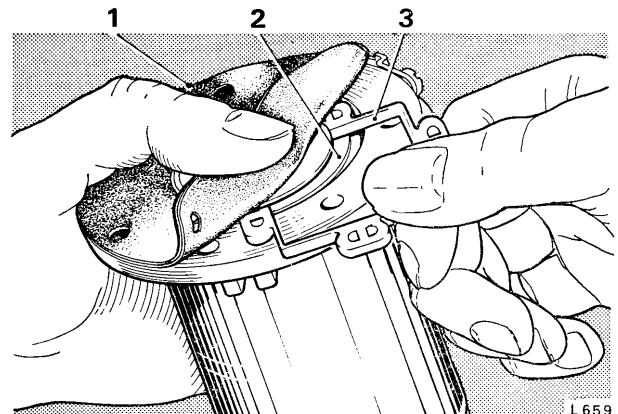


FIG. K9 FITTING THE NYLON ARMATURE GUIDE PLATE

- 1 Diaphragm
- 2 Solenoid recess
- 3 Nylon guide plate

11. Turn back the edge of the diaphragm and insert one of the armature guide plate end lobes into the recess beneath the diaphragm as shown in Figure K9; ensure that the flat face of the guide plate is adjacent to the diaphragm.

12. Carefully ease the guide plate into position beneath the diaphragm.

13. Press each lobe of the guide plate into the recess. In order to avoid distorting the guide plate it is most important that the two end lobes are not pressed into position until all other operations have been carried out.

14. Repeat these operations for the remaining diaphragm assembly.

15. Fit the new joint washer to the body, ensuring that the screw holes are correctly aligned.

16. Offer the solenoid housing to the body, making sure that the seating between them is correct.

17. Line up the six securing screw holes ensuring that the cast lugs on the solenoid housing are to the bottom. Screw in the six setscrews until they are finger-tight and then fit the earthing screw with its Lucar connector.

18. **Fuel pumps fitted with brass rollers.** Remove the roller retaining fork, tighten the body securing screws, ensuring the rollers retain their positions; a displaced roller will damage the diaphragm.

Fuel pumps fitted with nylon armature guide plates. Tighten the body securing screws.

19. Progressively tighten the securing screws on opposite diameters.

20. Fit the contact blade and the condenser lead to the pedestal with the 5 B.A. screw and washer.

21. Adjust the blade so that its contact points are a little above the contact points on the rocker when the

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points are closed. Check that when the contact points 'make' or 'break' one pair of points wipes over the centre line of the other in a symmetrical manner. The contact blade is slotted to provide some degree of adjustment.

22. To set up the contact gap proceed as follows.

Ensure that when the outer rocker is pressed onto the solenoid housing, the contact blade rests on the narrow ridge which projects slightly above the main face of the pedestal. This is achieved by slackening the contact blade attachment screw, swinging the blade clear of the pedestal, and bending it downward a sufficient amount so that when repositioned it rests lightly against the ridge. Over-tensioning of the blade will restrict the travel of the rocker mechanism.

23. Check the lift of the contact blade top above the top of the pedestal with a feeler gauge. If necessary, bend the stop finger beneath the pedestal to obtain a gap of between 0.030 in. and 0.040 in. (0.76 mm. and 1.02 mm.).

24. Tighten the contact blade attachment screw when the correct setting has been obtained.

25. Ensure that the end cover seal washer is in position on the terminal stud. Fit the bakelite end cover and secure it in position with the lock washer and brass nut.

Fuel pump—To fit

To fit the fuel pump, reverse the procedure given for its removal noting the following points.

1. In order to prevent excessive transmission of noise from the pumps, it is essential to ensure that when fitting the fuel pump, the delivery and feed pipes

of the fuel system are kept clear of the body frame between the insulated mounting clips. Also ensure that the two breather pipes are firmly attached to their nipples.

Test data

1. When both fuel pumps are operating they should deliver 1.333 pints (0.758 litres) of paraffin in 28 seconds at a delivery head of 4 ft. (1.22 m.) and a suction lift of 10 in. (25.4 cm.).

2. Mount the pump unit on a test rig 10 in. (25.4 cm.) above a paraffin bath. Fit $\frac{5}{16}$ in. (7.94 mm.) diameter bore pipes to both the inlet and outlet unions of the pump; immerse the pipe connected to the inlet union in the paraffin bath and suspend the pipe connected to the outlet union 4 ft. (1.22 m.) above the pump unit. A measuring jar or receptacle of known capacity should be placed beneath the outlet union, and the delivery of the pump checked against a stopwatch.

3. Operate each pump independently at 13.5 volts; each pump should deliver 1.333 pints (0.758 litres) of paraffin in 56 seconds. Partly block the outlets of the pumps, reducing the flow to 1 pint (0.568 litres) of paraffin in 8 minutes when both pumps are operating; check the operation of the pumps and should buzzing occur, they should be rejected.

4. Buzzing occurs when the pumps are operating quickly but without doing any work, resulting from the sponge of the diaphragm being equal to the stroke of the pump.

5. A faulty pump unit should either have a new diaphragm fitted or be exchanged for a reconditioned unit (see *Reconditioned fuel pump units*).

Section K3

AIR CLEANER

Introduction

All cars destined for the following countries are fitted with paper air filter elements.

Africa, (including Algeria, Egypt, Kenya, South Africa, Morocco, Sudan, Tunisia, Madeira, Tangiers, Nigeria, etc.) also Asia (including India, Turkey, Iran, Iraq, Syria, Lebanon, Israel, Jordan, Hong Kong, etc.) also Australia, New Zealand, Spain, Portugal, Greece, Yugoslavia, Gibraltar, South America, Jamaica,

Bahamas and Mexico.

Paper element—To clean

1. Should it be necessary to clean the paper elements before the mileage quoted in Chapter D—Lubrication and Maintenance, is reached, a high pressure air line should be applied to the inside of each element. Do not attempt to clean the paper element in petrol, etc.

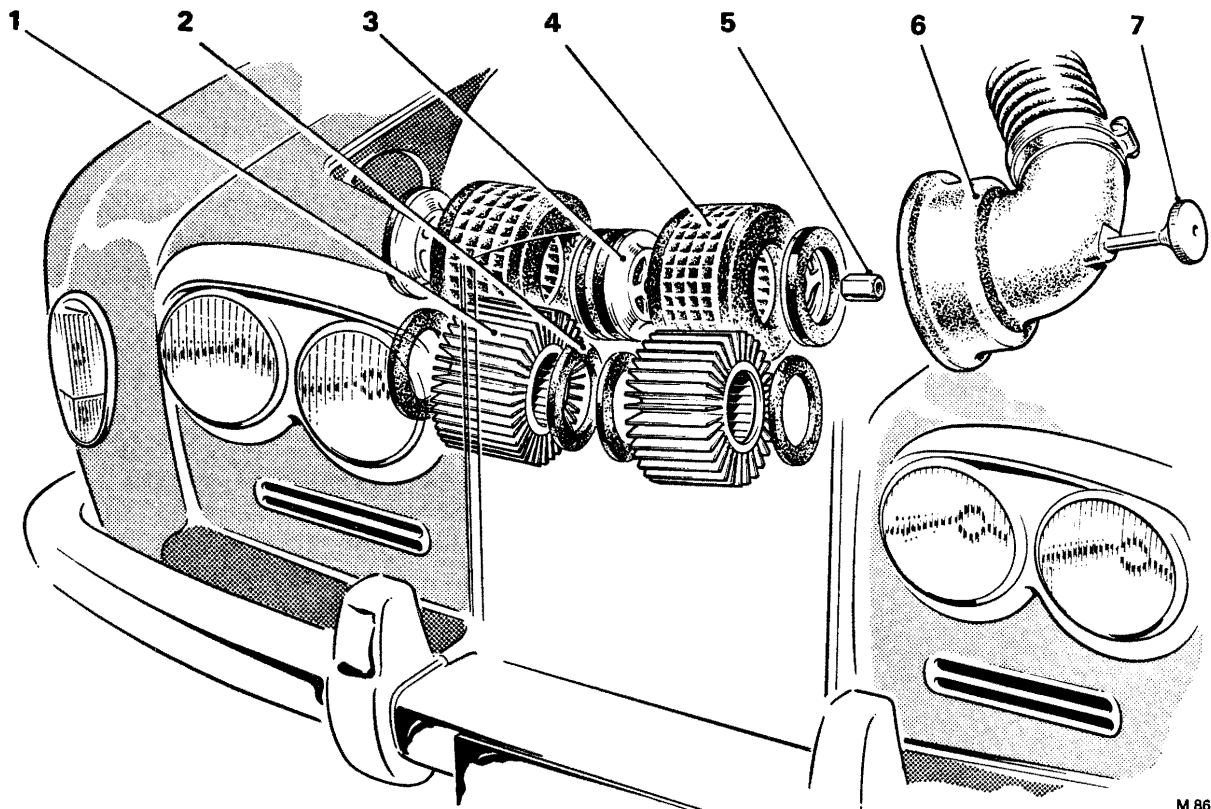


FIG. K10 EXPLODED VIEW OF THE AIR FILTER

- | | |
|---|-----------------|
| 1 Paper element | 4 Wire element |
| 2 Sealing washer (four required for paper elements only) | 5 Securing nut |
| 3 Locating plate (four required for paper or wire elements) | 6 Cover |
| | 7 Securing bolt |

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Wire mesh filter element—To clean

1. The oil wetted, wire mesh filter elements should be removed and washed thoroughly in petrol at the mileage quoted in Chapter D—Lubrication and Maintenance.

2. After washing, all surplus petrol should be removed by blowing through the filter from the inside with a high pressure air line.

3. The elements should then be completely immersed in clean engine oil and allowed to soak for a period of approximately five minutes and afterwards allowed to drain for a period of two hours.

Filter elements—To remove

1. Remove the knurled nut on the side of the unit (*see Fig. K10*) then remove the cover together with the outlet hose.

2. Remove the hexagonal nut from the centre stud, then dismantle the air filter in the following manner.

3. **On cars fitted with paper elements**, withdraw the outer locating plate, sealing ring, element, sealing ring, two locating plates, sealing ring and finally the second element. Note that the cone end of the locating plates

fit into the element bore.

4. **On cars fitted with wire mesh elements**, the dismantling procedure is similar to that previously described, except that the four sealing rings are not fitted.

Air silencer/cleaner unit—To remove

1. Jack up the front of the car and support the car on suitable stands.

2. Remove the right-hand front wheel.

3. Remove the stone guard.

4. Disconnect the trunking from the air cleaner outlet.

5. The air cleaner is secured to the valance plate by six setscrews, equally spaced around the filter access hole. Remove the six setscrews from inside the engine compartment and detach the air cleaner together with the cork joint; discard the joint if it is in poor condition.

Air silencer/cleaner unit—To fit

Fit the air cleaner by reversing the procedure given for its removal.

Section K4

THE CARBURETTORS AND AUTOMATIC CHOKE SYSTEM

Carburettors—To remove (see Chapter E— Engine Compartment illustrations)

1. Disconnect the battery leads.
2. If a hot idle compensator valve is fitted disconnect the rubber pipe connected to the choke butterfly housing rubber elbow; also remove the rubber pipe connected to the carburetter 'Tee' piece.
3. Remove the air hose steady bracket noting that the small bracket retaining the kick-down micro-switch wire is retained by one screw.
4. Disconnect the hose from the air silencer and butterfly housing; remove the hose together with the bonding cable earth strip (if fitted).
5. Move the spring clip away from the choke solenoid cover then disconnect the wires noting from which terminal each wire was removed to ensure correct assembly.

For engines fitted with a refrigeration fast-idle solenoid carry out Operations 6 and 7.

6. Disconnect the two rubber tubes connected to the refrigeration fast-idle solenoid noting their respective connections for correct assembly.
7. Disconnect the wiring to the refrigeration fast-idle solenoid noting the colour of the wiring to avoid incorrect assembly.
8. Remove the engine oil dipstick.
9. Remove the split pin, washers and swivel pin, securing the throttle linkage to the fore and after manifold shaft lever; this connection is adjacent to the 'A' bank carburetter.
10. Disconnect the distributor vacuum pipe (if fitted).
11. Disconnect the main fuel feed pipe.
12. Disconnect the fuel spill pipe.
13. Disconnect the choke stove pipe from the choke housing.

14. Remove the three small screws securing the small end cover to the bi-metal coil cover then withdraw the cover along the choke stove pipe to reveal the pipe connection. Disconnect the choke stove pipe.

15. Remove the crankcase breather pipe from the choke butterfly housing; withdraw the housing from the end of the pipe.

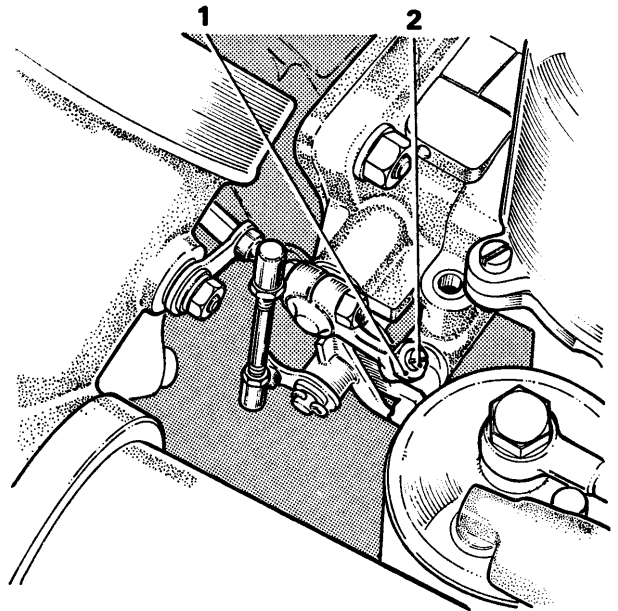
16. Cars from Car Serial Number SRH 8742 and onwards. Disconnect the hose from the carburetter

weakening device and discard the retaining clip.

17. Remove the wires connected to the micro-switch(es) adjacent to the carburettors noting their respective position to avoid incorrect assembly.

18. Remove the air horns, the choke butterfly housing, the carburettors and the 'Tee' piece as a complete assembly. This assembly is secured to the induction manifold by a setscrew, location being provided by two dowel pins.

19. Slacken the pinch bolt and remove the 'fast-idle' lever from the 'A' bank carburetter butterfly spindle (see Fig. K11).



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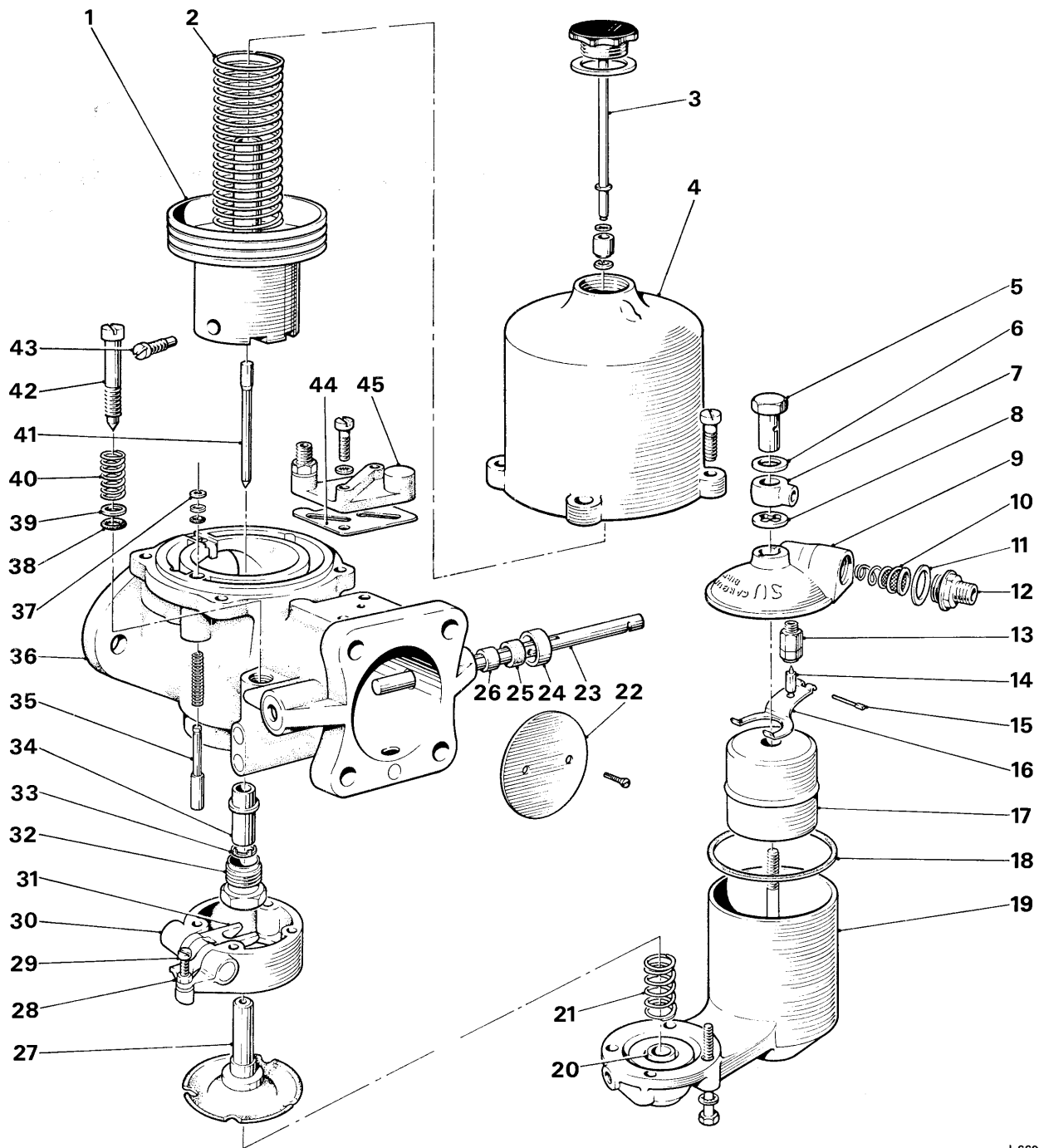
FIG. K11 FAST-IDLE MECHANISM

- 1 Lock-nut
- 2 Adjusting screw

20. Remove the three setscrews and bolt securing the air horns to the carburettors; remove the micro-switch(es), refrigeration 'fast-idle' solenoid (if fitted) and the hot idle compensator valve (if fitted) together with their brackets.

21. Remove the air horns.

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FIG. K12 EXPLODED VIEW OF CARBURETTER (Early cars)

- | | | | |
|----------------------|-------------------------|-----------------------------------|--------------------------|
| 1 Piston | 13 Float needle housing | 24 End cap | 34 Jet bearing |
| 2 Piston spring | 14 Float needle | 25 Sealing gland | 35 Piston lift pin |
| 3 Damper | 15 Hinge pin | 26 Bearing | 36 Carburettor body |
| 4 Suction chamber | 16 Lever | 27 Jet diaphragm and jet assembly | 37 Circlip |
| 5 Central nut | 17 Float chamber | 28 Lock-nut | 38 Seal |
| 6 Washer | 18 Gasket | 29 Jet adjusting screw | 39 Brass washer |
| 7 Banjo connection | 19 Float chamber body | 30 Jet housing | 40 Spring |
| 8 Fibre washer | 20 Anti-boiling device | 31 Rocker lever | 41 Needle |
| 9 Float chamber lid | 21 Jet spring | 32 Jet locking nut | 42 Volume screw |
| 10 Spring and filter | 22 Throttle valve | 33 Lock-washer | 43 Needle locking screw |
| 11 Washer | 23 Spindle | | 44 Joint |
| 12 Fuel inlet union | | | 45 Vacuum take-off plate |

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22. Disconnect the fuel feed pipe from the float chambers.
23. **Cars from Car Serial Number SRH 8742 and onwards.** Remove the weakening device pipes.
24. Disconnect the carburetter spill pipe from the float chambers.
25. Remove the float chamber lids and floats keeping them identified for their respective carburetters.
26. Remove the nut securing the throttle damper (if fitted) to its bracket; remove the damper.
27. Remove the throttle spring.
28. Completely remove the two pinch bolts securing the levers to the 'A' and 'B' bank carburetter butterfly valve spindles; remove the levers.
29. Remove the nuts and washers securing both carburetters to the 'Tee' piece; remove the carburetters together with the throttle damper bracket (if fitted) adjacent to 'A' bank carburetter.

Carburetter—To dismantle (see Fig. K12)

1. Thoroughly clean the outside of the carburetter.
Important Parts from the two carburetters should not be interchanged. To prevent this, the parts as they are removed from each carburetter, should be placed in two boxes, preferably marked 'A' bank and 'B' bank.
 2. Unscrew and remove the damper and washer from the suction chamber lid.
 3. Remove the suction chamber retaining screws and remove the chamber without tilting it.
 4. Remove the piston spring.
 5. Carefully lift out the piston and needle assembly; empty the damper oil from the piston rod.
- For carburetters fitted with a fixed needle carry out Operation 6 (see Fig. K17).**

6. Remove the needle locking screw and withdraw the needle from the piston. If it cannot easily be removed, first tap the needle inwards then pull outwards. Do not bend the needle. If excessive force is required to remove the needle it should be discarded and a new one fitted.

For carburetters fitted with a spring loaded needle and centralised jet carry out Operations 7 and 8 (see Fig. K18).

7. Remove the needle guide locking screw from the piston and withdraw the needle assembly taking care not to bend the needle.

8. Withdraw the needle guide from the needle and remove the spring.

Note The flange collar pressed onto the jet needle is pre-set at the factory and must not be disturbed.

9. Mark the relative position of the float chamber,

jet housing and carburetter body (see Fig. K13) then unscrew the float chamber screws, holding the float chamber against the pressure of the jet spring; carefully detach the float chamber.

10. Lift off the jet housing. Withdraw the jet assembly and jet spring.

11. Using a ring spanner, remove the jet locking nut together with the jet bearing and locking washer; discard the locking washer.

Note Locking washers are not fitted to carburetters with a spring loaded needle.

12. **Cars prior to Car Serial Number SRH 8742.** Unscrew the fuel inlet union from the float chamber lid and remove the union and aluminium washer; extract the filter and spring assembly.

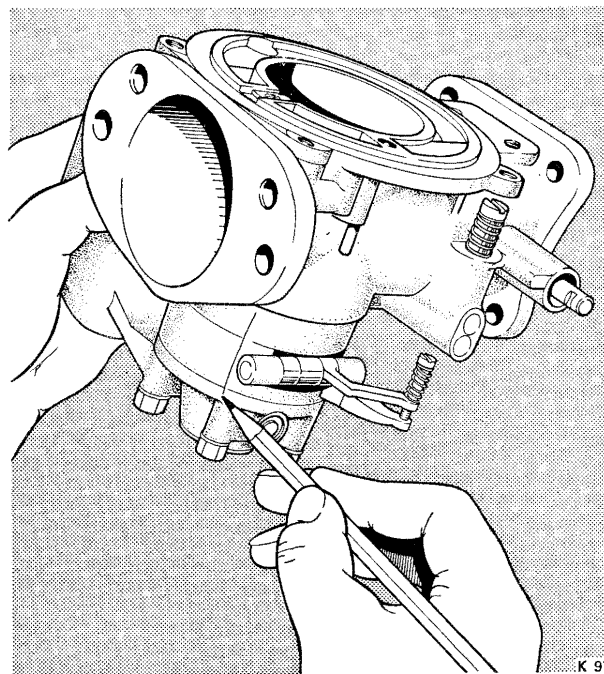


FIG. K13 SCRIBING CARBURETTER CORRELATION MARKS

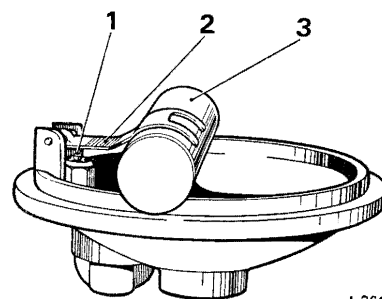


FIG. K14 CHECKING THE FLOAT LEVEL

- 1 Needle valve
- 2 Forked lever
- 3 Test bar

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Cars from Car Serial Number SRH 8742 and onwards. Unscrew the two screws securing the fuel inlet union to the float chamber lid. Withdraw the union together with the spring, spring retainer and paper filter element.

13. Push out the float lever hinge pin from the end opposite the serrations. Detach the lever.

14. Extract the float needle from its seating and unscrew the seating from the lid using a box spanner.

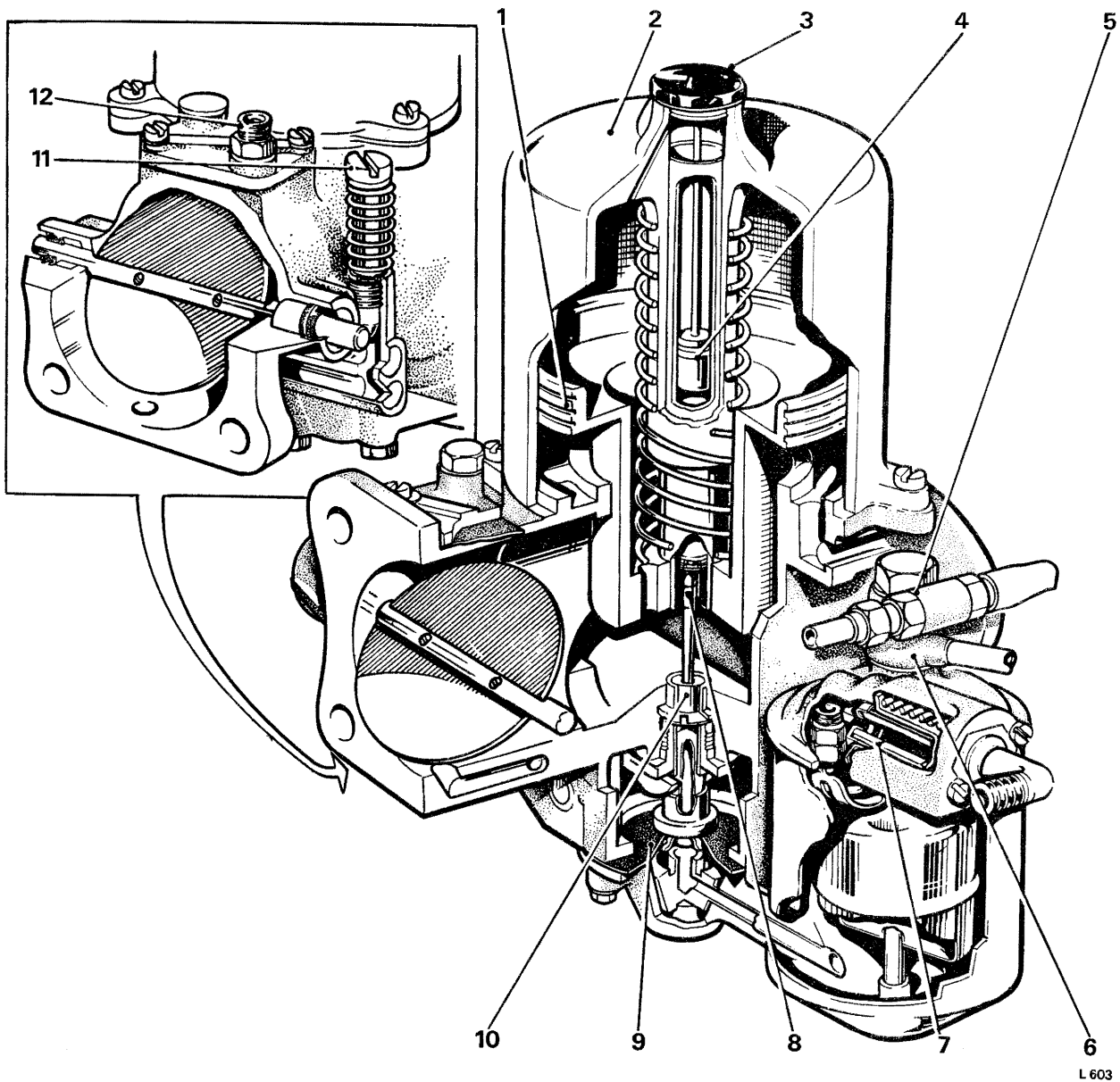
Do not distort the seating.

15. Close the throttle and mark the relative positions of the throttle butterfly valve and the carburettor flange.

16. Slacken and remove the butterfly valve from its slot in the throttle spindle. The butterfly valve is oval and will jam if care is not taken.

17. Slide the spindle out of its bearings.

18. Cars prior to Car Serial Number SRH 8742. The



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FIG. K15 CUT-AWAY VIEW OF 'B' BANK CARBURETTER (Late cars)

- | | | |
|--------------------|----------------------|---------------------------|
| 1 Air valve piston | 5 Weakening device | 9 Diaphragm |
| 2 Suction chamber | 6 Communication pipe | 10 Jet |
| 3 Damper cap | 7 Filter | 11 Volume adjusting screw |
| 4 Damper piston | 8 Needle | 12 Union—weakening device |

throttle sealing glands should not be removed as servicing is not required.

Cars from Car Serial Number SRH 8742 and onwards. Remove the two rubber seals from the throttle spindle bore.

19. Unscrew and remove the slow-running valve complete with spring, seal and brass washer.

20. Remove the two screws and shakeproof washers retaining the vacuum take-off plate and union. Lift off the plate and gasket.

21. Remove the piston lifting pin by extracting the circlip from its groove with the pin pressed upwards.

22. Withdraw the pin downwards.

Carburetters—To assemble

1. Wash all parts with clean paraffin then dry with compressed air.

2. Check that all the passages in the carburetter body and vacuum take-off plate are not obstructed.

3. Fit the plate together with a new gasket then secure the plate to the carburetter body.

4. Examine the butterfly valve spindle for scoring or signs of wear. Fit the spindle in its bearings and check for slackness in the bearings and freedom of operation.

5. Fit the butterfly valve to the slot in the butterfly valve spindle noting the position marked during dismantling. The countersunk ends of the screw holes in the spindle must face outwards toward the flange of the carburetter body. Fit the two new retaining screws but do not tighten.

6. Adjust the butterfly valve until it closes fully. Check this visually, then tighten the screws. Spread the split ends of the screws sufficiently to prevent turning.

7. **Cars from Car Serial Number SRH 8742 and onwards.** Using the special tool (RH 8383) fit the rubber seals to each end of the butterfly valve spindle. Ensure that the concave end of the seals enter the bores first.

8. Examine the slow running valve seal for serviceability. Check that the concave face of the brass washer is towards the seal. Fit the valve assembly.

9. Fit the piston lifting pin, spring, rubber washer, plain washer and circlip.

10. Examine the float needle and seating for damage or wear. Screw the seating into the float chamber lid but do not overtighten. Fit the needle to the seating, coned end first. Using light finger pressure to hold the needle against its seating, test the assembly for leaks with an air pressure line. The pressure should be approximately 5 lb/sq. in. (0,35 kg/sq. cm.).

11. Fit the float chamber lid lever and fit the hinge pin.

12. Check the float level.

With the needle on its seating, insert a $\frac{7}{16}$ in.

(11,11 mm.) diameter bar between the forked lever and the lip of the float chamber lid. The prongs of the lever should just rest on the bar (see Fig. K14). If they do not, carefully bend the lever at the start of the pronged section until the correct setting is obtained.

13. Examine the piston rod and the outside surface of the piston for damage.

14. The piston assembly must be scrupulously clean. Use paraffin or methylated spirits as a cleaning agent; do not use abrasive. Clean inside the suction chamber and piston rod guide using paraffin or methylated spirits.

15. Fit the damper assembly and washer. Seal the transfer holes in the piston assembly with rubber plugs and fit the assembly to the suction chamber.

16. Invert the complete assembly and check the time it takes for the suction chamber to fall away from the piston (see Fig. K16). This should be between 5 and 7 seconds. Remove the plugs, damper assembly and washer.

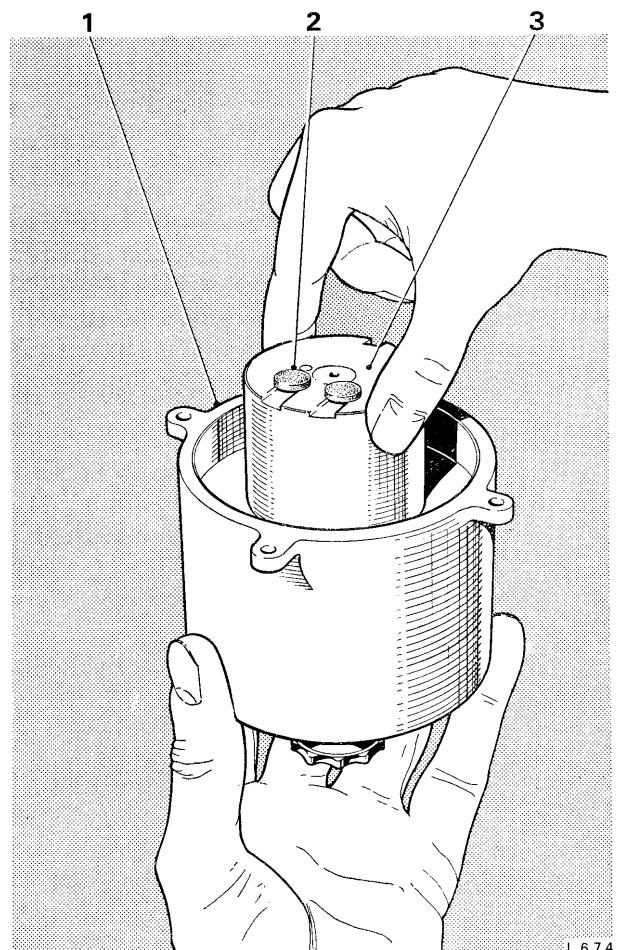


FIG. K16 CHECKING THE SERVICEABILITY OF THE SUCTION CHAMBER

- 1 Suction chamber
- 2 Rubber plug
- 3 Piston

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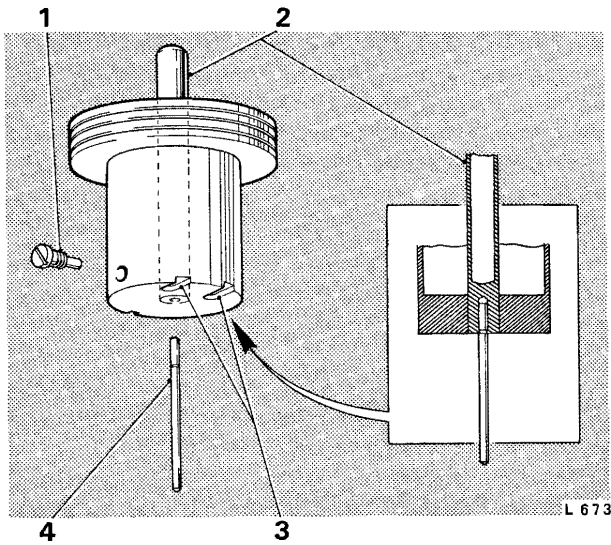


FIG. K17 CORRECT POSITION OF THE FIXED NEEDLE

- 1 Needle locking screw
- 2 Piston rod
- 3 Transfer holes
- 4 Needle

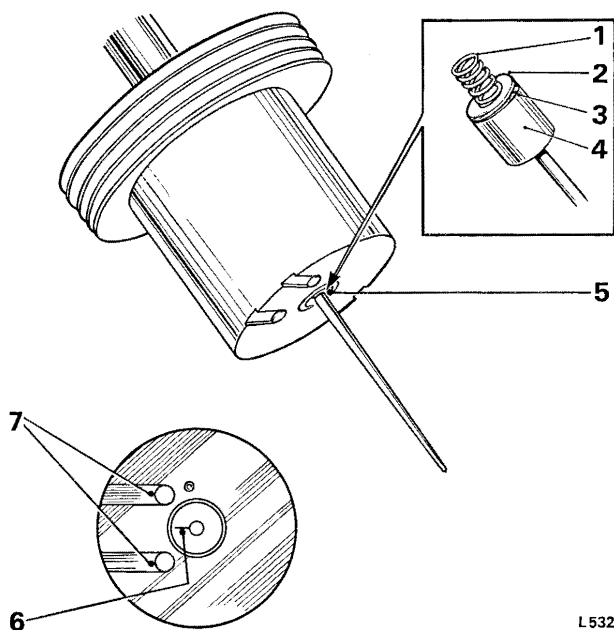


FIG. K18 CORRECT POSITION OF SPRING LOADED NEEDLE

- 1 Spring
- 2 Collar
- 3 Indentation
- 4 Guide
- 5 Needle and guide position
- 6 Mark on guide
- 7 Transfer holes and cut-outs

For carburetters fitted with a fixed needle carry out Operations 17 to 27 inclusive.

17. Fit the needle to the piston assembly. The shoulder or lower edge of the groove must be level with the lower face of the piston rod (see Fig. K17); fit the locking screw and tighten.
18. Invert the suction chamber and spin the piston assembly inside to check for concentricity of the needle.
19. Check that the piston key is secure in the carburettor body.
20. Fit the piston assembly to the body then fit the piston spring over the piston rod. Fit the suction chamber taking care not to 'wind up' the piston spring; fit and tighten the suction chamber retaining screws.
21. Fit the jet bearing, a new locking washer and locking nut; do not tighten the nut.
22. With the piston resting on the bridge of the carburettor, feed the jet into the jet bearing ensuring that the two noughts on the diaphragm are towards the inlet flange.

Important It is important that the jet and diaphragm be kept in the same radial position relative to the carburettor body, as the jet orifice is not necessarily concentric with its outside diameter; turning may cause decentralisation.

23. Check that the jet is free to move inside the jet bearing and does not foul the needle, then tighten the nut. Repeat this check to ensure that the jet bearing has not moved.
24. Fit the jet housing, diaphragm, spring and float chamber complete with the anti-boiling device ensuring that the correlation marks made previously (see Fig. K13) line up with each other and that the noughts on the diaphragm are in their correct position.
25. Before tightening the four screws securing the float chamber, ensure that the chamber is pushed towards the inlet flange of the carburettor. This is very important to prevent a foul with the throttle controls (see Fig. K21 dimension Z).
26. Using a finger, lift the carburettor piston clear of the bridge piece, then set the jet flush with the bridge piece (see Fig. K19).
27. To provide an initial setting for the carburettor, turn the jet screw 2 turns clockwise (downward).

For carburetters fitted with a spring loaded needle and centralised jet carry out Operations 28 to 41 inclusive (see Fig. K18).

28. Fit the jet bearing and lock-nut; tighten the lock-nut.
29. Fit the jet housing, jet, jet spring and float chamber complete with anti-boiling device ensuring that the jet and diaphragm are kept in the correct relationship to the body and that the raised edge of the diaphragm

is located in the housing groove.

30. Before tightening the four screws securing the float chamber, ensure that the chamber is pushed towards the inlet flange of the carburetter. This is very important to prevent a possible foul with the throttle controls (see Fig. K21 diagram Z); tighten the screws.

31. Check that the jet is not sticking in its guide. This can be carried out by moving the jet lever up and down.

32. Set the jet flush with the bridge of the carburetter (see Fig. K19) and then turn the jet screw clockwise $2\frac{1}{2}$ turns.

33. Fit the spring of the spring loaded needle onto the needle collar ensuring that the spring locates in the groove.

34. Fit the guide onto the needle so that the end with the indentation is towards the flange on the collar.

35. Fit the needle assembly and guide into the piston. The lower face of the guide must be flush with the face of the piston (for guidance refer to Fig. K18), and the mark on the guide must be adjacent to the point midway between the two cut-outs in the piston (see Fig. K18). On later cars, the flat on the side of the collar should be positioned towards its locking screw.

36. Fit and tighten a new guide locking screw to the piston.

37. Check that the piston key is secure in the carburetter body.

38. Fit the piston assembly to the carburetter body carefully guiding the needle into the jet.

39. Fit the piston spring over the piston rod.

40. Fit the suction chamber taking care not to 'wind-up' the piston spring, fit and tighten the suction chamber retaining screws.

41. Fit the piston damper and washer.

Carburetters—To fit

Fit the carburetters by reversing the procedure given for their removal noting the following points.

1. Fit new gaskets and washers to all joints.
2. Examine the floats for damage or punctures; fit the floats to their respective float chambers.
3. Fit new gaskets to the float chamber lids then fit the lids to the chambers.
4. Secure the float chamber lids and pipes to the chambers using the appropriate connections.
5. Cars prior to Car Serial Number SRH 8742. Clean the fuel filter assemblies and examine for damage; renew if necessary.

Cars from Car Serial Number SRH 8742 and onwards. Examine the paper fuel filter elements for cleanliness and damage; renew if necessary.

6. Cars prior to Car Serial Number SRH 8742. Fit the fuel filters to the lid inlets, spring end leading; fit the unions with new aluminium washers.

Cars from Car Serial Number SRH 8742 and

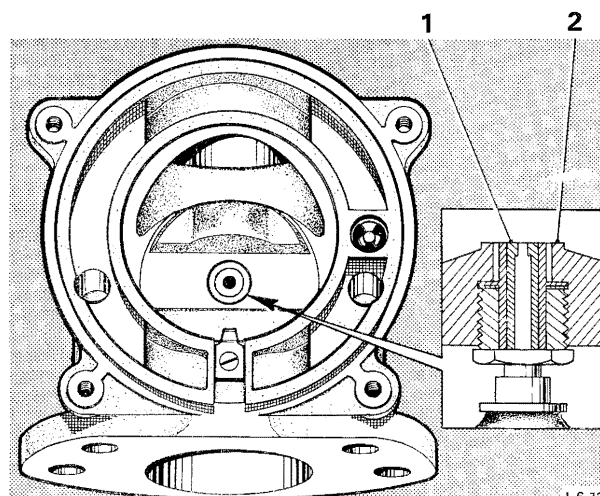


FIG. K19 CARBURETTER JET SET FLUSH WITH THE BRIDGE PIECE

1 Jet

2 Bridge piece

onwards. Ensure that the 'O' ring on the fuel inlet unions are in good condition; renew if necessary. Fit the paper fuel filter elements, spring retainers, springs and inlet unions to each float chamber lid. Secure the inlet unions with the retaining screws.

7. Fill the damper piston with an approved oil; the oil level should be approximately $\frac{1}{2}$ in. (12,7 mm.) below the top of the piston rod. Do not overfill.

Fuel spill pipe—To remove

The following procedures apply to cars from Car Serial Number SRH 8742 and onwards only.

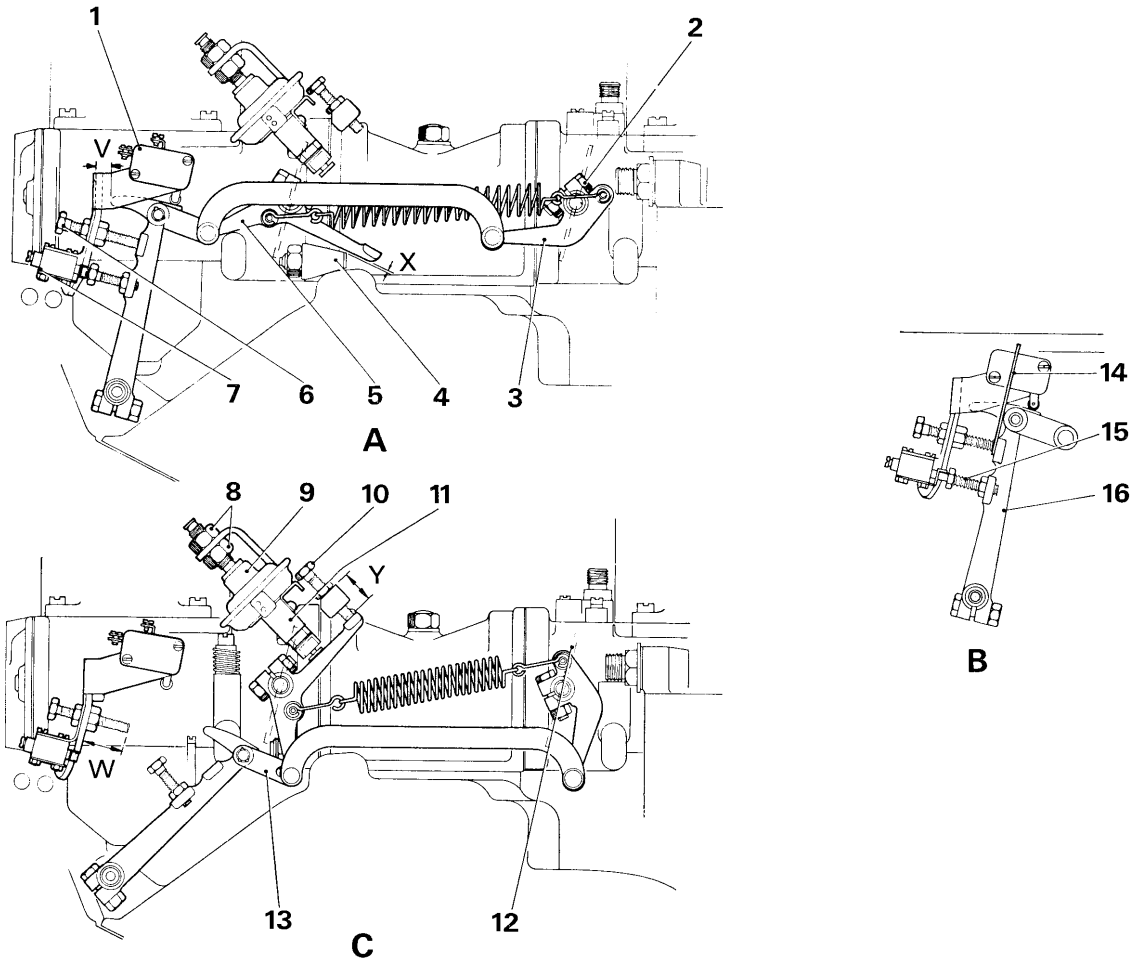
1. Unscrew the worm drive clip situated above the float chamber drain valve.
2. Unscrew the worm drive clip from the hose adjacent to the distributor.
3. Detach the hose.
4. Unscrew the worm drive clip situated below the float chamber drain valve.
5. Detach the hose from the float chamber drain valve noting that it is attached to the induction manifold fuel drain pipe.
6. If the float chamber drain valve is to be removed, unscrew the bolt securing the valve clamping bracket and remove the bracket together with the valve. The valve clamping bracket is secured to a bracket attached to the bell housing.

Note If a float chamber drain valve is faulty or damaged a new valve must be fitted.

Fuel spill pipe—To fit

Fit the pipe by reversing the procedure given for its removal.

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FIG. K20 CARBURETTER SETTINGS (Early cars)

Diagram A—Linkage in full throttle position

Diagram B—Setting kick-down micro-switch

Diagram C—Linkage in closed throttle position

- | | | |
|---|--|--|
| <p>1 Micro-switch—transmission stator</p> <p>2 Pinch bolt</p> <p>3 'B' bank throttle lever</p> <p>4 Anti-toggle stop</p> <p>5 'A' bank throttle lever</p> <p>6 Full throttle stop</p> <p>7 Micro-switch kick-down</p> <p>8 Lock-nut</p> | <p>9 Throttle damper</p> <p>10 Fixed throttle stop screw</p> <p>11 Micro-switch—transmission stator</p> <p>12 Throttle valve</p> | <p>13 Link (one hole elongated on refrigerated cars)</p> <p>14 0.015 in. to 0.030 in. (0,38 mm. to 0,76 mm.) feeler gauge</p> <p>15 Adjusting screw—kick-down micro-switch</p> <p>16 Lever—manifold to carburetter</p> |
|---|--|--|

V 0.245 in. (6,233 mm.) min. **X** 0.025 in. (0,635 mm.)

W 0.775 in. (19,7 mm.) **Y** 0.600 in. (15,24 mm.)

Carburetters — To set

Cars prior to Car serial Number SRH 8742

Having set the mechanical adjustments to the automatic choke set the carburetters by carrying out the following operations (where applicable) in the sequence given.

The correct method for carrying out the operations, follows the undermentioned list.

- A Synchronise throttles and temporarily set the throttle stop screw.
- B Set the full throttle stop.
- C Check the linkage clearances.
- D Tune the carburetters.
- E Set the cold start 'fast-idle'.
- F Set the throttle damper plunger (if fitted).
- G Set the stator micro-switches (if fitted).
- H Set the kick-down micro-switch (if fitted).
- I Set the refrigeration 'fast-idle' (if fitted).

Throttle synchronisation

1. Check that the fixed throttle stop screw is set to the correct dimension; refer to the appropriate illustration (see Figs. K20 and K21 diagram C dimension Y).
2. Unscrew the four screws securing the suction chamber of each carburetter and remove the suction chambers together with the pistons, springs and dampers.

Note It is important that each chamber and air valve piston should be fitted to the carburetter from which it was removed.

3. Slacken the two pinch bolts which clamp the operating levers to the throttle spindles (see Figs. K20 and K21).
4. Ensure that the choke is in the off position; an elastic band fitted between the choke link rod and the crankcase breather pipe fitting on the choke housing will serve to hold the choke in the off position.
5. With the 'A' and 'B' bank throttle butterfly valves held in the closed position, move the 'A' bank throttle lever so that it abuts its stop; tighten the two pinch bolts which clamp the operating levers to the throttle spindles.
6. Check that both throttle butterfly valves are closed.
7. Release the idle stop screw lock-nut, then turn the screw clockwise (downward) half-a-turn so that the throttle butterfly valves are just cracked open; tighten the lock-nut.
8. Final adjustment of the idle stop screw should be carried out as described in 'Carburetter Tuning'.

9. **Cars prior to Car Serial Number SRX 9001.** If a refrigeration vacuum unit (see Fig. K21) is fitted, set

the gap between the vacuum unit shaft and the adjustment screw to 0.100 in. (2.54 mm.).

Cars from Car Serial Number SRX 9001 and onwards fitted with the Exhaust Emission Control System. Set the gap between the throttle stop vacuum actuator shaft and the adjusting screw to 0.070 in. (1.78 mm.).

Full throttle stop

1. Adjust the full throttle stop screw so that it is set to the dimension given on the appropriate illustration (see Figs. K20 and K21 dimension W).
2. Check that the clearance (X) between the fixed stop and the lever is correct (see appropriate illustration Figs. K20 and K21). If the clearance is less than that which is given, the full throttle stop screw should be adjusted to give the correct clearance.

Linkage clearances—To check

1. Operate the carburetter linkage mechanism to ensure complete freedom of movement.
2. Particular attention should be paid to the clearance between the 'B' bank carburetter float chamber and the refrigeration 'fast-idle' adjusting screw on early cars (if fitted) or the vacuum throttle stop screw on later cars (if fitted); the clearance at this point when the linkage is moved towards its full throttle position should be at least 0.100 in. (2.54 mm.). If less than this figure, the four screws securing the float chamber to the carburetter body should be slackened and the chamber moved outward until the correct clearance is established; tighten the four screws. This dimension is applicable to both early and late linkage arrangements and is shown in Figure K21, clearance Z.

Carburetter tuning

Cars prior to Car Serial Number SRH 8742

Preliminary checks

Before tuning the carburetters the following checks should be carried out.

1. Check that the distributor contact point gaps are set correctly; if necessary clean and reset.
2. Check the sparking plug gaps.
3. Check the ignition timing, refer to Chapter M—Electrical System.
4. Check that the entire induction system is completely free from air leaks.
5. Check that the choke stove pipe is not obstructed (see Page K27).
6. Ensure that the throttle damper is not holding the throttles open.
7. Ensure that the throttle butterfly valves are

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synchronised, the full throttle stop screw is adjusted and the linkage clearance is correct as described under Carburetter—To set.

Tuning conditions

To ensure that the engine temperature and mixture requirements are stabilised, tuning must be carried out in accordance with the following setting cycle.

1. Set the volume screws fully in, then back off $1\frac{1}{2}$ turns.

2. With the carburetter dampers, suction chambers, springs and pistons already removed to enable the throttle synchronisation to be checked, set the main jet screw as follows.

Using special spanner (RH 8050), slacken the carburetter jet screw lock-nuts then manipulate each jet screw until the jet in each carburetter body is level with its bridge piece.

Screw down the jet screw 2 turns.

3. Check that the lower face of the annular groove in the needle is level with the piston base (*see Fig. K17*).

4. Check that the piston is free to slide in its suction chamber.

5. Fit the air valve pistons, springs and suction chambers in a clean dry condition then top-up the damper piston with the approved oil; the oil level should be approximately $\frac{1}{2}$ in. (12,7 mm.) below the top of the piston rod. **Do not overfill.**

It is important that each chamber and air valve piston should be fitted to the carburetter from which it was removed.

Do not fit the damper at this stage.

6. If a hot idle compensator valve is fitted remove the pipe from the hot idle compensator valve connection marked 'OUT'. Blank off the pipe.

7. Connect an electric impulse tachometer in accordance with the manufacturer's instructions.

8. Warm-up the engine at fast-idle speed until the normal operating temperature is attained. Preferably this should be carried out with the car standing in an ambient temperature of between 16°C. and 27°C. (60°F. and 80°F.). Run the engine for at least five minutes after the thermostat has opened; the thermostat opening point can be detected by a sudden rise in temperature of the thermostat elbow pipe or by reference to the coolant temperature gauge (if fitted).

9. If a refrigeration system is fitted, ensure that the system is switched off.

10. Check that the choke butterfly valve is fully open by feeling the tension at the operating levers and hearing it snap back on its stop when any tension which has been applied, is released.

Tuning procedure

11. Tuning operations may now be commenced and must be carried out in the shortest time possible. If the time for setting exceeds a three minute period, open the throttle and run the engine at 2 000 r.p.m. for $\frac{1}{4}$ minute to purge the system then resume tuning. Repeat this clearing operation if further periods of three minutes are exceeded.

Immediately after a clearing operation when the engine is at idle speed, the suction chamber should be tapped all the way round with a light weight, non-metallic instrument (e.g. the wooden handle of a screw-driver) to eliminate piston hysteresis (*see Fig. K23*).

12. Ensure that Neutral is selected on the gear range selector.

13. Set the idle speed to 600 r.p.m. by adjusting the fixed throttle stop screw.

14. Run the engine at idle speed then balance the carburetters using the volume screws, the carburetters are balanced when the hiss heard at the small drilling in the neck of each suction chamber is of equal intensity. The volume screws should only be adjusted within the range fully closed to two complete turns open, otherwise an obtrusive whistle from the carburetters may result. Fit the dampers.

15. Turn both jet adjusting screws by equal amounts in the same direction, approximately $\frac{1}{8}$ of a turn at a time until the maximum r.p.m. is recorded on the tachometer.

Note Turning the screw clockwise richens the mixture, conversely, turning the screw anti-clockwise weakens the mixture.

16. Set the mixture balance on each carburetter individually using the jet adjusting screw approximately $\frac{1}{8}$ of a turn at a time in either direction until the maximum r.p.m. is obtained.

17. Turn both jet adjusting screws by equal amounts anti-clockwise (weaker mixture) until the engine speed just commences to fall, then turn both adjusting screws $\frac{1}{8}$ of a turn clockwise (richer mixture) and tighten the lock-nuts using spanner (RH 8050).

18. Check the idle speed and if necessary adjust to the original speed (*see Operation 13*).

19. Check that the carburetters are balanced by raising and releasing each carburetter piston lift pin in turn then comparing engine response. The carburetters are balanced if the response is the same for each carburetter. If the carburetters are not balanced repeat Operations 13 to 18 inclusive until a satisfactory balance is obtained.

In certain countries the exhaust C.O. must be checked. If these regulations apply Operation 20 to 24 inclusive should be carried out.

20. Purge the engine at 2 000 r.p.m. in Neutral for a period of $\frac{1}{4}$ minute.

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21. Ensure that the engine has run a minimum period of 25 minutes since the thermostat has opened (see *Operation 8*) then fit the probe of a C.O. meter into the exhaust system. The C.O. meter should be set in accordance with the manufacturer's instructions.

Note Suitable C.O. meters are:

1. Horiba Mexa 200.
2. Borsh Model Efaw 109.

22. Idle the engine until a steady C.O. reading is obtained (minimum time $\frac{1}{2}$ minute) then check the exhaust emission on the C.O. meter; the correct reading should be between 4% and 4½%.

If the C.O. meter reading is not within this limit it is permissible to unlock the jet adjusting screws and turn them a maximum of $\frac{1}{8}$ of a turn, either clockwise or anti-clockwise, whichever is necessary to give the correct reading on the meter. **Do not turn them in opposite directions** (i.e. richen one and weaken the other). Lock the jet adjusting screws.

If the correct C.O. meter reading is unobtainable at this setting, **and the settings have been carried out to the instructions given**, the carburetters should be removed from the engine and overhauled as described previously.

23. Remove the C.O. meter.
24. Check and if necessary set the engine idle speed (see *Operation 13*) using the fixed throttle stop screw.
25. Re-connect the hose to the hot idle compensator valve.

Cold start 'fast-idle' speed—To set

(see Figs. K11 and K21)

The cold start engine speed should be set with the engine at normal running temperature.

1. With the engine stopped depress the accelerator from beneath the bonnet (see *Section K5—Throttle Control Linkage Settings*); at the same time close the choke butterfly by hand. Release the accelerator, so allowing the 'fast-idle' cam to turn.
2. Release the choke butterfly, so allowing the 'fast-idle' adjusting screw to rest on the high step of the cam. This will leave the throttles in the cold start position.
3. Ensure that the gearchange selector is in Neutral position and that the handbrake is applied.
4. Start the engine.
5. Check to ensure that the 'fast-idle' adjusting screw is resting on the high step of the cam, then using the 'fast-idle' adjusting screw adjust the engine speed to 1 850 r.p.m.; lock the adjusting screw by means of the lock-nut and check to ensure that the engine speed is still 1 850 r.p.m. By slightly opening the throttles the cam will fall away; on releasing the throttles the engine will assume normal idling speed.

On cars from Car Serial Number SRH 8742 and onwards the 'fast-idle' speed should be set to 2 000 r.p.m.

6. Where the engine is required to start below -12°C . (10°F .) the 'fast-idle' speed should be set to 2 000 r.p.m.

Throttle damper plunger—To set

(see Figs. K20 or K21)

1. Move the cold start 'fast-idle' to its off position.
2. Move the 'A' bank throttle lever to its closed throttle position.
3. Slacken both nuts securing the throttle damper to its bracket then back them off until they are well clear of the bracket.
4. Set the damper with the throttle spindle compressed to 0.187 in. (4.75 mm.) and tighten the lock-nuts.
5. Ensure that the centre of the damper spindle is resting on the centre of the throttle lever pad.

Stator micro-switches—To set (if fitted)

(see Fig. K20)

The stator micro-switch (see *Fig. K20 item 11*) which signals the initial stator angle change is non-adjustable and it is only necessary to check that the switch is functioning correctly.

The stator micro-switch (see *Fig. K20 item 1*) which signals stator angle change at approximately 45 degrees of throttle opening should be adjusted as follows.

1. Move the throttle linkage to the full throttle position, then check that the gap between the heel of the cam lever and the inner face of the micro-switch bracket is set to dimension V.
2. If the gap is less than the dimension quoted, the full throttle stop (*item 6*) should be turned clockwise until the correct gap is attained.

Kick-down micro-switch—To set

1. Using a 0.015 in. to 0.030 in. (0.381 mm. to 0.762 mm.) feeler gauge fitted between the full throttle stop screw and its stop, adjust the kick-down micro-switch adjusting screw so that it just operates the switch; a clicking noise will be heard as the switch is operated (see *appropriate illustration Figs. K20 and K21 diagram B*).

Refrigeration 'fast-idle'—To set

(see Figs. K21 diagram C)

The following procedure applies to cars prior to Car Serial Numbers SRH 7834, SRX 7826, CRH 7886 and DBH 7883.

The engine should be thoroughly warm when carrying out this check. If the refrigeration 'fast-idle' is not checked at the same time as the normal idle speed

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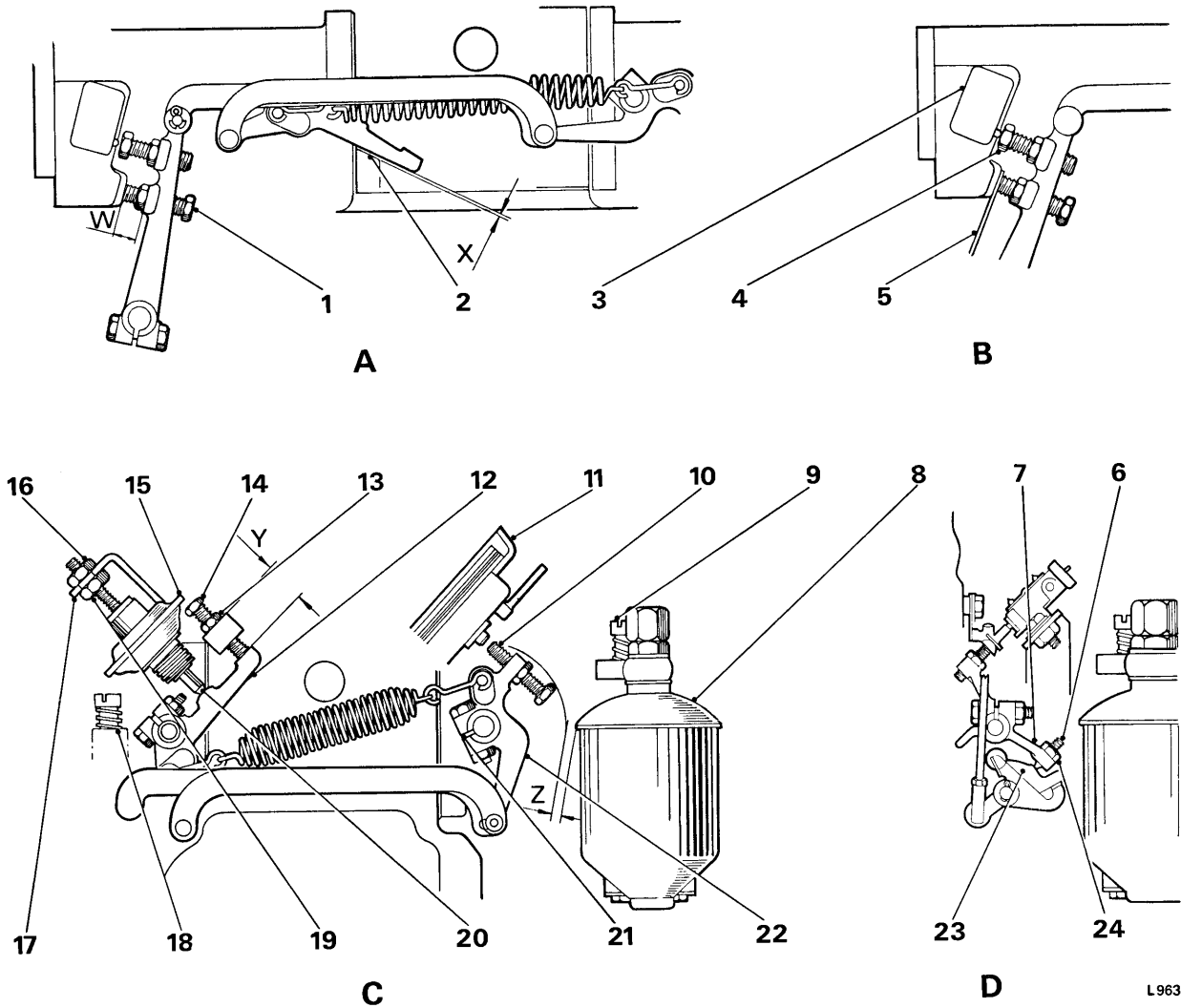


FIG. K21 CARBURETTER SETTINGS (Late cars)

Diagram A=Linkage in full throttle position

Diagram B=Setting kick-down micro-switch

Diagram C=Linkage in closed throttle position

Diagram D=Cold start 'fast-idle' linkage

- | | | |
|--|------------------------------------|--------------------------------|
| 1 Full throttle stop | 8 'B' bank float chamber | 15 Throttle damper (if fitted) |
| 2 Anti-toggle stop | 9 Volume screw | 16 Lock-nut |
| 3 Micro-switch—kick-down | 10 Refrigeration 'fast-idle' screw | 17 Underside of bracket |
| 4 Adjusting screw—kick-down micro-switch | 11 Vacuum unit | 18 Volume screw |
| 5 0.015 in. to 0.030 in. (0,38 mm. to 0,76 mm.) feeler gauge | 12 'A' bank throttle lever | 19 Lock-nut |
| 6 'Fast-idle' adjusting screw | 13 Lock-nut | 20 Damper spindle |
| 7 'Fast-idle' lever | 14 Throttle stop screw | 21 Pinch bolt |
| | | 22 'B' bank throttle lever |
| | | 23 'Fast-idle' cam |
| | | 24 Lock-nut |

W 0.350 in. (8,89 mm.) **Y** 0.650 in. (16,5 mm.)

X 0.025 in. (0,635 mm.) **Z** 0.100 in. (2,54 mm.)

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adjustment, the car should be run for the equivalent of 20 miles (32 km.) followed by five minutes at idle speed.

1. With the engine running at idle speed and Neutral or Park selected, switch the air conditioning system to the full COLD position. Select maximum blower speed and open the circular facia outlets and the rectangular outlet.

2. Allow the engine to idle for a minimum period of two minutes.

3. Measure the ambient temperature outside the car and from the table given select the appropriate 'fast-idle' speed.

4. Using the refrigeration 'fast-idle' adjustment screw situated in the 'B' bank carburetter lever (*see Fig. K21*), set the engine to run at the appropriate 'fast-idle' speed.

Ambient air temperature	'Fast-idle' speed (r.p.m.)
10°C. (50°F.)	1 280
12.8°C. (55°F.)	1 250
15.6°C. (60°F.)	1 210
18.3°C. (65°F.)	1 170
21°C. (70°F.)	1 140
24°C. (75°F.)	1 100
26.7°C. (80°F.)	1 060
29.4°C. (85°F.)	1 020
32.2°C. (90°F.)	990
35°C. (95°F.)	950
37.8°C. (100°F.)	920

Carburetters—To set

Cars from Car Serial Number SRH 8742 and onwards

Having set the mechanical adjustments to the automatic choke set the carburetters by carrying out the following operations in the sequence given.

- A. Synchronise throttles and temporarily set idle speed.
- B. Set full throttle stop.
- C. Check linkage clearances.
- D. Tune carburetters.
- E. Set cold start 'fast-idle'.
- F. Set the throttle damper plunger.
- G. Set the kick-down micro-switch.

Throttle synchronisation

Refer to Page K19.

Full throttle stop

1. Adjust the full throttle stop screw so that it measures 0.350 in. (8.89 mm.) from the boss face (*see*

Fig. K21 diagram W).

2. Check that the clearance (*X* in *Fig. K21 diagram A*) between the fixed stop and the lever is correct. If the clearance is less than that specified, the throttle stop screw should be adjusted to give the correct clearance.

Linkage clearance—To check

Refer to Page K19.

Carburetter Tuning

Cars from Car Serial Number SRH 8742 and onwards

Preliminary checks

Before tuning the carburetters the following checks should be carried out.

1. Check the distributor contact point gaps; clean and re-set if necessary. Renew the points if they are badly damaged.
2. Check the sparking plug gaps.
3. Adjust the fixed throttle screw to give an idle speed of 800 r.p.m. When setting the engine idle speed the operation must be carried out by reducing from a higher speed to 800 r.p.m. Using a dwell angle meter set the dwell angle to between 26° and 28° by means of the adjustment screw (*see Chapter M—Electrical System*).
4. Check the ignition timing (*see Chapter M—Electrical System*).
5. Check that the choke stove pipe is not obstructed (*see Page K28*).
6. Check that the entire induction system is completely free from air leaks.
7. Ensure that the throttle butterfly valves are synchronised, the full throttle stop screw is adjusted and the linkage clearance is correct as described under Carburetters—To set.

Tuning conditions

To ensure that the engine temperature and mixture requirements are stabilised, tuning must be carried out in accordance with the following setting cycle.

1. Screw the volume screws fully in, then back off $1\frac{1}{2}$ turns.
2. With the carburetter dampers, suction chambers, springs and pistons already removed to enable throttle synchronisation to be checked, set the main jet screws as follows.

Using special spanner (RH 8050), slacken the carburetter jet screw lock-nut then manipulate each

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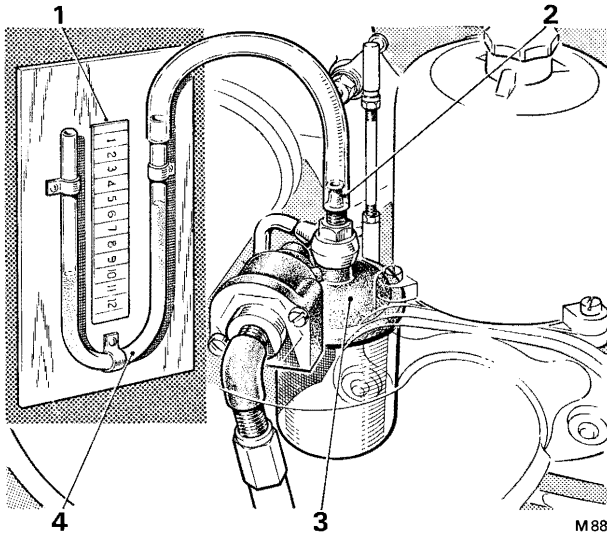


FIG. K22 CHECKING THE FLOAT CHAMBER DEPRESSION

- 1 Rule
- 2 Pressure tapping
- 3 'A' bank float chamber
- 4 Manometer

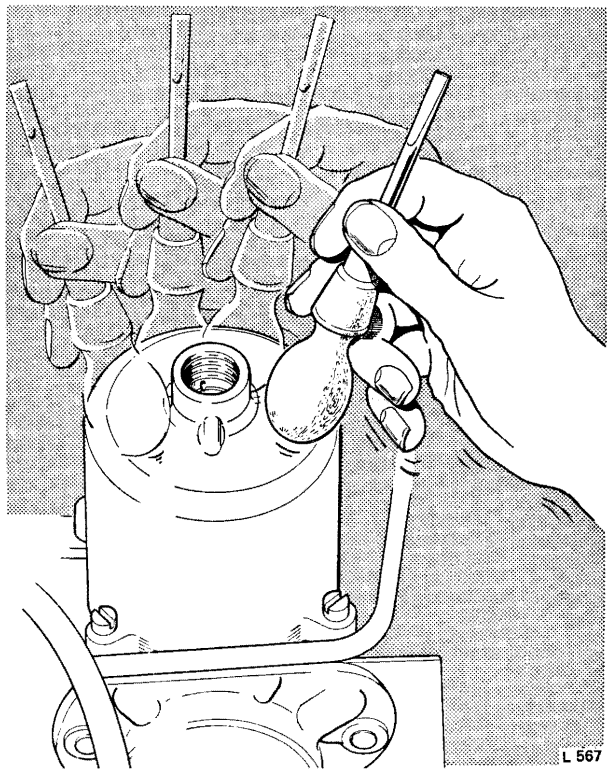


FIG. K23 TAPPING THE NECK OF THE SUCTION CHAMBER

screw until the jet in each carburettor body is level with the bridge piece (see Fig. K19).

Screw down the jet screw $2\frac{1}{2}$ turns.

Fit the air valve pistons, springs and suction chambers in a clean dry condition then top-up each damper piston with the approved oil; the oil level should be approximately $\frac{1}{2}$ in. (12,7 mm.) below the top of the piston rod, do not overfill.

It is important that each suction chamber and air valve piston should be returned to the carburettor from which it was removed.

Do not fit the damper at this stage.

3. Connect an electric impulse tachometer in accordance with the manufacturer's instructions.

4. Warm the engine at 'fast-idle' speed until normal operating temperature is attained. Run the engine for at least five minutes after the thermostat has opened; the thermostat opening point can be detected by a sudden rise in temperature of the thermostat elbow pipe or by reference to the coolant temperature gauge.

Note It is important that the engine tuning is carried out only after the engine temperature has stabilised and at an ambient temperature of between 16°C. and 27°C. (60°F. and 80°F.).

During the warm-up period, Operations 5, 6 and 7 should be carried out.

5. Ensure that the refrigeration system is switched off.

6. Check that the choke butterfly valve is fully open by feeling the tension at the operating levers and hearing it snap back on its stop when any tension which has been applied is released.

7. Remove the cap from the pressure tapping on 'A' bank carburettor float chamber then connect a manometer to the tapping (see Fig. K22). The manometer must be capable of measuring 6 in. (15,25 cm.) of water level difference.

8. Run the engine in Neutral at 2 000 r.p.m. for $\frac{1}{4}$ minute to purge the system. During this period check the manometer reading; this reading should show between $2\frac{3}{4}$ in. and $3\frac{1}{4}$ in. (6,99 cm. and 8,25 cm.) difference in water level. If this reading is not readily attained the system should be checked as follows.

A low or zero reading may be caused by:

- (a) An obstruction in one or more of the following:
 - The engine side of the weakener unit.
 - Weakener unit to weakener cut-off valve pipe.
 - Vacuum take-off plate to weakener cut-off valve pipe.
 - Vacuum take-off plate.
 - Pressure tapping on 'A' bank carburettor float chamber.

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- (b) An air leak at one or more of the following:
 - Float chamber lid joint.
 - Float chamber vent and drain pipes.
 - Weakener cut-off valve pipe unions.
 - Vacuum take-off plate flange on 'B' bank carburetter.
- (c) A dirty or faulty float chamber drain valve.
- (d) Low engine temperature, below 18°C. (64°F.) or a faulty weakener cut-off valve.

A high reading may be caused by:

- (a) An obstruction in the weakener air bleed orifice or the weakener hoses.
- (b) A blockage in the weakener filter.

Tuning procedure

9. Tuning operations may now be commenced and must be carried out in the shortest time possible. If the time for setting exceeds a three minutes period, open the throttle and run the engine at 2 000 r.p.m. for $\frac{1}{4}$ minute then resume tuning. Repeat this clearing operation if further periods of three minutes are exceeded.

Immediately after a clearing operation when the engine is at idle speed, the suction chamber should be tapped all the way round with a light weight, non-metallic instrument (e.g. the wooden handle of a screw-driver) to eliminate piston hysteresis (see Fig. K23).

10. Remove the pipe from the hot idle compensator valve connection marked 'OUT'. Blank off the pipe.

11. Set the idle speed to 600 r.p.m. by adjusting the fixed throttle stop screw.

12. Run the engine at idle speed then balance the carburetters using the volume screws; the carburetters are balanced when the hiss heard at the small drilling in the neck of each suction chamber (see Fig. K23) is of equal intensity. A rubber or plastic tube of approximately $\frac{1}{8}$ in. (3.17 mm.) diameter bore and 2 ft. (60.96 cm.) long should be used for this purpose. Fit the dampers.

13. Turn both jet adjusting screws by equal amounts in the same direction, approximately $\frac{1}{8}$ of a turn at a time until the maximum r.p.m. is recorded on the tachometer.

Note Turning the screw clockwise richens the mixture conversely turning the screw anti-clockwise weakens the mixture.

14. Set the mixture balance on each carburetter individually using the jet adjusting screws approximately $\frac{1}{8}$ of a turn at a time in either direction until maximum r.p.m. is obtained.

15. Turn the jet adjusting screws by equal amounts anti-clockwise (weaker mixture) until the engine speed just begins to fall, then turn both adjusting screws $\frac{1}{8}$ of a turn clockwise and tighten the lock-nuts.

16. Check the idle speed and if necessary re-adjust to 600 r.p.m. using the fixed throttle stop screw.

17. Check that the carburetters are balanced by raising and releasing each carburetter piston lift pin in turn then comparing the engine response. The carburetters are balanced if the response is the same for each carburetter. If the carburetters are not balanced repeat Operations 9 to 16 inclusive until a satisfactory balance is obtained.

In certain countries the exhaust emission C.O. must be checked. If these regulations apply Operations 18 to 21 inclusive should be carried out.

18. Purge the engine at 2 000 r.p.m. in Neutral for a period of $\frac{1}{4}$ minute (see Operation 9).

19. Ensure that the engine has run a minimum period of 25 minutes since the thermostat has opened (see Operation 4) then fit the probe of a C.O. meter into the exhaust pipe. The C.O. meter should be set in accordance with the manufacturer's instructions.

Note Suitable C.O. meters are:

1. Horiba Mexa 200.
2. Bosch Model Efaw 109.

20. Idle the engine until a steady C.O. reading is obtained (minimum time $\frac{1}{2}$ minute) then check the exhaust emission on the C.O. meter; the correct reading should be between 4% and 4½% (Europe only).

If the C.O. meter reading is not within this limit, it is permissible to unlock the jet adjusting screws and turn them a maximum of $\frac{1}{8}$ of a turn, either clockwise or anti-clockwise, whichever is necessary to give the correct reading on the meter. **Do not turn them in opposite directions** (i.e. richen one and weaken the other). Lock the jet adjusting screws.

If the correct C.O. meter reading is unobtainable at this setting, **and settings have been carried out to the instructions given**, the carburetters should be removed from the engine and overhauled as described previously.

21. Remove the C.O. meter.

22. Remove the manometer from the float chamber pressure tapping. Fit the cap to the pressure tapping using a new washer.

23. Check the idle speed and using the fixed throttle stop screw, reset to 600 r.p.m. if necessary.

24. Re-connect the hose to the hot idle compensator valve.

Cold start 'fast-idle'—To check

Refer to Page K21.

Throttle damper plunger—To set

Refer to Page K21.

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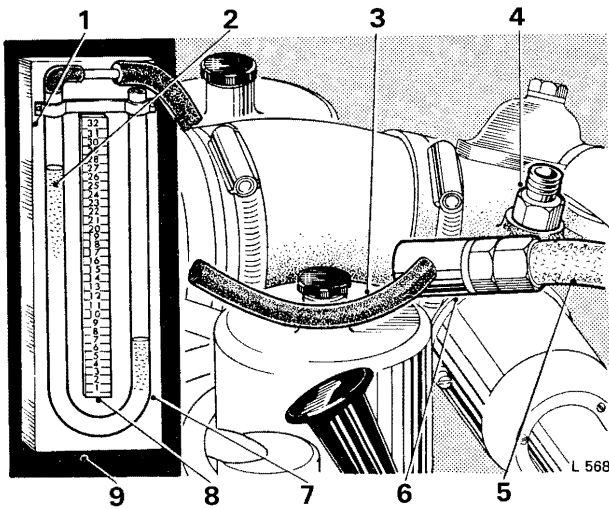


FIG. K24 CHECKING THE CHOKE STOVE PIPE DEPRESSION

- 1 Wooden board
- 2 Water
- 3 Rubber tube
- 4 Union—choke stove pipe connection
- 5 Choke stove pipe
- 6 Calibrated orifice
- 7 Polythene tube
- 8 Scale
- 9 Manometer

Kick-down micro switch—To set

Refer to Page K21.

Mixture weakening device fittings—To remove

The following procedures apply to cars from Car Serial Number SRH 8742 and onwards.

1. Disconnect and remove the pipes fitted to the carburetter float chambers, choke housing and carburetter butterfly housing connection. Also disconnect the hose fitted to the weakening device; discard the clip.
2. Using special spanner (RH 8087), remove the weakener cut-off valve assembly; do not dismantle the assembly.

Note The weakener cut-off valve assembly has a critical setting to ensure that the valve operates at very precise temperatures; therefore the assembly must not be dismantled. If the assembly is not operating correctly, or if the wax capsule is thought to be faulty a new cut-off valve assembly must be fitted.

3. Remove the two screws securing the vacuum take-off plate to the 'B' bank butterfly housing; remove the plate and gasket.

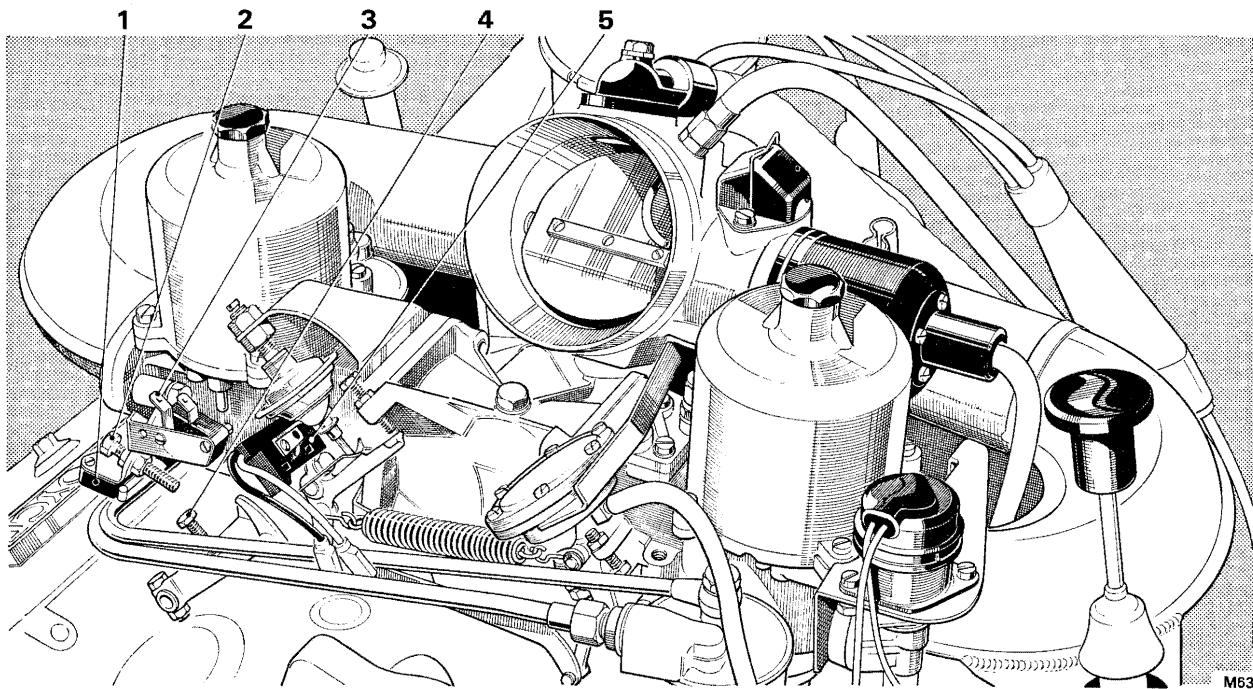


FIG. K25 VIEW OF TYPICAL CARBURETTER LINKAGE ARRANGEMENT (Early cars)

- 1 Kick-down micro-switch
- 2 Full throttle stop
- 3 Micro-switch—transmission stator
- 4 Adjusting screw—kick-down
- 5 Micro-switch—transmission stator

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4. Using special pliers (RH 8090), remove the steel clips (if fitted) securing the outlet hose to the filter unit; detach the hose. Discard the clips.

To remove the filter unit, slacken the worm drive clip securing the filter unit to its mounting bracket. Withdraw the filter unit from the securing clip.

Note The filter unit is a sealed unit and no attempt should be made to clean the element.

Mixture weakening device fittings—To fit

Fit the mixture weakening device fittings by reversing the procedure given for removal noting the following points.

1. Ensure that all pipes and hoses are in good condition.
2. Renew all sealing washers.
3. Renew all steel clips (if fitted).
4. When fitting the filter unit it is essential that the inlet pipe, which is off-set from the centre is situated in its lowest position.

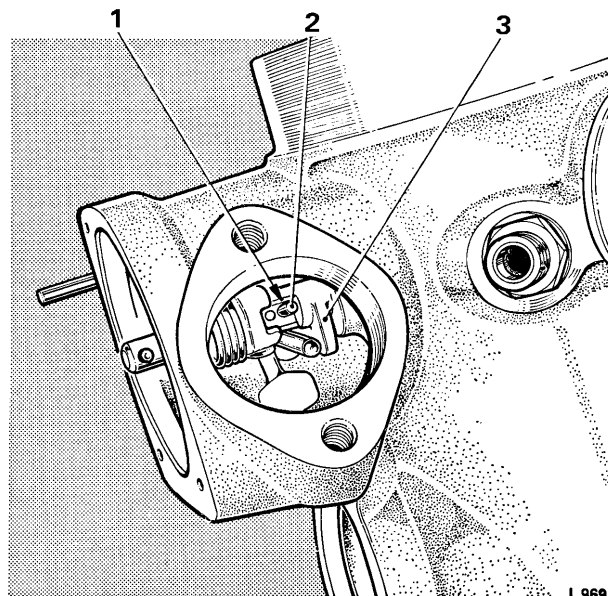


FIG. K27 PICK-UP LEVER CLEARANCE

- 1 0.010 in. (0.254 mm. clearance)
 3 Lever
 2 Pin

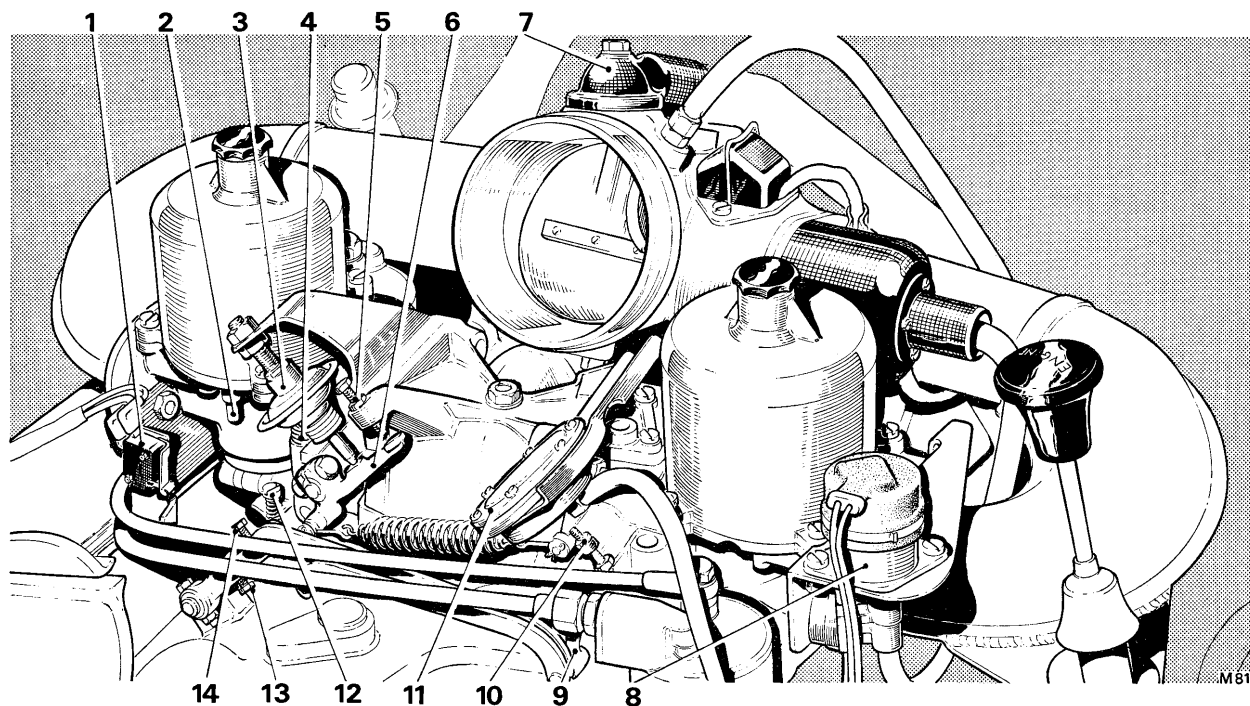
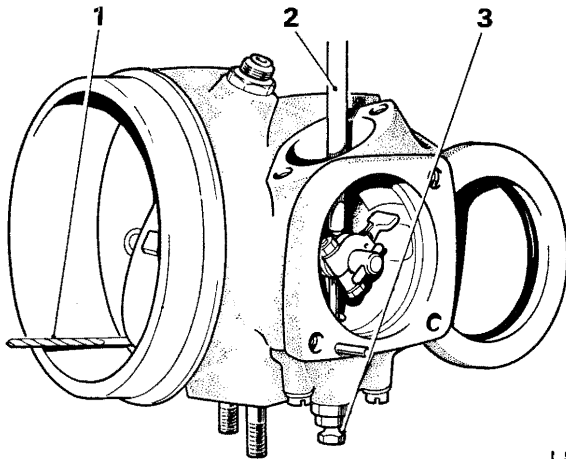


FIG. K26 VIEW OF TYPICAL CARBURETTOR LINKAGE ARRANGEMENT (Later cars)

- | | | |
|-----------------------------|------------------------------------|------------------------------|
| 1 Kick-down micro-switch | 7 Crankcase breather connection | 11 Vacuum unit |
| 2 Piston lift pin | 8 Refrigeration solenoid | 12 Jet adjusting screw |
| 3 Throttle damper | 9 'B' bank throttle lever | 13 Full throttle stop |
| 4 Volume screw | 10 Refrigeration 'fast-idle' screw | 14 Adjusting screw—kick-down |
| 5 Fixed throttle stop screw | | |
| 6 'A' bank throttle lever | | |

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* FIG. K28 KICK GAP ADJUSTMENT

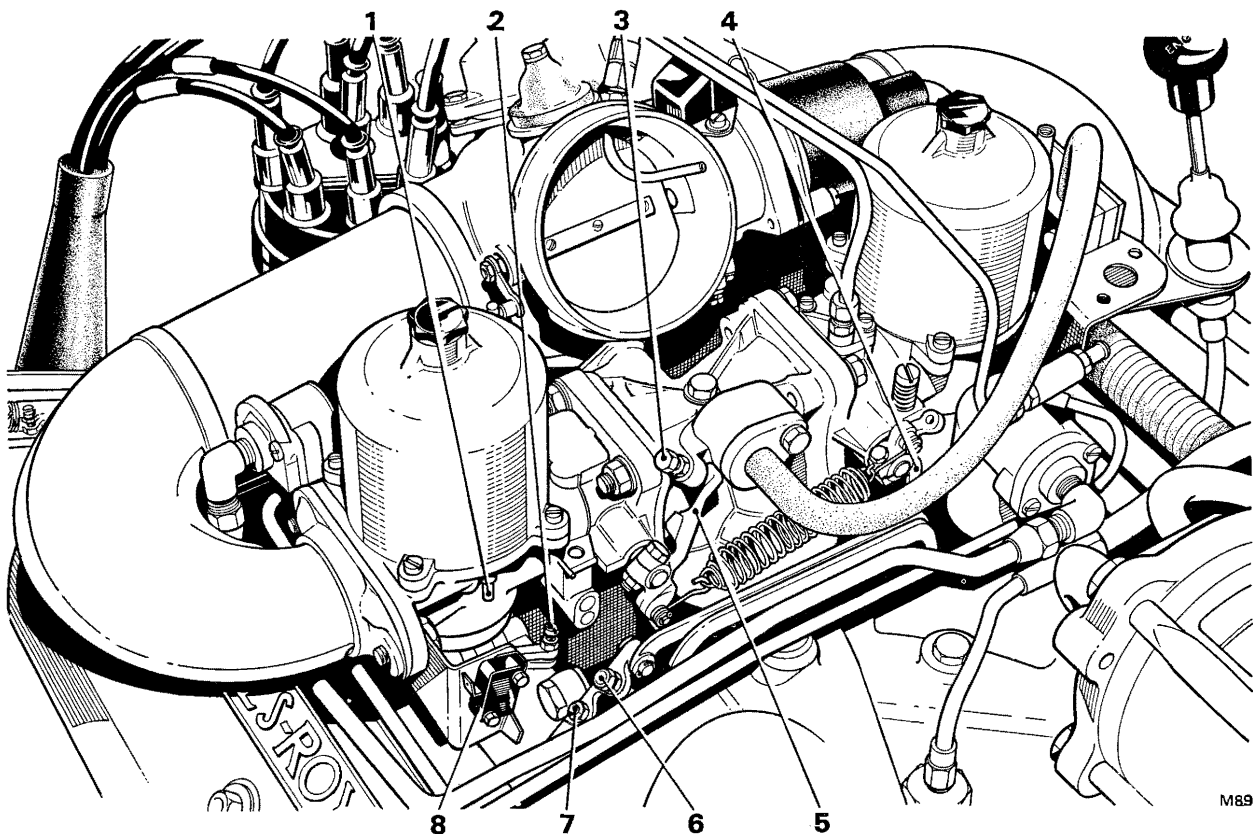
- 1 0.050 in. (1.27 mm.) diameter drill
- 2 Rod holding down depression lever
- 3 Adjusting screw with lock-nut

Automatic Choke—To set

Automatic choke stove pipe—To check (see Fig. K24)

To check the choke stove pipe for any blockages, carry out the following operations.

1. Disconnect the choke stove pipe at its choke butterfly housing connection.
2. Connect the calibrated orifice (RH 8095) to the open end of the choke stove pipe, then connect a manometer capable of measuring 25 in. (63,50 cm.) of water level difference to the orifice.
3. Run the engine until it reaches normal operating temperature then allow the engine to idle and observe the depression shown on the manometer. The correct reading should be between 16 in. and 18 in. (40,64 cm. and 45,72 cm.).
4. If the level is less than 16 in. (40,64 cm.), examine the pipe and choke stove assembly, remove any blockage. After removing the blockage, again check the manometer reading.



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FIG. K29 VIEW OF TYPICAL CARBURETTER LINKAGE ARRANGEMENT
(Cars after Car Serial Number SRH 8742)

- | | |
|--|--|
| <ul style="list-style-type: none"> 1 Piston lift pin 2 Jet adjusting screw 3 Fixed throttle stop screw 4 'B' bank throttle lever | <ul style="list-style-type: none"> 5 'A' bank throttle lever 6 Adjusting screw—kick-down 7 Full throttle stop 8 Kick-down micro-switch |
|--|--|

5. Remove the manometer and connect the choke stove pipe to the choke housing.

Adjustment of kick diaphragm

1. Hold the choke butterfly closed and check the clearance between the depression valve operating link and the choke spindle pin. The clearance should be 0.010 in. (0,254 mm.) (see Fig. K27). The clearance can be adjusted by fitting washers on the diaphragm operating rod.

* Adjustment of kick-gap (see Fig. K28)

The kick-gap should be set to give a reading of 0.050 in. (1,27 mm.) at the bottom of the choke valve.

To obtain this setting, proceed as follows.

1. Slacken the choke depression diaphragm locking nut. Ensure that the choke is in the 'closed' position, then press down the depression valve operating lever, using a suitable rod, so that the depression valve link rod bears against the end of the 2 B.A. adjusting screw.

2. The screw should then be adjusted so that a 0.050 in. (1,27 mm.) diameter rod or drill can be inserted between the butterfly housing and the butterfly valve. Tighten the adjusting screw lock-nut; check the kick-gap and adjust if necessary.

3. Fit the solenoid and shims to the butterfly housing.

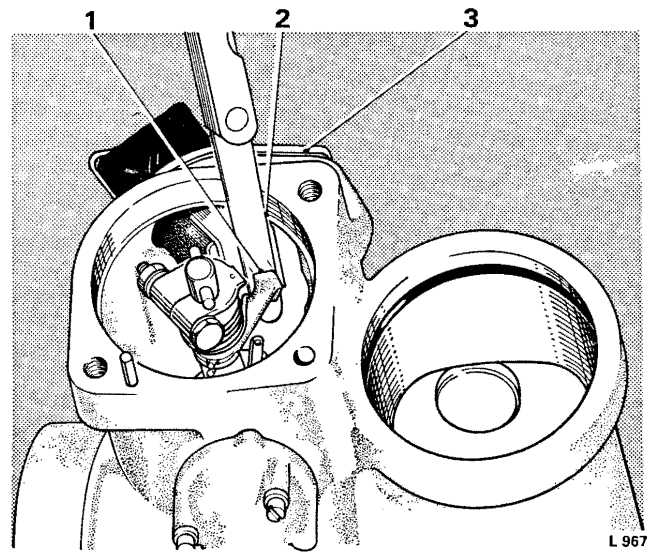


FIG. K30 SOLENOID ADJUSTMENT

- 1 Butterfly lever
- 2 Feeler gauge in position
- 3 Adjusting shims

Solenoid air gap (see Fig. K30)

1. Hold the choke butterfly firmly closed. Check the air gap (between the solenoid lever and the solenoid) with a feeler gauge; this should be between 0.0015 in. and 0.004 in. (0,038 mm. and 0,102 mm.). Adjustment is effected by fitting shims between the solenoid and the body.

Solenoid lever spring tension

The spring tension should be set so that a weight of 8.25 oz. (233,88 gm.) acting on a 2 in. (5,08 cm.) arm will open the choke valve just sufficiently to allow a 0.062 in. (1,58 mm.) diameter drill to be inserted between the valve and body as shown in Figure K31.

Having set the kick diaphragm travel and the solenoid air gap, check the setting of the lever spring as follows.

1. Produce a lever 2 in. (5,08 cm.) between centres to fit a choke spindle as shown in Figure K31. Secure the lever in a horizontal position, using a 2 B.A. nut and washer, connect a 12 volt battery to the solenoid and hang the weight on the lever; this should open the choke valve 0.062 in. (1,58 mm.) as described above.

2. Adjustment of the spring can be effected by slackening the clamping bolt and turning the clamp.

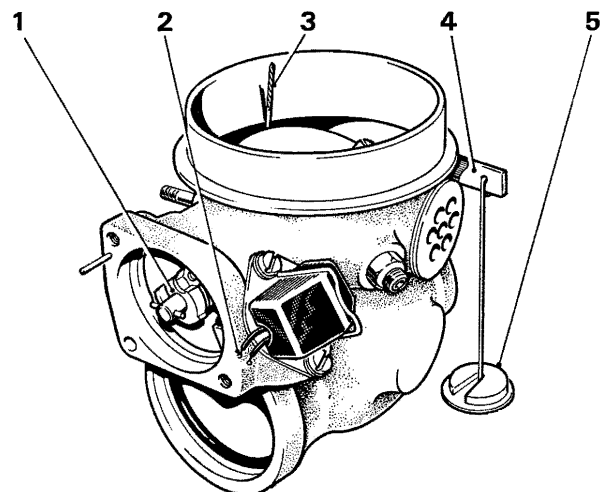


FIG. K31 LEVER SPRING TENSION

- 1 Clamp adjuster
- 2 Solenoid electrical connections
- 3 0.062 in. (1,58 mm.) diameter drill
- 4 Lever
- 5 Weight

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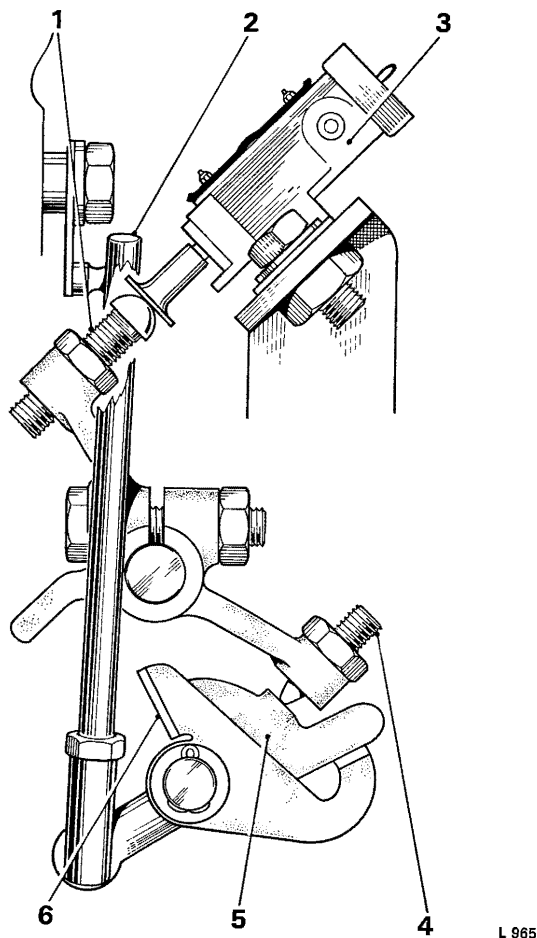


FIG. K32 FAST-IDLE MECHANISM AND VACUUM RETARD TAP

- 1 Vacuum retard tap adjusting screw
- 2 Control rod
- 3 Vacuum retard tap
- 4 Fast-idle adjusting screw
- 5 Cam
- 6 Cam link

'Fast-idle' cam and Vacuum retard tap

1. Fit the 'fast-idle' mechanism; do not tighten the 'fast-idle' lever clamping bolt.
2. Ensure that the 'fast-idle' adjustment screw is directly over the cam.
3. With the throttles closed, insert a 0.100 in. (2.54 mm.) diameter rod between the top of the 'fast-idle'

cam and the boss under the 'fast-idle' adjustment screw. Tighten the clamping bolt on the 'fast-idle' lever.

4. Check that there is sufficient clearance between the cam link, which is mounted alongside the 'fast-idle' cam, and the boss on the 'fast-idle' lever. Insufficient clearance at this point can result in the cam link fouling the 'fast-idle' lever. In the event of this happening the 'fast-idle' lever would be prevented from returning to the closed throttle position, thus causing a 'fast-idle' speed.

5. Ensure that the throttles are closed; screw in the 'fast-idle' adjustment screw until it just makes contact with the top step of the 'fast-idle' cam.

6. Insert a 0.100 in. (2.54 mm.) diameter rod between the leading edge of the choke butterfly valve and the choke housing

7. With the butterfly valve in this position, adjust the length of the butterfly rod so that the tip of the 'fast-idle' screw is in line with the start of the top step of the 'fast-idle' cam, (i.e. the position when the tip of the adjustment screw is about to fall from the top step to the bottom step of the cam).

Remove the 0.100 in. (2.54 mm.) diameter rod from the choke housing.

8. With the throttles closed and the choke partly open, adjust the 'fast-idle' adjustment screw to just contact the start or bottom step of the 'fast-idle' cam; tighten the lock-nut ensuring that the adjustment screw does not move.

9. Cars from SRX 9001 and onwards fitted with the Exhaust Emission Control System. Ensure that the throttles are in the fully closed position. With the vacuum retard tap in the fully open position (i.e. the plunger on the tap pushed in) adjust the vacuum retard tap adjusting screw until a gap of 0.025 in. (0.635 mm.) between the adjusting screw and the vacuum retard tap is obtained.

Thermocoil

Adjustment of the thermocoil is carried out in a temperature controlled room and under no circumstances should adjustment be attempted without specific instructions from the factory.

The factory setting is indicated by an arrow stamped on the pointer. Should any trouble be encountered this setting should be checked.

Section K5

THROTTLE CONTROL LINKAGE SETTINGS

The settings described in Section K4 should be carried out before the settings contained in this Section are attempted.

Throughout the setting procedure, reference should be made to the appropriate illustration (see Figs. K33, K34, K35 and K36).

The settings in this Section, unless otherwise stated, are given for the throttles in the closed position and the 'fast-idle' mechanism in the off position.

When working on a cold engine, the 'fast-idle' off position can be maintained by securing an elastic band between the 'fast-idle' mechanism (when it is in the off position) and the crankcase breather plug on the choke housing.

Four Speed Automatic Gearbox (Early right-hand drive cars)

Throttle control linkage settings

Ideally the following settings should be carried out before the engine and gearbox are fitted into the car.

1. Set the levers on 'A' bank control shaft, so that the 'A' bank to control shaft rod lever is vertical and the 'A' bank control shaft lever is horizontal when the manifold to carburetter lever is connected to the carburetter control link with all slackness in the carburetter twin-links taken up; refrigerated cars have links with elongated holes in them. Tighten the lever pinch bolts.
2. Set the micro-adjuster to its mid-position and adjust the rod length to dimension D in the respective illustration.
3. Fit the micro-adjuster (long rod uppermost).
4. Lock the T.V. lever onto the gearbox and hold fully back in the no T.V. position (i.e. forward position). Then, with the carburetters still in the closed throttle condition, lock the pinch bolts on the bell housing-to-T.V. rod lever and the bell housing micro-adjuster lever to the bell housing cross-shaft.

5. Turn the micro-adjuster six 'clicks' anti-clockwise looking from the top, to take up free play in the T.V. linkage.

6. Ensure that the linkage moves freely and that the closed and full throttle positions on the carburetters are obtainable.

Assembly of the pedal linkage to the carburetter and T.V. linkage

With the engine and gearbox installed in the car, proceed to connect the pedal and compensator linkage to the engine as follows.

1. Assemble the compensator linkage to the engine as shown in Figure K33.
2. Fit control rod (3).
3. The setting given for control rod (3) is very important and should not be disturbed. If however, a new control rod is to be fitted or the original setting has inadvertently been altered, the control rod should be adjusted to the dimensions given. Ideally the setting for this rod should be measured between ball centres, but if this cannot be accomplished fairly easily then the setting given between the nut inner faces should be used.
4. Fit the pedal linkage to the body, then ensure that it operates smoothly.
5. Check that the pedal return spring (21) holds the pedal against the pedal stop (if fitted).
6. Position the accelerator pedal so that it is the correct distance below the level of the brake pedal (see dimension C), then, if a pedal stop is fitted adjust it to maintain this position. If a pedal stop is not fitted, a block of wood should be utilized to temporarily maintain the pedal in the position required.
7. Build up control rod (7) to dimension B leaving the lock-nuts slack, then fit the rod to the fulcrum lever (5).
8. With the accelerator pedal set to dimension C, adjust the position of the jaw (20) at the end of control rod (7) so that the bolt will pass easily through the jaw and lever (19); whilst fitting this rod it should be

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held downward to ensure that any slackness in the carburetters slotted link (14) is removed. Fit the nut and tighten the bolt.

9. Remove the block of wood if one was used, from the accelerator pedal.

10. Operate the mechanism and ensure that it functions without fouling and that the fulcrum lever (5) and control rod (3) do not tend to toggle over when the accelerator pedal is released sharply from its full throttle position. If the compensator mechanism does toggle over, control rod (7) should be disengaged from fulcrum lever (5) and control rod (3) lengthened until toggling is prevented. Control rod (7) should then be shortened to suit and re-fitted to fulcrum lever (5).

11. Tighten the lock-nuts.

12. Fit the kick-down button.

Kick-down button—To adjust

1. Slacken the large lock-nut, then adjust the position of the kick-down button by screwing the body up or down as required until the button is depressed approximately $\frac{1}{16}$ in. (1.58 mm.) when the throttles are in the full throttle position. Tighten the lock-nut.

2. If, when adjusting the kick-down button, its position is such that it is in danger of being hidden by the carpet and thereby rendered ineffective, the accelerator to compensator link control rod should be shortened. Shortening this rod will move the pedal away from the toe board thus allowing the kick-down button to be raised clear of the carpet; the accelerator lever pedal-stop (if fitted) will have to be adjusted to suit.

3. Ensure that the whole control mechanism operates smoothly, that the closed throttle condition is still available and that operation of the kick-down button is noticeable.

4. The kick-down setting quoted should provide sufficient 'feel' for most owners, if however, a more positive 'feel' is desired, the button may be raised a small amount beyond the setting given.

Final T.V. adjustment

If the controls have been set to the instructions already given, the final setting should only involve adjustment of the T.V. micro-adjuster and possibly the re-setting of the kick-down button so that the 'feel' it provides coincides with the advent of kick-down in the gearbox.

Car—To road test

1. Drive the car on the road to allow the engine and gearbox to reach normal working temperature then proceed as follows.

2. Place the gear selector lever into position '4' and

accelerate the car using light throttle, note the quality of the gear changes on light throttle; these should take place as follows.

(a) First to second gear—5 m.p.h. to 8 m.p.h.

(8 k.p.h. to 13 k.p.h.)

(b) Second to third gear—12 m.p.h. to 15 m.p.h.

(19 k.p.h. to 24 k.p.h.)

(c) Third to top gear—22 m.p.h. to 25 m.p.h.

(35 k.p.h. to 40 k.p.h.)

3. It should be noted that the gear changes will occur at a higher road speed with a full throttle opening. The gear changes should take place at the following speeds.

(a) First to second gear—18 m.p.h. to 21 m.p.h.

(29 k.p.h. to 34 k.p.h.)

(b) Second to third gear—33 m.p.h. to 37 m.p.h.

(53 k.p.h. to 59 k.p.h.)

(c) Third to top gear—73 m.p.h. to 75 m.p.h.

(117 k.p.h. to 121 k.p.h.)

Final adjustment

If the changes are found to be 'slippy' and there is no kick-down, advance the T.V. lever by turning the micro-adjuster anti-clockwise (viewed from the top). If the changes are jerky or late, the micro-adjuster should be turned in the opposite direction.

Torque Converter Transmission

(All left-hand drive cars and late right-hand drive cars)

Throttle control linkage settings

1. Loosely assemble the components onto the engine.

2. Set the levers on 'A' bank control shaft (1) so that the lever (2) is vertical when the manifold to carburetter lever is connected to the carburetter control link with all slackness in the carburetter coupling twin-links taken up; refrigerated cars have links with elongated holes in them. Tighten the lever pinch bolts.

Assembly of the pedal linkage to the carburetter linkage

With the engine and transmission fitted into the car, proceed to connect the pedal and compensator linkage to the engine as follows.

1. Assemble the compensator linkage to the engine as shown in the appropriate illustration. (*see Figs. K34, K35 and K36*).

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2. Fit the control rod (3).
3. The setting given for control rod (3) is very important and should not be disturbed. If however, a new control rod is to be fitted or the original setting has inadvertently been altered, the control rod should be adjusted to the dimensions given. On early cars the ideal setting for this rod should be measured between ball centres, but if this cannot be accomplished fairly easily then the setting given between the nut inner faces should be used.
4. Fit the pedal linkage to the body, then ensure that it operates smoothly.
5. Check that the accelerator pedal return spring holds the pedal against the pedal stop.
6. Position the accelerator pedal so that it is the correct distance below the level of the brake pedal (*see dimension C*), then, adjust the stop to maintain this position.
7. Assemble the accelerator to compensator control rod to dimension B, leaving the lock-nut(s) slack, then fit the rod to the fulcrum lever (5). On very late cars, only the upper end of control rod is adjustable, the lower end being cranked and held in position by a split pin (*see Figs. K35 and K36*). On these cars the initial dimension B is 19.50 in. (50,00 cm.).
8. With the accelerator pedal set to dimension C, adjust the position of the jaw at the bottom of the control rod, so that the bolt will pass easily through the jaw and lever; whilst fitting this rod it should be held downward to ensure that any slackness in the carburetter elongated coupling link is removed. Fit the nut and tighten the bolt. On very late cars having a control rod on which only the upper end is adjustable, a similar operation should be carried out, with any adjustment to the length of the control rod being effected at the upper end.
9. Operate the mechanism and ensure that it functions without fouling and that the fulcrum lever (5) and small control rod (3) do not tend to toggle over when the accelerator pedal is released sharply from its full throttle position. If the compensator mechanism does toggle over, the accelerator to compensator con-

trol rod should be disengaged from fulcrum lever (5) and small control rod (3) should be lengthened until toggling is prevented. The accelerator to compensator control rod should then be shortened to suit and refitted to fulcrum lever (5).

10. Tighten the lock-nuts.
11. Fit the kick-down button.

Kick-down micro-switch—To set**Carburetter mounted kick-down micro-switch**

Refer to Chapter K, Section K4.

Kick-down button—To adjust**Carburetter mounted kick-down micro-switch**

1. The kick-down button should be adjusted as described on Page K32 bearing in mind the following points.
2. When checking the kick-down on cars fitted with transmissions having variable stator blade angles, care must be taken not to confuse part throttle down-changes and stator changes with the forced down-changes (kick-down).
3. When the kick-down button is set correctly and the accelerator pedal is depressed, the kick-down micro-switch (*see Figs. K25, K26 and K29*) will produce a clicking noise as it is operated by the carburetter linkage.

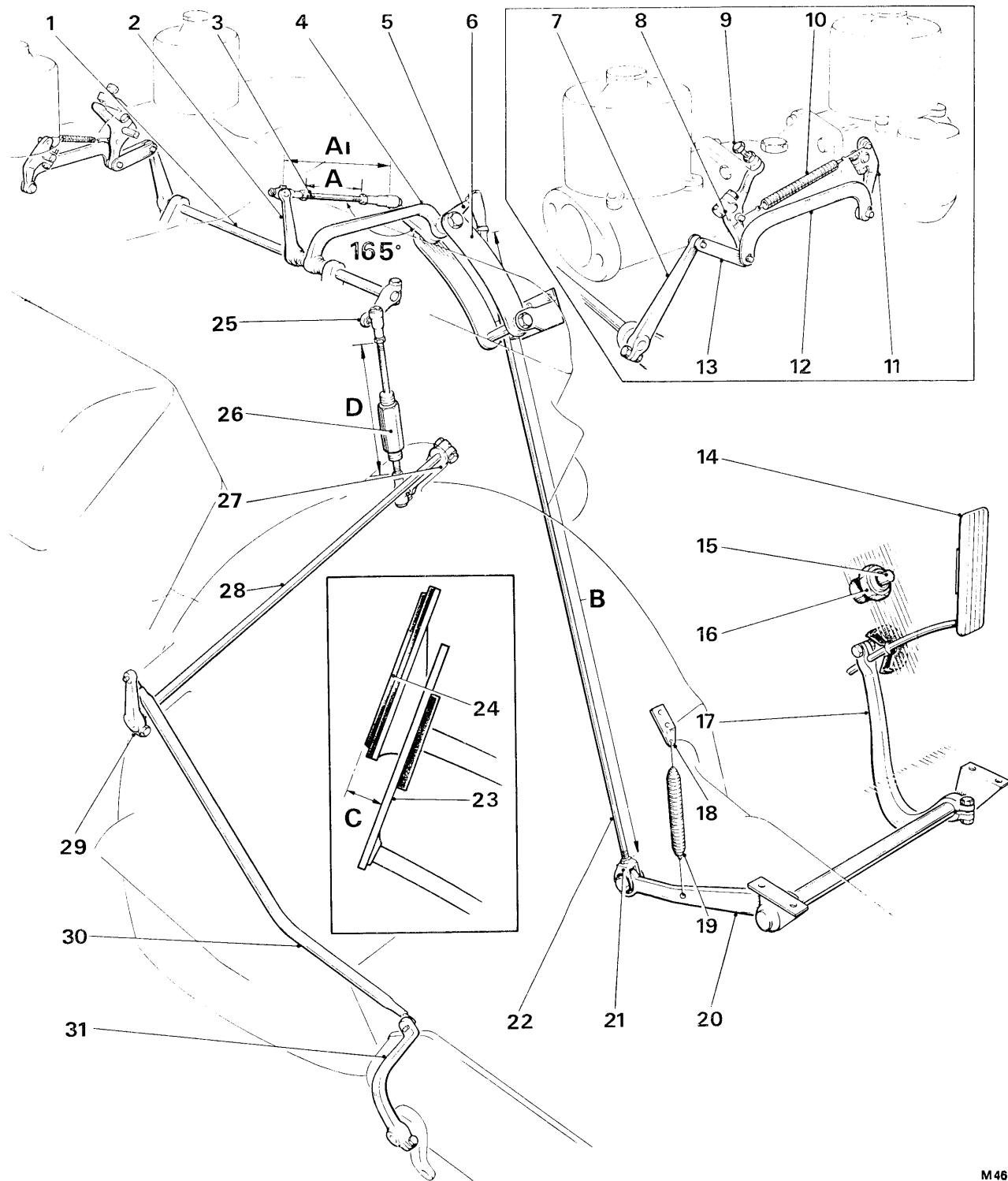
★ Kick-down micro-switch—To set**Toeboard mounted kick-down micro-switch**

Refer to Chapter U, Section U5.

Car—To road test

Drive the car on the road to allow the engine and transmission to warm up, then test the kick-down and accelerator mechanism for efficient operation.

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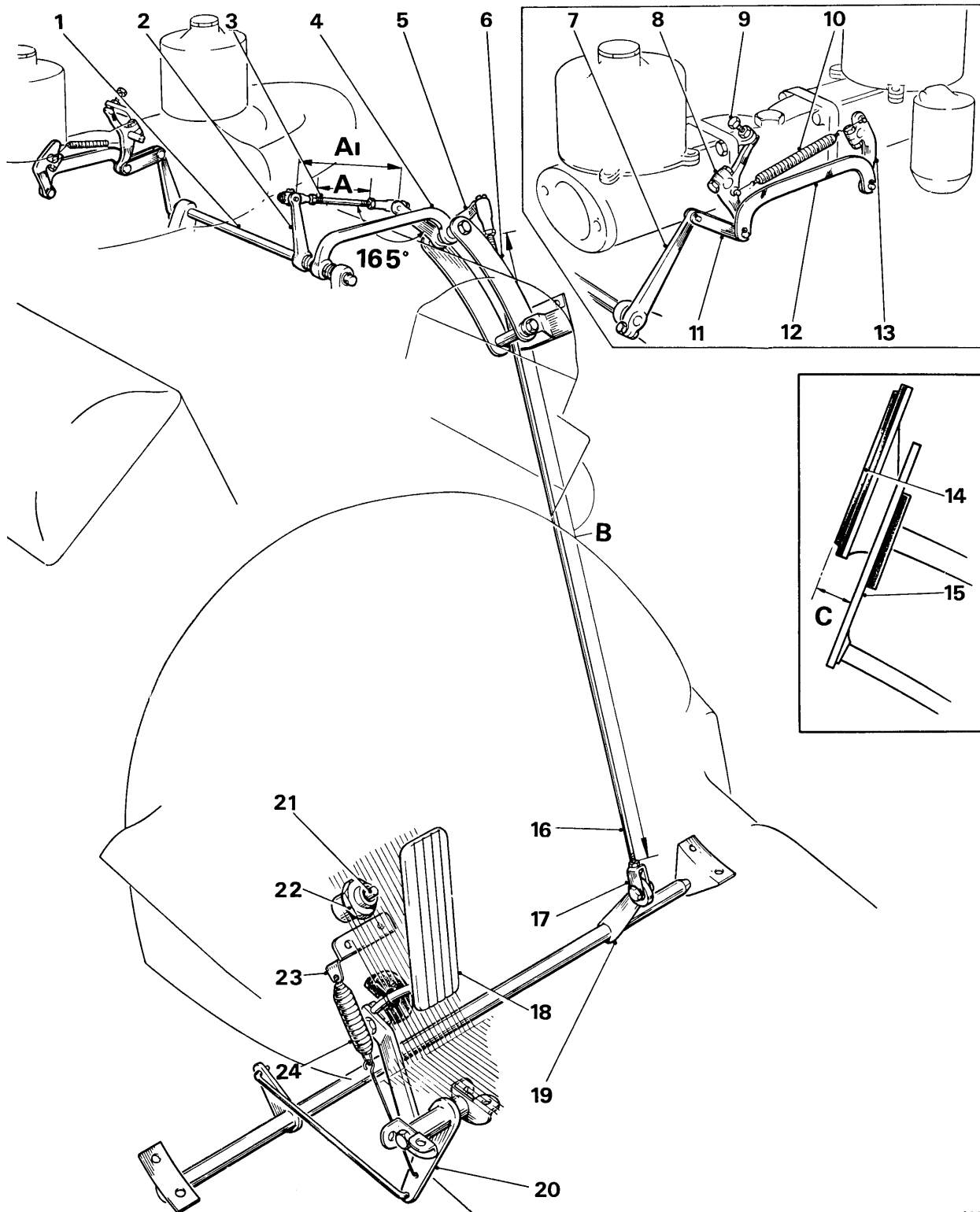
FIG. K33 THROTTLE AND T.V. CONTROLS—EARLY R.H. DRIVE CARS

FIG. K33 THROTTLE AND T.V. CONTROLS—EARLY R.H. DRIVE CARS

A1=4.125 in. (10,478 cm.)
 (between ball centres)
 A=2.175 in. (5,526 cm.)
 B=22 in. (55,88 cm.)
 C=0.250 in. to 0.500 in.
 (0,63 cm. to 1,27 cm.)
 D=3.812 in. (9,682 cm.)

- | | | | |
|----|---|----|---|
| 1 | 'A' bank control shaft | 16 | Lock-nut |
| 2 | Lever—'A' bank control shaft to control rod | 17 | Accelerator pedal lever |
| 3 | Control rod—'A' bank manifold lever to fulcrum lever | 18 | Bracket |
| 4 | Tie-rod | 19 | Pull-off spring |
| 5 | Fulcrum lever | 20 | Lever—accelerator pedal cross-shaft |
| 6 | Compensator link | 21 | Jaw |
| 7 | Lever—manifold to carburetter | 22 | Control rod—accelerator to compensator linkage |
| 8 | Throttle lever—'A' bank | 23 | Accelerator pedal |
| 9 | Slow running throttle stop screw | 24 | Brake pedal |
| 10 | Return spring | 25 | Lever—'A' bank control shaft to T.V. micro-adjuster |
| 11 | Throttle lever—'B' bank | 26 | T.V. micro-adjuster |
| 12 | Coupling link | 27 | Lever—bell housing to micro-adjuster |
| 13 | Coupling link (one hole elongated when refrigeration is fitted) | 28 | Bell housing cross-shaft |
| 14 | Accelerator pedal | 29 | Lever—bell housing to T.V. rod |
| 15 | Kick-down button | 30 | Control rod—bell housing to T.V. lever |
| | | 31 | T.V. lever |

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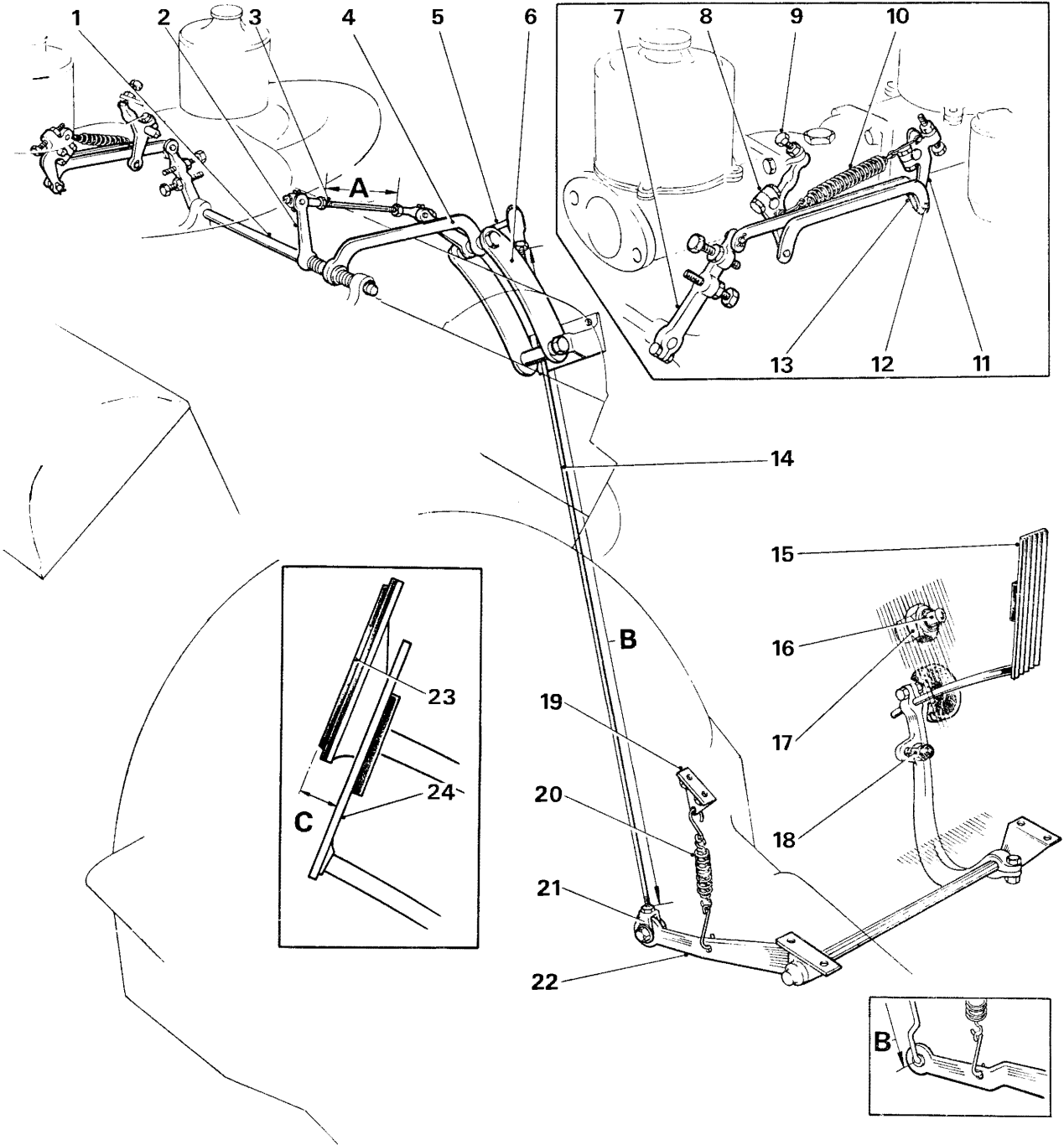
FIG. K34 THROTTLE CONTROL LINKAGE—EARLY L.H. DRIVE CARS

FIG. K34 THROTTLE CONTROL LINKAGE—EARLY L.H. DRIVE CARS

A1=4.125 in. (10,478 cm.)
 (between ball centres)
 A=2.175 in. (5,526 cm.)
 B=22 in. (55,88 cm.)
 C=0.250 in. to 0.500 in.
 (0,63 cm. to 1,27 cm.)

- | | |
|--|--|
| 1 'A' bank control shaft | 11 Coupling link (one hole elongated when refrigeration is fitted) |
| 2 Lever—'A' bank control shaft to control rod | 12 Coupling link |
| 3 Control rod—'A' bank manifold lever to fulcrum lever | 13 Throttle lever—'B' bank |
| 4 Tie-rod | 14 Brake pedal |
| 5 Fulcrum lever | 15 Accelerator pedal |
| 6 Compensator link | 16 Control rod—accelerator to compensator linkage |
| 7 Lever—manifold to carburetter | 17 Jaw |
| 8 Throttle lever—'A' bank | 18 Accelerator pedal |
| 9 Slow running throttle stop screw | 19 Lever—accelerator pedal cross-shaft |
| 10 Return spring | 20 Accelerator pedal lever |
| | 21 Kick-down button |
| | 22 Lock-nut |
| | 23 Bracket |
| | 24 Pull-off spring |

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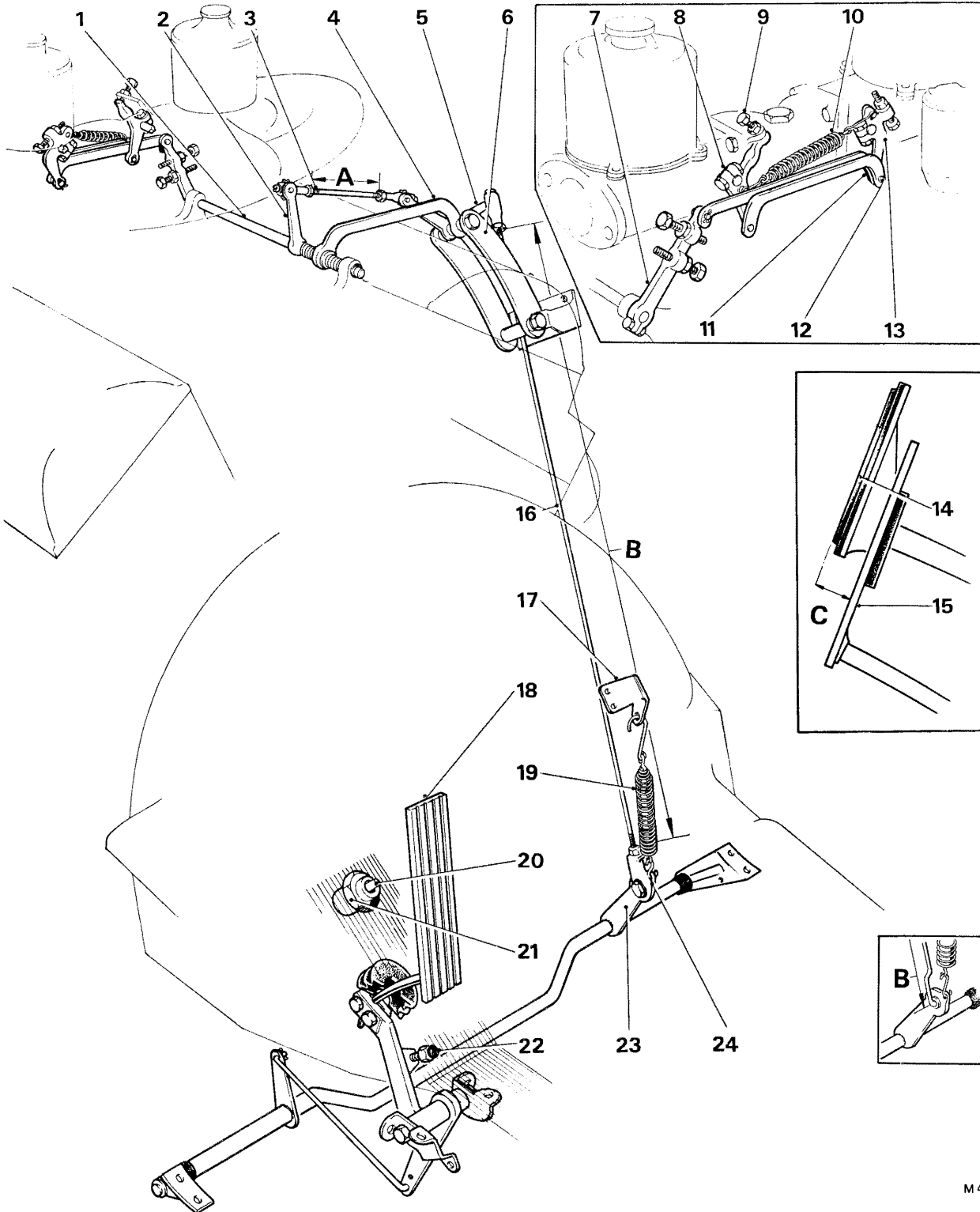
FIG. K35 THROTTLE CONTROL LINKAGE—LATE R.H. DRIVE CARS

FIG. K35 THROTTLE CONTROL LINKAGE—LATE R.H. DRIVE CARS

A=2.265 in. to 2.300 in.
(5,75 cm. to 5,84 cm.)
B=18.575 in. (47,18 cm.)
inset 19.50 in. (50,00 cm.)
C=0.250 in. to 0.500 in.
(0,63 cm. to 1,27 cm.)

- | | |
|--|--|
| 1 'A' bank control shaft | 10 Return spring |
| 2 Lever—'A' bank control shaft to control rod | 11 Throttle lever—'B' bank |
| 3 Control rod—'A' bank manifold lever to fulcrum lever | 12 Coupling link |
| 4 Tie-rod | 13 Coupling link (one hole elongated when refrigeration is fitted) |
| 5 Fulcrum lever | 14 Control rod—accelerator to compensator linkage |
| 6 Compensator link | 15 Accelerator pedal |
| 7 Lever—manifold to carburetter | 16 Kick-down button |
| 8 Throttle lever—'A' bank | 17 Lock-nut |
| 9 Slow running throttle stop screw | 18 Stop—accelerator pedal |
| | 19 Bracket |
| | 20 Pull-off spring |
| 21 Jaw | |
| 22 Lever—accelerator pedal cross-shaft | |
| 23 Brake pedal | |
| 24 Accelerator pedal | |

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FIG. K36 THROTTLE CONTROL LINKAGE—LATE L.H. DRIVE CARS

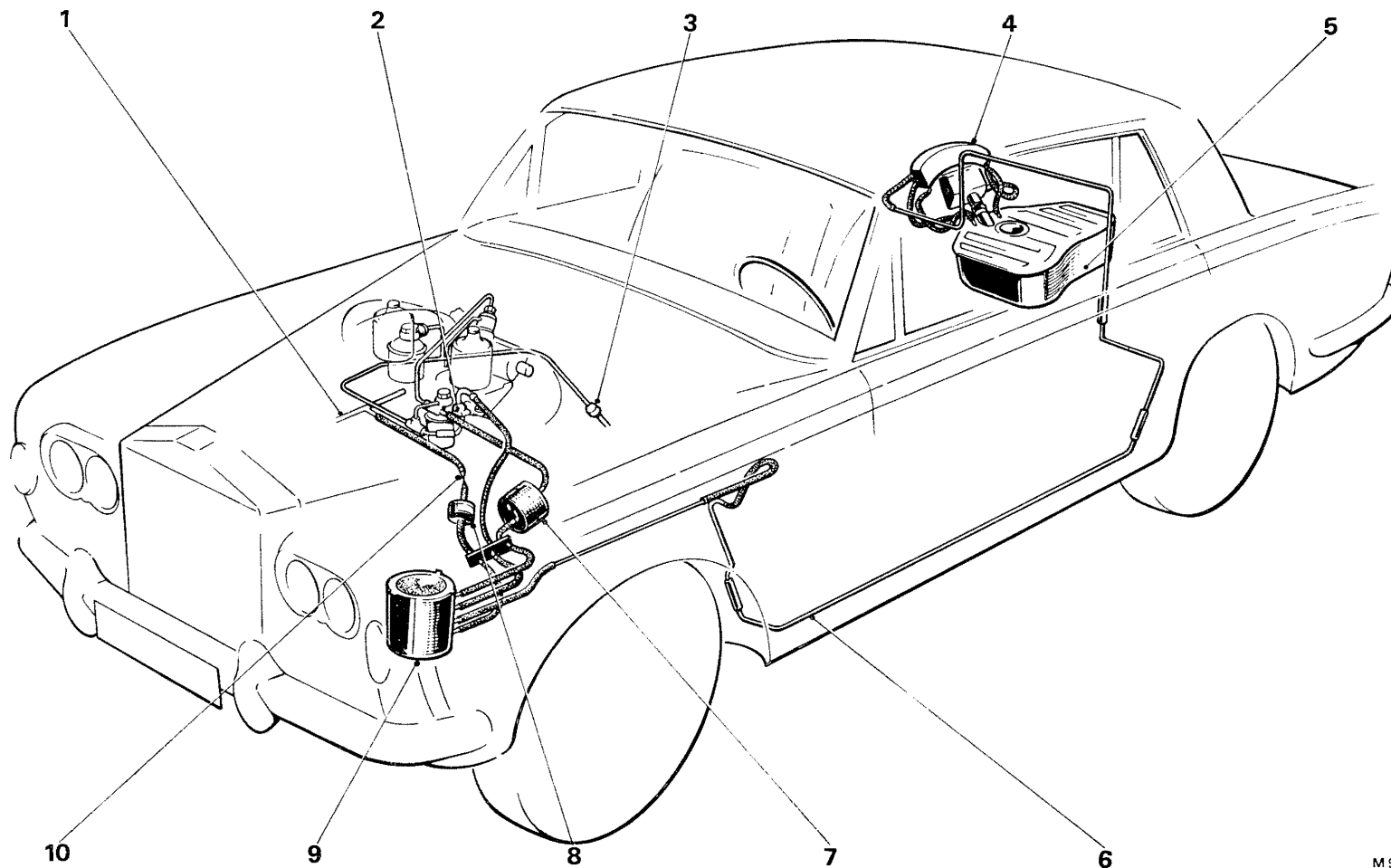
FIG. K36 THROTTLE CONTROL LINKAGE—LATE L.H. DRIVE CARS

A=2.265 in. to 2.300 in.
(5,75 cm. to 5,84 cm.)

B=18.575 in. (47,18 cm.)

C=0.250 in. to 0.500 in.
(0,63 cm. to 1,27 cm.)

- | | | | |
|----------|--|-----------|---|
| 1 | 'A' bank control shaft | 10 | Return spring |
| 2 | Lever—'A' bank control shaft to control rod | 11 | Coupling link (one hole elongated when refrigeration is fitted) |
| 3 | Control rod—'A' bank manifold lever to fulcrum lever | 12 | Coupling link |
| 4 | Tie-rod | 13 | Throttle lever—'B' bank |
| 5 | Fulcrum lever | 14 | Brake pedal |
| 6 | Compensator link | 15 | Accelerator pedal |
| 7 | Lever—manifold to carburetter | 16 | Control rod—accelerator to compensator linkage |
| 8 | Throttle lever—'A' bank | 17 | Bracket |
| 9 | Slow running throttle stop screw | 18 | Accelerator pedal |
| | | 19 | Pull-off spring |
| | | 20 | Kick-down button |
| | | | |
| | | 21 | Lock-nut |
| | | 22 | Stop—accelerator pedal |
| | | 23 | Lever—accelerator pedal cross-shaft |
| | | 24 | Jaw |



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FIG. K37 FUEL EVAPORATION EMISSION CONTROL SYSTEM—GENERAL VIEW

- | | | |
|---|--|--|
| <p>1 Gulp valve pipe
 2 Float chamber vent valve
 3 Float chamber drain valve
 4 Fuel trap assembly</p> | <p>5 Fuel tank including vent pipes and expansion tank
 6 Fuel vapour line
 7 Weaker filter</p> | <p>8 Purge line filter
 9 Evaporation loss control canister
 10 Purge line restrictor</p> |
|---|--|--|

Section K6

FUEL EVAPORATION EMISSION CONTROL SYSTEM

Cars from Car Serial Number SRX 9001 onwards built to comply with American Federal Safety Standards requirements.

In order to comply with regulations governing the emission of fuel vapour, an efficient Fuel Evaporation Emission Control System has been designed and is fitted to cars from Car Serial Number SRX 9001 destined for the U.S.A. and Canada.

The Fuel Evaporation Emission Control System eliminates direct venting of the fuel tank and carburettors, thus preventing the release of unburnt hydrocarbons into the atmosphere.

Fuel vapours are collected from the fuel tank and carburettors and stored in a charcoal filled canister. The canister is purged whenever the engine is running and the stored fuel vapours are extracted from the charcoal and burnt in the engine.

A diagrammatic illustration of the system can be seen in Figure K37.

The engine compartment components are clearly shown in Figure K39 and the fuel tank components in Figure K42.

Fuel evaporation loss control canister (see Fig. K38)

The large centre section of the canister contains approximately 775 grammes of dust free activated carbon type BPX 8X20 and accommodates nylon filter connectors which connect the canister to the various fuel vapour emission sources on the car (i.e. the carburettor weakener unit, float chamber vent and fuel tank vent).

The function of the activated carbon is to absorb and retain fuel vapour from the carburettor float chambers and fuel tank.

At either end of this section of the canister are thin discs of polyurethane filter.

The lower compartment of the canister is the purge chamber and is connected via the purge line filter and line restrictor, to the engine induction system. It is operative whenever the engine is running, and its func-

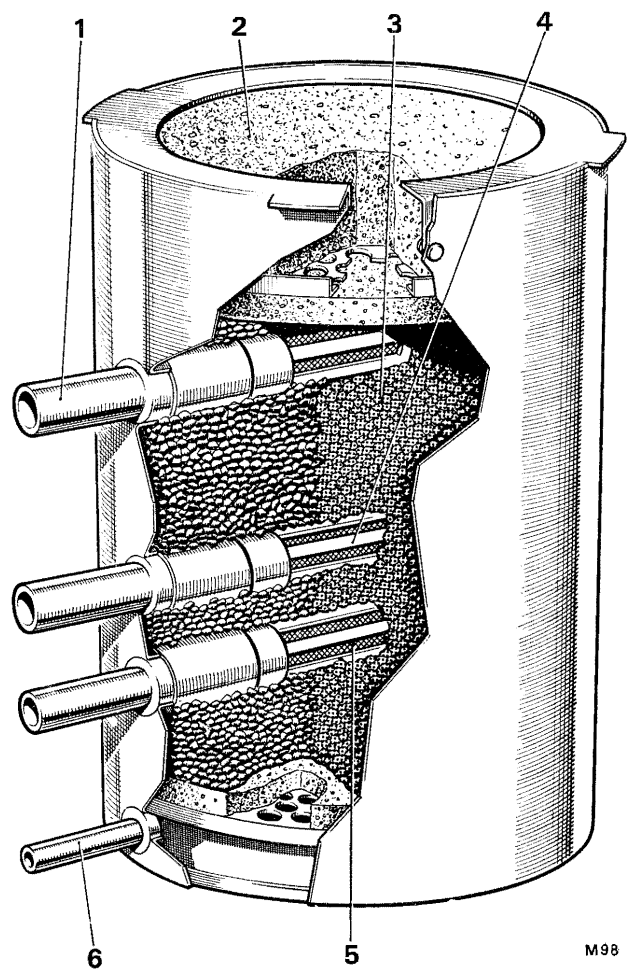


FIG. K38 FUEL EVAPORATION LOSS CONTROL CANISTER

- 1 Weaker connection
- 2 Polyurethane filter
- 3 Carbon
- 4 Float chamber vent connection
- 5 Fuel tank vent connection
- 6 Purge line connection

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tion is to draw air through the carbon, extracting the fuel vapour as it does so for consumption in the engine. The upper section of the canister is open to the atmosphere and houses a polyurethane foam filter to ensure that the air drawn through the carbon is clean.

**Polyurethane foam filter element—
To renew**

It is not necessary to remove the canister from the car

in order to extract the polyurethane foam filter element. A detachable cover is situated in the left-hand valance, adjacent to the blower motor resistances (*see Fig. K40*).

1. Unscrew the four screws retaining the access cover, lift off the cover and withdraw the filter element from the top of the canister.

When fitting a new filter element, ensure that it is correctly positioned inside the retaining rim of the canister. Fit the access cover and tighten the setscrews.

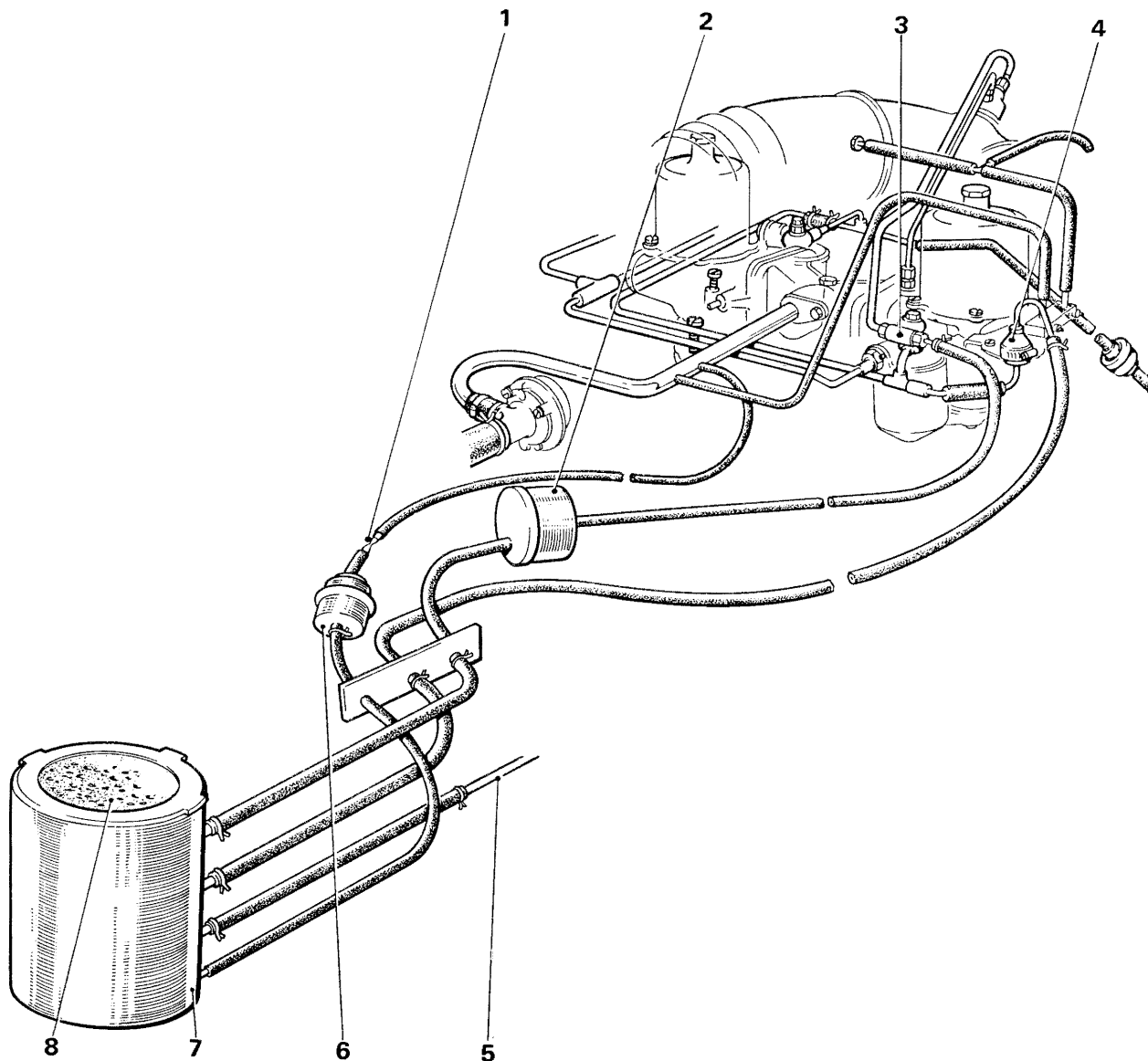


FIG. K39 FUEL EVAPORATION EMISSION CONTROL SYSTEM—ENGINE COMPARTMENT FITTINGS

- | | | |
|-------------------------|----------------------------|--|
| 1 Purge line restrictor | 4 Float chamber vent valve | 7 Evaporation loss control canister |
| 2 Weakener filter | 5 Vent from fuel trap | 8 Evaporation loss control canister polyurethane foam filter |
| 3 Weakener unit | 6 Purge line filter | |

Fuel evaporation loss control canister— To remove

The canister is mounted under the left-hand front wing and is removed as follows.

1. Remove the front left-hand road wheel as described in Chapter R—Wheel—To remove.

Note Left-hand front is determined when viewed from the driver's seat.

2. Suitably position stands under the raised portion of the car as a safety precaution.

3. Remove the front section of the underwing sheet by unscrewing the $\frac{7}{16}$ in. A/F nut and bolt, and the 16 small screws situated around the sheet.

4. The canister is now clearly visible.

5. Using special pliers (RH8090), remove the steel retaining clips and detach the four rubber hoses connected to the canister.

6. Raise the bonnet.

7. Inside the engine compartment adjacent to the blower motor resistances, (see Fig. K40) locate the six $\frac{7}{16}$ in. A/F setscrews. Unscrew the lower four setscrews and withdraw the canister from beneath the wing.

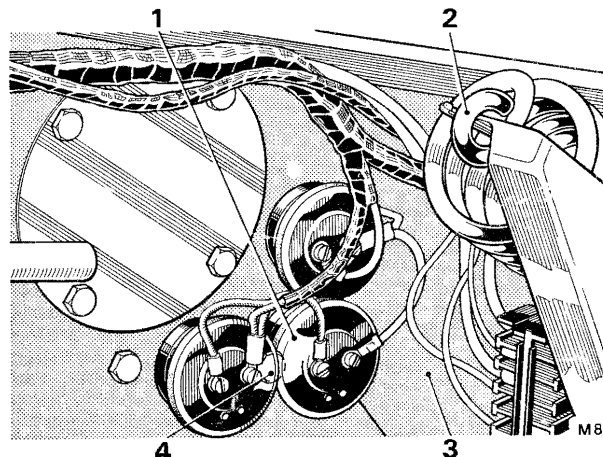


FIG. K40 SETSCREWS SECURING CONTROL CANISTER AND ACCESS COVER

- 1 Blower motor resistances
- 2 Bonnet hinge spring
- 3 Valance
- 4 Securing setscrew (hidden by blower motor resistances)

Fuel evaporation loss control canister— To fit

Fit the canister by reversing the procedure described for removal, noting the following points.

1. Ensure that the rubber hoses are in a good condition and new hose retaining clips are used.

2. Ensure that the underwing sheet is sealed with Bostik Sealing Compound 771.

Purge line (see Fig. K39)

The purge line consists of a rubber hose, passing from the lowest connection on the canister through the valance junction piece to the gulp air pipe situated between the gulp valve and carburetter 'Tee' piece. Incorporated into this hose there is the purge line filter and restrictor.

When the engine is running, air drawn through the canister filter and carbon picks up the stored fuel vapours and passes them via the hose, to the induction manifold. The restrictor in the line controls the flow rate at 1 cu. ft. per min. to maintain carburetter metering accuracy and the paper element line filter is fitted to prevent blockage of the restrictor.

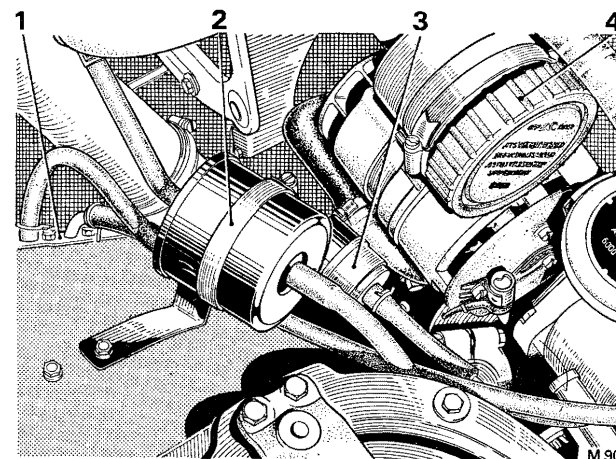


FIG. K41 WEAKENER FILTER AND PURGE LINE FILTER

- 1 Connections through valance to the fuel evaporation loss control canister
- 2 Fuel mixture weakening device filter
- 3 Purge line filter
- 4 Air injection system intake filter

Purge line filter—To remove (see Fig. K41)

1. Using special pliers (RH8090) remove the two steel retaining clips (if fitted) situated on either side of the unit.

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2. Slacken the 2 B.A. setscrew which secures the nylon retaining clip.
3. Withdraw the component from the clip.

Purge line filter—To fit

Fit the purge line filter by reversing the procedure described for removal, noting the following point.

1. Ensure that the rubber hoses are in a good condition and new hose retaining clips are used (if fitted).

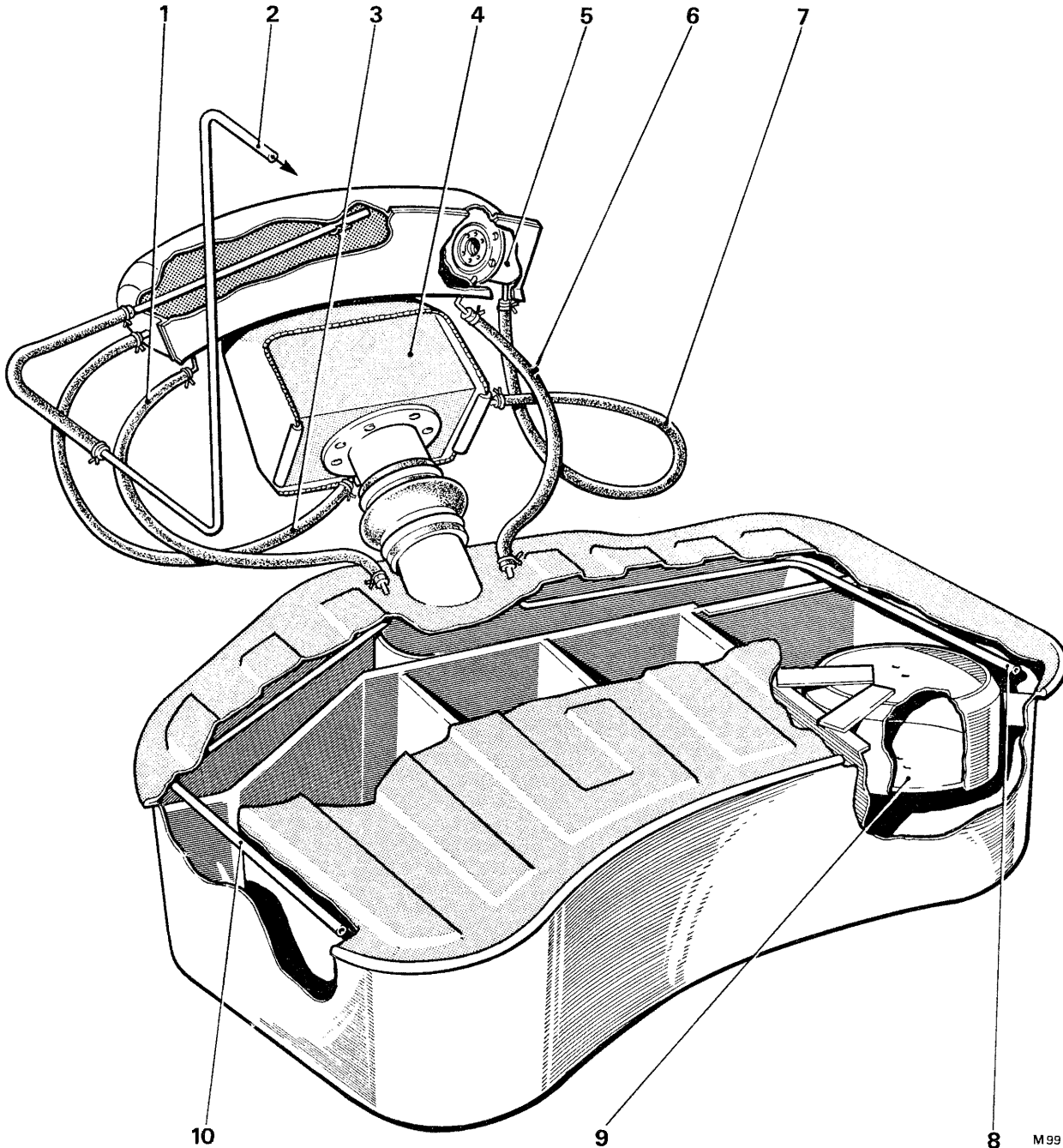


FIG. K42 FUEL EVAPORATION EMISSION CONTROL SYSTEM—FUEL TANK

- | | | |
|--|--|---|
| <ol style="list-style-type: none"> 1 Fuel trap drain 2 Connection to evaporation loss control canister 3 Filler neck vent | <ol style="list-style-type: none"> 4 Fuel filler box 5 Combined relief and vacuum valve 6 Fuel trap drain | <ol style="list-style-type: none"> 7 Valve vent 8 Vent pipe 9 Expansion tank 10 Vent pipe |
|--|--|---|

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Purge line restrictor—To remove

1. Hold the restrictor firmly and slide the rubber hosing from both ends.

Purge line restrictor—To fit

Fit the restrictor by reversing the procedure described for removal, noting the following point.

1. Ensure that the purge line restrictor is fitted into the line correctly. This can be determined by comparing the diameters of the restrictor ends with those of the rubber hoses.

Weakener line

The weakener line connects the weakener unit on the float chamber with the evaporation loss control canister (*see Fig. K39*). With the engine running under light throttle opening a depression is created in this line, so allowing air to pass from the canister to the weakener unit.

A filter incorporated in the line prevents blockage of the weakener unit.

During 'hot soak' conditions fuel vapour can pass along this pipe from the float chamber to be stored in the carbon filled canister.

Weakener filter—To remove (*see Fig. K41*)

1. Remove the steel clips (if fitted) from the inlet and outlet hoses using special pliers (RH8090).
2. Slacken the worm drive clip which retains the weakener filter to the bracket.
3. Withdraw the filter.

Weakener filter—To fit

Fit the weakener filter by reversing the procedure given for its removal noting the following points.

1. Ensure that the rubber hoses are in good condition.
2. If clips have been previously fitted, ensure that new clips are fitted.
3. Ensure that the inlet pipe for the unit which is off-set from the centre is facing the front of the car and is in its lowest position (*see Fig. K39*).

Float chamber vent line (*see Fig. K39*)

The carburettor float chambers are vented to the evaporation loss control canister through the float chamber vent line. Incorporated in the line is a non-return valve which maintains a depression in the float chamber during light throttle operation.

The vent valve is not serviceable and if its operation is suspect a new vent valve should be fitted.

Float chamber vent valve—To remove

(*see Fig. K39*)

1. Remove the rubber hose from both the inlet and outlet connections.
2. Slacken the worm drive clip which secures the vent valve to its mounting bracket.
3. Remove the vent valve.

Float chamber vent valve—To fit

Fit the vent valve by reversing the procedure given for its removal noting the following point.

1. Ensure that the inlet and outlet connections of the vent valve are positioned so that the rubber hoses can be connected.

Fuel tank assembly

The fuel tank assembly consists of the fuel tank, expansion tank and fuel trap assembly (*see Fig. K42*).

The fuel tank is vented from three positions to a fuel trap assembly which is mounted above the fuel filler. One vent is from the fuel filler neck and the other two vents from the fuel tank.

From the fuel trap, a vent line passes under the floor of the car to the evaporation loss control canister.

Fuel tank

The fuel tank (*see Fig. K42*) is similar to that fitted to standard cars, except that two vent pipes, 0.375 in. (9.525 mm.) diameter, are rigidly attached to the underside of the fuel tank top plate. The open ends of the vents terminate inside the tank at the front and rear. The outer ends of the two vent pipes terminate adjacent to the fuel filler neck.

A 5.5 Imp. pts. (3,125 litres, 6.7 U.S. pts.) capacity expansion tank situated within the main fuel tank inhibits complete filling and provides additional fuel expansion volume to contend with extreme temperature conditions.

When a vehicle is being filled with fuel, automatic cut-off could completely fill the tank leaving only the filler neck, vent connector pipes and fuel trap to accommodate the expansion of the fuel. The expansion tank is situated in the upper part of the fuel tank and as the fuel level rises above the lower part of the expansion tank it flows inside through the two small holes in the base. Two additional holes in the top of the expansion tank will also admit fuel if the level rises above the top of the tank.

At normal rates of filling it takes approximately 3 minutes to fill an empty tank whereas it takes approximately 9 minutes for the levels in both the main and expansion tanks to stabilise. After this time the main

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tank will have transferred 5.5 Imp. pts. (3,125 litres, 6.7 U.S. pts.) to the expansion tank leaving the equivalent air space in the main tank for expansion.

Fuel tank—To remove

To remove the fuel tank proceed as described in Section K1—Fuel System (Early Cars) noting that Operation 6 should be omitted and Operation 6 as follows should be carried out.

6. Using a pair of special pliers (RH8090), remove the steel clips from the two rubber hoses situated one on either side of the fuel filler neck.

Withdraw the rubber hoses from the pipes.

Fuel tank—To fit

Fit the fuel tank by reversing the procedure given for its removal noting the following points.

1. Ensure that the two rubber vent hoses are in a good condition.
2. New steel clips should be used to secure the rubber vent hoses to the metal pipes on either side of the filler neck base.

Fuel trap assembly

The fuel trap (*see Fig. K42*) has a capacity of 3.25 Imp. pts. (1,87 litres, 4.00 U.S. pts.).

It acts as a liquid separator and prevents liquid fuel from being transferred to the control canister under severe driving manoeuvres when the fuel tank is full or during expansion of the fuel at elevated ambient temperatures.

The tank vent pipes are fed to the lower ends of the banana-shaped fuel trap. These pipes also serve as drain pipes for any fuel in the trap.

The filler tube is vented into the forward end of the fuel trap.

An outlet pipe is attached to the interior of the fuel trap and the other end is connected via metal and rubber pipes to the evaporation loss control canister.

A combined relief and vacuum valve in the fuel trap prevents any excessive pressure build-up due to vaporisation, or depression as the fuel is consumed, should the vent line to the evaporation loss control canister become blocked.

Fuel trap assembly—To remove

1. Disconnect the battery.
2. Remove the luggage compartment carpet and underlay.
3. Remove the tool kit (*see Chapter R—Wheels and Tyres, Fig. R10*).
4. Remove the fuel filler door release ring.
5. Unscrew the five 'Philips' headed screws from the side carpet; four secure the brackets retaining the tool kit and the fifth is positioned at the front of the side carpet.
6. Release the 'Tenax' clip situated adjacent to the rear lamps access point.
7. Remove the side carpet and the carpet covering the fuel filler neck.
8. Using special pliers (RH8090) remove the steel clips from the rubber hoses. Withdraw the hoses from their respective pipes.
9. Unscrew and remove the three 2 B.A. setscrews securing the fuel trap assembly.
10. Slowly move the fuel trap rearward and downward until the lower end can be turned into the luggage compartment and the assembly withdrawn from the car.

Fuel trap assembly—To fit

Fit the fuel trap assembly by reversing the procedure given for its removal noting the following points.

1. Ensure that the rubber hose connections are in a good condition.
2. Ensure that new steel retaining clips are used.

Fuel trap relief and vacuum valve— To remove

1. Remove the fuel trap assembly as described in Fuel trap assembly—To remove.
2. Unscrew the retaining setscrews, taking care not to lose the washers.
3. Withdraw the relief and vacuum valve.

Fuel trap relief and vacuum valve—To fit

Fit the relief and vacuum valve by reversing the procedure given for its removal, noting the following points.

1. Ensure that the joint faces of the relief and vacuum valve and fuel trap assembly are clean and in a good condition.
2. Fit a new gasket.

Section K7

FAULT DIAGNOSIS

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T.S.D. 2476

SYMPTOM	POSSIBLE CAUSE	ACTION
Fuel Pumps 1. Fuel pump fails to operate.	1. (a) Faulty fuel pumps. (b) Faulty or obstructed float chamber needle valves. (c) Blocked carburetter filters. (d) Faulty electrical circuit. (e) Dirty or incorrectly set contact points.	1 (a) Disconnect the fuel line at the carburetters, switch on the ignition and check for fuel flow. If there is a good flow of fuel, carry out checks 1 (c) and 9 (a). If there is no fuel flow connect the carburetter feed pipe and disconnect the flexible pipe from the pressure side of the pump. If there is no fuel flow, carry out check 1 (d). (b) Refer to Symptom 9—Action 9 (a). (c) Disconnect the carburetter fuel feed pipes, then unscrew the float chamber lid unions; if necessary, remove and clean the filters. Reconnect the pipes. (d) Connect a 12 volt bulb between the electrical supply and the pump body. If the bulb fails to light, examine the earthing of the pump and the supply lead from the main ignition fuse. (e) Ensure that the electrical supply is satisfactory (see 1 (d)). Remove the bakelite cover and ensure that the tungsten points are in contact. Clean the points by drawing a piece of fine glass paper across them whilst they are held together. Check their operation by placing the supply lead onto the terminal and a short piece of bared wire put across the contacts. If the pump operates for one stroke the fault is due to dirt, corrosion or mal-adjustment of the contact points.

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SYMPTOM	POSSIBLE CAUSE	ACTION
<p>Fuel Pumps—continued</p>	<p>(f) Obstruction in the pipe line between the fuel tank and the pump. This fault usually causes overheating of the pump.</p>	<p>(f) If the fuel pump operates correctly with the pump inlet pipe disconnected, the trouble is due to an obstruction in the pipe line between the fuel tank and the pump. Remove the fuel tank filler cap, then blow compressed air through the inlet pipe. Note Compressed air should not be passed through the pump, as this will cause serious damage to the valves. Refer to Action 2 (b).</p>
<p>2. Fuel flow initially correct, then diminishing rapidly resulting in slow pump operation. Inadequate ventilation of the fuel tank causes a slow power stroke with resultant excessive burning of the contact points.</p>	<p>2. (a) Insufficient fuel tank ventilation. (b) Restriction on the suction side of the pump.</p>	<p>2. (a) Remove the filler cap. If this cures the fault remove any blockage or obstruction from the fuel tank vent pipe. (b) Check that the rear fuel filter is not choked; if necessary renew the filter element. Ensure that the pump supply pipe from the fuel tank is unobstructed.</p>
<p>3. Reduced fuel flow with rapid operation of the fuel pump.</p>	<p>3. (a) Air leak on the suction side of the pump or faulty sealing washers.</p>	<p>3. (a) Check for air leaks and the condition of the pump sealing washers. Remove the inlet and outlet valve assemblies from the pump (see Fig. K7). Check that the assemblies are clean and that they operate freely.</p>
<p>4. As Symptom 1.</p>	<p>4. (a) If all the preceding operations fail to locate the fault, stiffening of the diaphragm or abnormal friction in the rocker 'toggle over' mechanism should be suspected.</p>	<p>4. (a) Remove the solenoid housing, then flex the diaphragm several times. Care should be taken not to lose any of the eleven brass rollers (if fitted) from beneath the diaphragm. Prior to assembly, it is advisable to apply several drops of thin oil to the 'toggle over' spring spindles at the point where they pivot in the brass rockers. Assemble and set the diaphragm armature assembly (see Section K2—Solenoid housing and diaphragm—To fit).</p>
<p>5. Fuel pump operates without fuel delivery.</p>	<p>5. (a) Serious air leak on the suction side of the pump. (b) Dirt lodged under one of the valves particularly the inlet valve.</p>	<p>5. (a) Check that the inlet flexible pipe and union are tight. (b) Remove the valves for cleaning.</p>
<p>6. Noisy pump operation.</p>	<p>6. (a) Air leak in suction line.</p>	<p>6. (a) Disconnect the fuel pipe at the carburetter and allow the pump to discharge into a fuel filled container with the end of the pipe submerged. The emission of continuous bubbles at this point will confirm the existence of an air leak.</p>

SYMPTOM	POSSIBLE CAUSE	ACTION
<p>Fuel Pumps—continued</p>	<p>(b) Hard mounting rubbers. (c) Fuel pipe fouling body.</p>	<p>To rectify the fault, ensure that all connections from the fuel tank to the pump are in good condition, also check that the inlet union is tight. Check that the solenoid housing securing screws are firmly and evenly tightened. Air leaks on the suction side of the pump cause rapid operation and are the most frequent cause of premature failure.</p> <p>(b) Renew mounting rubbers. (c) Alter position of pipe as necessary to obviate foul.</p>
<p>Carburetters</p> <p>7. Stalling, poor slow running, lack of power and high fuel consumption.</p>	<p>7. (a) Sticking carburetter piston caused by the needle fouling the jet.</p>	<p>7. (a) Remove the air cleaner hosing from the butterfly housing. A spring-loaded pin, located on the right-hand side of the suction chamber, is provided for lifting the piston (see Fig. K12 item 35). Normally, when the engine is not running, the piston rests on the buffer pin in the base of the piston just above the bridge of the main carburetter body. Raise the piston to its highest position, against the resistance of the damper piston, then release it and check that it drops freely. If the downward movement of the piston is sluggish or if the piston does not readily leave the bridge of the carburetter, lower the main jet by pushing the mixture adjusting screw lever upwards and repeat the check on the piston.</p> <p>The elimination of sticking by lowering the jet indicates that the needle is fouling the jet. First check for a bent needle; if the needle is satisfactory, it will be necessary to centralise the jet (Carburetters with fixed needles only).</p> <p>After lowering the jet, if the piston continues to stick it is probable that the piston is fouling the side of the suction chamber or that the piston rod is not free to move within its bush (refer to Action 7 (b)). On completion of these checks re-set the carburetters (see Section K4—The Carburetters and Automatic Choke System—Carburetter Tuning).</p>

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SYMPTOM	POSSIBLE CAUSE	ACTION
<p>Carburetters—<i>continued</i></p>	<p>(b) Sticking carburetter piston caused by a bent damper rod.</p> <p>(c) Sticking carburetter piston caused by dirt between the suction chamber and piston rod sticking in its bush.</p>	<p>(b) Remove the oil cap and damper piston assembly and repeat the check for a sticking piston (see 7 (a)). If it is determined that the damper rod is bent a new damper rod should be fitted.</p> <p>(c) Remove the suction chamber and damper piston assembly, then remove the air valve piston assembly. Clean the parts with clean petrol or methylated spirits and wipe dry with a clean lint-free cloth. Apply a few drops of clean light oil to the piston rod. Fit the damper assembly and washer to the suction chamber. Seal the transfer holes in the piston assembly with rubber plugs and fit the assembly to the suction chamber. Invert the complete assembly and allow the suction chamber to fall away from the piston. Check the time it takes, which should be between 5 and 7 seconds, remove the plugs and damper assembly. On no account should any attempt be made to increase the bore of the suction chamber, or to reduce the diameter of the enlarged part of the piston, as the maintenance of a limited clearance between these two parts is essential for the correct operation of the carburetter. If the needle is disturbed or renewed the carburetters must be tuned (see Section K4—The Carburetters and Automatic Choke System—Carburetter Tuning).</p>
<p>8. Stalling.</p>	<p>8. (a) Flooding of the float chamber or the jet.</p>	<p>8. (a) Examine the float to determine if it is punctured; renew if necessary. Examine the needle valve seating to ensure that it is clean and serviceable. Check that the float level is correct (see Section K4—The Carburetters and Automatic Choke System—Carburetter—To assemble). Ensure that the cork gasket between the float chamber body and the lid is in good condition.</p>

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SYMPTOM	POSSIBLE CAUSE	ACTION
<p>Carburettors—continued</p>	<p>(b) Water or foreign matter in the float chamber.</p>	<p>(b) Remove the float chamber lid, then withdraw the float. Thoroughly clean the float chamber and the wire mesh filter in the lid (if paper filter is fitted it should be renewed). If dirt is present in the float chamber, it is possible that the main jet may be choked. The following method should successfully clear a choked jet.</p> <ul style="list-style-type: none"> (i) Remove the suction chamber and withdraw the piston assembly. (ii) Fit the suction chamber and seal the air intake. (iii) Disconnect the L.T. lead on the distributor then remove the protective cap from the starter solenoid. (iv) Lower the jet to its bottom position by pushing the mixture adjusting screw lever upward, hold it in this position. (v) Operate the starter motor. This should cause any foreign matter to be drawn out of the jet into the carburetter body. (vi) Should this fail to clear the blockage, remove and clean the jet, bearing in mind that all carburetter parts should be assembled in the same relative position from which they are removed (<i>see Section K4</i>). <p>If globules of water are found in the carburetter, the fuel system should be cleaned thoroughly and the fuel tank drained in order to inspect the fuel for water content. On completion of this operation, tune the carburettors (<i>see Section K4</i>).</p>
<p>9. Engine stalls when idling or under light running conditions.</p>	<p>9. (a) Providing that there is a good supply of fuel available at the float chamber inlet unions, it is possible that the float needle valve has stuck to its seating. This results from a gum deposit which forms in the fuel system after prolonged storage of the fuel in the tank.</p>	<p>9. (a) Remove the float chamber lid and withdraw the needle valve, then clean the valve and its seating with a clean cloth soaked in alcohol. Cleaning of the seat will be facilitated by wrapping the cloth around a thin wooden stick. Repeated trouble of this nature can only be rectified by completely dismantling and thoroughly cleaning the fuel system and tank.</p>
<p>10. Engine shows serious power loss evident at high speeds and loading.</p>	<p>10. (a) Insufficient delivery of fuel.</p>	<p>10. (a) Check the fuel pumps for adequate delivery and the filters in the system for cleanliness.</p>

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SYMPTOM	POSSIBLE CAUSE	ACTION
<p>Malfunctioning mixture weakening system (Symptoms 11 and 12 are applicable to cars from SRH.8742 onwards).</p> <p>11. High float chamber depression also spitting back in the carburetters.</p>	<p>11. (a) Weakening device filter blocked or blockage in rubber hose or bleed orifice.</p> <p>(b) Dislodged venturi in weakening device.</p> <p>Items (c), (d), (e) and (f) are applicable only when a Fuel evaporation emission control system is fitted.</p> <p>(c) Evaporation loss control canister filter blocked.</p> <p>(d) Incorrect connection of weakener hose to valance adaptor or evaporation loss control canister.</p> <p>(e) Incorrect purge flow rate (greater than 1 cu. ft./minute).</p> <p>(f) Evaporation loss control canister obstructed.</p>	<p>11. (a) Renew filter or remove the blockage.</p> <p>(b) Renew the weakening device.</p> <p>(c) Renew filter or remove blockage.</p> <p>(d) Ensure connections are fitted correctly; rectify if necessary.</p> <p>(e) Renew purge line restrictor.</p> <p>(f) Remove obstruction or fit new canister.</p>
<p>12. Low float chamber depression also small increase in fuel consumption.</p>	<p>12. (a) Blockage in engine side of weakening device.</p> <p>(b) Float chamber and weakening device air leaks.</p> <p>(c) Float chamber connection air leaks as far as and including the one way valves in the fuel drain and vent pipes.</p> <p>(d) Engine intake air temperature below 18°C. (64°F.).</p> <p>(e) Inoperative weakener cut-off valve.</p> <p>(f) Leaks in weakening device, carburetter tapping or weakener cut-off valve.</p> <p>(g) Faulty cut-off valve.</p> <p>(h) A dirty or faulty float chamber drain valve.</p> <p>Items (i) and (j) are applicable only when a Fuel evaporation emission control system is fitted.</p> <p>(i) A dirty or faulty float chamber vent valve.</p> <p>(j) Incorrect purge flow rate (correct flow rate 1 cu. ft./minute).</p>	<p>12. (a) Remove blockage.</p> <p>(b) Renew gaskets and washers. Ensure that both float chamber lids are tight also that all connections are tight.</p> <p>(c) Check that all pipe connections are tight and seating correctly and rubber hoses are in a good condition. Check that the one way valve assemblies are clean and correctly seated also that it is tightly assembled</p> <p>(d) Allow engine to warm up.</p> <p>(e) Renew valve.</p> <p>(f) Check and tighten any loose connections also check the condition of sealing washers and renew if necessary.</p> <p>(g) Disconnect the two pipes fitted to the cut-off valve then connect the pipes by fitting a small piece of thick walled rubber tube over the two end nipples; a piece of tube similar to the type fitted to the refrigeration fast-idle solenoid would suffice. Run the engine and check the float chamber depression, if the depression is correct, the cut-off valve is faulty and should be renewed.</p> <p>(h) Remove foreign matter or renew valve.</p> <p>(i) Remove foreign matter or renew valve.</p> <p>(j) Remove any blockage in the purge line restrictor or renew the restrictor. Also remove any blockage in the purge line filter or the pipes situated between the gulp valve to carburetter 'Tee' piece pipe and evaporation loss control canister.</p>

Section K8

WORKSHOP TOOLS

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Tool Number	Description
RH8050	Spanner—Carburettor Jet Screw.
RH8087	Spanner—Weakener Cut-off Valve.
RH8090	Pliers—Wire Hose Clips.
RH8095	Restrictor — Manometer Check —Choke Stove Pipe.
RH8383	Positioning Tool—Throttle Spindle Seal.

Chapter L

ENGINE COOLING SYSTEM

SECTION	PAGE
L1 General Information	L1
L2 Radiator	L5
L3 Thermostat	L7
L4 Coolant Pump	L9
L5 Dimensional Data	L15
L6 Workshop Tools	L17

Section L1

GENERAL INFORMATION

Introduction

The cooling system must be filled with a 50% mixture of anti-freeze and water. This should be renewed annually.

A thermostat valve is fitted in the coolant outlet pipe between the engine and radiator header tank. This valve prevents circulation of the coolant through the radiator until the engine has reached normal operating temperature.

Coolant temperature is detected by a transmitter mounted on the thermostat housing and on earlier cars, recorded on a gauge situated on the facia. Later Silver Shadow cars had the gauge deleted and an illuminating warning panel fitted. The Corniche continued to be fitted with the single instrument mounted on the facia.

A coolant level probe situated in the header tank will illuminate the warning panel, (or an amber lamp on earlier cars) if the coolant drops below the required level.

Three drainage points are provided in the system. A tap at the bottom of the radiator (see Fig. L1) and a drain plug on each side of the cylinder block (see Fig. L2).

On cars produced prior to car serial numbers, SRX 3200 (Standard) and CRH 3315 (Coachbuilt), drain taps are fitted to all three positions.

Important

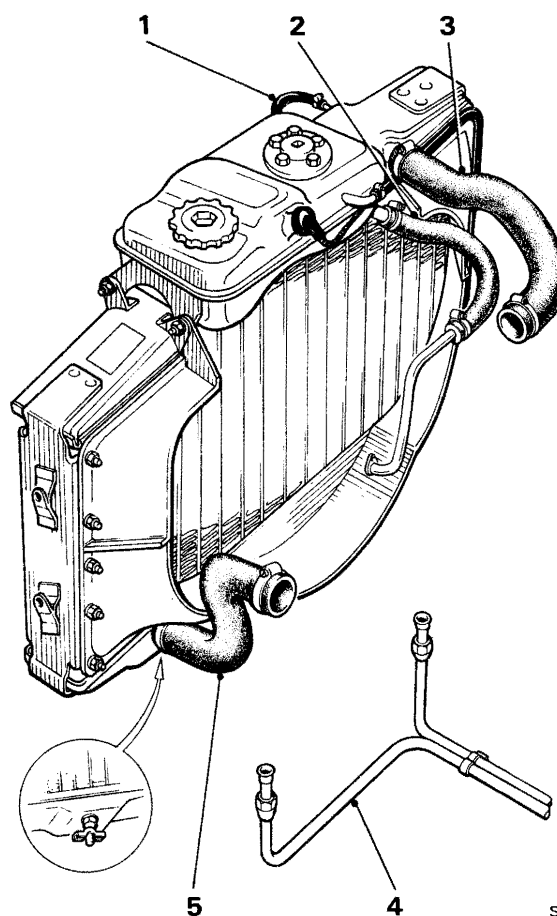
The cooling system is pressurised. **Do not** remove the radiator filler cap while the engine is running or when the engine is hot, otherwise internal pressure will blow out the hot coolant. If it is necessary to check the level of the coolant when the engine is hot, muffle the filler cap with a thick cloth. Gradually turn the cap anti-clockwise until the pressure is reduced, then remove the cap.

Corrosion and freeze protection

For protection against frost and corrosion, the cooling system must be filled with a solution of 50% prescribed anti-freeze and 50% water.

The mixture should be renewed annually.

The trade names of the anti-freezes that may be



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FIG. L1 RADIATOR AND CONNECTING PIPEWORK

- 1 Header tank to radiator
- 2 Pump to header tank
- 3 Radiator to thermostat
- 4 Gearbox oil cooler pipe
- 5 Radiator to pump

used are UT 184 (BP-Hythe Chemicals) or Prestone II. The former is used predominantly in Europe and the latter in North America. Both are summer coolant/anti-freeze solutions and are miscible, but **must not** be mixed with any other brand of anti-freeze.

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As a visual aid to identifying the two types of anti-freeze 'Prestone Anti-freeze and Summer Coolant' UT 184 is coloured turquoise blue and 'Prestone II Winter/Summer Concentrate' is coloured fluorescent green.

Cooling system - To drain

1. Drive the car onto a ramp.
2. Firmly apply the handbrake/parking brake and remove the gear range selector thermal cut-out from the fuseboard.
3. Switch on the ignition but do not start the engine.
4. Move either the UPPER or LOWER air conditioning switch into the fully clockwise position. This will open the heater water tap and assist the draining operation.
5. Switch off the ignition and carefully remove the radiator filler cap.
6. Raise the car to a convenient working height.
7. Place containers under the car to collect the coolant. Attach a length of rubber hose from the radiator drain tap to direct the coolant into the containers.
8. Open the radiator drain tap and drain the coolant from the radiator. When completed, remove the drain plugs to drain the residue from the crank-case.

Radiator - To flush

1. Drain the cooling system as described previously under the heading, Cooling system - To drain.

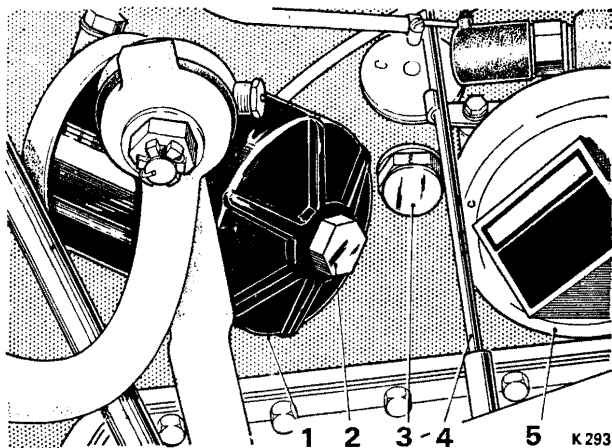


FIG. L2 CYLINDER BLOCK DRAIN

- 1 Oil filter
- 2 Filter bowl securing setscrew
- 3 Cylinder block drain
- 4 Engine dip-stick tube
- 5 Front hydraulic accumulator

2. Remove the inlet and outlet coolant hoses.
3. Fit a waste pipe to the upper (inlet) connection of the radiator.
4. Apply mains water under pressure through the lower (outlet) connection of the radiator. This should remove all loose sediment in approximately 30 minutes.

Do not under any circumstances use a strong alkaline compound or detergent to clean the cooling system. Such compounds have a detrimental chemical action on aluminium alloys.

5. Examine all rubber coolant hoses and renew any which show signs of deterioration.

Engine - To flush

1. Remove the outlet hose.
2. Remove the drain plug or drain tap from each cylinder head.
3. Remove the thermostat cover, withdraw the thermostat and replace the cover.
4. Fit a suitable pipe to the drain plug aperture and apply mains water pressure to each aperture in turn.

Flush for approximately 30 minutes, or until the water runs clear.

5. Fit the drain plugs, thermostat and thermostat cover using a new gasket.

If the engine is being flushed as part of the two year scheduled maintenance, the thermostat should be discarded and a new one fitted.

6. Examine all rubber coolant hoses and renew any which show signs of deterioration.

Heater matrix - To flush

1. Detach the matrix hose at the electrically operated water tap and disconnect the return hose at the coolant pump.
2. Fit a waste pipe to the inlet connection of the heater matrix.
3. Flush the matrix for approximately 30 minutes.
4. Examine the cylinder head to heater tap hose and matrix inlet for deterioration. Renew if necessary.

Removal and fitting of heater and matrix

Refer to Chapter C - Air conditioning system.

Cooling system - To fill

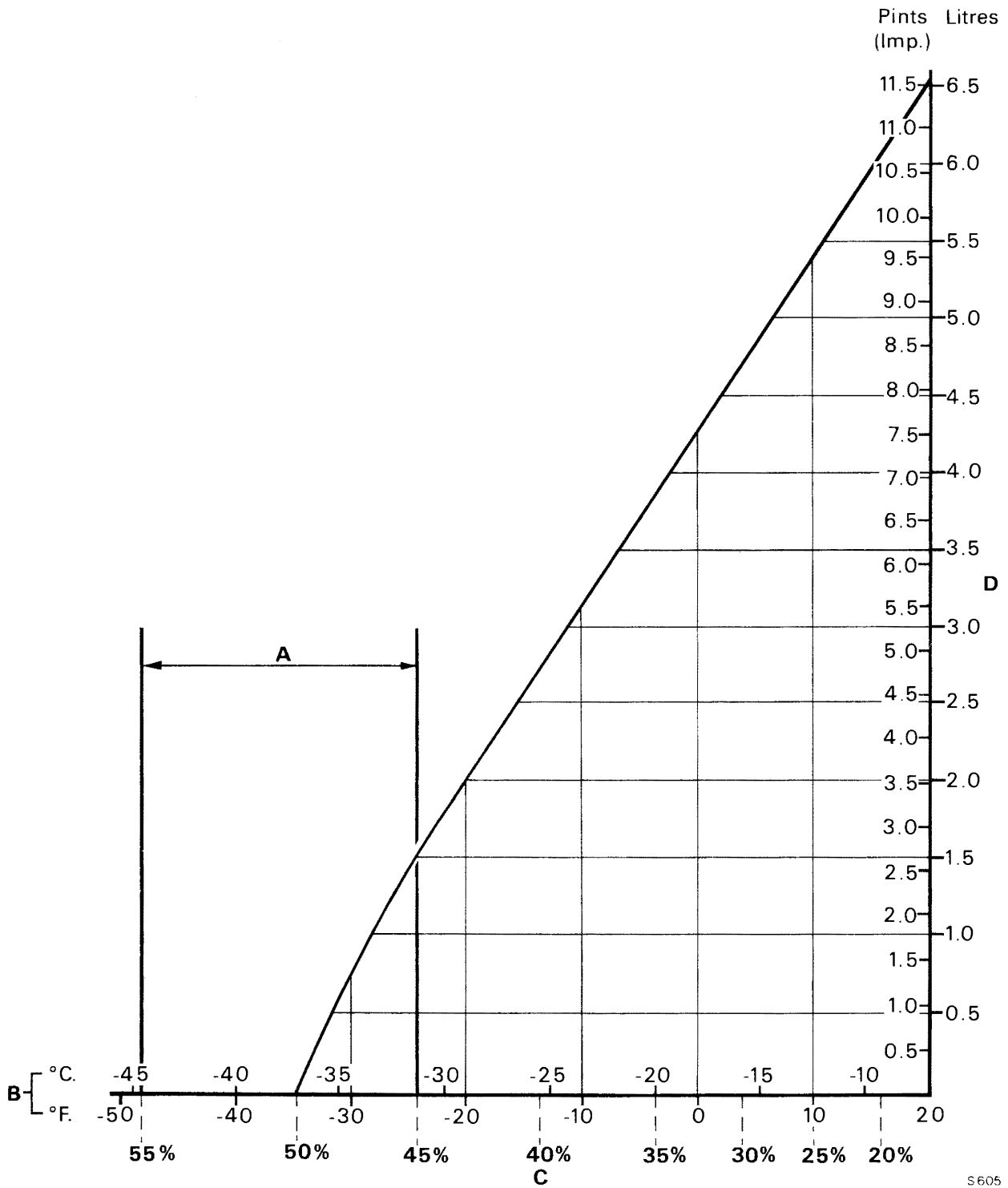
To facilitate filling the cooling system the UPPER or LOWER air conditioning switches on the fascia should be in the fully clockwise position.

1. Ensure all hose connections and drain plugs are fitted and secure. Check that the radiator drain tap is closed.

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FIG. L3 ANTI - FREEZE CONCENTRATION CORRECTION CHART TO GIVE A 50% SOLUTION

- A Acceptable service range of concentration
- B Freezing point of coolant
- C Percentage concentration
- D Volume of 100% anti-freeze to be added to maintain a 50% solution after removal of the same volume of old coolant first

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2. Using the correct anti-freeze/water mixture, fill the system by pouring slowly to avoid the possibility of air locks.
3. Start the engine and allow time for the system to reach normal operating temperature ensuring uniform distribution of the coolant.
4. Stop the engine and check the coolant level. Top-up if necessary. The correct level is when the coolant reaches the rubber seal in the filler neck.
5. Fit the radiator filler cap.
6. Check the tightness of all hose clips.
7. Examine all disturbed hoses and joints for leaks.

Coolant - To check

In the majority of cases hydrometers, used for checking anti-freeze concentrations, are inaccurate above a 40% figure.

As the acceptable range of concentration is between 45% and 55%, a refractometer, similar to the 'AO Duo-check' instrument, is more suitable for measuring a 50% solution.

The graph (*see Fig. L3*) shows the degrees of frost protection converted to a percentage concentration. Should the system be less than the acceptable limit, the graph indicates the necessary amount of coolant to be drained from a full system before replacing with 100% anti-freeze.

1. After pouring into the system the correct amount of 100% anti-freeze, replace the filler cap, then run the engine on fast idle for approximately five minutes to enable a complete mix with the existing solution. Failure to circulate the new anti-freeze will result in an incorrect reading.
2. Remove the filler cap and check that the solution now measures within the range shown on the graph (*see Fig. L3*). Rectify if necessary.

Section L2

RADIATOR

Radiator - To remove

1. Drive the car onto a ramp.
 2. Firmly apply the handbrake/parking brake and remove the gear range thermal cut-out from the fuseboard.
 3. Drain the coolant as described in Cooling system - To drain, Section L1.
 4. Slacken the worm drive clips and remove the two top hoses and one bottom hose at the radiator.
 5. Disconnect the cables from the coolant probe in the header tank.
 6. Disconnect the two heat exchange pipes, if fitted, from the underside of the radiator. Fit blanking plugs to prevent the ingress of dirt.
 7. Disconnect the header tank steam escape pipe and bleed hose from the header tank to the radiator.
 8. Remove the four setscrews securing the fan, or the four nuts holding the fan and viscous coupling to the water pump pulley extension cone.
 9. Slacken the tension on the drive belts.
 10. Carefully withdraw the fan or, in the case of the fan and viscous coupling, place these inside the radiator cowl.
- Take care not to damage the radiator matrix.**
11. Support the radiator then remove the four setscrews securing the assembly to the bonnet hinge panels.
 12. Carefully withdraw the radiator and header tank.
 13. Remove the fan or fan and viscous coupling from the cowl.

Radiator - To fit

To fit the radiator, reverse the procedure given for removal noting the following points.

1. Examine all hoses for deterioration and renew any found to be unserviceable.
2. Fill the system with a clean coolant solution.
3. Check the level of concentration as shown in Section L1 - Coolant - To check. Correct the level of concentration as necessary.

Important - Cars with radiator cowlings

After replacement of the radiator a check must be made for possible fouling of the fan blades on the radiator cowling, using the following procedures.

4. Check that a minimum clearance of 16 mm. (0.630 in.) exists between the tip of the fan blades and around most of the cowling. A clearance of 9,5 mm. (0.370 in.) is acceptable at the lower section of the cowling.
5. To check that engine torque does not cause the fan to foul the cowling, apply the handbrake/parking brake, set the engine onto fast idle by pressing the accelerator and then start the engine.
6. Select (D) Drive and (R) Reverse. Listen for any catching of the blades on the radiator cowling. No attempt must be made to increase engine speed above that of fast idle.
7. Choose an open stretch of dry road. When the road is free from any potential danger, accelerate the car sharply from a stand still position and listen for fouling of the blades on the cowling.

Radiator header tank - To remove (radiator in the car)

The header tank is supported on three brackets attached to the top face of the radiator.

1. Remove the radiator filler cap, open the drain tap and drain sufficient coolant to empty the header tank; approximately 2 litres (3.5 pints) into a clean container.
2. Slacken the worm drive clips and remove the hose between the header tank and the radiator.
3. Remove the header tank steam escape pipe at the header tank connection.
4. Disconnect the cables from the coolant probe.
5. Remove the three nuts, bolts and washers from the supporting brackets and remove the header tank.

Radiator header tank - To fit

To fit the header tank, reverse the procedure given for removal noting the following points.

1. Examine hoses for deterioration and ensure

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all worm drive clips are secure. Renew any hoses that appear to be unserviceable.

2. Replace the clean fluid drained from the system.

3. Check the concentration level of the coolant and if below the acceptable level of between 45% and 55% bring the coolant up to the acceptable level (*see Section L1 Coolant - To check*).

Booster fan - To remove (late cars)

1. Disconnect the battery.

2. Remove the radiator grille. For details refer to Chapter S - Body.

3. Release the wiring loom attached along the upper mounting bar of the fan and unwind the adhesive tape to expose two Lucar connectors; disconnect the Lucars.

4. Remove the four setscrews attaching the mounting bars to the condenser end plates and withdraw the unit.

5. To remove the booster fan, unscrew the four bolts and self-locking nuts to dismantle the unit from the mounting bars.

Booster fan - To fit (late cars)

To fit the booster fan reverse the procedure given for removal noting the following points.

1. When assembling the booster fan to the mounting bars ensure new self-locking nuts are used.

2. After connecting the wiring loom, cut away the unwrapped portion of adhesive tape. Completely cover the Lucar connections with new tape.

3. Touch in any black paint chipped or scratched from the area of the fan during removal.

4. Switch on the ignition, then test the fan by shorting the two wires from the switch of the thermostat outlet elbow to the engine casing.

Section L3

THERMOSTAT

Thermostat - To remove (see Fig. L4)

1. Drive the car onto a ramp.
2. Firmly apply the handbrake/parking brake and remove the gear range selector thermal cut-out from the fuseboard.
3. Drain the coolant as described in Cooling system - To drain, Section L1.
4. On cars fitted with exhaust emission control equipment it will be necessary to disconnect the cable to the primary valve lock-out switch and, dependent on the car's domicile, to remove the air diverter valve. Refer to Chapter U - Emission systems, for removal and fitting of exhaust emission control components.
5. Remove the setscrew to the air intake elbow bracket then the two setscrews securing the bracket to the thermostat cover and release the bracket.
6. Unscrew the remaining two setscrews securing the thermostat cover to the housing and move the cover to one side; the hose being sufficiently flexible to allow the desired movement without having to be removed.
7. Remove the heat exchanger water connection, if fitted.
8. Lift the thermostat from the housing.

Thermostat - To test

If the thermostat is suspected of being faulty, it can be tested as follows.

1. Suspend the thermostat and the bulb of an accurate thermometer into a container of water so that they are completely immersed. They must not be allowed to touch the sides or bottom of the container as this would cause a false reading.
2. Gradually heat the water, stirring continuously to ensure that the water and thermostat are at a uniform temperature.
3. Note the temperature at the point when the thermostat valve begins to open.

If the water is heated too quickly, or if it is not adequately stirred, a false reading may result. The thermostat has its opening temperature

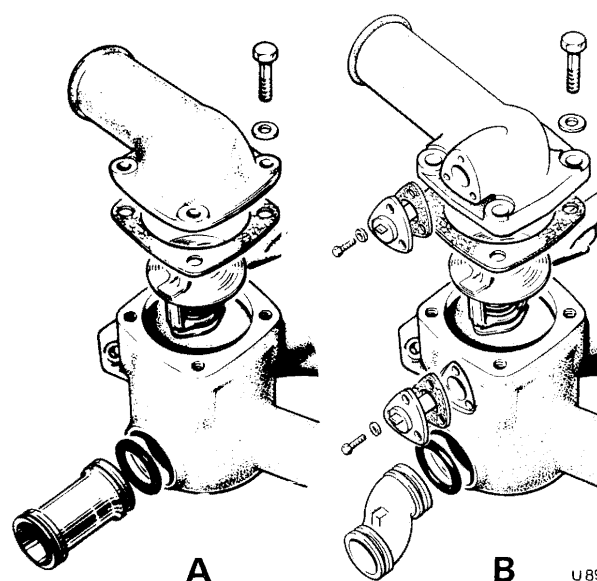


FIG. L4 THERMOSTAT AND HOUSING

- A Early cars
B Late cars

stamped on the base of the unit, for example, 80° C. (190° F.).

When fully open, the valve should have travelled a minimum of 9.5 mm. (0.375 in.).

No attempt must be made to adjust the thermostat.

4. Check that the fusible plugs are intact.

Thermostat - To fit

1. Remove the old gasket material from the thermostat housing and cover, ensuring that no material enters the thermostat housing.

Check that the two faces are wiped clean.

2. Fit a new gasket and insert the thermostat into its housing.
3. Replace the cover and secure in position by progressively tightening the four setscrews.
4. Examine hoses for deterioration and ensure all worm drive clips are secured. Renew any hoses that are unserviceable.

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5. Replace exhaust emission control components, or heat exchanger water connection, if fitted.

6. Fill the system, using the correct anti-freeze/water mixture, verifying and adjusting the concentration level using the method described in Section L1 Coolant - To check.

Section L4

COOLANT PUMP

Coolant pump - To remove

For normal service and maintenance, including reconditioning, it is not necessary to remove the pump casing from the engine.

All moving parts can be withdrawn, complete with the bearing housing (see Figs. L5 and L6)

1. Drive the car onto a ramp, chock the rear wheels and remove the gear range selector thermal cut-out. Raise to a convenient working height.

2. Place a clean container under the car to collect the coolant. Attach a length of rubber hose from the radiator drain tap to direct coolant into the container.

3. Open the radiator drain tap (see Fig. L1) and drain the coolant from the radiator (see Cooling system - To drain, Section L1). Close the drain tap, cover the container to prevent contamination of the fluid then lower the car.

4. Remove the header tank from the radiator.

5. Remove the fan from the extension cone, or if a fan and viscous coupling are fitted, dismantle the upper half of the fan cowl to facilitate removal of the fan and coupling assembly. Take care not to damage the matrix fins.

6. Remove the four nuts and washers securing the viscous coupling, fan and pulley to the driving flange.

When removed, it is not necessary to separate the fan and coupling unless one of them is to be replaced.

Note

When the viscous coupling is removed, it should be stored with the bi-metal strip downwards.

7. Release the tension on all drive belts. Remove the belts.

8. Slide the coolant pump pulley forward **carefully** to reveal the bearing housing setscrews.

9. Unscrew the six setscrews which secure the bearing housing to the coolant pump casing.

10. Detach the bearing housing containing all the moving parts of the pump. It will be possible to manoeuvre the pulley off the assembly at this stage.

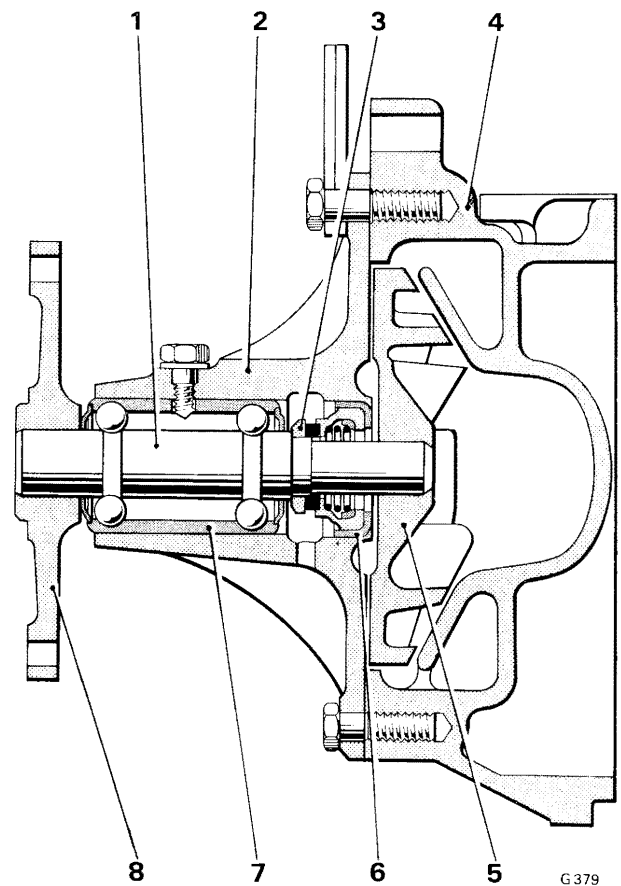


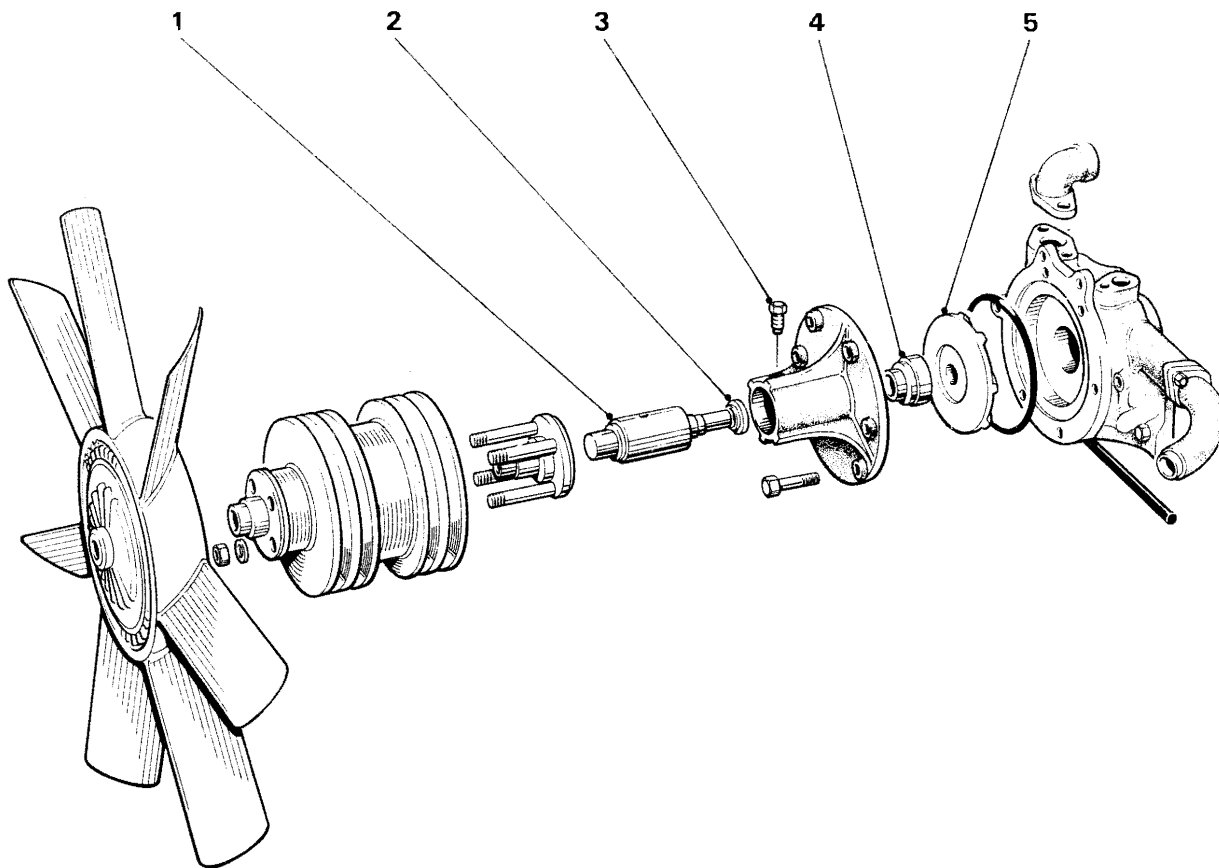
FIG. L5 COOLANT PUMP (EARLY CARS)

- 1 Driving shaft
- 2 Bearing housing
- 3 Thrust collar
- 4 Coolant pump casing
- 5 Impeller
- 6 Sealing gland
- 7 Bearing housing
- 8 Driving spider

11. Remove and discard the 'O' ring from the pump casing.

If it is necessary to remove the pump casing from the engine, carry out the following operations.

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FIG. L6 COOLANT PUMP (LATE CARS)

- | | |
|------------------------------|--------------------------|
| 1 Shaft and bearing assembly | 4 Sealing gland assembly |
| 2 Counterface | 5 Impeller |
| 3 Locating screw | |

12. Slacken the worm drive clips and disconnect the pump casing to radiator bottom tank hose.

13. If the car is fitted with an exhaust emission control system, remove the air injection pump as described in Chapter U - Emission Systems.

14. Remove the nut and washer from the jockey pulley pivot pin and withdraw the jockey pulley assembly.

15. Remove the adjusting setscrew to the pivot plate of the steering pump (see Chapter N - Steering System Fig. N15). Swing the steering pump away from the engine.

16. Remove the nuts and bolts securing the refrigeration compressor (if fitted) but do not disconnect the pipework. Lift bodily away from the working area placing carefully onto a protective cover to ensure that no damage is caused to other engine components.

17. Remove the alternator as described in Chapter M - Electrical System.

18. Unscrew and remove the setscrews and

plain washers from the by-pass elbow.

Remove the elbow and bobbin. Discard the 'O' rings and gasket.

19. Slacken the worm drive clips and disconnect the hose from the expansion tank to coolant pump pipe and from the heater return pipe. Remove the setscrew and washer securing each pipe to the coolant pump casing, detach the pipes and discard the 'O' rings.

20. Unscrew and remove the two lower setscrews securing the coolant pump casing to the crankcase, and the two setscrews and plain washers entering the top of the coolant pump casing from the crankcase side with the air injection pump bracket attached.

21. Detach the coolant pump casing, together with the Neoprene sealing strip, fitted to its lower edge.

22. With a sharp knife, cut the paper gasket across the upper edge of the crankshaft front cover and discard this portion of the gasket.

Coolant pump - To dismantle

For normal service operation, the bearing housing will have already been separated from the pump casing.

1. Draw the impeller off the shaft using the special tool (RH 7098).

2. Remove the peg screw which retains the bearing in the housing.

3. Support the bearing housing to enable the bearing assembly to be lightly driven out with a mallet.

4. Remove and discard the seal and counterface.

5. Examine the shaft and bearing for wear and damage. The assembly contains lubricant therefore no attempt must be made to wash any of the components.

6. If the *spider* (early cars), *flange* (later cars) or the shaft has been damaged, draw the component off the shaft using the following special tool.

Spider - (RH 7099)

Flange - (RH 8615)

Discard the damaged component.

If no damage has occurred and the diameter of the shaft is within the specified limits it will not be necessary to withdraw the flange.

7. With the flange or spider withdrawn, check that the bore conforms to the limits specified (*see Section L5 Dimensional Data*). If satisfactory, the component may be used for further service.

8. Measure the diameter of a new shaft to ensure that the tolerances required for the flange/spider and impeller are within the limits shown (*see Section L5 Dimensional Data*).

Coolant pump - To assemble

1. Before assembly, any damage marks on the joint faces of the bearing housing and pump casing should be removed using a fine carborundum stone.

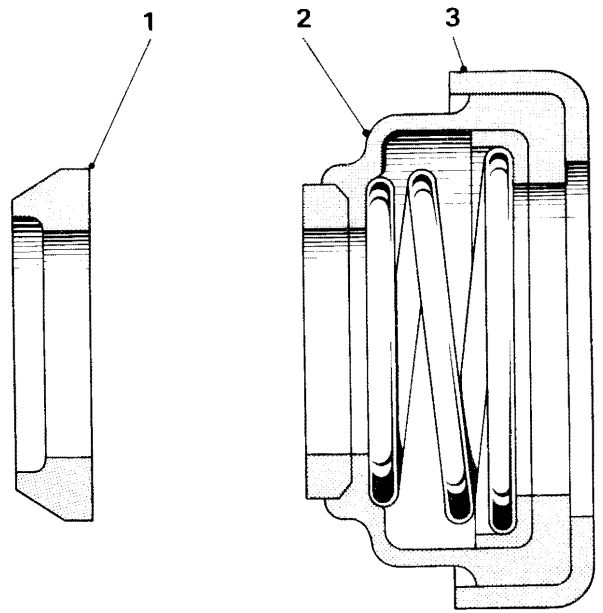
2. Lightly coat the inside surface of the gland cover with a waterproofing solution such as 'Seelastik' then fit the sealing gland assembly into the gland cover (*see Fig. L7*).

3. Fit the sealing gland assembly into the impeller end of the bearing housing. The assembly must lie flush with the end of the housing (*see Figs. L5 and L6*).

4. If the driving *spider* (early cars) or *flange* (later cars), is not fitted at this stage press this component onto the shaft. Check that the run out is less than 0.05 mm. (0.002 in.) total indicator reading.

5. Fit a new seal counterface onto the shaft until the chamfered face abuts the shoulder.

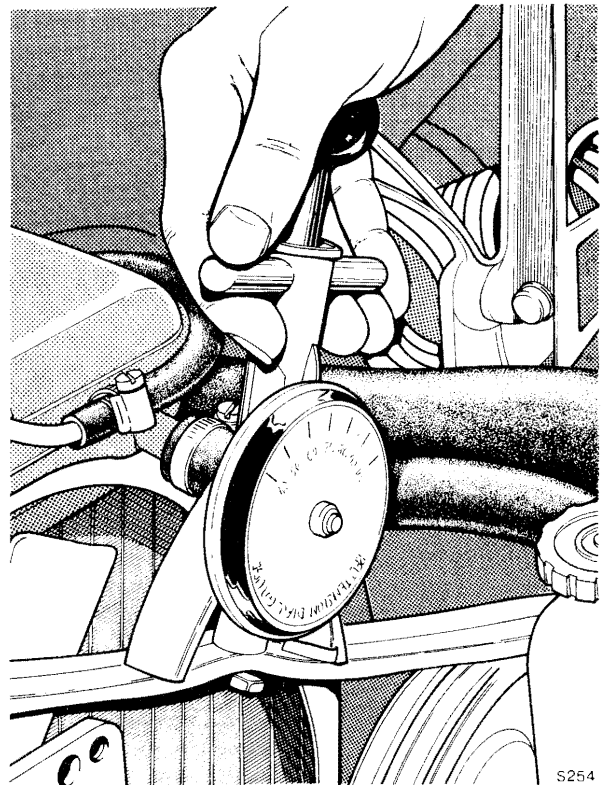
6. Insert the impeller end of the shaft into the outer end of the bearing housing. Using a soft headed mallet, tap the bearing into the bore until



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FIG. L7 SHAFT SEAL AND COUNTERFACE

- 1 Counterface
- 2 Sealing gland assembly
- 3 Gland cover



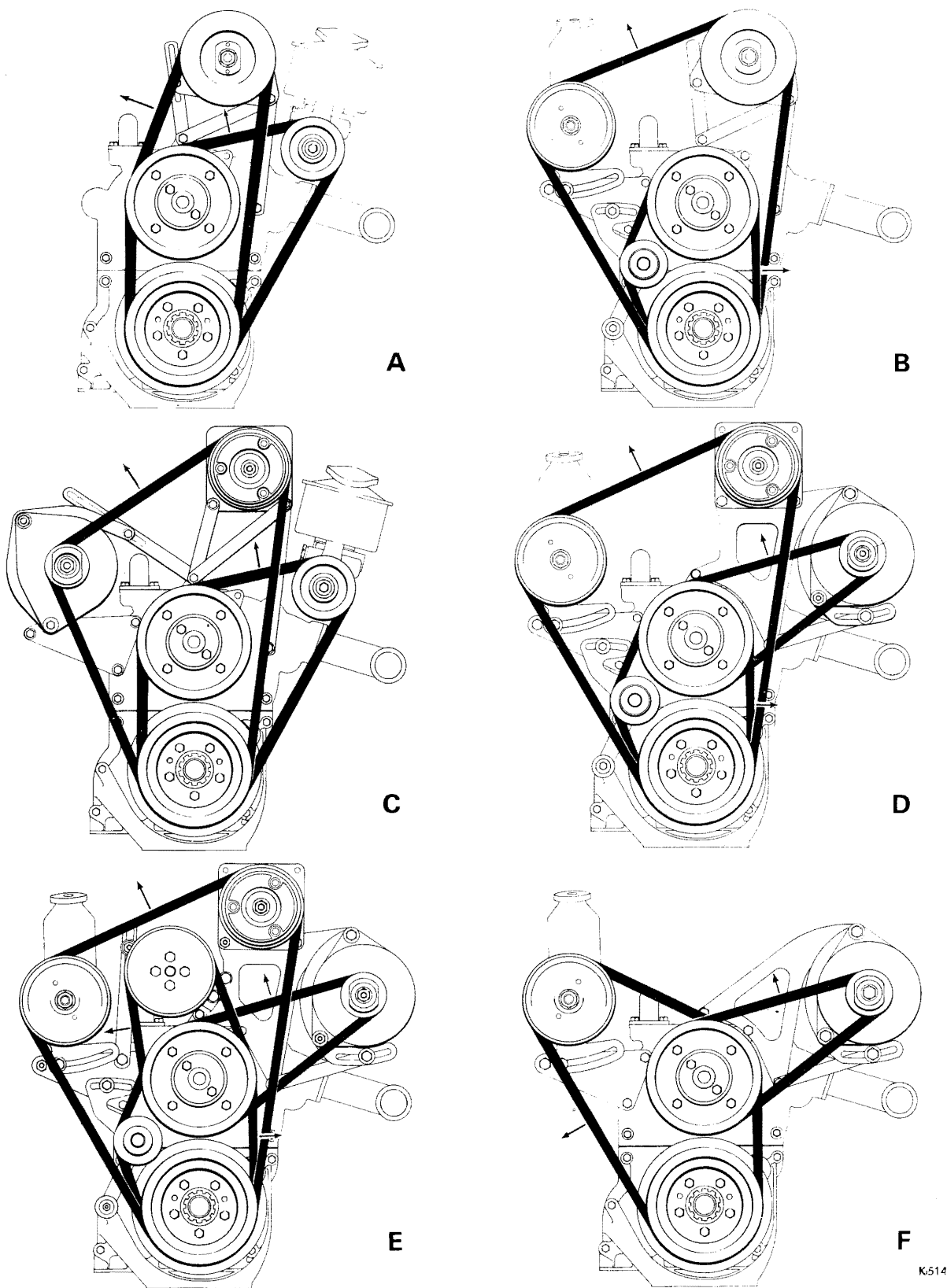
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FIG. L8 BELT TENSION METER

the locating holes are aligned. Fit the locating screw.

7. Ensure the inner end of the shaft and the

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FIG. L9 BELT LAYOUT AND TENSION CHECKING POINTS

- | | |
|--|--|
| <p>A Standard cars</p> <p>C Early refrigerated cars</p> <p>E Cars fitted with the exhaust emission control system</p> | <p>B Standard car - Saginaw steering pump</p> <p>D Later refrigerated cars</p> <p>F Standard car - Alternator and Saginaw steering pump</p> |
|--|--|

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impeller bore are free from burrs.

8. Lightly smear the contact surfaces with Retinax 'A' grease.

9. Press the impeller into position on the shaft. The inner face of the impeller must be flush with the end of the shaft.

10. Spin the assembly to ensure the shaft rotates freely.

Coolant pump - To fit

If the coolant pump casing was detached from the engine it should be fitted by reversing the procedure given for its removal. A new Neoprene sealing strip should be fitted to the bottom edge of the casing.

1. Remove any burrs which may exist on the joint face of the pump casing by lightly stoning with a fine carborundum stone.

2. Modify a new coolant pump casing gasket to suit the coolant pump casing.

3. All bolts should be tightened to the standard torque tightness figures, relative to size, shown in Chapter P.

4. Fit the belt driven auxiliaries as described in Chapter U for the air injection pump, Chapter N for the steering pump, Chapter C for the refrigeration compressor and Chapter M for the alternator.

5. Ensure a new strip of polyether foam is fitted between the upper quadrants of the fan cowl and radiator, before securing.

6. Examine all hoses for deterioration and renew any that are unserviceable. Check the security of all worm drive clips.

7. Fill the cooling system with the correct anti-freeze/water mixture as shown in Section L1 Cooling system - To fill, pouring slowly to avoid air locks.

8. Carefully examine all joints and hoses for leaks.

Belt tensioning (see Figs. L8 and L9)

The belt tensioning recommended for the various engine driven external auxiliaries must be checked at a point midway between the two pulleys by the use of a belt tension meter (see Fig. L8), or by applying a spring balance to give a 9,5 mm. ($\frac{3}{8}$ in.) belt deflection.

In a pair of belts, if the tension of one belt differs markedly from the other, a new matched pair must be fitted.

Belt dressing must not be applied to prevent slip.

Early cars - Holbourn Eaton steering pump (see Fig. L9 diagram A)

Spring balance load applied between -

Steering pump and coolant pump 3,6 kg. (8 lb.)

Crankshaft and generator 2,7 kg. (6 lb.)

Early cars - Saginaw steering pump (see Fig. L9, diagram B)

Spring balance load applied between -

Crankshaft and coolant pump 7,26 kg. (16 lb.)

Steering pump and generator 3,60 kg. (8 lb.)

Early refrigerated cars - Holbourn Eaton steering pump (see Fig. L9, diagram C)

Spring balance load applied between -

Steering pump and coolant pump 3,6 kg. (8 lb.)

Refrigeration compressor and alternator 2,7 kg. (6 lb.)

Later refrigerated cars - Saginaw steering pump (see Fig. L9, diagram D)

Spring balance load applied between -

Crankshaft and coolant pump 7,26 kg. (16 lb.)

Coolant pump and alternator 3,6 kg. (8 lb.)

Steering pump and refrigeration compressor 4,1 kg. (9 lb.)

Later refrigerated cars - Saginaw steering pump and fitted with air injection pump for exhaust emission control (see Fig. L9, diagram E)

Crankshaft to cooling pump

Load may be applied on either side of the belt run.

Belt tension meter 23 kg. (50 lb.)

Spring balance 4,1 kg. (9 lb.)

Coolant pump to alternator

Load may be applied on either side of the belt run.

Belt tension meter 23 kg. (50 lb.)

Spring balance 3,6 kg. (8 lb.)

Steering pump to refrigeration compressor

Load must be applied on the top run of the belts.

Each belt to be checked individually.

Belt tension meter 32 kg. (70 lb.)

Spring balance 4,1 kg. (9 lb.)

Coolant pump to air injection pump (car fitted with exhaust emission control system)

Load may be applied on either side of the belt run.

Belt tension meter 18 kg. (40 lb.)

Spring balance 5,44 kg. (12 lb.)

The difference between the spring balance loads for similar belt tension meter loads is due to the varying lengths of belt between the individual pulley centres.

Later standard cars - Alternator and Saginaw steering pump (see Fig. L9, diagram F)

Spring balance load applied between -

Coolant pump and alternator 4,1 kg. (9 lb.)

Crankshaft and coolant pump 3,6 kg. (8 lb.)

Section L5**DIMENSIONAL DATA**

Spider bore	18,910 mm. to 18,923 mm. (0.7445 in. to 0.7450 in.)
Impeller end of shaft	16,185 mm. to 16,198 mm. (0.6372 in. to 0.6377 in.)
Spider/flange end of shaft	18,948 mm. to 18,961 mm. (0.7460 in. to 0.7465 in.)
Impeller bore	15,88 mm. to 15,893 mm. (0.625 in. to 0.6255 in.)
Flange bore	18,905 mm. to 18,923 mm. (0.7443 in. to 0.7450 in.)

Section L6

WORKSHOP TOOLS

Tool Number	Description
RH 7098	Extractor - Coolant Pump Impeller
RH 7099	Extractor - Coolant Pump Driving Spider
RH 8615	Extractor - Coolant Pump Driving Flange

Chapter M

ELECTRICAL SYSTEM

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Chapter M

ELECTRICAL SYSTEM

Section M1

BATTERY

Introduction

The electrical system is negative earth.

Electrical components not described within this chapter are given in the following list:

Electric gear change actuator	- Chapter T - Transmission
Electric fuel pumps	- Chapter K - Fuel System
Air conditioning e.g. Servo module, voltage stabiliser	- Chapter C - Air conditioning
Exhaust emission control e.g. Primary & secondary EGR lock-out switches	- Chapter U - Emission Control Systems

Important It is imperative that the negative (earth) lead is disconnected from the battery before commencing work on the electrical system or components, or if any electric arc welding is to be used on the motor car.

THE BATTERY MUST NOT BE CONNECTED OR DISCONNECTED WHEN THE ENGINE IS RUNNING.

Battery—To remove (see Fig. M1)

Important The acid in the battery is highly corrosive - do not spill.

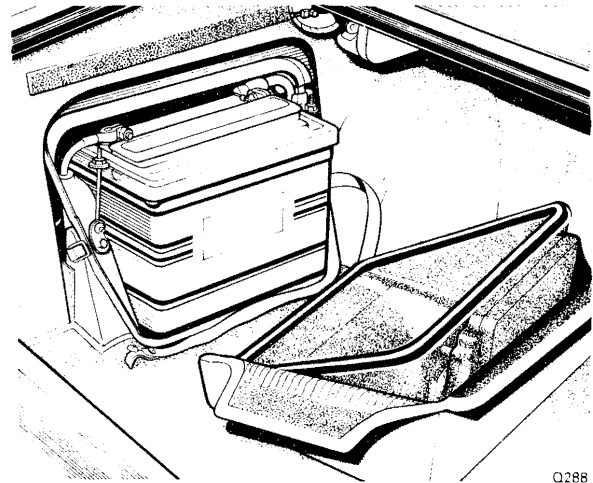


FIG. M1 ACCESS TO BATTERY

1. Remove the trim panel covering the battery in the luggage compartment; the panel is held in position with contact strip or press studs.
2. Unclip the retaining strap.
3. Remove the battery cover and small tools tray.
4. Remove the two battery securing clamps.
5. Disconnect the battery terminals.
6. Protect the carpet with paper and carefully lift the battery from the car.

Chapter M

Battery—To fit

Reverse the procedure given for removal, noting the following points.

1. **Ensure that the correct battery lead is fitted to the correct terminal, i.e. negative to negative, otherwise damage to electrical components will occur.**
2. **Verify that the battery terminals are secure and positioned correctly.**
3. **Smear the terminals with petroleum jelly. (Do not use grease).**

Corrosion

To remove corrosion from the battery leads and terminal posts, disconnect the leads and wash with hot water or a dilute solution of ammonium carbonate

The ammonium carbonate solution must be removed with clean water; thoroughly dry the leads and terminal posts with a cloth.

Connect the battery leads to the terminal posts on the battery and smear with petroleum jelly.

Specific gravity—To check

1. Remove the battery as described in Battery - To remove.
2. Using a hydrometer, obtain the specific gravity and compare the reading against the figures given in Table 1.

Battery—To top-up

1. Remove the battery from the car.
2. Remove the cover from the filling trough.
3. Fill the trough with distilled water.
4. Clean and refit the trough cover.

The cover will press down on each valve and allow an equal amount of distilled water to enter each cell.

5. With a damp cloth, clean the top of the battery; do not use petroleum or paraffin etc.
6. Refit the battery and ensure that the battery terminals are secure and positioned correctly.

Note On late European cars, the battery has individual screw vent caps.

Initial charge—For new batteries

1. The acid specific gravity figures given in Table 1 are corrected to 15.6°C (60°F). To the specific gravity obtained add 0.004 for every 5.6°C (10°F) above this temperature. e.g. Measured specific gravity at 32.3°C (90°F) is 1.265, corrected specific gravity 1.277.

2. Fill the battery with cool accumulator acid preferably between 4°C (40°F) and 27°C (80°F) of the correct specific gravity given in Table 1.

3. The electrolyte level will fall soon after filling and must be restored by the addition of more electrolyte, after which the battery must be allowed to stand for 3 hours. At the end of this period, topping up will again be necessary to obtain the correct level.

4. The recommended charge rate is 7 amp. for 12 hours. The charge may be interrupted provided that the charging periods are of at least 8 hours and the rest periods not exceeding 16 hours.

5. The charge will not be complete until the total specified charging time has expired, the voltage and specific gravity of each cell has remained constant throughout 5 successive hourly readings and gas is freely emitted from each cell.

Table 1

Dagenite Demon battery

Air Temperature below 32°C. (90°F.)

Specific Gravity	Condition of Battery
1.270 to 1.290	Fully charged
1.180 to 1.200	Half discharged
1.090 to 1.110	Fully discharged

Air Temperature above 32°C. (90°F.)

Specific Gravity	Condition of Battery
1.220 to 1.240	Fully charged
1.150 to 1.170	Half discharged
1.070 to 1.090	Fully discharged

Lucas Pacemaker battery

Air Temperature below 27°C. (80°F.)

Specific Gravity	Condition of Battery
1.270 to 1.290	Fully charged
1.180 to 1.200	Half discharged
1.090 to 1.110	Fully discharged

Air Temperature above 27°C. (80°F.)

Specific Gravity	Condition of Battery
1.220 to 1.240	Fully charged
1.130 to 1.150	Half discharged
1.050 to 1.070	Fully discharged

6. On completion of the charge, the specific gravity of the acid in each cell should not exceed the values stated in Table 1; if it does, acid must be withdrawn from the cell(s) and an equal volume of distilled water added. The battery should then be charged for a further one hour and the specific gravity measured again.

The final adjustment of the acid level should be made after the battery has been allowed to stand for two hours to allow excess gas to escape and the electrolyte level to fall.

Battery—To charge

1. Remove the battery from the car.
2. Ensure that the battery charger is switched off.
- 3. Connect the battery charger leads to the battery, ensuring that the positive lead of the charger is connected to the positive terminal of the battery and the negative lead to the negative terminal.**
4. Check that the filling trough cover is firmly in position (or screw caps fitted).
5. Switch on the battery charger and adjust the charging current to 7 amps (Max).
6. Periodically measure the specific gravity of the electrolyte with a hydrometer and compare with the values shown in Table 1, when the fully charged value is attained, the charging is completed.

A filled battery should not be allowed to remain in a discharged condition, it should be maintained in a fully charged condition by giving it a fresh charge once a month. The battery should be fully charged before it is put back into service.

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Section M2

FUSE PANEL

The fuse panel is situated below the facia on the driver's side of the car (see Figs. M2 & M3).

To gain access to the fuse panel, unscrew the knurled retaining screw and lower the panel; an identification plate is fitted between the padded housing and supporting framework.

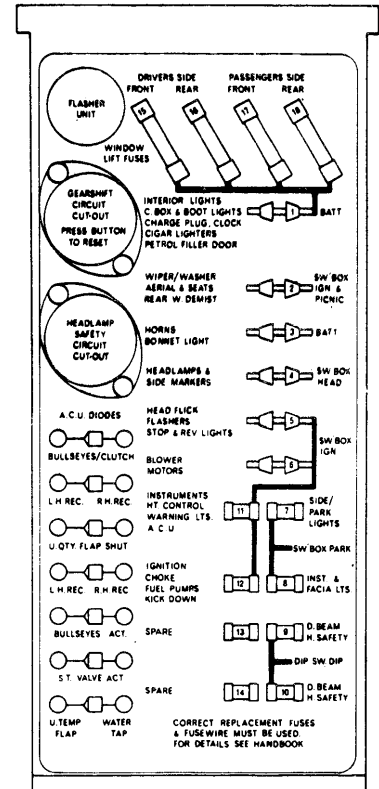
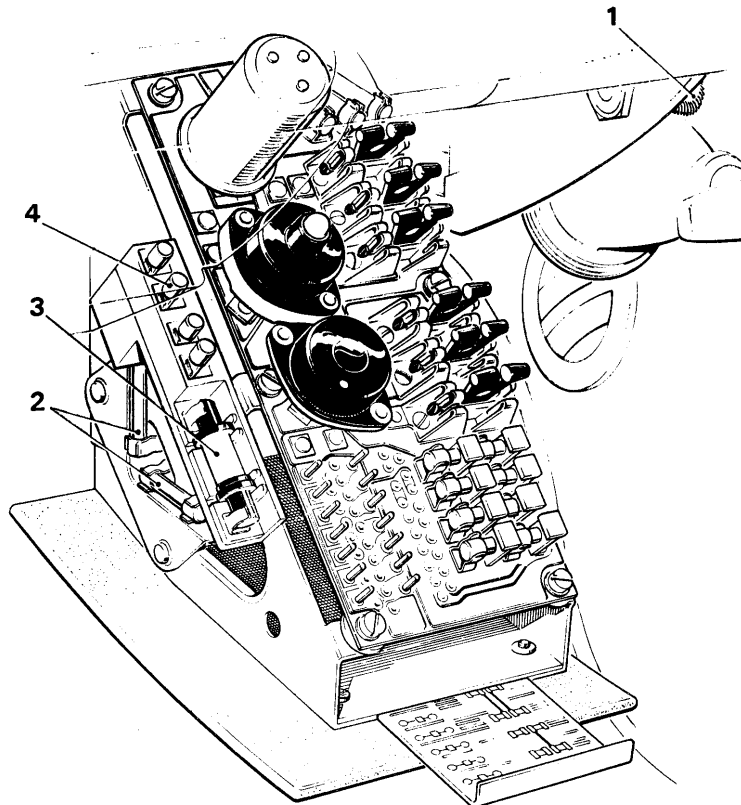
Important It is important to note that if new glass fuses are required, they should be of 'Bulgin' manufacture and of the correct rating.

The fuse panel also houses the direction indicators flasher unit, the thermal cut-out button for the transmission actuator and the thermal cut-out for the headlamps protection circuit.

If a refrigeration unit is fitted to the car, the fuse panel has seven small diodes fitted to prevent feedback from the electric actuators (see Fig. M4). The diodes have the following identification numbers: DD 000 or 49453A. The identification plate clearly shows the positions.

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FIG. M2 FUSE PANEL (EARLY CARS)

- 1 Fuse panel knurled retaining screw
- 2 Electrically operated front seat fuses

- 3 Bobbin of spare fuse wire
- 4 Spare fuses (4)

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Fuse panel—To remove

The glass fuses are fitted with a plastic extractor. The bakelite fuses have an integral grip.

The flasher unit, the thermal cut-out with re-set button and the headlamp protection thermal cut-out have blade terminals. To remove the fuse panel printed circuit base proceed as follows.

1. Remove the knurled retaining screw and the six screws securing the panel to the support framework.
2. Lift the fuse panel carefully from the supporting frame sufficiently to enable the wiring

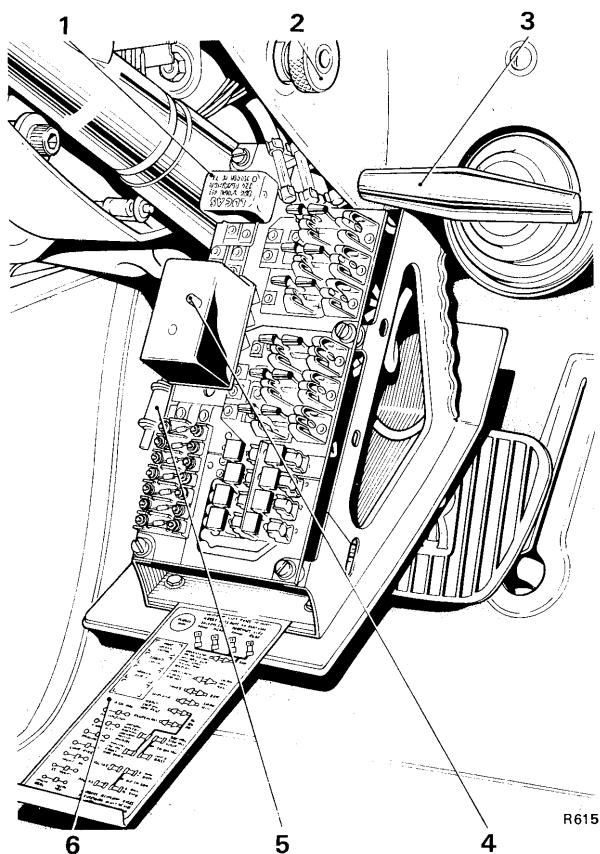


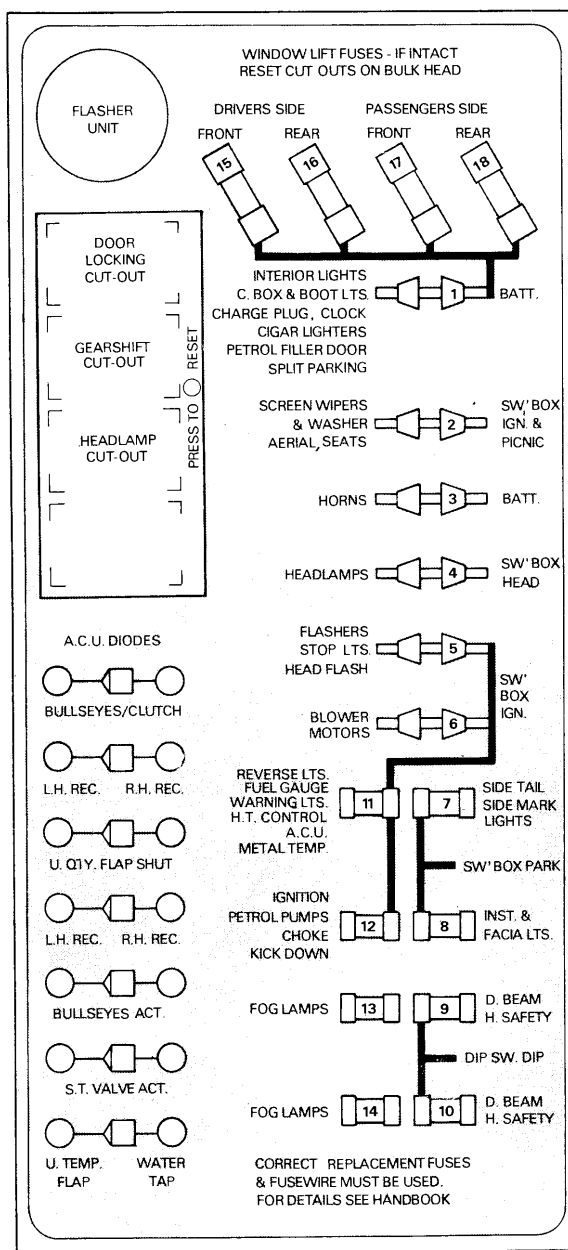
FIG. M3 ACCESS TO THE MAIN FUSEBOX (LATE CARS)

- 1 Flasher unit
- 2 Fusebox securing screw
- 3 Handbrake
- 4 Thermal cut-out reset button
- 5 Bobbin of spare fuse wire
- 6 Fuseboard identification plate

loom sockets to be detached. Each socket is designed to fit only the terminals from which it was removed.

Diode—To renew

It is important to note the position of the existing diodes to ensure correct assembly before attempting to renew one or more of the diodes. The red end of the diode is fitted toward the left-hand terminal of the fuse panel. The diode connectors are secured to the fuse panel by small nuts, bolts and washers.



M975

Gearchange selector thermal cut-out (see Figs. M2 & M3)

If work is to be carried out on the car with the engine running, it is strongly recommended that the

gear range selector thermal cut-out be removed from the fuse panel. This will isolate the gear range selector.

The gear range selector thermal cut-out is removed by pulling away from the fuse panel.

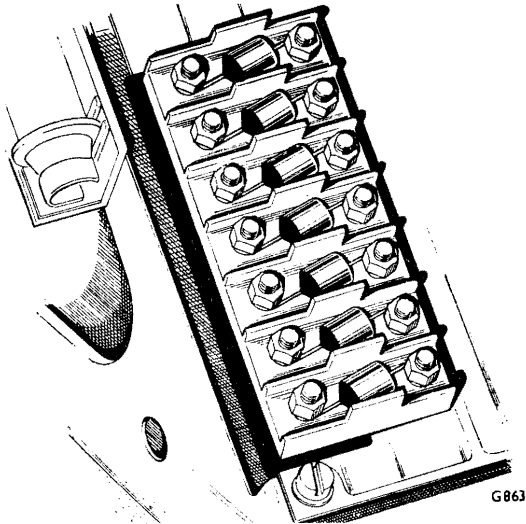
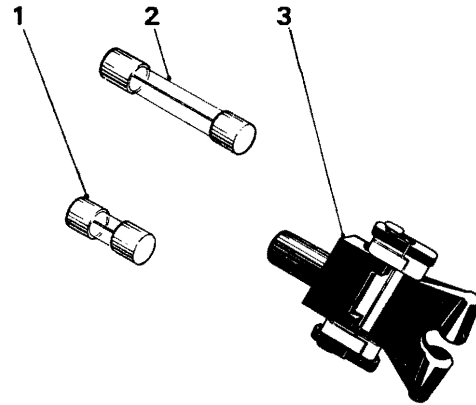


FIG. M4 POSITION OF DIODES ON FUSE PANEL



L101

FIG. M5 FUSE IDENTIFICATION

- 1 Small glass fuse - 10 amp. rating
- 2 Large glass fuse - 30 amp. rating
- 3 Bakelite fuse - 22 amp. rating

Section M3

DISTRIBUTOR, IGNITION COIL
AND SPARKING PLUGS**Distributor—To remove (not Opus)
(see Fig. M6)**

1. Remove the distributor cap.
2. Remove the gearchange selector thermal cut-out as described in Section M2.
3. Turn the crankshaft in the normal direction of rotation until 'A1' piston is approaching T.D.C. on the firing stroke. This can be checked by the position of the rotor arm.
4. Remove the cover from the flywheel housing.
5. Rotate the flywheel to the correct ignition timing mark (refer to Table 2).
6. If preferred, the crankshaft damper timing mark and timing points may be used.

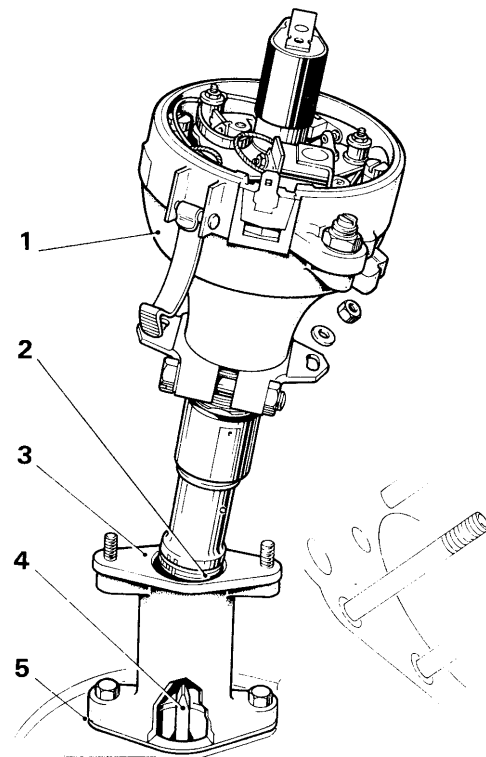
Note The flywheel must always be turned in the normal direction of rotation (anti-clockwise when viewed from the rear of the engine). If rotated clockwise, an inaccurate setting may be obtained due to backlash in the timing gears and camshaft end float.

6. Disconnect the low tension lead from the terminal on the distributor casing.
7. Unscrew the two setscrews securing the distributor to the crankcase.
8. Withdraw the distributor.

Distributor—To fit (not Opus)

Reverse the procedure given for removal, noting the following points. Should the crankshaft be inadvertently rotated while the distributor is removed from the engine, the correct position for ignition timing should be obtained as follows.

1. Remove 'A' bank rocker cover from the right-



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FIG. M6 DISTRIBUTOR REMOVAL

- 1 Distributor body
- 2 'O' ring
- 3 Pedestal
- 4 Distributor driving tongue
- 5 Joint

Chapter M

hand side of the engine - when viewed from the driving seat.

2. Rotate the crankshaft by hand at least one full turn in the normal direction of rotation, until the 'AI' inlet valve has opened and just closed.

3. Further rotate the crankshaft in the correct direction of the rotation until the flywheel is at T.D.C.

4. Fit the 'A' bank rocker cover.

5. Renew the neoprene seal at the base of the distributor housing.

6. Fit the distributor with the rotor arm adjacent to the contact breaker adjuster.

7. Set the ignition timing as described in

Ignition timing - To set.

Contact breaker points—To remove

Cars prior to Car Serial Number 8742

1. Remove the distributor cap and rotor arm.
2. Remove the nuts from the posts to which the contact breaker points are anchored.

3. Remove the insulating pieces and electrical connections and lift the contact breaker levers off the pivot points.

4. Remove the screws which secure the fixed contact points.

5. Remove the fixed contact breaker from the distributor.

6. Examine the contact points for 'pitting' and 'piling' and if necessary clean with a fine carborundum stone, ensuring that the contact faces are square. If the contact surfaces are badly damaged they should be renewed.

Contact breaker points—To adjust

Cars prior to Car Serial Number 8742

1. Slacken the two screws which secure the fixed contact point.
2. Using a screwdriver in the contact breaker adjusting slot (*see Fig. M7*), set the gaps to between 0,356 mm. and 0,406 mm. (0.014 in. and 0.016 in.).
3. Lubricate the distributor cam with the approved lubricant (*see Chapter D - Lubricants*).

Ignition timing—To set (static)

Cars prior to Car Serial Number 8742

1. The ignition timing must be set with the octane selector in the fully advanced position, as follows.
2. Release the lock-nut and set the octane selector scale to 'A' (*see Fig. M7*).
3. Turn the distributor spindle until the rotor arm aligns with Number 'AI' cylinder ignition period.
4. Release the distributor clamping screw.
5. Rotate the distributor body until the contact breaker points opposite the vacuum housing are just breaking.
6. During the above operation, hold the top of the rotor in the fully retarded position (anti-clockwise rotation) to take up any backlash in the centrifugal advance mechanism.
7. Clockwise rotation of the distributor advances the ignition timing and anti-clockwise rotation retards the ignition timing.
8. To check when the contact points are breaking, use an ignition timing lamp.
9. Tighten the distributor clamping screw to lock the body in position.
10. Rotate the crankshaft two full turns in the normal direction of rotation and with the aid of the ignition timing lamp, again check to ensure that the contact points are just breaking when the rotor arm is in line with Number 'AI' firing position and the flywheel is at T.D.C.

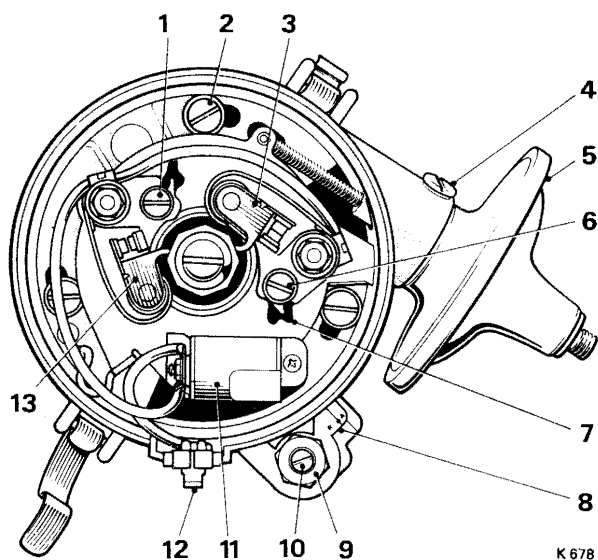
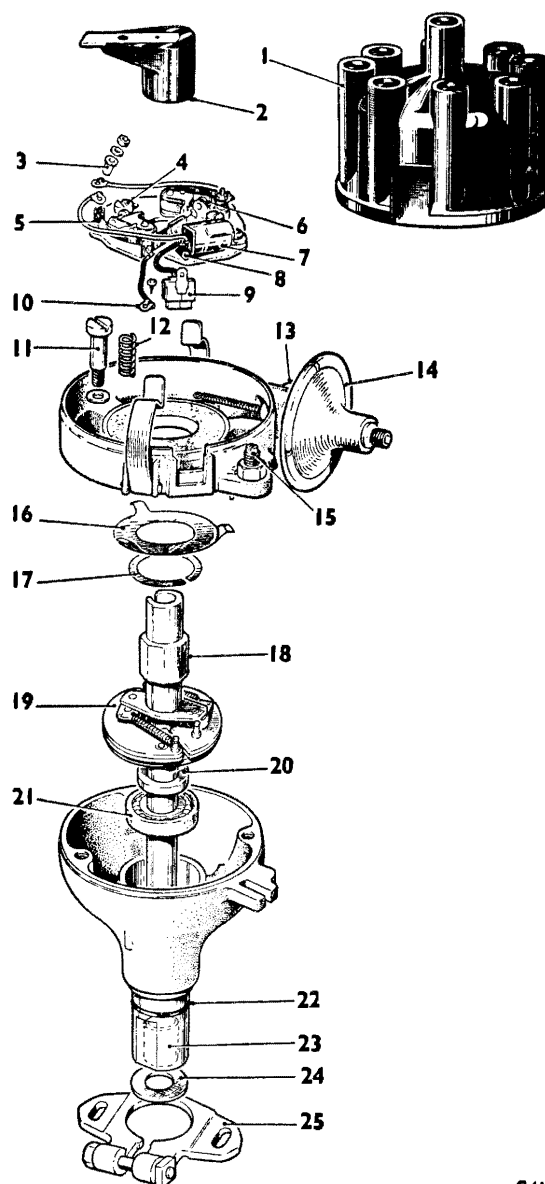


FIG. M7 INTERNAL VIEW OF DISTRIBUTOR

- 1 Fixed contact plate securing screw
- 2 Contact breaker housing securing screw
- 3 Contact breaker
- 4 Vacuum housing unit securing screw
- 5 Vacuum timing control unit
- 6 Fixed contact securing screw
- 7 Contact breaker gap adjusting slot
- 8 Octane selector scale
- 9 Octane selector adjusting screw lock-nut
- 10 Adjusting screw
- 11 Condenser
- 12 Low tension terminal
- 13 Contact breaker

FIG. M8 EXPLODED VIEW OF DISTRIBUTOR

- 1 Distributor cap
- 2 Rotor
- 3 Bush
- 4 Fixed contact retaining screw
- 5 Contact set
- 6 Contact
- 7 Condenser
- 8 Fibre insulating tab
- 9 Low tension terminal
- 10 C.B. earth lead
- 11 Fixed screw C.B. housing
- 12 Spring-screw-C.B. housing
- 13 Vacuum unit fixing screw
- 14 Vacuum unit timing control
- 15 Octane selector adjusting screw—eccentric
- 16 Star spring
- 17 Circlip
- 18 Cam
- 19 Centrifugal timing control
- 20 Distance piece
- 21 Bearing
- 22 Sealing ring
- 23 Bearing bush
- 24 Thrust washer (fibre)
- 25 Securing plate



Ignition timing—To set (stroboscopic method)

Cars prior to Car Serial Number 8742

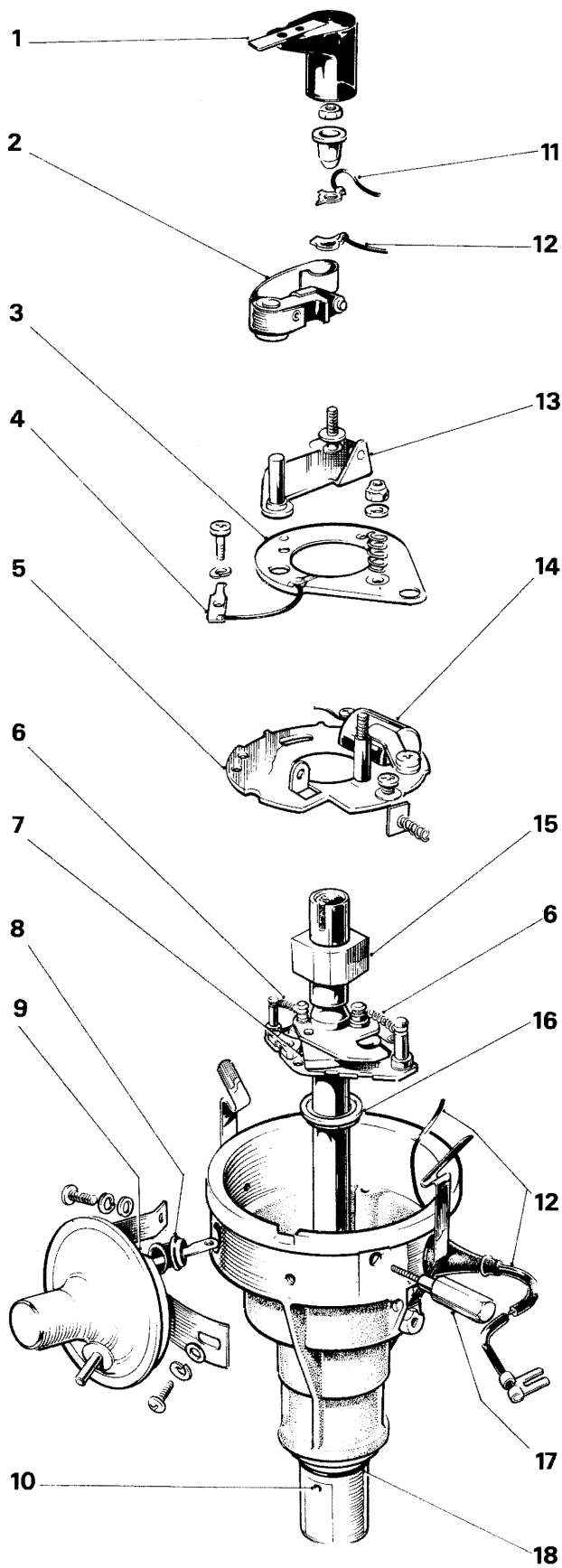
To carry out the ignition timing proceed as follows.

1. Run the engine until normal operating temperature is reached and the automatic choke is in the off position.
2. Stop the engine.
3. Check that the octane selector position is in the fully advanced position and that the scale is set to the 'A' mark and adjust if necessary (*see Fig. M7*). Adjustment is carried out by slackening the lock-nut and turning the slotted screw.
4. Ignition timing is carried out on 'A1' cylinder and should be set to 3° B.T.D.C. The 'A' bank is the right-hand side and the 'B' bank is the left-hand side when viewed from the driver's seat.
5. Connect a stroboscope and an electric impulse tachometer to the ignition system as described in the manufacturer's instructions.
6. Start the engine then adjust the throttle stop to give an idle speed of 500 r.p.m.
7. Direct the flashing light of the timer on to the crankshaft damper timing marks and timing pointer.

8. Check and adjust the ignition timing if necessary. To adjust the timing, release the clamp screw on the distributor and rotate the head of the distributor in the appropriate direction until the correct timing is obtained. Clockwise rotation of the distributor head advances the ignition and anti-clockwise rotation retards the ignition. After adjustment has been carried out, tighten the clamp screw and again check the timing to ensure that it has not altered whilst tightening the clamp screw.
9. Adjust the throttle stop to give an idle speed of between 550 r.p.m. and 600 r.p.m.
10. Switch off the ignition.
11. Remove the tachometer and stroboscopic timing equipment.

Note If the car is operating in a territory where only low octane fuels are available, it will be necessary to retard the ignition to obtain optimum performance.

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FIG. M9 EXPLODED VIEW 35 D8 DISTRIBUTOR

- 1 Rotor arm
- 2 Contact breaker
- 3 Contact breaker base plate
- 4 Earth cable
- 5 Contact breaker bearing plate
- 6 Centrifugal timing control springs
- 7 Centrifugal timing control weights
- 8 Grommet
- 9 Vacuum unit
- 10 Oil release hole
- 11 Low tension cable
- 12 Low tension lead
- 13 Fixed contact
- 14 Capacitor
- 15 Cam
- 16 Distance collar
- 17 Contact breaker adjuster
- 18 'O' ring

Contact breaker points—To remove

Cars from Car Serial Number 8742

1. Remove the distributor cap and rotor.
2. Remove the nut from the terminal post.
3. Remove the electrical connections and contact breaker spring.
4. Remove the moving contact.
5. Unscrew the cheese-headed screw securing the fixed contact.
6. Remove the fixed contact.
7. Examine the contact points for 'pitting' and 'piling', and if necessary clean them with a fine carborundum stone, ensuring that the contact faces are square. If the contact surfaces are damaged, they should be renewed.

Contact breaker points—To fit

1. Reverse the procedure given for removal.
2. Set the dwell angle as described in Dwell angle To set.

Dwell angle—To set

Cars from Car Serial Number 8742 without Opus ignition

1. Fit a dwell angle meter to the engine as described in the manufacturer's instructions.
2. Check that the dwell angle (cam closed position) is between 26° - 28°.
3. Adjust the dwell angle by turning the hexagonal adjustment screw (see Fig. M9).

Ignition timing—To set (static)

Cars from Car Serial Number 8742 without Opus ignition

1. Turn the distributor spindle until the rotor arm aligns with Number 'A1' cylinder ignition period.
2. Release the distributor clamping screw.
3. Rotate the distributor body until the contact breaker points are just breaking.
4. During the above operation hold the top of the rotor arm in the fully retarded (anti-clockwise rotation) position to take up any backlash in the centrifugal advance mechanism.
5. Clockwise rotation of the distributor advances the ignition timing and anti-clockwise rotation retards the ignition timing.
6. To check when the contact points are breaking, use an ignition timing lamp.
7. Tighten the distributor clamping screw to lock the body in position.
8. Rotate the crankshaft two full turns in the normal direction of rotation and with the aid of the ignition timing lamp, again check to ensure that the contact points are just breaking when the rotor arm is in line with Number 'A1' firing position and the flywheel is at T.D.C.

Ignition timing—To set (stroboscopic method)

Cars from Car Serial Number 8742

For cars fitted with the Exhaust Emission Control System, refer to Chapter U - Exhaust Emission Control System.

For all other cars proceed as follows.

1. Run the engine until normal operating temperature is reached and the automatic choke is off.
2. Stop the engine.

Note Ignition timing is set to 5° B.T.D.C. on A1 cylinder; A1 cylinder is the front cylinder on the left-hand side when viewed from the front of the engine.
3. Set the dwell angle as described in Dwell angle - To adjust. (Not applicable to Opus).
4. Connect a stroboscope and an electric impulse tachometer to the engine as described in the manufacturer's instructions.
5. Start the engine and adjust the fixed throttle screw to give an idle speed of 800 r.p.m.
6. Direct the flashing light of the timer on to the crankshaft damper timing marks and timing pointer.
7. Check and if necessary adjust the ignition timing. To adjust the timing, release the clamp screw on the distributor and rotate the head of the distributor in the appropriate direction until the correct timing is obtained. Clockwise rotation of the distributor head advances the ignition and anti-clockwise rotation retards the ignition. After adjustment has been carried out tighten the clamp screw and again check the timing to ensure that it has not altered whilst tightening the clamp screw.

8. Adjust the throttle screw to give an idle speed of 600 r.p.m.
9. Switch off the ignition.
10. Remove the tachometer and stroboscopic timing equipment.

Table 2

For cars fitted with Emission Control Systems, refer to Chapter U. All other cars are as follows:

Car Serial Number	Timing
Up to 9000	3° B.T.D.C. @ 500 r.p.m.
9001 to 22117	5° B.T.D.C. @ 800 r.p.m.
22118 onwards	15° B.T.D.C. @ 1200 r.p.m.

Distributor—To dismantle and overhaul

Cars prior to Car Serial Number 8742

An exploded view of the distributor is shown in Figure M8.

Note Before dismantling take care to note the position of the parts in relation to each other to ensure correct re-assembly.

1. Remove the distributor from the crankcase as described in Distributor - To remove.
2. Remove the contact breaker points.
3. Remove the condenser.
4. Remove the three spring-loaded screws.
5. Withdraw the upper portion of the distributor to expose the centrifugal advance mechanism.
6. Remove the circlip which retains the star washer on the underside of the contact breaker housing.
7. Lift the contact breaker base plate out of the housing.
8. Remove the screw securing the vacuum control unit and remove the unit.
9. Remove the cam spindle screw and withdraw the cam assembly.
10. Lift the weights, springs and toggles off the action plate.
11. Withdraw the tapered retaining pin securing the driving sleeve to the shaft.
12. Remove the driving sleeve from the shaft; lift off the thrust washer.
13. Press out the driving shaft from the distributor body, taking care not to lose the distance piece positioned beneath the centrifugal timing control mounting plate.

Distributor—To inspect

Cars prior to Car Serial Number 8742

1. Check the bearing at the top of the distributor body shaft housing. If excessive wear or roughness is detected the bearing should be renewed. The bearing should be removed using a 'Claw' extractor.

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2. Renew the neoprene seal located below the bearing.
3. To facilitate removal and fitting of the bearing, heat the distributor body to a temperature of 110 °C. (230 °F.) to 120 °C. (248 °F.).
4. Check the shaft for wear and parallelism.
5. If the shaft is excessively worn, renew the shaft.
6. If a new shaft is fitted, or if the original shaft is to be fitted, renew the bush at the base of the distributor body and ream to size.
7. Check the condition of the centrifugal advance springs; renew if necessary.
8. Check the condition of the contact breaker points; renew if necessary.

Distributor—To assemble

**Cars from Car Serial Number 8742
(not Opus)**

Reverse the procedure given for dismantling, noting the following points.

1. Fit the distance collar to the shaft before fitting the shaft to the distributor body.
2. Ensure that the vacuum advance peg engages correctly with the vacuum unit spring link.
3. Renew the externally fitted 'O' ring oil seal, situated below the body casting.

Distributor—To dismantle

**Cars from Car Serial Number 8742
(not Opus)**

An exploded view of the distributor is shown in Figure M9. Before dismantling take care to note the position of the parts in relation to each other to ensure correct assembly.

1. Remove the distributor from the crankcase as described in Distributor - To remove.
2. Remove the distributor cap, rotor arm and contact breaker.
3. Unscrew the contact breaker gap adjuster; remove the adjuster, spring and plastic friction plate.
4. Unscrew and remove the nut, washer and spring that secures the contact breaker base plate.
5. Remove the screw securing the contact breaker base plate earth lead to the contact breaker bearing plate.
6. Lift off the base plate.

Cars fitted with vacuum retard unit

7. Remove the two screws securing the vacuum unit bracket to the distributor; remove the unit and rubber grommet.
8. Remove the two screws from the contact breaker bearing plate; lift out the plate.
9. Remove the centrifugal advance springs from their anchor points on the cam foot.
10. Unscrew and remove the screw and felt from the top of the cam; remove the cam.

11. Remove the driving gear and withdraw the shaft and plate assembly from the distributor body.

Note Retain the distance collar located on the shaft below this plate.

Distributor—To inspect

**Cars from Car Serial Number 8742
(not Opus)**

1. Check the bearings at the top and bottom of the distributor body shaft housing. If excessive wear or roughness is detected the distributor body must be renewed.
2. Check the shaft for wear and parallelism.
3. If the shaft is excessively worn, renew the shaft.

Distributor—To assemble

**Cars from Car Serial Number 8742
(not Opus)**

Reverse the procedure given for removal, noting the following points.

1. Lightly smear the cam spindle, weight pivots and working surfaces of the weights with Rocol 'Moly Pad'.
2. Lubricate the shaft with Retinax 'A' or equivalent grease.
3. Ensure that the distance collar is on the shaft just below the action plate.
4. Ensure that the cam foot pivots are correctly located in the weights before tightening the cam screw.
5. Lubricate the felt pad with engine oil.
6. Smear the contact breaker base plate pivot point (located on the contact breaker bearing plate), the exposed surface of the adjustment plate, the nylon 'pips' on the underside of the base plate, and the vacuum unit linkage (if fitted) with Retinax 'A' or equivalent grease.
7. Smear the contact breaker heel pivot post with Retinax 'A' or equivalent grease.
8. Set the dwell angle as described in Dwell angle - To set.

Distributor—Opus ignition

Important On no account must the Opus ignition distributor be dismantled. If a distributor is faulty it must be removed and a new distributor fitted.

Sparking plugs—To remove

1. Remove the high tension plug cables.
2. Unscrew and remove the sparking plugs.

Sparking plugs—To clean and check

1. Remove the sparking plugs.
2. Thoroughly clean in a suitable sparking plug cleaning machine.
3. Clean off all surplus abrasive material from the plug electrodes and threads with compressed air.
4. Inspect the electrodes for excessive wear.
5. Set the gap to the figures shown in Table 3.

Table 3

For cars fitted with Emission Control Systems, refer to Chapter U. All other cars are as follows:

Car Serial Number	Gap
Up to 22072	0,635 mm. (0.025 in.)
22073 onwards	0,76 mm. (0.030 in.)

Sparking plugs—To fit

Reverse the procedure given for removal, noting the following points.

1. Before fitting the sparking plugs, ensure that the threads are perfectly clean then lubricate with a small amount of 'Graphogen' grease.
2. Ensure that the steel washer is fitted to each sparking plug.
3. Fit and tighten the sparking plugs to between 1,79 kg.m. and 2,35 kg.m. (13lb.ft. and 17 lb.ft.).

Ignition coil—To remove

1. The coil is situated on the left-hand side of the distributor (when viewed from the driving seat).
2. Disconnect the battery.
3. Disconnect the low tension leads and suppressor.
4. Remove the high tension lead.
5. Remove the two setscrews and spacers securing the coil.
6. Remove the suppressor and coil ballast control.
7. Remove the coil.

Ignition coil—To fit

Reverse the procedure given for removal, noting the following points.

1. Ensure that the suppressor and low tension leads are fitted correctly. The coil is marked clearly + and -.
2. The suppressor must be connected to the positive coil terminal and the distributor cable to the negative terminal.

Section M4

STARTER MOTOR

Maintenance

The starter motor will operate for long periods before requiring attention and should need servicing only during major engine overhauls but a check should be made from time to time to ensure that the electrical connections are secure and clean.

Starter motor—To test in position

Starter motor cranks the engine, but at reduced speed.

1. Check the condition and connections of the battery.
2. Check the electrical connections on the starter circuit.

If the performance is still unsatisfactory after the previous checks, remove the starter motor from the car and check the starter motor as described in Starter motor - To bench test.

Starter does not crank the engine

1. Check the condition and connections of the battery.
2. Check the electrical connections on the starter circuit.
3. Disconnect the low tension (negative) lead from the ignition coil.
4. Connect a Zero to 20 Volt moving coil voltmeter between the starter solenoid switch main input terminal and earth.
5. Operate the starter motor and record the voltmeter reading.
6. Transfer the voltmeter positive lead from the starter solenoid switch main terminal on to the small setscrew terminal.
7. Again operate the starter motor and record the voltmeter reading.

Note The voltage measured in Operation 5 should not exceed by more than 0.6 volt the voltage measured in Operation 7.

If battery voltage is not available, trace the fault. If the external circuits are found to be satisfactory and the starter fails to operate, the starter must be removed and examined.

Starter motor—To remove

1. Place the car on a ramp or over a suitable pit.
2. Disconnect the battery.
3. Remove the electrical connections from the starter motor.
4. Remove the three setscrews and washers which secure the starter motor, then from beneath the car, lower the starter motor between the engine and front sub-frame sidemember.
5. Remove the packing piece(s) fitted between the starter motor flange and the crankcase end face, (if fitted).

Starter motor—To dismantle (see Fig. M10)

1. Remove the bolt, nut and washer and remove the end cover and sealing ring from the front of the starter motor.
2. Disconnect the flexible copper link between the lower solenoid terminal and the starter motor yoke; remove the brush inspection cover and carefully lift out the brushes.
3. Remove the two nuts securing the solenoid and withdraw the solenoid from the drive-end bracket casting, carefully disengaging the solenoid plunger from the starter drive engagement lever.
4. Remove the two 'through' bolts from the commutator end bracket, then remove the commutator end bracket and yoke from the intermediate drive-end bracket.

Chapter M

5. Slacken the lock-nut and remove the eccentric pin on which the starter drive engagement lever pivots.

6. Remove the drive-end bracket from the armature and intermediate bracket assembly.

7. Using an aluminium tube of a suitable diameter, (see Fig. M11) remove the thrust washer from the end of the armature shaft extension. Prise the jump ring from its groove and slide the drive assembly and intermediate bracket from the shaft.

8. Prise off the jump ring retaining the operating bush and engagement spring.

If there is excessive sparking at the commutator, check that the brushes are clean and free to move in their boxes and that the spring pressure is correct.

Measuring lock torque and lock current.

Carry out a torque test and compare the results with the values given in Chapter A - General Information. If a constant voltage supply is used, it is important to adjust this to 7.2 Volt at the starter terminal when testing.

Starter motor—Bench inspection

After dismantling the starter motor examine each component for damage and wear.

Starter motor—To bench test

Measuring the light running current.

Clamp the starter motor securely in a vice. Using a 12 Volt battery, check the light running current and compare it with the values given in Chapter A - General Information.

Brush gear and commutator—To service

1. Remove the starter motor as described in Starter motor - To remove. Clean the unit prior to removing the die-cast alloy cover and sealing ring.

2. Remove the two nuts which secure the die-cast cover and sealing ring to the starter motor; remove the cover.

3. Check that the brushes are of adequate length, the brushes must be renewed if they are worn to 8 mm. (5/16 in.).

4. Check the commutator for signs of 'pitting' and 'burning'. If necessary, clean it with a cloth moistened with petrol. If this proves to be unsatisfactory, the armature must be removed from the starter motor. Check that the bearing diameters

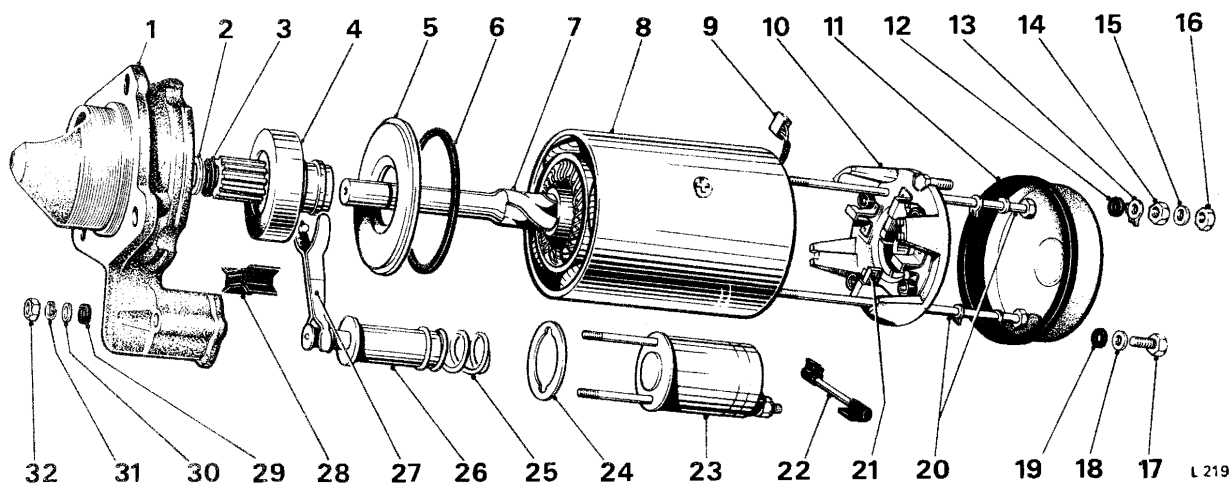


FIG. M10 EXPLODED VIEW OF STARTER MOTOR

1 Drive end bracket	10 Commutator end bracket	17 Setscrew	25 Spring—push off
2 Jump ring	11 Alloy end cover (showing rubber seal)	18 Washer	26 Plunger
3 Thrust collar	12 Seal	19 Seal	27 Operating lever (fork)
4 Roller clutch	13 Lock-washer	20 Through bolts and washers	28 Seal (rubber)
5 Intermediate bracket	14 Nut	21 Brush	29 Seal
6 Seal (rubber)	15 Washer	22 Strap—copper	30 Washer
7 Armature	16 Nut	23 Solenoid	31 Washer
8 Yoke		24 Gasket	32 Nut
9 Brush			

are true to centre, then set up the armature between the centres on a lathe and polish the commutator with fine glass paper; on no account should emery cloth or a similar abrasive be used.

5. If the commutator needs to be skimmed, the minimum diameter to which it may be reduced is 39,0 mm. (1.545 in.). After skimming, the commutator surface should be finally polished with very fine glass paper, on no account should emery cloth or a similar abrasive be used.

The insulation segments on the commutator must not be undercut.

Brushes—To remove

1. There are four brushes in the starter motor, two are connected to the brush boxes and two connected to the free ends of the field coils. Carefully prise open the field connections with a screwdriver and use a soldering iron to remove the solder from the connections. Remove the brushes.

Brushes—To fit

Reverse the procedure given for removal. When fitting a new brush ensure that it is free in its brush box, noting the following point.

1. New brushes are pre-formed and do not require bedding in.

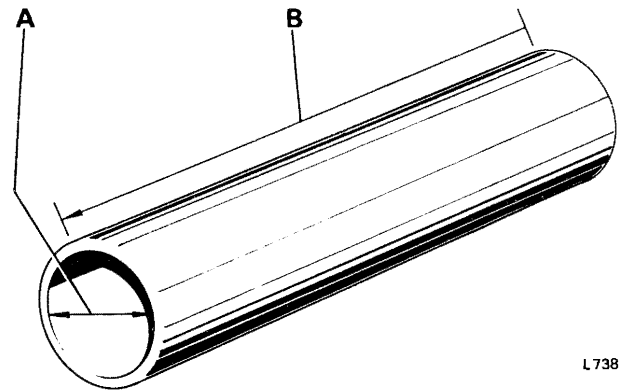
Brush springs—To service

1. Check the brush spring pressure using a pull-type spring gauge and without the brush in the brush box (see Fig. M12). The spring pressure recorded by the spring gauge at the moment the spring pressure is relieved from the brush box should be 1,1 kg minimum (42 oz).

2. If new brush springs are required ensure that they are correctly fitted (see Fig. M13). If the springs are incorrectly fitted there will be excessive pressure on the brushes resulting in premature brush wear and damage to the commutator.

Brush gear insulation—To check

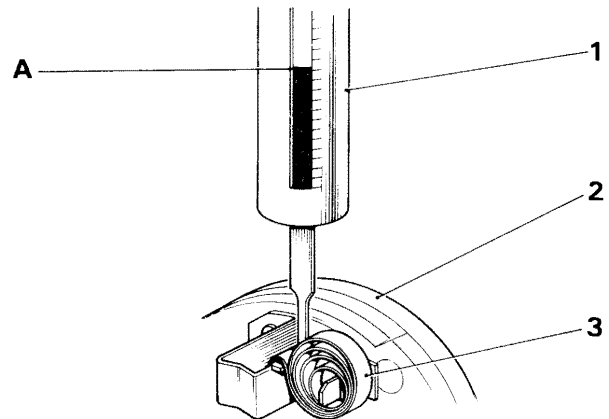
Check the brushgear, using a 110 volt A.C. 15 watt test lamp connected between each of the two insulated brushboxes in turn and a clean unpainted part of the bracket (see Fig. M14). The lamp should not illuminate,



L738

FIG. M11 TUBE DIMENSIONS

A 12,70 mm. (0.050 in.) B 7,62 cm. (3.0 in.)



Q411

FIG. M12 CHECKING BRUSH SPRING PRESSURE

- 1 Commutator end bracket
- 2 Spring gauge
- 3 Anchor post
- A Pressure reading

Armature—To check

1. If the solder on the armature has 'thrown' or the conductors have lifted from the commutator segments, the armature should be discarded. This also indicates possible shorting and over-speeding of the motor and the operation of the roller clutch drive should be checked as described in Roller clutch drive - To check.

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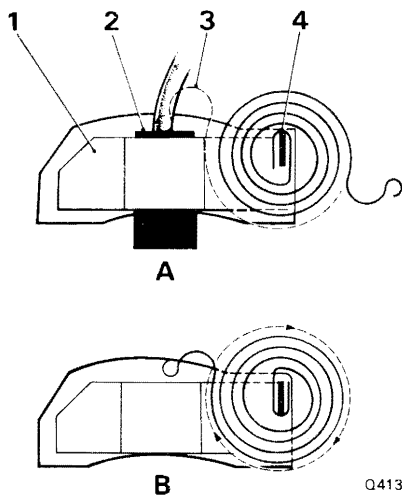


FIG. M13 CORRECT FITTING OF BRUSH SPRING

- 1 Brush box
 - 2 Brush
 - 3 Normal working position of spring
 - 4 Anchor post
- A CORRECT (Spring tensioning half-turn)
 B INCORRECT (Spring tensioning full-turn)

2. If the armature shows signs of fouling the pole-shoes, worn bearings or an untrue armature shaft are indicated. Check the armature between centres for eccentricity; renew if necessary.

If the armature is serviceable, the bearings must be renewed (see Bearings - To renew).

3. Check the insulation of each armature segment with a 110 Volt A.C. 15 Watt test lamp connected between the commutator segments and the shaft (see Fig. M15). The lamp will light if the insulation is not satisfactory.

4. Check the armature for short circuit in the windings using 'Growler' equipment and following the manufacturer's instructions.

Field coils—To remove

1. Using a wheel operated screwdriver, unscrew and remove the four screws securing the pole-shoes.
2. Remove the insulation piece fitted to prevent intercoil connectors from contacting the yoke.
3. Draw out the pole-shoes and coils from the yoke, and lift off the coils.

Field coils—To fit

1. Fit the new field coils over the pole-shoes and place them in position inside the yoke. Ensure that the taping of the field coils is not trapped between the mating surfaces of the pole-shoes and yoke.
2. Locate the pole-shoes and field coils by lightly tightening the retaining screws and fit the insulation piece between the field coil connections and the yoke.
3. Hold the pole piece in position by means of a pole-shoe expander or mandrel, then tighten the screw, using the wheel operated screwdriver.

Field coils—To test

To test the continuity of the field coils, proceed as follows.

1. Connect a 12 Volt test lamp and battery between the terminal on the yoke and each brush; ensure that the brushes and their flexible connectors are clear of the yoke. If the lamp fails to illuminate, an open circuit in the field coil is indicated and the coil must be renewed.

To test the insulation of the field coils proceed as follows. (see Fig. M16).

1. Connect a 110 Volt A.C. test lamp between the terminal post and a clean part of the yoke. If the test lamp illuminates it indicates that the field coils are earthed to the yoke and that the field coils must be renewed.

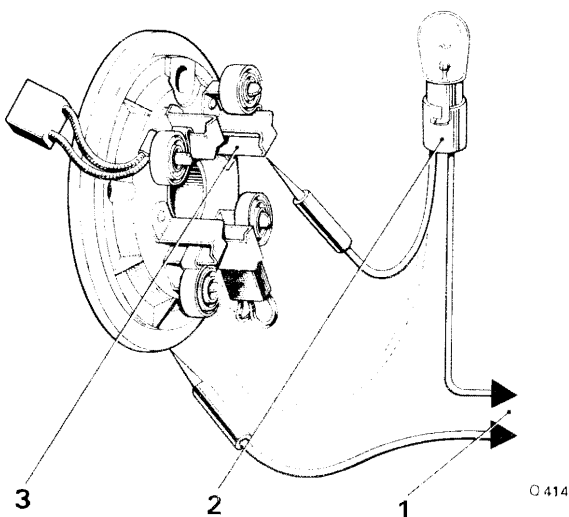


FIG. M14 CHECKING BRUSHGEAR INSULATION

- 1 110 volt AC mains
- 2 15 watt lamp
- 3 Insulated brush box

2. The insulated pair of brush holders on the commutator end bracket should also be checked. Clean off all traces of brush dust before testing. Connect a 110 Volt A.C. test lamp between each insulated brush holder and bracket.

If the lamp illuminates this indicates faulty insulation, and the end brackets must be renewed.

Bearings—To renew

The bearings must be renewed if they are worn to such an extent that excessive side movement of the armature is detected.

1. Press out the bushes in the intermediate and end bracket.

2. On starter motors not fitted with an end cover, remove the bush from the commutator end bracket by inserting a 14 mm. (9/16 in.) tap squarely into the bush and withdrawing the bush with the tap; press in the new bush.

On starter motors fitted with an end cover, press out the bush from the commutator end bracket and press in the new bush, using a highly polished mandrel 0.0127 mm. (0.005 in.) greater in diameter than the shaft which is to fit into the bush.

Note The bushes (bearings) are porous bronze and before fitting should be immersed for 24 hours in clean engine oil (S.A.E. 30/40). Porous bronze bushes must not be reamed out after fitting.

Lubricate the bearing surfaces with Rocol 'Molypad' molybdenised non-creep oil, or a similar equivalent.

Roller clutch drive—To check

If the roller clutch drive is in good condition it will perform the following functions efficiently:

1. Provide instantaneous take-up of the drive in one direction whilst being free to rotate in the other.

2. Ensure that the assembly will move freely along the armature shaft splines without binding or roughness.

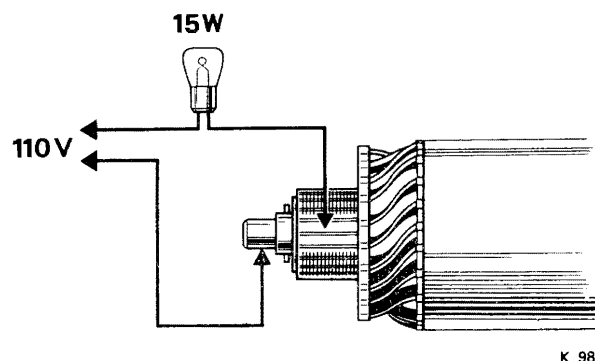
3. The operating bush will be able to slide freely along the driving sleeve when the engagement spring is compressed.

All the moving parts should be smeared with Shell Retinax 'A' grease.

Starter motor—To assemble

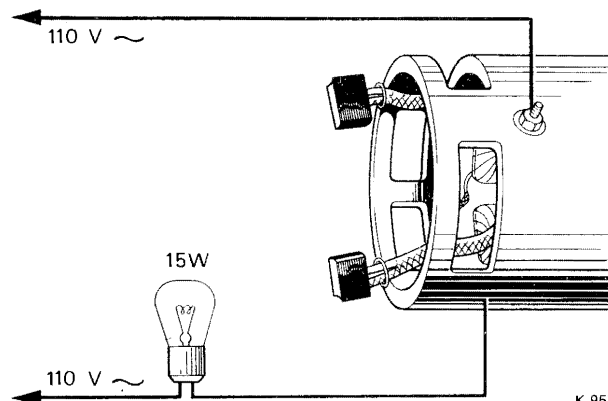
Reverse the procedure given for dismantling, noting the following points.

1. Ensure that the moulded brake shoes are seated squarely; turn them until the ends of the crosspeg in the armature shaft engage correctly with the slots in the shoes.



K 985

FIG. M15 CHECKING ARMATURE INSULATION



K 957

FIG. M16 CHECKING FIELD COIL INSULATION

2. Tighten the 'through' bolts to 1,11 kg.m. (8 lb.ft.). Tighten the solenoid retaining nuts to 0,62 kg.m. (4.5 lb.ft.).

Pinion movement—To set

1. Remove the flexible copper link from between the yoke terminal and 'STA' terminal on the solenoid end and connect terminal 'STA' to earth.

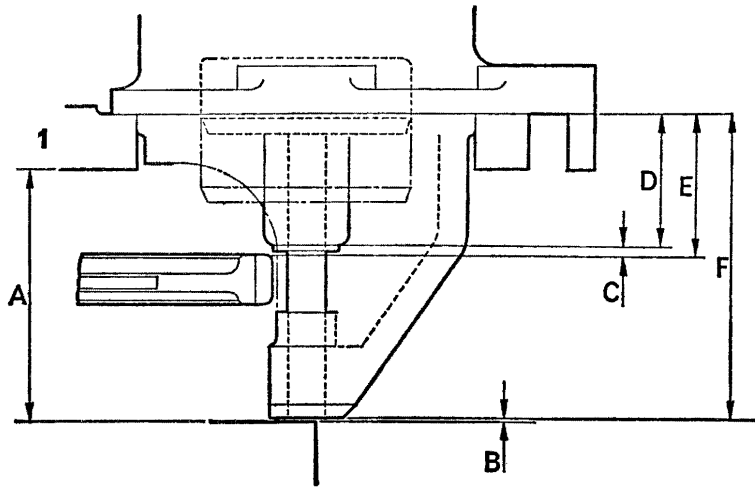
2. Connect a 6 Volt supply between the small unmarked setscrew terminal and earth on the solenoid.

Note This will energise both the series and shunt windings in the solenoid. The period of energising should be as brief as possible to prevent overheating of the series winding.

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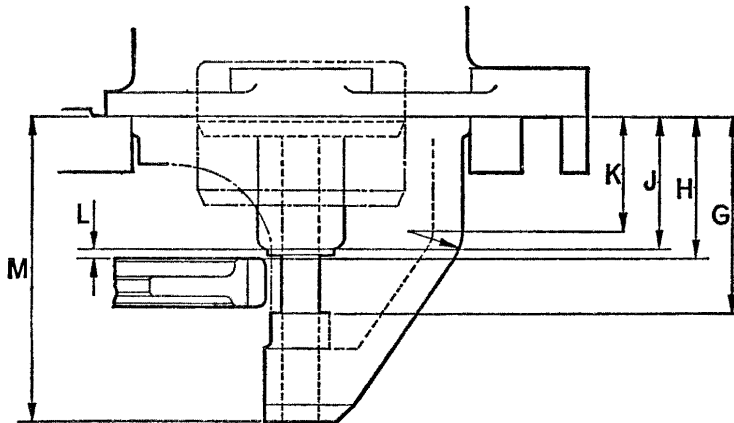
Arrangement for Torque Converter Transmission without Packing Pieces

- A** 2.614 in. min. (6,641 cm.)
- B** 0.23 in. min. (5,95 mm.)
clearance between gearbox and starter motor
- C** 0.138 in. min. (3,572 mm.)
static clearance
0.251 in. max. (6,35 mm.)
static clearance
- D** 1.362 in. - 0.085 in.
(3,460 cm. - 2,002 mm.)
- E** 1.467 in. + 0.061 in. - 0.044 in.
(3,731 cm. + 1,588 mm. - 1,191 mm.)
- F** 3.156 in. max. (8,017 cm.)



Arrangement for Four-Speed Automatic Transmission

- G** 2.045 in. min. (5,199 cm.)
- H** 1.472 in. + 0.063 in. - 0.055 in.
(3,738 cm. + 1,588 mm. - 1,193 mm.)
- J** 1.362 in. - 0.085 in.
(3,460 cm. - 2,002 mm.)
- K** 1.195 in. (3,034 cm.)
- L** 0.055 in. min. clearance (1,193 mm.)
0.258 in. max. clearance (6,352 mm.)
- M** 3.156 in. max. (8,017 cm.)



Arrangement for Torque Converter Transmission with Packing Pieces fitted

- N** 0.019 in. (0,398 mm.) min. working clearance
- P** 0.108 in. (2,778 mm.) max. flywheel float
- Q** 0.036 in. + or - 0.003 in. (0,795 mm. + or - 0,760 mm.)
- R** 1.362 in. - 0.085 in. (3,460 cm. - 2,002 mm.)
- S** 1.467 in. + 0.061 in. - 0.044 in. (3,730 cm. + 1,159 mm. - 1,191 mm.)

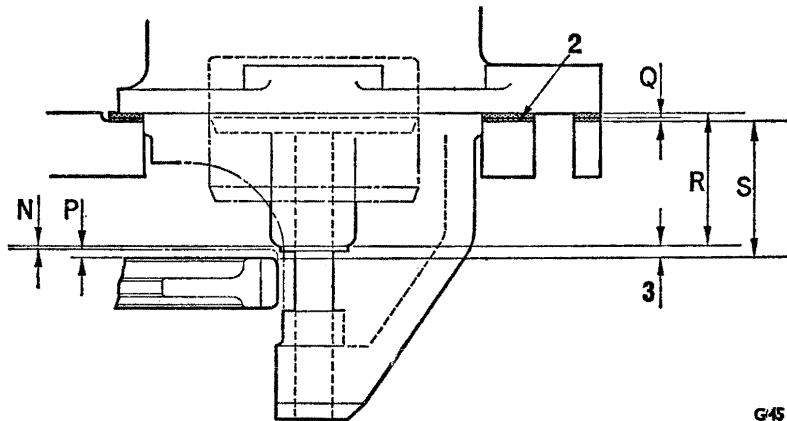


FIG. M17 CLEARANCES BETWEEN PINION & FLYWHEEL

	1 Rear face of crankcase	2 Packing pieces	3 Pinion to flywheel clearance	
	1.423 in.—1.459 in. (3,612 cm.—3,706 cm.)	Min. static 0.127 in. (3,176 mm.)	Max. static 0.260 in. (6,353 mm.)	Min. Working 0.019 in. (0,398 mm.)
	1.460 in.—1.499 in. (3,709 cm.—3,810 cm.)	0.131 in. (3,117 mm.)	0.261 in. (6,353 mm.)	Packing pieces 2 off
	1.500 in.—1.528 in. (3,810 cm.—3,880 cm.)	0.138 in. (3,572 mm.)	0.251 in. (6,350 mm.)	1 off
				None
				0.030 in. (0,794 mm.)

3. Energise the solenoid to bring the drive assembly into the engaged position. Measure the distance between the pinion and the thrust collar on the armature shaft extension. This measurement must be taken with the pinion pressed lightly toward the armature to take up any slack in the engagement linkage. The correct setting for this distance should be 3,404 mm. to 3,658 mm. (0.134 in. to 0.144 in.) on 17 and 19s solenoids, 0,254 mm. to 0,508 mm. (0.010 in. to .020 in.) on 15s solenoid.

4. To adjust the setting, slacken the eccentric pivot pin lock-nut and turn the screw until the required setting is obtained. The arc of adjustment is 180° therefore ensure that the head of the arrow marked on the pivot pin is set only between the arrowed ends of the arc scribed on the drive end bracket casting. After setting, ensure that the eccentric pivot pin lock-nut is tightened.

5. Re-check the setting.

Starter solenoid contacts—To check

When carrying out the following checks it must be assumed that the pinion travel has been correctly set.

1. Remove the copper link, connecting solenoid terminal 'STA' with the starter motor terminal and connect terminal 'STA' to earth.
2. Connect a 12 Volt D.C. supply, between the small unmarked solenoid terminal and earth.
3. Connect a 12 Volt 15 Watt test lamp in circuit.
4. Insert a stop in the drive-end bracket to restrict the pinion travel to that of the normal out-of-mesh clearance. An open-ended spanner can be used with its jaws embracing the armature shaft extension.
5. Close the switch to energise the solenoid.
6. The solenoid contacts should close and remain fully closed, as indicated by the test lamp being switched on and emitting a steady light.
7. Switch off and remove the stop.
8. Switch on and hold the pinion assembly in the fully engaged position.
9. Switch off and observe the test lamp.
10. The solenoid contacts should open, as indicated by the test lamp being extinguished.

Starter motor—To fit

Important Ensure that any existing packing pieces are fitted as they provide the correct clearance between the starter motor and the flywheel. If a new starter motor is to be fitted or the original packing pieces have been mislaid proceed as follows. (see Fig. M17)

1. Measure the distance from the mounting face on the crankcase to the edge of the flywheel. If this measurement is 3,706 cm. (1.459 in.) or less, two packing pieces should be fitted. If the measurement reads between 3,709 cm. (1.460 in.) and 3,807 cm. (1.499 in.), one packing piece should be fitted.

2. Packing pieces are not required when the measurement exceeds 3,810 cm. (1.500 in.).

On completion, fit the starter motor and packing pieces, reversing the procedure given for removal.

Starter motor—Solenoid operated switch Model 2.S.T. and 4.S.T.

The unit is a factory sealed item and requires no service other than to ensure that all electrical connections are clean and correctly tightened. If the unit is found to be faulty, it should be renewed.

Switch Model 2.S.T.—To remove

Cars prior to Car Serial Number SRH 5500,
SBH 5517, SRX 6771 and LRX 6724

1. Disconnect the battery.
2. Disconnect the electrical connections, noting the cable colouring to facilitate fitting.
3. Remove the two setscrews securing the switch.

Switch Model 4.S.T.—To remove

Cars from Car Serial Number SRH 5500,
SBH 5516, SRX 6770 and LRX 6724

1. Disconnect the battery.
2. Disconnect the electrical connections, noting the cable colouring to facilitate fitting.
3. Remove the two 2.B.A. nuts, bolts and washers securing the switch to the accelerator bracket.

Switch—To test

1. Connect a variable Zero to 12 Volt D.C. supply to the main terminals.
2. The plunger must be attracted fully home at between 5 and 9 Volts.
3. After raising the voltage to 12 Volts, the plunger must release at less than 2.5 Volts.
4. The value in ohms of the solenoid winding, measured from the 2.B.A. terminal and the switch body is 2.1 to 2.5 ohms at 20°C (68°F.).

Chapter M

Starter Motor Fault Diagnosis		
Symptom	Possible Cause	Action
Speed, torque and current consumption low	(a) Battery in poor condition (b) Faulty brushgear connections (c) Commutator in poor condition (d) Faulty connections	(a) Check battery (b) Check connections (c) Clean commutator and skim if necessary (d) Check battery connections and earth leads
Speed and torque low, current consumption high	(a) Tight or worn bearings, bent shaft, armature fouling a pole-shoe or cracked spigot on drive end bracket (b) Insufficient end float (c) Short circuited armature or field coils	(a) Examine components and renew if necessary (b) Check armature end float (c) Check circuits (see Starter motor - Bench inspection)
Armature does not rotate; low current consumption	(a) Open circuited armature field coil (b) Faulty solenoid unit (c) If the commutator is badly burnt there may be poor contact between brushes and commutator	(a) Check circuits (see Starter motor - Bench test) (b) Check solenoid (c) Check commutator and brushgear
Armature does not rotate; high current consumption	(a) Earthed field winding or short circuited solenoid unit (b) Armature physically prevented from rotating	(a) Check circuits (see Starter motor - Bench test) (b) Remove starter motor from engine and bench test, if the fault persists dismantle starter to determine the fault
Excessive brush movement causing arcing at commutator	(a) Low brush spring tension (b) Brushes worn (c) Worn or eccentric commutator (d) Thrown or high segment on commutator	(a) Check spring tension (see Brush springs - To service) (b) Renew brushes (c) Rectify by skimming on a lathe (d) If a segment(s) has been 'thrown', the armature should be renewed If a segment(s) is 'high' the fault can be rectified by skimming the commutator on a lathe
Excessive arcing at the commutator	(a) Defective armature windings (b) Sticking brushes (c) Dirty commutator	(a) Check circuit (see Starter motor - Bench test) (b) Check brush spring pressure, and ensure that the brushes are free to move in their boxes (c) Clean commutator; skim if necessary

Section M5

ALTERNATOR AND REGULATOR

C.A.V. Model AC 512 and 440 Regulator

Alternator

The alternator is a three-phase machine of the revolving field and stationary armature type and is self limiting in current output. Rectification of the output into direct current is provided by six silicon diodes contained in the slip ring end-shield and connected in a three phase bridge circuit between the stator and output terminals. A second rectifier bridge is formed by using three auxiliary diodes in conjunction with three of the six main diodes and these supply the energy for the alternator field coil which is fed through slip rings and brushes. This arrangement of auxiliary diodes prevents the battery from discharging through the field coil when the alternator is stationary.

440 Regulator

The regulator is fully transistorised with no moving parts, requires no service attention and is non-repairable. A cut-out relay is not necessary as the diodes in the alternator prevent reverse currents from the battery flowing through the stator when the machine is stationary or when generating less than the battery voltage.

Important The transistors in the regulator and diodes in the alternator are sensitive to voltage changes and high temperature, therefore it is essential that the following precautions are taken to avoid damage to the system when carrying out vehicle maintenance:

THE BATTERY MUST NOT BE CONNECTED OR DISCONNECTED WHEN THE ENGINE IS RUNNING.

2. Whenever a lead is disconnected it should be identified in relation to its terminal to facilitate reconnection. Short circuiting or reverse polarity no matter how brief will cause immediate and permanent damage to transistors and diodes.

3. The battery must not be disconnected whilst the alternator is running nor should the battery be connected into the system without first checking for correct polarity.

4. Do not use insulation testers on the regulator.

Maintenance

The charging system requires very little attention but it should be kept free from dirt build-up and a check made if it fails to keep the battery charged. This may be due to a slipping drive belt.

1. Occasionally inspect the driving belt for wear and correct tension and verify that the alternator is properly aligned with respect to the drive. (See Drive belt - To adjust).

2. Keep the alternator clean with a cloth moistened in paraffin or white spirit and ensure that the ventilation slots and air spaces are clear and unobstructed.

3. Remove any dirt accumulated on the regulator housing and ensure that cooling air can pass freely over the casing.

Alternator—To test in position

1. Connect a 0-50 volt first grade moving coil voltmeter between the regulator negative terminal and the positive terminal marked H1.

2. Connect a 0-100 amp first grade ammeter in series in the alternator positive line.

3. With the battery in a fully charged condition, the system is in correct working order when the following sequence is observed:-

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- a. Switch the ignition on and observe that the warning lamp marked GEN illuminates.
 - b. Switch on all the electrical loads with the exception of the windscreen wipers.
 - c. Start the engine, allow it to run at approximately 1000 r.p.m. and observe that the warning lamp is extinguished.
 - d. Momentarily increase the engine speed to approximately 3000 r.p.m. and observe that the alternator current is approximately 53 amps.
 - e. With the engine running at approximately 1500 r.p.m. switch off all the loads. The voltage should rise to between 14.0 and 14.5 volts and then remain constant, the current reading should drop appreciably.
4. Should there be a fault in the system this will be apparent by one or more of the following symptoms:
- a. If the warning lamp does not illuminate check the bulb and renew if defective.
 - b. If the bulb is serviceable but does not illuminate, check the regulator by first switching off the engine and disconnecting the lead from terminal F on the regulator. Clip this lead to earth and switch on the engine. If the lamp now illuminates the regulator is faulty and must be replaced by a new regulator. If the lamp still remains unlit then the alternator is faulty and requires workshop attention (see Alternator - To dismantle).
The tests described in 5 may be used to locate the alternator fault. Having located the fault, switch off the engine and reconnect the F lead to F terminal.

5. Tests on the alternator can be carried out on the engine by partial dismantling in the following manner:

a. Field Winding

Disconnect the leads from F and A terminals on the alternator and remove brush gear moulding (see Fig. M18). Measure the field resistance across the slip rings which should be $3.2 \text{ ohms} \pm 0.16 \text{ ohms}$. An appreciably lower field resistance could mean a short circuit between the coils: a higher reading indicates that the contact surfaces of the slip rings need cleaning. A reading of infinity indicates an open circuit in the field.

b. Brushes

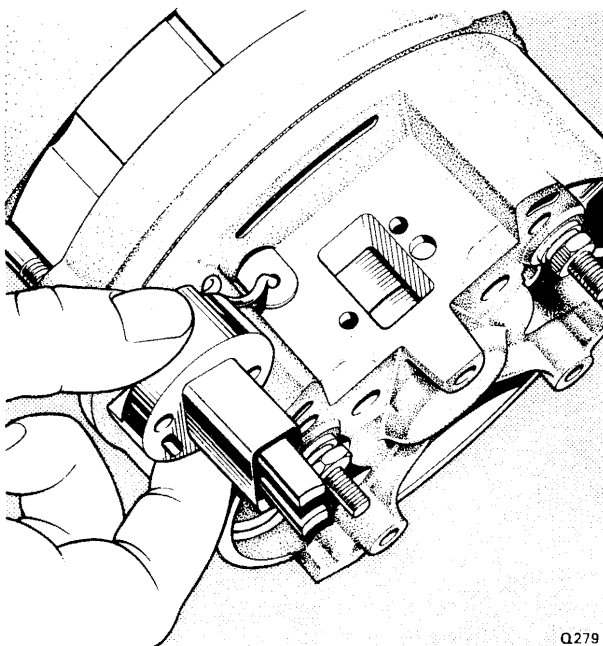
If the field resistance is correct check that the brush length is greater than the minimum length of 7.94 mm. (0.312 in.) and ensure that proper contact with the slip rings is made.

c. Slip rings

The surface of the slip rings should be smooth and uncontaminated by oil or other foreign matter. The surface may be cleaned with very fine glass paper without fully dismantling the machine. On no account must emery cloth or similar abrasive be used.

d. Stator winding

Low output or no output at all from the alternator may be due to either a faulty stator or a faulty diode in which case it is difficult to distinguish between the two faults without first dismantling the alternator. In these circumstances it is necessary to remove the stator from the alternator and measure the volts drop across each pair of three stator connections as described in Alternator - Bench testing.



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FIG. M18 BRUSHGEAR INSPECTION

Alternator—To dismantle

(see Fig. M19)

1. Remove the alternator from the car.
2. Unscrew the three screws and detach the baffle from the slip ring end-shield (SRE).
3. Disconnect the lead from terminal A of brush box, remove the retaining screws, spring and plain washers and withdraw the brush box complete with brushes. Discard the gasket.
4. Remove the field terminal retaining nuts, crinkle washers, Lucar blades and insulator from the terminal posts. Withdraw the brushes and field terminal posts from the brushbox. Discard the sealing washers.
5. Remove the pulley nut from the drive end (DE) and withdraw the pulley, fan, woodruff key and fan spacer.
6. Scribe light correlation marks across both end shields and stator to facilitate alignment on assembly.

7. Remove the three through bolts and spring washers and withdraw the DE shield complete with rotor. If 'Loctite' grade A has been used to secure the through bolts, local heat should be applied with a heated soldering iron to loosen them, the part should not be overheated. If necessary use a hide faced hammer and gently tap the DE shield away from the stator and SRE shield. Do not damage the slip ring when laying the DE shield and rotor assembly on the bench.

Note The stator is sandwiched between the two end-shields therefore great care must be taken at this stage to prevent the full weight of the stator from falling onto the three stator phase leads.

8. Lay the stator and SRE shield assembly carefully on the bench with the endshield uppermost.

9. Unsolder the three stator phase leads from the heatsink terminal tags (do not remove tags from heatsinks) and separate the SRE shield from the stator using a hide faced mallet if necessary.

10. Remove and discard the 'O' ring from the shield bearing housing using a sharp pointed probe. Do not damage the 'O' ring groove.

11. Place the DE shield with drive shaft upwards over a suitable large diameter cylinder so that the

rotor is encased within the cylinder and the cylinder sits squarely against the three end shield webs. Support the rotor from underneath and gently press the rotor from the DE shield with a standard fly-press.

Note It is unnecessary to strip the diode assembly from the SRE shield unless it is established that there is a fault in one or more of the diodes. Accordingly, the diodes should next be subjected to the tests detailed under Alternator - Bench testing. If a faulty diode is detected proceed as instructed in Alternator - Inspection and repair.

Alternator—Inspection and repair General

After dismantling, all components which require cleaning should be thoroughly cleaned.

1. Examine all parts for cracking, corrosion, serviceability of threads, score marks and excessive wear. The 'nyloc' pulley nut may be used again provided that the nylon insert is in reasonable condition.

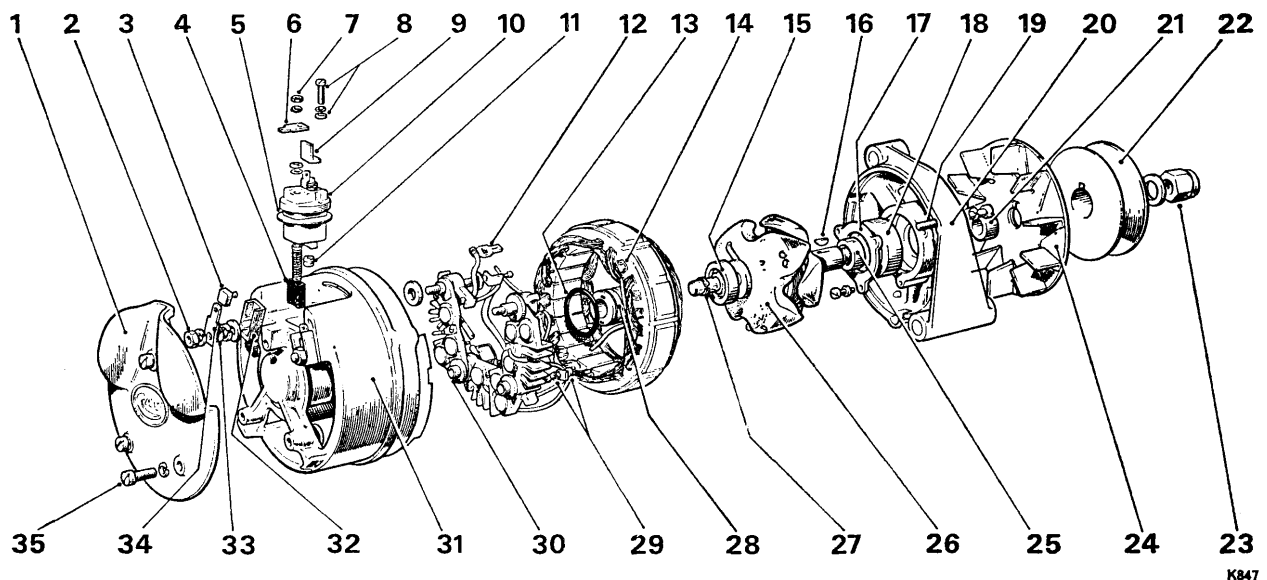


FIG. M19 EXPLODED VIEW OF CAV 512 ALTERNATOR

- | | | |
|-----------------------------------|---------------------|----------------------------------|
| 1 Baffle | 12 'A' lead | 24 Fan |
| 2 Main terminal nut | 13 'O' ring | 25 Bearing spacer |
| 3 Insert | 14 Stator | 26 Rotor |
| 4 Brush | 15 Bearing | 27 Circlip |
| 5 Gasket | 16 Woodruff key | 28 Slip rings |
| 6 'Lucar' blade | 17 Clamp plate | 29 Heat sink securing screw |
| 7 Field terminal nuts and washers | 18 Bearing | 30 Diode and heat sink assembly |
| 8 Retaining screw and washers | 19 'Through' bolt | 31 Slip ring end shield assembly |
| 9 Insulator | 20 Drive-end shield | 32 Shroud |
| 10 Brush holder | 21 Fan spacer | 33 Round slotted nut |
| 11 Grommet | 22 Pulley | 34 'Lucar' terminal |
| | 23 Pulley nut | 35 Baffle screw |

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2. Remove foreign material from rotor shaft and stator using a clean cloth moistened with white spirit.

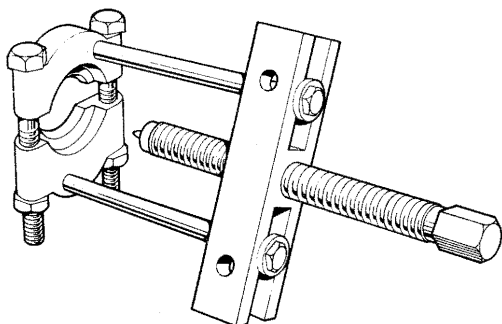
Caution Spirit should not be allowed to contact the leads of the stator and must not contaminate the protective coating of the rotor core.

3. Examine the stator windings for security and condition. Check the insulation of the stator leads for deterioration.

4. Check the bearings for excessive play and smoothness of operation. The bearings are sealed and cannot be lubricated therefore any evidence of dryness will necessitate renewal. If the SRE bearing requires replacement it will also be necessary to renew the slip ring.

5. Examine the slip rings for signs of wear and scoring. The slip rings may be skimmed to a minimum diameter of 28,5 mm. (1.136 in.) before replacement is necessary.

6. Check carbon brushes for wear. New brushes are 15,9 mm. long (0.625 in.) and the minimum length of usable brushes is 7,9 mm. (0.312 in.).



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FIG. M20 BEARING EXTRACTOR

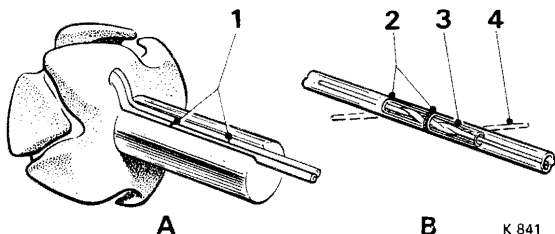


FIG. M21 RENEWING SLIP RING CONNECTING LEADS

- 1 Staggered wire cuts
- 2 3 mm sleeving
- 3 2 mm sleeving
- 4 Excess wire removed

Bearing renewal—Drive end

1. Remove the three screws and washers securing the clamp plate and push out the bearings with a copper drift.
2. Press a new bearing into the housing, ensuring that it is perfectly square to the housing.
3. Place the clamp plate in position and secure with three screws and washers.

Bearing renewal—Slip ring end

1. Cut the ends of the field leads free from the slip ring terminal posts.
2. Using an extractor (*see Fig. M20*) withdraw the slip ring assembly. Removal of the slip ring renders it unserviceable and a new one must be fitted.
3. Remove bearing circlip. Adjust the jaws of bearing extractor so that the jaws locate between the outer race and the bearing spacer and withdraw bearing.
4. Examine bearing spacer for cracks and distortion. Clean out groove. Renew spacer if damaged.
5. Detaching the rotor leads from the slip ring assembly imposes mechanical stresses that may weaken the leads and produce the possibility of failure under operating conditions at a later date. It is strongly recommended that the leads are renewed in the following manner (*see Fig. M21*). Cut the leads so that the subsequent joints are staggered. Trim back the glass-fibre sleeving and lightly twist a new length of Lumex copper wire (21.5 swg) to the existing wire and solder together. Snip off excess wire. Apply a liberal coating of shellac and slide a short length of 2 mm. glass-fibre sleeving over the joint so that it slides inside the existing sleeve. Apply a further coating of shellac and slide on a new length of 3 mm. glass-fibre sleeving to abutt the original sleeve. Apply a final coat of shellac to the outside.
6. Refit the bearing spacer over the rotor shaft so that the moulded groove is in the correct position to contain the field leads from the rotor. Press into position. Press new bearing onto the rotor shaft with a suitable hand press. Refit the circlip, ensuring it is fully seated and a tight fit in its groove. Plug with 'Silcoset' 151 any gap that appears where the leads enter the spacer between the spacer and the rotor claws. Wipe off any surplus 'Silcoset' 151.

7. Place the rotor (drive end downwards) in a hand press so that the weight is supported on the rotor claws. Pass the two field leads through the bore of a new slip ring and locate the slip ring to the shaft with the terminal posts positioned at 90° relative to the shaft lead slot.

8. Place press tool (see Fig. M22) so that the spigot registers in the slip ring bore with the cut-away portion in line with the field leads. Gently press the slip-ring down until the press tool spigot abutts the rotor shaft. Pass the field leads through cut-away portion of press tool as they appear.

9. Trim off the ends of the glass-fibre sleeve to leave approximately $\frac{1}{4}$ inch projecting beyond the rotor shaft. This will prevent the field leads from shorting onto the shaft during service. Wrap the field leads around the terminal posts of the slip ring, cut to length, and solder in position.

10. Mount the rotor in a suitable lathe, locating the steady on the outer race of the SRE bearing. Lightly skim the slip rings to ensure that they are concentric with the SRE bearing to within 0,05 mm. (0.002 in.). Remove the minimum amount of metal to achieve this degree of concentricity and do not reduce the slip ring diameter to below 28,85 mm. (1.136 in.). To obtain the required surface finish, it is essential that a highly finished diamond or tungsten carbide tipped cutting tool be used for this operation.

Electrical tests

1. Subject the stator to an insulation test between any terminal tag and the frame. The minimum resistance should be 10 megohms.
2. Connect the stator leads, two at a time to a 20 ampere dc supply and check that the voltage drop in each case is 2.2 volts.

Slipring end shield diode tests

Connect a test probe in series with a 48 watt 24 volt lamp on the positive terminal of 24 volt dc supply. Connect another test probe to the negative terminal of the dc supply.

Test No.	Test lead Connection (+)	Test lead Connection (-)	Diode under test	Serviceable
1	Each heat sink in turn	D	Positive	Lamp illuminates
2	D	Each heat sink in turn	Positive	No illumination
3	D-	Each heat sink in turn	Negative	Lamp illuminates
4	Each heat sink in turn	D-	Negative	No illumination
5	Each heat sink in turn	A	Auxiliary	Lamp illuminates
6	A	Each heat sink in turn	Auxiliary	No illumination

The opposite reaction to any of the above tests will establish a faulty diode, and the complete associated heat sink must be renewed.

Note: If any of the diodes have been replaced or if the polyurethane paint (blue) on the diodes is damaged the diodes must be painted with polyurethane paint. (Early cars only).

Diode replacement (SRE shield)

Note: Individual diodes cannot be replaced and a fault in any diode will entail the renewal of the complete associated heat sink.

1. Carefully separate the Ross Courtney tag from the 'A' lead and pull the lead through the rubber grommet in the end shield. Remove and discard grommet.
2. Remove external positive and negative main terminal nuts, spring washers, terminal post retaining nuts, spring and plain washers.
3. Remove heat sink securing screws (two large cheese headed screws), spring and plain washers from underside of SRE shield. Withdraw complete heat sink assembly.
4. Snip the two copper braids of the faulty heat sink close to the angle terminal tags and unsolder the sleeved lead from the third diode. Remove appropriate nylon retaining washers and withdraw heat sink.
5. Assemble new heat sink ensuring that nylon insulating washers are interposed between adjacent heat sinks. Replace outside retaining washers.
6. Solder the diode braids to the appropriate angle tags. (Note: the length of the braids are such that it is impossible to connect them incorrectly).
7. Solder sleeved wire to remaining diode.

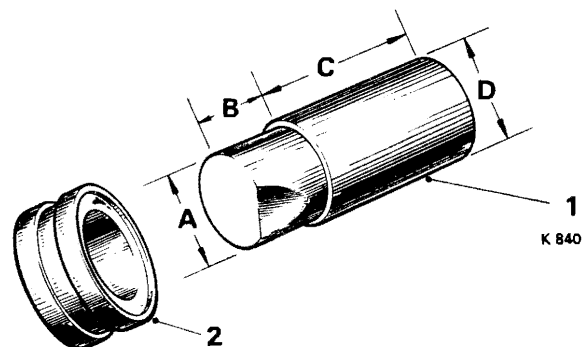


FIG. M22 SLIP RING PRESS TOOL

- A 15,875 0.0254 mm. (0.625 0.0010 in.)
 B 25,4 mm. (1.00 in.)
 C 63,5 mm. (2.5 in.)
 D 19,05 mm. (0.75 in.)

- 1 Tool 2 Slip ring

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Warning Excessive heat can cause immediate and permanent damage to diodes. It is recommended that a pair of long nosed pliers be used to grip the diode shank to act as a thermal shunt and that the operation be carried out as quickly as possible.

8. Apply lamp test as detailed under Alternator - Bench testing to ascertain that the diodes are functioning correctly.

9. Thread lead A through a new rubber grommet. If the lead is cotton braided it is advisable to replace this with a Unipren covered lead, size Unipren 4.

10. Replace heat sink assembly in SRE shield. Secure with the two cheese headed screws, plain and spring washers. Replace grommet and A lead, and re-fit Ross Courtney tag.

11. Fit new 'O' ring to groove in internal bore of slip ring housing.

12. Replace plain and spring washers, main terminal post retaining nuts, spring washers and main terminal nuts.

Assembly

Normal workshop practices should be followed taking special care to keep working surfaces and tools clean.

1. Lay the stator on the bench with the three stator phase leads facing upwards.

2. Invert the end shield and locate it over the stator, so that the three wide spaces on the heat

sink finning coincide with the three stator phase leads. Carefully lower the slip ring end shield to the stator and align scribe marks. Twist stator phase leads once only around heat sink tags and solder.

3. Fit spacer over the rotor drive shaft and insert drive shaft through the bore of the drive end shield ballrace.

4. Support the rotor, slip rings downwards, between a pair of parallel blocks on a suitable handpress table (great care must be exercised at this stage not to damage the rotor field leads with the blocks). Gently press the drive end shield into place with a suitable piece of tube pressing on the bearing housing.

5. Assemble the rotor and slip ring end shield assembly to the drive end ensuring again that the scribed lines are in alignment. Insert the three through bolts with 'Loctite' grade A applied to the threads and tighten them evenly and progressively whilst gently tapping the slip-ring end shield with a hide faced mallet to draw end shields squarely into position. Finally tighten the through bolts to a maximum torque of 0,52 kg.m. (45 lb.in.).

6. Refit brushes to brush box making sure that the terminals are fully seated. Thread 'O' sealing rings over both the terminal posts and assemble insulator to one of the terminals. Fit Lucar blades and crinkle washers to both terminals and secure with terminal nuts.

7. Fit a new gasket to the brush box moulding and assemble brush gear to the slip ring end shield. Correct positioning is ensured by the locating dowel. Secure with retaining screws, plain and spring washers. Reconnect 'A' lead to terminal post marked 'A', secure with crinkle washer, plain washer and terminal nut.

8. Fit fan spacer machined slot outwards and aligned with keyway. Fit woodruff key, fan pulley and pulley nut. Tighten pulley nut to a torque of 5,3 kg.m. (40 lb.ft.).

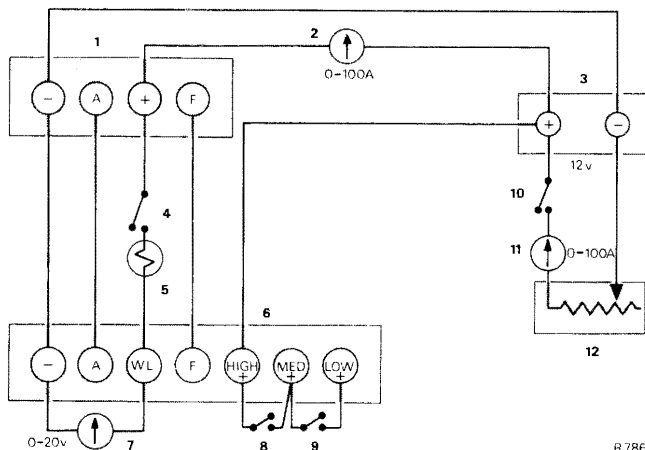


FIG. M23 BENCH TEST CIRCUIT

- | | |
|-----------------|--|
| 1 Alternator | 7 Voltmeter |
| 2 Ammeter | 8 Switch |
| 3 Battery | 9 Switch |
| 4 Switch | 10 Switch |
| 5 Ignition lamp | 11 Ammeter |
| 6 Regulator | 12 Carbon pile resistor
(60 amps minimum) |

Alternator—Bench testing

Procedure

1. Before making any connections, test the alternator for earths by non-destructive flash test (or Megohm Meter) with voltage rating of 110 volt. Connect instrument between D+ and earth, D- and earth and A terminal and earth. Make sure always to keep the one probe on the frame so as not to apply full test voltage between any two terminals on the alternator. If Megohm Meter is used the minimum insulation resistance should be 10 megohms.

2. Mount the alternator to the test machine drive and make all connections to the battery and regulator as wiring diagram.

3. Close switch 4 and observe that the bulb is lit.
4. Start the drive and increase speed until warning lamp is extinguished which indicates that alternator is charging. This should occur below 2000 r.p.m.
5. Reduce alternator speed to 1125 r.p.m. and measure dc voltage between WL and -ve on the 440 regulator. The voltage should be between 12-14 volt.

Load applied	Ammeter reading	Voltage
40-50 amp	50-55 amp	@ 13-13.6

6. Increase alternator speed to 10,000 r.p.m. and again observe ammeter reading which should be as follows:-

Ammeter reading	Voltage
60-65 amp	@ 13-14

Adjust battery load as necessary. Run at top speed of 10,000 r.p.m. for 1 minute.

7. Decrease speed to 3000 r.p.m. and switch off loads connected across the battery, the voltage should rise to between 13-14 volts and then remain constant. At the same time the current reading should drop appreciably. This test indicates that the regulator is working correctly.

With switches 8 and 9 open, the voltmeter reading should be between 14 and 14.5 volts. With 8 closed and 9 open the voltmeter reading should be between 13.5 and 14 volts and with both 8 and 9 closed the voltmeter reading should be between 13 and 13.5 volts.

Alternator

Lucas Model 20 ACR

Important Before commencing work on the alternator, please note the following:

1. If it is necessary to disconnect a lead from the system, the engine must be switched off.
2. Whenever a lead is disconnected it should be identified in relation to its terminal to facilitate reconnection. Short circuiting or reverse polarity no matter how brief will cause immediate and permanent damage to transistors and diodes.
3. The battery must not be disconnected whilst the alternator is running nor should the battery be connected into the system without first checking for correct polarity.
4. Do not use insulation testers on the alternator.

Routine maintenance

- a. **Cleaning**
Wipe away any dirt or oil that has collected around the apertures in the moulded cover.
 - b. **Belt adjustment**
Inspect the driving belt for condition and correct tension. If necessary adjust the tension so that an applied force of 3,6 kg. (8 lb.) mid-way between the two pulleys causes the belt to deflect 9,5 mm. (0.375 in.).
- Important** To avoid damage to the alternator when adjusting belt tension, apply leverage only on the alternator drive end bracket, not on any other part of the alternator. The lever should be of a soft material, preferably wood.
- c. **Lubrication**
The bearings are packed with grease during assembly and will not normally require further lubrication during their service life.
 - d. **Circuit connections**
Ensure that parts of the charging circuit, including the battery, are not disconnected or connected while the engine is running. When connecting an alternator, always observe correct polarity i.e. positive to positive and negative to negative.

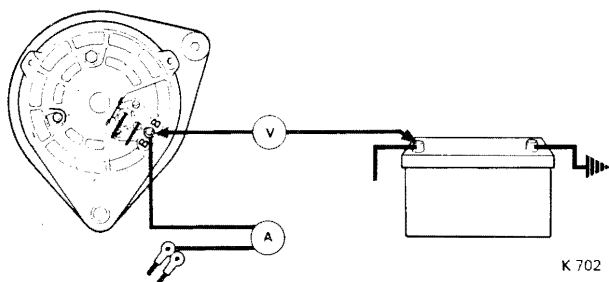
Alternator—To service in position

Alternator output test

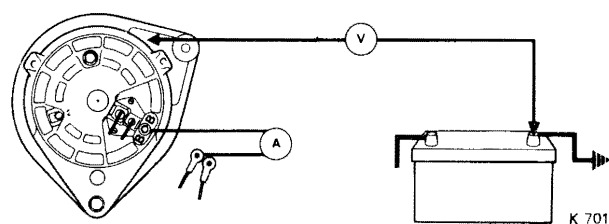
This test should be carried out with the alternator at normal temperature. Run a cold engine at charging speed for 3-4 minutes.

- a. With the engine stationary, disconnect the battery earth cable.
- b. Connect an ammeter in series with the alternator main output cable.
- c. Remove the connections from the alternator, remove the moulded cover and remake the connections. Short together the black lead and the large 'Philips' screw securing the metal plate.
- d. Connect the battery earth cable.
- e. Switch on all the vehicle loads (except wipers) and switch on the ignition. Observe that the warning lamp is illuminated.
- f. Start the engine and slowly increase the speed. At 3000 r.p.m. the ammeter reading should be 66 amps. Any appreciable deviation from this figure will necessitate removal of the alternator for further examination.

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**FIG. M24 CHARGING CIRCUIT VOLTAGE DROP TESTING
- INSULATION SIDE**



**FIG. M25 CHARGING CIRCUIT VOLTAGE DROP TESTING
- EARTH SIDE**

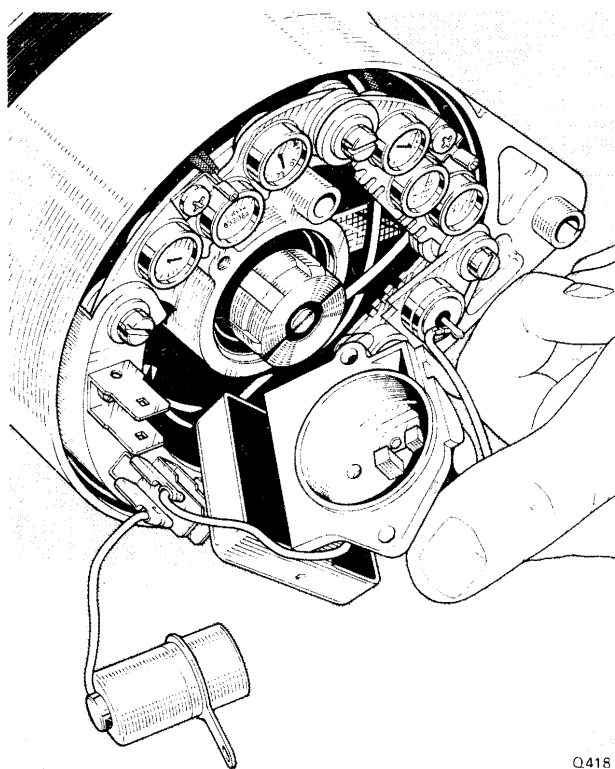


FIG. M26 BRUSHGEAR INSPECTION

Charging circuit—Voltage drop test (see Figs. M24 and M25)

A voltmeter is used to check for high resistance in the charging circuit.

- Connect a 0-1 volt voltmeter between the battery insulated terminal and alternator main terminal.
- Switch on the vehicle lights (headlamps on main beam). Start the engine and run at 3000 r.p.m. Note the voltmeter reading. Switch off engine.
- Transfer the voltmeter connections to the battery earth terminal and alternator earth terminal.
- Start and run the engine at 3000 r.p.m. and note the voltmeter reading.

The voltmeter readings should not exceed 0.5 volt for the insulated side and 0.25 volt for the earth side. Higher readings indicate high resistance in the circuit which must be located and rectified.

Control unit voltage setting

The charging circuit wiring and connections must be in good order and the battery must be in a well charged condition or temporarily replaced by a charged battery.

- Connect an ammeter in series with the alternator main output cable, connect a 0-20 volt voltmeter across the battery terminals.
- Start the engine and run at charging speed (3000 r.p.m.) until the ammeter reading is less than 10 amps. The voltmeter reading should be within 13.6 - 14.4 volts.

An unstable reading or a reading outside the specified limits indicates that the alternator control unit is faulty and should be replaced.

Alternator—To dismantle for electrical tests

The following instructions cover the dismantling required to enable the alternator to be tested electrically. If further dismantling becomes necessary as a result of the tests or because the rotor bearings are to be changed, proceed as described in Alternator - Further dismantling.

- Disconnect the battery and alternator cables and remove the alternator from the vehicle.
- Unscrew the two cover securing screws and remove the cover.
- Remove the brush moulding fixing screw.
- To remove the brush moulding complete with the control unit - disconnect the black earth lead. Disconnect the red leads from IND and + terminals. The moulding can now be withdrawn.

Brushgear—To inspect (see Fig. M26)

The brush length when new is 12,7 mm. (0.5 in.). The serviceability of a brush may be determined by measuring the amount by which it protrudes beyond the brush box moulding when in the free position. Replace the brush if there is less than 5 mm. (0.2 in.) protruding. If brushes are changed, take care not to lose the leaf spring fitted at the side of the inner brush.

Check the brush spring pressure using a push type spring gauge. This should indicate 0,255 kg - 0,368 kg (9 - 13 oz) when the brush face is flush with the housing. Sticking brushes may be cleaned with a petrol moistened cloth.

Sliprings—To inspect

The surfaces of the sliprings should be smooth and uncontaminated by oil or other foreign matter. Clean the surfaces with a petrol moistened cloth, or if there is evidence of burning, very fine glass paper. On no account must emery paper or similar abrasive be used.

Rotor—To test

For clarity, the illustrations of the electrical testing of the rotor and stator shows these components isolated from the remainder of the alternator.

Test the rotor winding by connecting either an ohmmeter or a 12 volt battery and ammeter between the sliprings (see Fig. M27). The resistance should be 3.6 ohms at 20 °C or the current approximately 3 amps. Test for defective insulation between one of the sliprings and one of the rotor poles using a 110 volt A.C. mains supply and a 15 watt test lamp (see Fig. M28). If the lamp illuminates the coil is earthed to the rotor core and a replacement rotor/slipring assembly must be fitted.

Stator—To test

Connect any two of the three stator windings in series with a 12 volt battery and 1.5 watt test lamp (see Fig. M29). Replace one winding with the third winding and repeat the test. If the test lamp does not illuminate on either occasion, the stator winding is open circuit and a replacement stator must be fitted.

Test for defective insulation between the stator coils and the lamination pack with the mains test lamp. Connect the test probes between any of the three cable ends and the lamination pack (see Fig. M30). If the lamp illuminates, the stator coils are earthing and a replacement stator must be fitted.

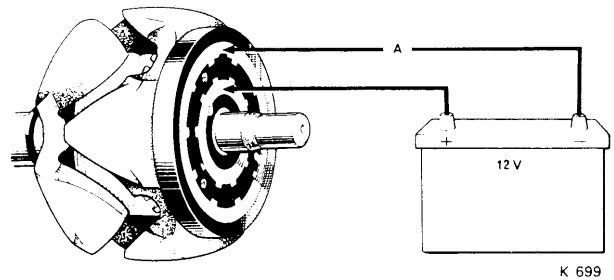


FIG. M27 MEASURING ROTOR WINDING RESISTANCE WITH BATTERY & AMMETER

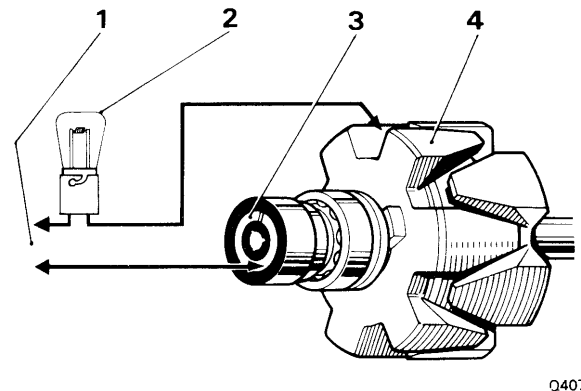


FIG. M28 INSULATION TEST OF ROTOR WINDING

- 1 110 volts AC
- 2 15 watt lamp
- 3 Slipring
- 4 Rotor poles

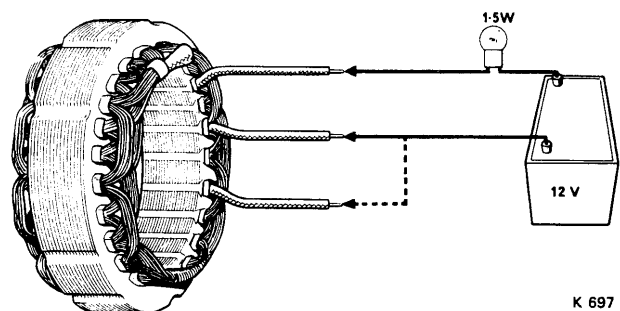


FIG. M29 STATOR WINDING CONTINUITY TEST

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Diodes—To test

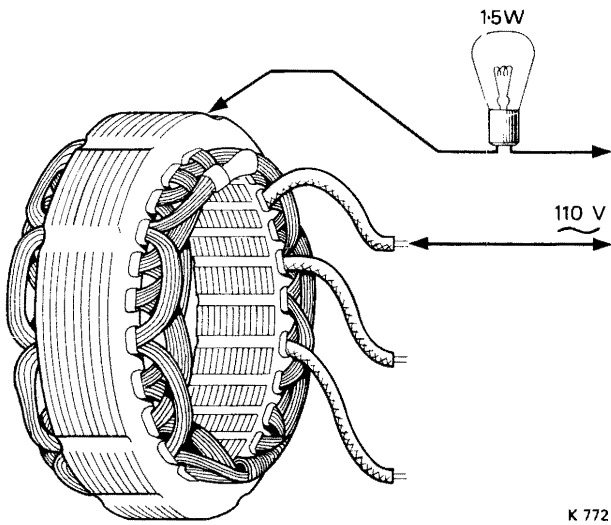


FIG. M30 INSULATION TEST

If a fault in a diode is indicated, remove the rectifier/heatsinks complete. Unscrew the three stator winding connections at each diode heatsink. Remove the four screws which pass through the nylon insulating washers and also the small screw which secures the earthing strip to the bracket and remove the complete assembly.

Connect the pin of a diode in series with a 1.5 watt test lamp and one terminal of a 12 volt battery, connect the other battery terminal to the diode heatsink (see Fig. M31). Observe the test lamp.

Reverse the connections to the diode and again observe the test lamp. If the lamp illuminates in both tests or remains unlit in both tests then the diode is faulty and a new rectifier/heatsink assembly must be fitted. Repeat the tests for each diode.

Note: When unsoldering any link wires connected to the diodes always use a thermal shunt (see Fig. M32).

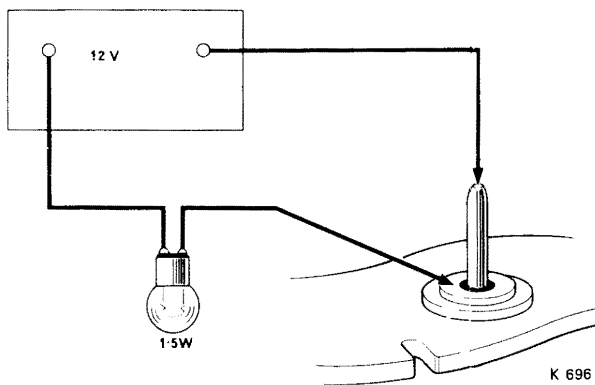


FIG. M31 TESTING DIODES

Alternator—Further dismantling

- a. Remove the heatsink/terminal block assembly.
- b. Withdraw the three through bolts.
- c. Separate the slip ring end bracket and stator assembly from the rotor and drive-end bracket by inserting a lever between the stator and drive-end bracket and carefully prise the two apart until the slip ring end bearing is clear of its housing.

If necessary, the rotor shaft can be pressed out from the drive-end bracket having first removed the shaft nut, washers, pulley, fan & shaft key.

- d. Drive-end bearing

Dismantle the alternator and separate the rotor from the drive-end bracket. Unscrew the three countersunk screws securing the bearing retaining plate, remove the plate and withdraw the drive-end bearing assembly.

- e. Slip ring end bearing

Dismantle the alternator. Unsolder the field winding connections to the slip ring moulding assembly and withdraw the assembly from the rotor shaft. Extract the bearing from the shaft. Fit the new bearing and engage the slip ring moulding with the slot in the motor shaft. Finally, remake the field to slip ring connections using Fry's H.T. 3 solder (or any high melting point solder).

When required, the alternator bearing may be lubricated with Shell 'Alvania' 'RA'.

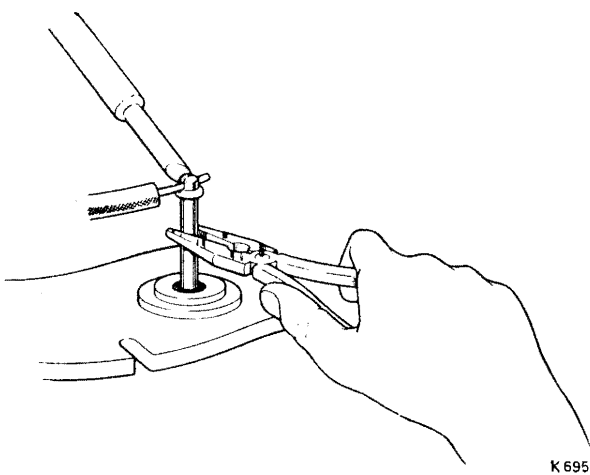


FIG. M32 USE OF THERMAL SHUNT

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Alternator—To assemble

Reverse the dismantling procedure, noting the following points:

- a. Ensure that the slip ring bearing is positioned as far as it will go along the rotor shaft towards the field assembly.
- b. Ensure that the brushes are in the brush housing before fitting the brush moulding.
- c. Tighten the through bolts evenly.
- d. If the rotor and drive-end bracket have been separated, support the inner ring of the drive-end bearing with the distance collar. Do not use the drive-end as a support for the bearing when fitting the rotor.

Alternator Lucas Model 11 AC**Field isolating device**

With the engine stationary, the control unit and the alternator field windings are isolated from the battery by the normally-open contacts of the Model 6RA relay, the operating coil of which is fed from the ignition switch.

The contacts of the relay are connected in the negative lead of the regulator.

Maintenance

Remove any dirt or oil from around the ventilating apertures of the slip ring end cover.

Lubrication

The alternator bearings are packed with grease during assembly and do not require periodic attention.

Terminal connections

Ensure that all terminal connections are secure.

Alternator—To test in position

A fault in the charging circuit should be located as follows:

1. Examine the alternator driving belts for wear and correct tension.
2. Apply the handbrake and chock the rear wheels. Start the engine and check to ensure that battery voltage is being applied to the rotor winding by connecting a voltmeter between the cable ends normally attached to the field terminals. Stop the engine.
3. Disconnect the battery earth lead.
4. Withdraw the leads from the alternator field terminals, then using a suitable pair of auxiliary cables, connect the terminals directly to the battery (*see Fig. M.23*).

5. Re-connect the battery earth lead. Start the engine and slowly open the throttle until the engine speed is approximately 1 650 r.p.m. At this speed the ammeter should indicate approximately 40 amps. If a Zero reading is registered on the ammeter, stop the engine and disconnect the leads from the field terminals. Remove the two screws securing the brushbox moulding and remove the brushgear for examination (*see Brushgear - To inspect*).

Note When carrying out this operation, on no account should the engine speed exceed 2000 r.p.m., or damage to the diodes will result.

6. If necessary fit new brush and spring assemblies and again test the alternator output. If the Zero reading persists, the alternator must be removed from the engine and dismantled for detailed inspection (*see Alternator - To dismantle*).

A low output current reading will indicate a faulty alternator or poor circuit wiring connections. Check the connections while the alternator is connected and running at 1 650 r.p.m. engine speed. Connect a low range voltmeter between the alternator output terminal and the battery insulated terminal (*see Fig. M24*), and note the voltmeter reading.

Transfer the voltmeter connections to the alternator frame and battery earth terminal (*see Fig. M25*); note the reading.

If either of these readings exceed 0.5 Volt there is a high resistance in the charging circuit, this must be traced and rectified.

If there is no undue resistance in the charging circuit even though the alternator output is low, proceed to dismantle the alternator.

Alternator—To remove

1. Disconnect the alternator electrical connections.
2. Slacken the two upper securing bolts (lower on early cars).
3. Slacken the setscrew on the slotted adjuster link.
4. Move the alternator inwards towards the engine, in order to release the tension on the driving belt; remove the belt.
5. Support the alternator and remove the previously slackened bolts, taking note of the position of the spacers to facilitate assembly.

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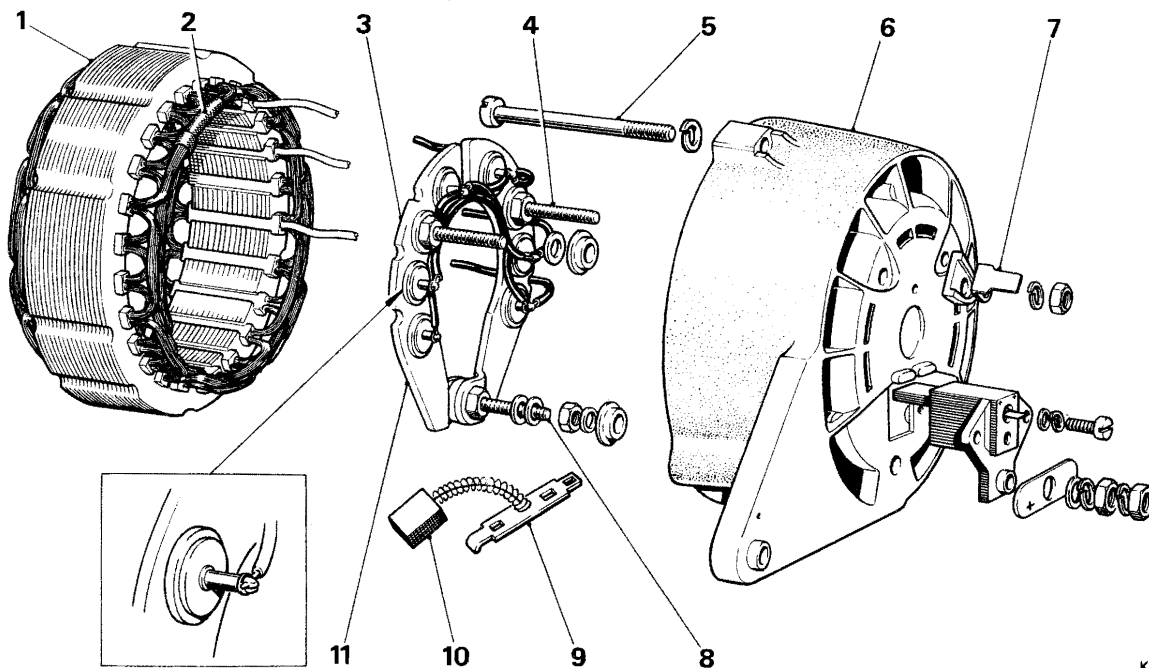
**Alternator—To dismantle
(see Figs M33 and M34)**

1. Remove the shaft nut, spring washer, pulley and fan from the drive-end of the alternator.
2. Unscrew and remove the three 'through' bolts.
3. Mark the drive-end bracket, lamination pack and slip ring cover so that they can be assembled in correct angular relationship to each other.
4. Withdraw the drive-end bracket and rotor from the stator. The drive-end bracket and rotor need not be separated unless it is necessary to examine the drive-end bearing or to renew the rotor.
5. In this event, the rotor should be removed from the drive-end bracket by means of a hand press, having first removed the shaft key and bearing collar.
6. Remove the terminal nuts, washers, insulating pieces, brushbox screws and the 2B.A. hexagon-headed bolt from the slip ring end bracket. Retain the two washers fitted between the brushbox moulding and the end bracket.
7. Withdraw the stator and heat sink assemblies from the slip ring end bracket.

7. Close up the retaining tongue at the base of each field terminal blade and withdraw the brush spring and terminal assemblies from the moulded brushbox.

Brushgear—To inspect

1. Measure the brush length. A new brush is 15,90 mm. (0.625 in.) long, a fully worn brush is 4,00 mm. (0.156 in.) long, and must be renewed at or near this length. The new brush is supplied complete with brush spring and 'Lucar' terminal blade and has merely to be pushed in until the tongue registers. To ensure that the terminal is properly retained, carefully lever up the retaining tongue with a screwdriver blade, so that the tongue makes an angle of 30° with the terminal blade.
2. The nominal brush spring pressures are between 113 g. and 142 g. (4 oz and 5 oz) with the spring compressed to 19,84 mm. (0.781 in.) in length and 212 g. to 242 g. (7.5 oz to 8.5 oz) with the spring compressed to 10,40 mm. (0.406 in.) in length. These pressures should be measured if equipment is available.



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FIG. M33 BRUSHGEAR AND HEATSINKS

- | | | | |
|--|-----------------------|-----------------------------------|---|
| 1 Stator | 4 Warning lamp 'AL' | 8 Output terminal | 11 Positive heat sink end cathode base diodes |
| 2 Star point | 5 Through bolt | 9 Terminal blade retaining tongue | |
| 3 Negative heat sink and anode base diodes (black) | 6 Slip ring end cover | 10 Slip ring brush | |
| | 7 Terminal 'AL' | | |

3. Check to ensure that the brushes move freely in their holders. If at all sluggish, clean the side of the brush with a cloth moistened in petrol; if this fails to effect a cure, lightly polish the side of the brush on a smooth file. Remove all traces of brush dust before fitting the brushes in the holders.

Note The brush which bears on the inner slip ring is always associated with the Positive pole of the electrical system, since the lower linear speed of the inner ring results in reduced mechanical wear and helps to offset the higher rate of electrical wear peculiar to the Positive connected brush.

Rotor-To test

Test the rotor winding by connecting either an ohmmeter (see Fig. M35) or the appropriate battery supply (see Fig. M36) between the slip rings.

1. The reading of field coil resistance should be 3.8 ohms at 20°C (68°F). If the alternative test has been made, the value of the current should be approximately 3.2 amps.

2. Using a 110 Volt (A.C.) mains supply and a 15 Watt test lamp (see Fig. M28), test for defective insulation between one of the slip rings and one of the rotor poles. If the lamp is illuminated the coil is earthing and a replacement rotor/slip ring assembly must be fitted.

No attempt should be made to machine the rotor poles or to true a distorted shaft.

Sliprings-To inspect

The slip ring surfaces should be smooth and uncontaminated by oil or other foreign matter. Clean the surfaces using a cloth moistened in petrol. If there is evidence of burning, clean with very fine glass paper. On no account must emery cloth or similar abrasives be used. The small current carried by the rotor winding, and the unbroken surface of the slip rings mean that the possibility of scored or pitted slip rings is almost negligible.

Stator-To test

1. Unsolder the three stator cables from the heat sink assembly, taking care not to overheat the diodes (see *Alternator diode heat sink assembly - To renew*).

2. Check the continuity of the stator windings, by first connecting any two of the three stator cables in series with a 1.5 Watt test lamp and a 12 Volt battery as shown in figure M29

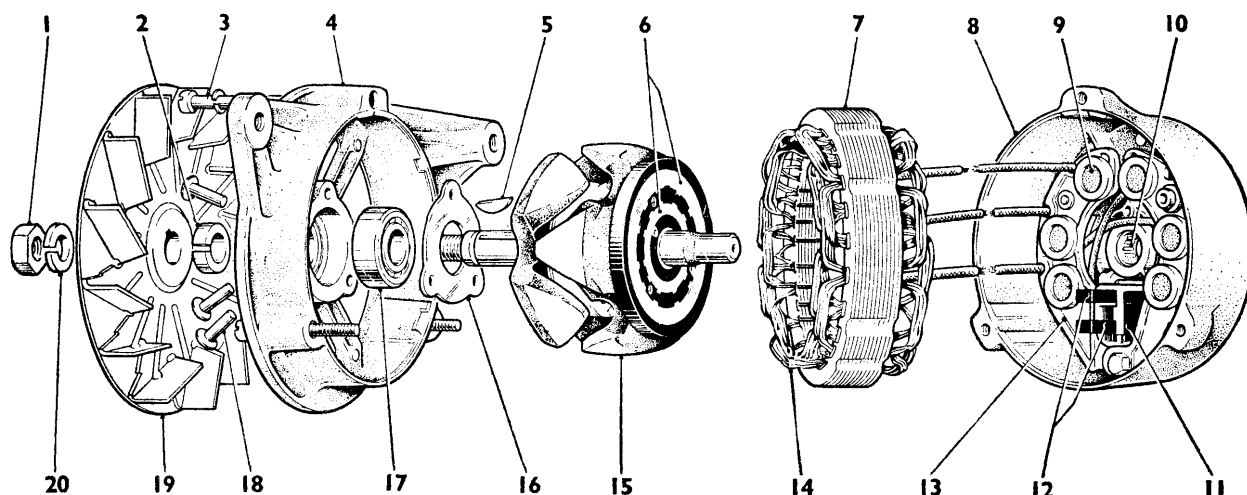


FIG. M34 EXPLODED VIEW OF 11 AC ALTERNATOR

- | | | | |
|---------------------|---------------------------|------------------------|------------------------|
| 1 Shaft nut | 6 Slip rings | 11 Brush box mouldings | 16 Retaining plate |
| 2 Bearing collar | 7 Stator laminations | 12 Brushes | 17 Ball bearing |
| 3 'Through' bolts | 8 Slip ring end bracket | 13 Diode heat sink | 18 Rivets |
| 4 Drive end bracket | 9 Silicon diodes | 14 Stator windings | 19 Cooling fan |
| 5 Key | 10 Needle roller bearings | 15 Rotor | 20 Shaft spring washer |

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3. Repeat the test, replacing one of the two cables by the third cable. Failure of the test lamp to illuminate on either occasion, means that part of the stator winding is open-circuit and the stator must be renewed.

4. Test for defective insulation between the stator coils and lamination pack with the mains test lamp (see Fig. M30).

5. Connect the test probes between any one of the three cable ends and the lamination pack. If the lamp is illuminated, the stator coils are earthing and the stator must be renewed.

6. Before soldering the stator cable ends to the diode pins, carry out the following test.

3. The above procedure is adequate for service purposes but for any accurate measurement of diode resistance it is necessary for factory equipment to be available. Since the forward resistance of a diode varies with the voltage applied, no realistic readings can be obtained with battery-powered ohmmeters. However, should a battery-powered ohmmeter be used a serviceable diode will yield 'Infinity' in one direction and some indefinite, but much lower reading in the other.

Note Ohmmeters of the type incorporating a hand-driven generator must never be used for checking diodes.

Diodes—To test

1. Each diode can be checked if connected in series with a 1.5 Watt test bulb across a 12 Volt (D.C.) supply. Test again by reversing the connections (see Fig. M31).

2. The bulb should be illuminated and current should flow in one direction only. Should the bulb be illuminated in both tests, or not be illuminated in either test, this indicates a defective diode and the appropriate heat sink assembly must be renewed.

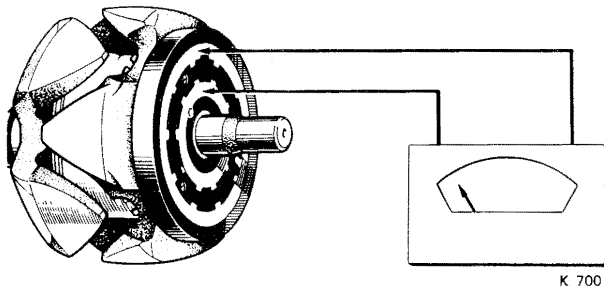
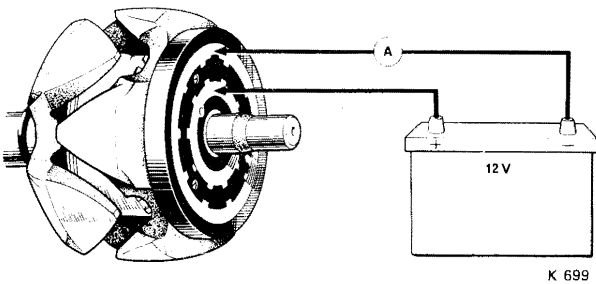


FIG. M35 MEASURING ROTOR WINDING



**FIG. M36 MEASURING ROTOR WINDING
RESISTANCE**

Diode heatsink assembly —To renew

The alternator heat sink assembly comprises two parts, one of positive polarity and the other negative (see Fig. M33).

The positive portion carries three cathode base diodes coloured Red and the negative portion carries three anode base diodes coloured Black.

The diodes cannot be renewed individually, but for service purposes, they are supplied already pressed into the appropriate heat sink portion.

When soldering the interconnections, 'M' grade 45-55 tin-lead solder should be used.

Great care must be taken to avoid overheating the diodes or bending the diode pins. The diode pins should be lightly gripped with a pair of long-nosed pliers (which act as a thermal shunt). This operation is shown in Figure M32; and the soldering must be carried out as quickly as possible.

After soldering, the connections must be neatly arranged around the heat sinks, to ensure adequate clearance for the rotor and should be tacked down with 'MMM' EC 1022 adhesive where indicated in Figure M43.

The stator connections must pass through the appropriate notches at the edge of the heat sink.

Bearings—To renew

Renew any bearings which are worn to such an extent that they allow excessive side movement of the rotor shaft.

The needle roller bearing in the slip ring end bracket cannot be serviced separately. In the unlikely event of this bearing becoming unserviceable a complete end bracket assembly must be fitted.

1. After withdrawing the rotor shaft from the drive-end bracket, renew the drive-end ball bearing race as follows.

2. File away the head of each of the three rivets securing the bearing retaining plate and punch out the rivets.

3. Press the old bearing out of the bracket.
4. Before fitting the new bearing, ensure that it is clean and packed with an approved melting-point grease.
5. Locate the bearing in the housing and press squarely into position.
6. When fitting the bearing retaining plate, use new rivets.

Alternator output control unit Model 4 TR

Important The battery must never be disconnected while the alternator is running. Failure to observe this ruling will cause the control unit to be damaged.

Checking and adjusting

1. Before checking and adjusting the control unit it must be established that the alternator and the charging circuit wiring are in good condition.
2. Check the battery to control unit wiring which incorporates the field isolating relay. To ensure correct working of the control unit, the resistance of this complete circuit, including the isolating relay, must not exceed 0.1 ohm. Any unduly high resistance must be traced and rectified.

Control unit—To check

Do not disturb the existing connections to the alternator and control unit.

1. Connect a voltmeter of the suppressed-zero type, reading 12 Volt to 15 Volt between the battery terminals and note the reading with all electrical equipment switched off.
2. Switch on an electrical load of approximately 2 amps., e.g. side and tail lighting. Refer to Figure M37.
3. Start the engine and run the alternator at approximately 1 250 r.p.m. engine speed for eight minutes; this ensures that the system voltage has stabilised.
4. If the charging current is still greater than 10 amps continue to run the engine until this figure is reached. The voltmeter should indicate a reading of between 13.9 Volt and 14.3 Volt.
5. If the reading obtained is stable but outside these limits the unit should be adjusted to control at the correct voltage (*see Control unit - To adjust*).
6. If the voltmeter reading remains unchanged (at open-circuit battery terminal voltage) or increases in an uncontrolled manner, the control unit is faulty and must be renewed.

Control unit—To adjust

1. Remove the screws from the control unit.
2. From the rear of the unit carefully remove the sealing compound which conceals the potentiometer adjuster.
3. Check that the voltmeter is still firmly connected between the battery terminals.
4. Start the engine, and while running the alternator at 1 250 r.p.m. engine speed turn the potentiometer adjuster slot clockwise to increase the setting or anti-clockwise to decrease, until the required setting is obtained.

Important Care must be taken in making this adjustment; a minimal amount of adjuster movement causes an appreciable difference in the voltage reading.

5. Stop the engine and again check the setting: start the engine and run the alternator at 1 250 r.p.m. engine speed.
6. Fit the control unit and disconnect the voltmeter.

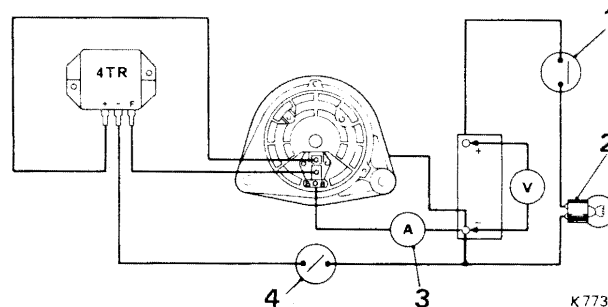


FIG. M37 LUCAS 4 TR CONTROL UNIT

TEST CIRCUIT

- 1 Side and tail lamps circuit switch
- 2 Side and tail lamps
- 3 Ammeter
- 4 Field isolating device

Section M6

GENERATOR

Testing in position

1. Check and if necessary adjust the generator driving belts (*see Chapter L*).
2. Disconnect the generator (dynamo) leads at the control unit terminals marked 'D' and 'F'.
3. Connect the two leads to the positive terminals of a Zero to 20 Volts voltmeter. Connect the negative lead to a good earthing point.
4. Start the engine but do not allow the generator speed to exceed 1000 r.p.m.
5. If the generator attains normal voltage, check the 'RB 340' control unit, the wiring and the battery connections.

6. If there is no voltage build-up, remove the generator (*see Generator - To remove*) and examine the condition of the brushes and commutator.

7. Hold back each brush spring in turn and move the brush by gently pulling on its flexible connector (*see Fig. M39*). If the movement is sluggish, remove the brush from its box and ease the sides of the brush by lightly polishing on a smooth file. Clean out the brush boxes if dirty and check the clearances of the brushes in the boxes as sticking of the brushes can occur if clearances are insufficient (*see Fig. M40*). It is important that the brushes are fitted in their original positions.

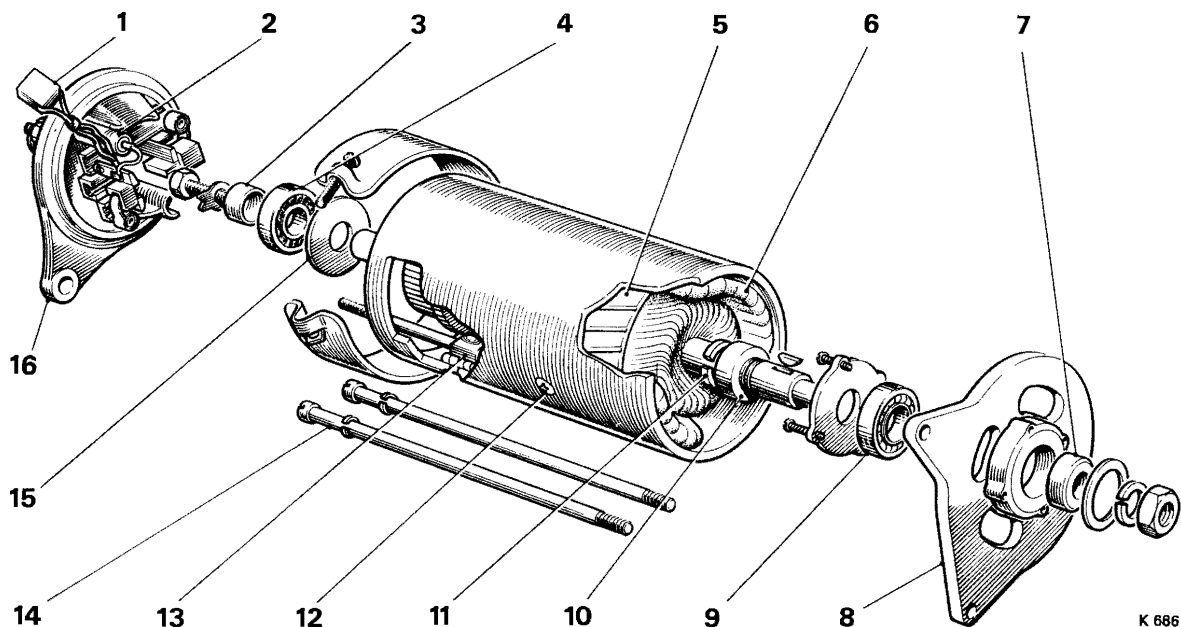


FIG. M38 EXPLODED VIEW OF GENERATOR

- | | | | |
|----------------|---------------------|-----------------------------|------------------------------|
| 1 Brushes | 5 Armature | 9 Ball bearing | 13 Field coil terminal block |
| 2 Capacitor | 6 Field coil | 10 Bearing spacer | 14 'Through' bolts |
| 3 Locking cap | 7 Pulley spacer | 11 Shaft collar | 15 Thrust washer |
| 4 Ball bearing | 8 Drive end bracket | 12 Pole shoe securing screw | 16 Commutator end bracket |

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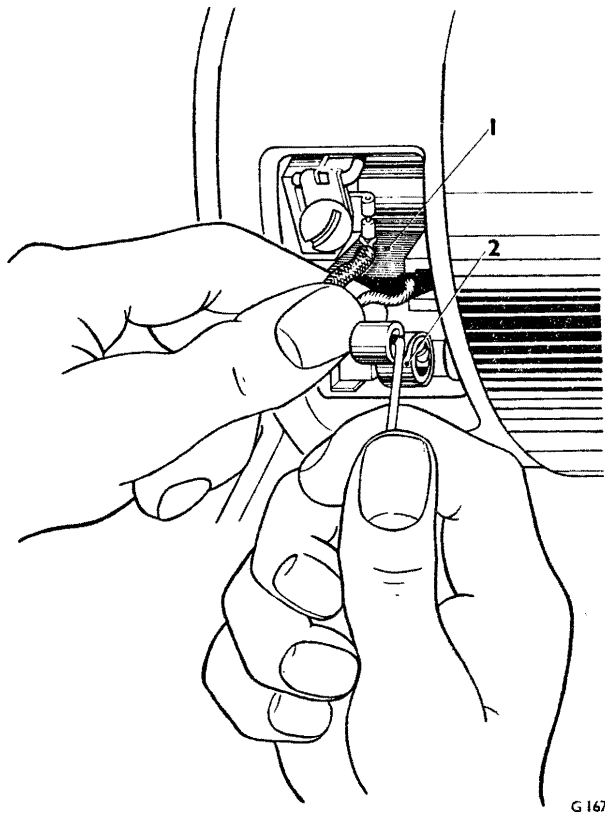


FIG. M39 CHECKING GENERATOR BRUSHES FOR FREEDOM OF MOVEMENT

- 1 Brush
- 2 Brush spring

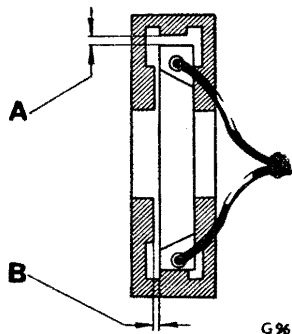


FIG. M40 BRUSH CLEARANCES

- A 0,457 mm. to 0,644 mm. (0.018 in. to 0.026 in.)
- B 0,101 mm. to 0,304 mm. (0.004 in. to 0.012 in.)

8. Excessive brush wear can cause damage to the commutator if the brush leads come into contact with the running face of the commutator.

9. The minimum acceptable length of the brushes is 8,70 mm. ($\frac{11}{32}$ in.). It is imperative that they are renewed when near or below this measurement.

10. Generator charging failures can sometimes be attributed to the brush leads fouling the corners of the brush boxes, or by a short circuit between the brush leads and band cover.

The latter of these faults can occur if the insulating sleeves have pulled away from their normal positions, exposing the wires. Always ensure that the wires are completely covered. The following information is included to assist generator overhaul when renewal is impracticable.

Generator—To remove

1. Slacken the bolts at both ends of the slotted link to release the tension from the driving belts.
2. Remove the driving belts.
3. Disconnect the leads from the rear of the generator.
4. Support the generator and remove the slotted link upper securing bolt, washer, distance piece and nut, noting the position of each to facilitate assembly.
5. Remove the setscrew and washer from the generator front and rear mounting brackets.
6. Remove the generator from the engine compartment.

Generator—To test

1. Connect a 12 Volt test lamp to the terminal marked 'D' and to the generator casing. Rotate the armature slowly through at least one revolution; the lamp should remain illuminated. If the generator has an open-circuit the lamp will not illuminate.

2. Remove the earthed brush; if the test lamp remains illuminated, the generator has a short circuit to earth.

3. With both brushes removed, transfer the test lead from terminal 'D' to the commutator. If the lamp illuminates, a short circuit in the armature is indicated.

4. Check the field coil with an ohmmeter, or with a voltmeter and ammeter. This should indicate between 5.7 ohms and 6.3 ohms or approximately 2 amps at 12 Volts.

Generator—To overhaul

1. Release the screw on the band cover and slide the cover clear of the brush apertures in the casing.
2. Check the brush spring tension. The tension should be between 510 g. and 850 g. (18 oz and 30 oz) both measurements being obtained radially to the commutator. (See Fig. M41).
3. Remove the brushes from their boxes and examine the commutator. Discolouration of the commutator may be removed by means of a clean lint-free cloth soaked in petrol or methylated spirits. If this is unsuccessful, insert a strip of fine glass paper through one of the apertures around the commutator and back through the same aperture. Hold the glass paper taut and rotate the commutator in its normal direction (clockwise, viewed from driving end). On no account clean an individual segment as this will produce 'flats' and induce burning when the generator is operating.
4. Remove all traces of abrasive dust.
5. Should the commutator be badly burned, worn or pitted, it should be skimmed on a lathe as described in Commutator - To skim.

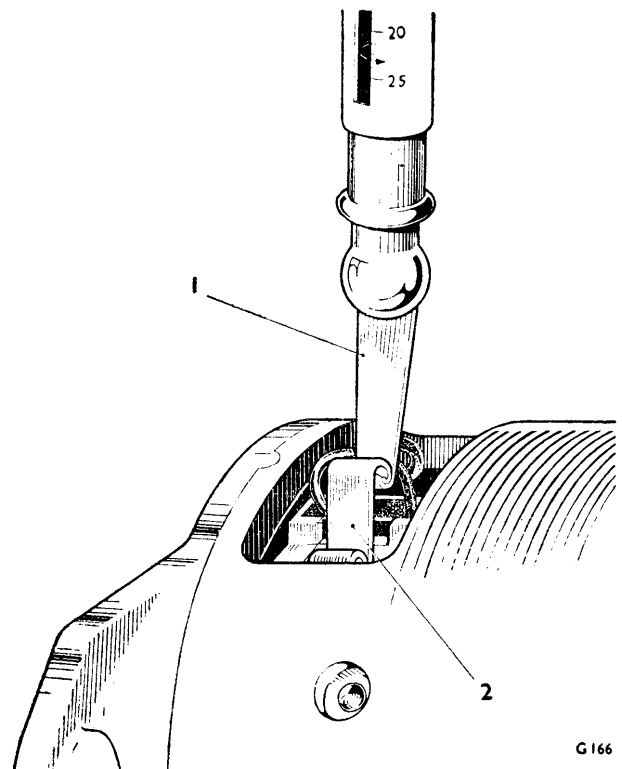


FIG. M41 CHECKING BRUSH SPRING TENSION

1 Spring balance 2 Brush spring

Generator—To dismantle

(see Fig. M38)

1. Remove the nut and spring washer from the armature shaft.
2. Using the special extractor (RH 7098) withdraw the pulley from the shaft and remove the locating key from its keyway.
3. Unscrew and remove the two 'through' bolts from the casing.
4. Remove the commutator-end bracket from the generator casing.
5. Remove the drive-end bracket complete with armature from the casing.

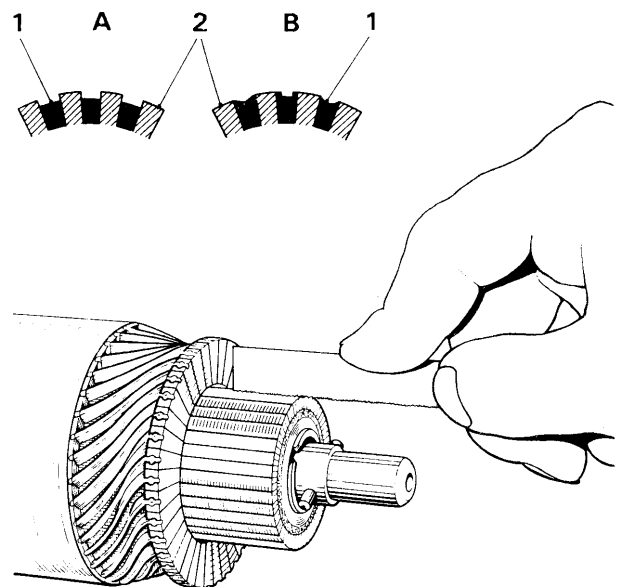


FIG. M42 METHOD OF UNDERCUTTING INSULATORS

1 Insulators 2 Segments
A Correct method B Incorrect method

Commutator—To skim

1. Mount the armature in a lathe.
2. Rotate the armature at a high speed and take a light cut with a very sharp tool. Do not remove more metal than is necessary.
3. Remove the armature from the lathe. Under-cut the insulators between the segments to a depth of 0,79 mm. ($\frac{1}{32}$ in.) using a hack-saw blade ground to the thickness of the insulator (see Fig. M42).
4. Polish the commutator with very fine glass paper.

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Field coils—To remove

1. Remove the rivet securing the field coil terminal block to the generator casing.
2. Unsolder the field coil connections.
3. Remove the insulator which is provided to prevent the junction of the field coils from contacting the generator casing.
4. Mark the casing and pole shoes so that the latter can be fitted in their original positions.
5. Using a wheel operated screwdriver, unscrew the two pole shoe securing screws.
6. Draw the pole shoes and coils out of the casing; remove the coils from the pole shoes.

Field coils—To fit

1. Fit the new field coils over the pole shoes and position inside the casing. Take care to ensure that the taping of the field coils is not trapped between the pole shoes and the casing.
2. Locate the pole shoes and field coils by lightly tightening the fixing screws. Using the wheel operated screwdriver, fully tighten the screws.
3. Fit the insulation piece between the field coil connections and the casing.
4. Solder the field connections to the field coil terminals block; rivet the terminal block to the generator casing.

Drive-end bearing—To remove

1. Withdraw the screws securing the bearing retaining plate to the end bracket; remove the plate.
2. Press out the bearing.

Drive-end bearing—To fit

1. Pack the new bearing with a high melting point grease.
2. Locate the bearing in the end-bracket housing and press into position.
3. Fit the bearing retaining plate and tighten the securing screws. Lock each screw by centre punching the screw end at three equally spaced points.

Commutator end bearing—To remove

1. Remove the setscrew, tab-washer and retaining cup.
2. Withdraw the bearing from the armature shaft by means of a hand press or 'Claw' type extractor.

Commutator end bearing—To fit

1. Pack the new bearing with high melting point grease.
2. Press the bearing into position on the shaft, pressure should only be exerted on the inner race of the bearing during this operation.
3. Fit a new tab-washer.

Brushes—To bed in

If new brushes are to be fitted, it is important that the correct brush be used and that a minimum of 75 per cent bedding is obtained on the face with 100 per cent bedding on the trailing edge.

1. To bed-in the brushes, wrap a strip of fine glass paper around the commutator, allowing the two ends to meet. The glass paper should be the same width as the commutator and be positioned with the abrasive side facing outward. Secure the ends of the glass paper to the commutator so that the commutator is completely encircled (see Fig. M43).
2. Temporarily assemble the generator and secure the end covers with the two 'through' bolts.
3. Fit the new brushes and rotate the armature in its normal direction of rotation, until the whole face shows continuous bedding. Remove the brushes from their boxes and dismantle the generator.

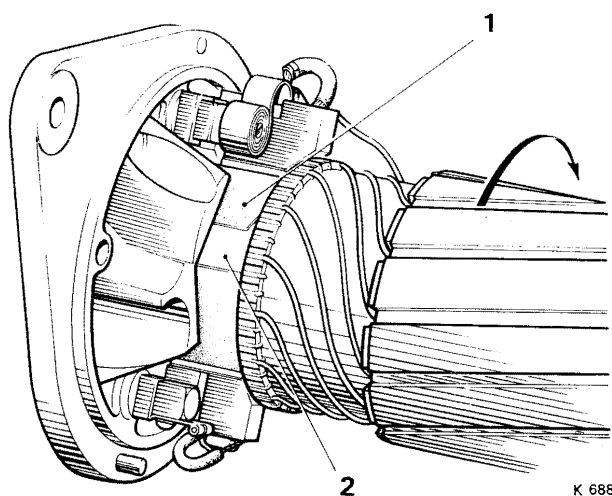


FIG. M43 BEDDING THE BRUSHES

- 1 Glass paper 2 Adhesive tape

4. Remove the glass paper and clean away all abrasive dust and carbon.
5. Assemble the generator by reversing the procedure given for dismantling. Fit the brushes within their respective boxes to their original 'bedding-in' positions.
6. The generator should be 'motored' for fifteen minutes by connecting the positive terminal of a 12 Volt battery to the terminal marked 'D', the negative battery terminal to earth on the generator casing and the field terminal of the generator to a 6 Volt supply. This 'motoring' is essential to prevent any brush or commutator burning during service.

Generator--To fit

Reverse the procedure given for removal, noting the following points.

1. Ensure that all the electrical contacts are clean and secure.
2. Fit the distance pieces in the correct position to maintain alignment between the engine and generator pulleys.
Misalignment will cause premature wear of the driving belts.
3. Check the tension of each driving belt as described in Chapter L - Cooling System.

Generator Control Box Control box--To check

If the control box is suspected of being faulty, carry out the following tests and checks before fitting a replacement unit.

General checks

Check if the battery is faulty by substituting a battery known to be in good condition or by using a hydrometer and a 150 amp heavy discharge tester.

1. Check the tension of the generator driving belts (*see Chapter L - Cooling System*).
2. Check the generator output as follows; disconnect the cables from the generator terminals, then, using a 'jumper lead', link the large generator terminal marked 'D' to the small terminal marked 'F'.
3. Connect a voltmeter between the link and earth, and run the generator up to approximately 1000 r.p.m.; if the voltmeter indicates a rising voltage then the generator is functioning correctly.
4. Examine the condition of the wiring in the charging circuit and carry out continuity tests between the generator, control box and ammeter.
5. Check all earth connections, including the control box.

Contact points--To examine

1. Remove the two screws securing the control box cover in position; remove the cover.
2. Examine the contact points for oxidization, burning, pitting and poor surface finish. If any of these defects are found, the contacts should be cleaned as described in Contact points - To clean.

Contact points--To clean

1. To clean the contacts of the voltage or current regulator, use a fine carborundum stone or silicon carbide paper followed by methylated spirits (denatured alcohol).
2. To clean the cut-out relay contacts, use a strip of fine glass paper; do not use a carborundum stone or emery cloth.
If the contacts are satisfactory, adjust the voltage regulator as described in Voltage regulator - To adjust.

Voltage regulator--To adjust

Checking and adjusting should be completed as rapidly as possible to avoid errors due to heating of the operating coil.

1. Withdraw the cables from the control box terminal blades marked 'B'. Alternatively, insert a strip of paper between the cut-out contacts as shown in Figure M44.
2. Connect a first grade Zero to 20 Volt moving coil voltmeter between the control box terminal marked 'D' and a good earthing point.

- Note** A convenient method of making this connection is to withdraw the feed for the ignition warning lamp from control box terminal 'WL', then clip the voltmeter positive lead to the small terminal blade thus exposed; this blade being electrically common with terminal 'D'.
3. Start the engine and run the generator at 1500 r.p.m.
 4. Observe the voltmeter pointer.
The voltmeter reading should be steady and read between the appropriate limits given in Chapter A - General Information, according to the ambient temperature. An unsteady reading may be due to dirty contacts. If the reading is steady but occurs outside the appropriate limits, an adjustment should be made as follows.
 5. If the control box cover has not already been removed, stop the engine; remove the cover by removing the securing setscrews.

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6. Start the engine and run the generator at 1500 r.p.m.
7. Using 'Lucas' tool (543-817-42), turn the voltage adjustment cam until the correct setting is obtained (turning the tool clockwise raises the setting and turning the tool anti-clockwise lowers the setting).
8. Stop and then re-start the engine and repeat the test to check the regulator settings.
9. Fit the original connections and fit the control box cover.

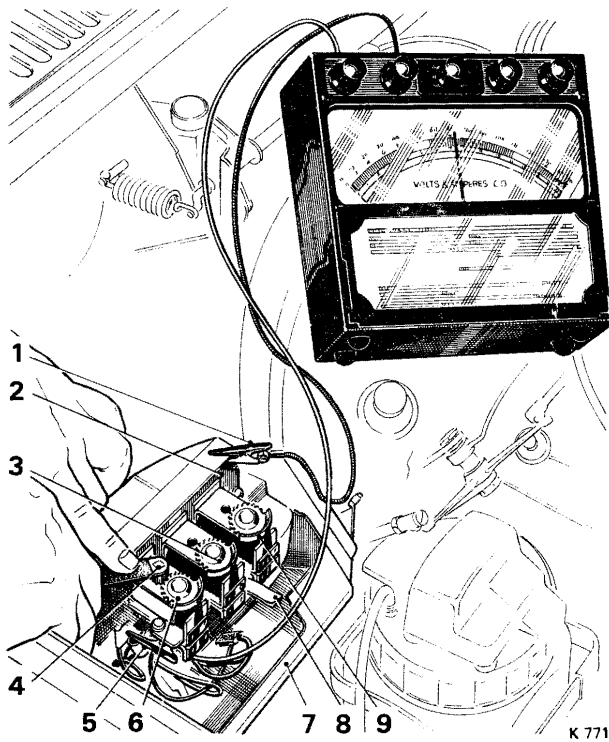


FIG. M44 CHECKING VOLTAGE REGULATOR SETTING

- 1 Bulldog clip connected to earth
- 2 Control box
- 3 C.R. adjustment cam
- 4 Lucas setting tool
- 5 Bulldog clip to terminal 'D'
- 6 V.R. adjustment cam
- 7 Cover
- 8 Strip of paper inserted between cut-out relay contacts
- 9 Cut-out relay adjustment cam

Current regulator—To adjust

The generator must be made to develop its maximum rated output, whatever the state of charge the battery might be at the time of setting. Therefore, in order to render the voltage regulator inoperative, a 'Bulldog' clip should be used to keep the voltage regulator contacts together.

1. Remove the control box cover.
2. Using a 'Bulldog' clip, short out the contacts of the voltage regulator (*see Fig. M45*).
3. Withdraw the cables from control box terminals 'B', then using a 'jumper lead', connect the cables to the positive side of a first grade Zero to 40 amp moving coil ammeter.
4. Connect the remaining ammeter cable to one of the control box terminal blades marked 'B'.

Note It is important to ensure that terminal 'B' carries only this one connection. All other load connections (including the ignition coil feed) must be made to the battery side of the ammeter.

5. Switch on all the lamps, blowers and rear window demister to ensure that the generator develops its full rated output.
6. Start the engine and run the generator at 4000 r.p.m. and observe the ammeter pointer.
7. The ammeter pointer should be steady and indicate a current of between 35 amps and 36 amps. An unsteady reading may be due to dirty contacts. If the reading is too high or too low, an adjustment must be made as follows.
8. Using the special 'Lucas' tool (543-817-42), turn the current adjustment cam until the correct setting is obtained (turning the tool clockwise raises the setting and turning the tool anti-clockwise lowers the setting).
9. Switch off the engine and fit the original connections, remove the bulldog clips.
10. Fit the control box cover.

Cut-in/cut-out relay—To adjust

To avoid errors due to heating of the operating coil, the cut-in figures, given in Chapter A - General Information, should be checked and adjusted as quickly as possible.

1. Connect a first grade Zero to 20 Volt moving coil voltmeter between the control box terminal 'D' and a good earthing point. Refer to Voltage regulator - To adjust.
2. Switch on an electrical load, e.g. the headlamps.
3. Start the engine and slowly increase the speed and observe the voltmeter pointer.

4. The voltage should rise steadily and then drop slightly at the instant of contact closure. The cut-in voltage is the reading which is indicated immediately before the pointer drops back and should occur between the limits given in Chapter A - General Information. If the cut-in occurs outside the limits, an adjustment must be made. In this event reduce engine speed to below cut-in and proceed as follows.

5. Remove the control box cover by removing the securing screws.

6. Using the special 'Lucas' tool (543-817-42), turn the cut-out relay adjustment cam a small amount in the appropriate direction (turning the tool clockwise raises the setting and turning the tool anti-clockwise lowers the setting).

7. Repeat Operation 6 until the correct setting is obtained.

8. Switch off the engine, fit the original connections and the cover.

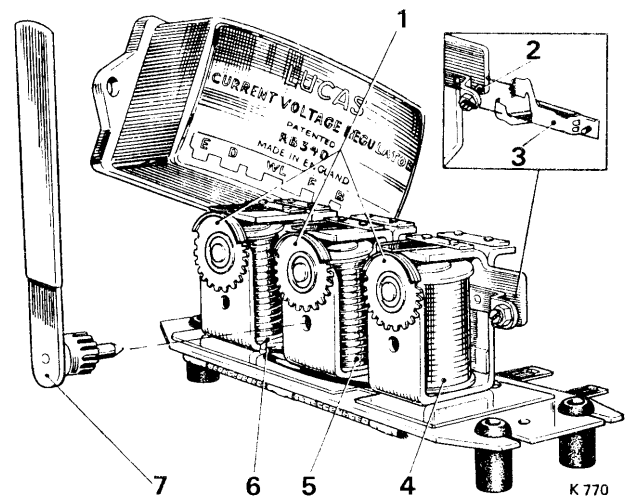


FIG. M45 ADJUSTING CURRENT REGULATOR

- | | |
|-----------------------------------|------------------------------|
| 1 Adjustment cams | 2 Voltage regulator contacts |
| 3 'Bulldog' clip | 4 Voltage regulator |
| 5 Current regulator | 6 Cut-out relay |
| 7 Setting tool (Lucas 543-817-42) | |

Drop-off voltage—To adjust

1. Withdraw the cables from the control box terminal blades 'B'.

2. Connect the first grade Zero to 20 Volt moving coil voltmeter between the control box terminal marked 'B' and earth.

3. Start the engine and raise the speed to approximately 3000 r.p.m.

4. Slowly decelerate and observe the voltmeter pointer.

5. Opening of the contacts (indicated by the voltmeter pointer falling to Zero) should occur between the limits given in Chapter A - General Information. If the drop-off voltage occurs outside these limits an adjustment must be made as follows.

6. Stop the engine and remove the control box cover.

7. Adjust the drop-off voltage by carefully bending the fixed contact bracket (see Fig. M46). Reducing the contact gap will raise the drop-off voltage and increasing the gap will lower the drop-off voltage.

8. Repeat the test and if necessary, adjust until the correct drop-off setting is obtained.

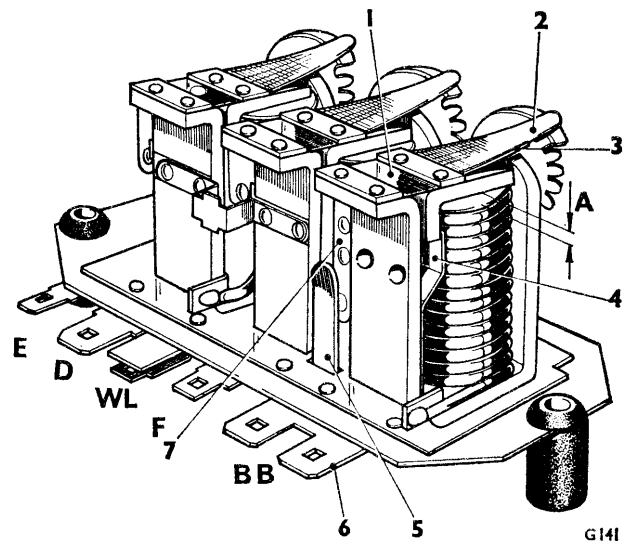


FIG. M46 CUT-OUT RELAY SETTINGS

- | | |
|-----------------------------|------------------------|
| 1 Phosphor bronze hinge pin | 2 Armature control pin |
| 3 Bi-metal backing spring | 4 Armature back-stop |
| 5 Fixed contact bracket | 6 'B-B' terminal plate |
| 7 Moving contact blade | |

A Armature to bobbin core gap

F 'F' terminal

D 'D' terminal

W.L. Warning lamp terminal

Note This should result in a contact follow-through or blade deflection of between 0.25 mm. to 0.89 mm. (0.010 in. and 0.035 in.)

9. Fit the original connections and the cover.

Air-gap settings—To adjust

Air gap settings are accurately adjusted during production of the control box and should require no further attention. If the original adjustments have been disturbed they should be set as follows.

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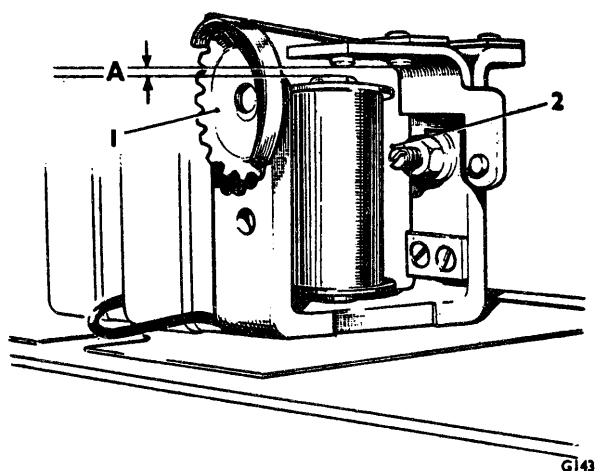


FIG. M47 VOLTAGE REGULATOR & CURRENT REGULATOR SETTINGS

- 1 Cam
- 2 Contact
- A 1,32 mm. to 1,42 mm.
(0.052 in. to 0.056 in.)

Voltage and current regulator core gaps—To set

1. Using the special 'Lucas' tool (543-817-42), turn the adjustment cam anti-clockwise to the point giving minimum lift to the armature tensioning spring.

2. Slacken the adjustable contact locking nut and screw back the adjustable contact.

3. Insert a 1,37 mm. (0.054 in.) feeler gauge between the armature and core face (see Fig. M47). The gauge should be inserted as far back as the two rivet heads on the underside of the armature.

4. Retain the gauge in position and press down squarely on the armature, screw in the adjustable contact until it touches the armature contact.

5. Tighten the locking nut and withdraw the gauge.

6. Re-set the voltage regulator and current regulator as described in Voltage regulator - To adjust and Current regulator - To adjust.

Contact 'follow-through' and cut-out relay core gap settings

1. As a first setting, insert a 0,38 mm. (0.015 in.) feeler gauge between the armature and the copper separation on the core face (see Fig. M46).

2. Adjust the fixed contact bracket so that the contacts just touch; remove the gauge.

3. Adjust the armature back stop to give a core gap of between 0,89 mm. to 1,14 mm. (0.035 in. and 0.045 in.).

4. Check the cut-in and drop-off voltage settings.

Section M7

EXTERIOR LIGHTING

Headlamp bulb—To renew

1. Remove the fairing securing screw, raise the lower edge of the fairing and unhook it from the two upper retainers; remove the seal (*see Fig. M48*).

2. Press the lamp unit against the tension of the adjusting screw spring and turn anti-clockwise until the heads of the screws can pass through the enlarged ends of the slots in the mounting; remove the lamp unit.

3. Detach the terminal socket from the bulb, open the retaining spring clip and remove the bulb from the reflector.

When fitting a new bulb, ensure that the groove and tang of the reflector and bulb assembly respectively are aligned correctly.

Sealed beam unit—To renew

1. Remove the fairing securing screw, raise the lower edge of the fairing and unhook it from the two upper retainers; remove the seal (*see Fig. M49*).

2. Unscrew but do not remove the three bezel retaining screws.

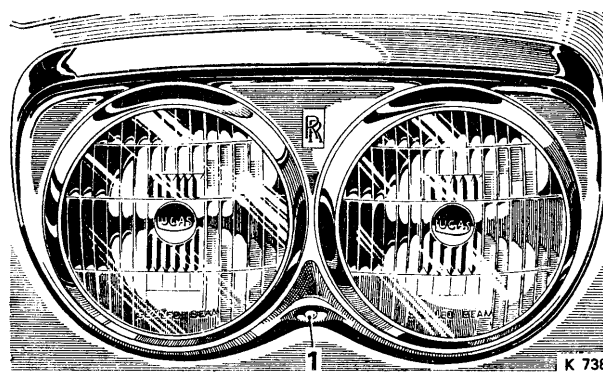
3. Press the lamp unit against the tension of the adjusting screw spring and turn anti-clockwise until the heads of the screws can pass through the enlarged ends of the slots in the bezel; remove the lamp unit. Before removing the bezel, hold the lamp with one hand to prevent it falling out of the back-shell.

4. For reference purposes, the outer lamp units have twin filaments, the inner lamp units have a single filament. (For correct lamp units refer to Section M19.)

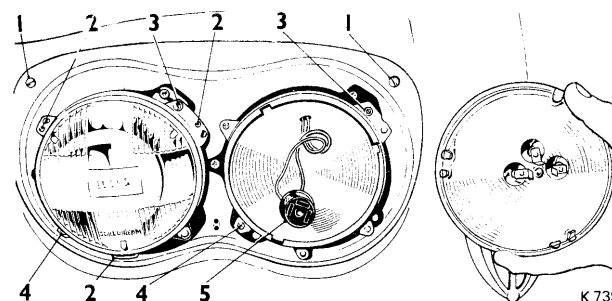
Alignment and setting

When the headlamp units have been disturbed the alignment of the headlamp beams should be checked and reset if necessary.

In order to obtain optimum results, it is recommended that the Lucas Beam Tester Mk III be used.

**FIG. M48 HEADLAMP SECURING SCREW**

1 Securing screw

**FIG. M49 ACCESS TO SEALED BEAM UNITS**

- 1 Location pegs
- 2 Securing screw
- 3 Vertical beam adjusting screw
- 4 Horizontal beam adjusting screw
- 5 Lamp socket

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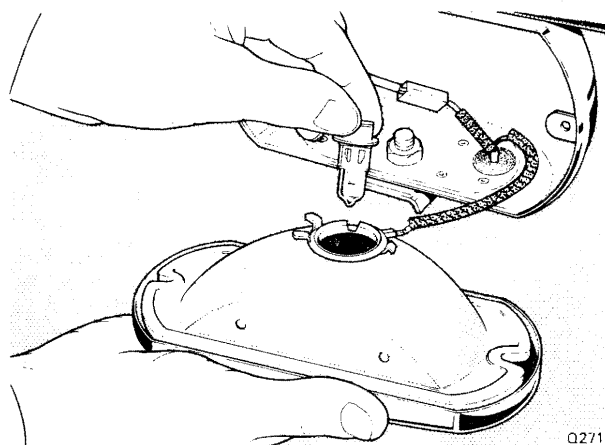


FIG. M50 FRONT FOGLEMPS

Headlamp—To adjust

Cars fitted with sealed beam units.

1. Drive the car onto a flat area, this need not be perfectly level, and ensure that the tyres are inflated to the correct pressures.
2. Remove the headlamp fairings as described in the Headlamp bulb - To renew; clean each lamp lens with a damp 'chamois' leather. Check that the lamps are operating satisfactorily on 'main' and 'dipped' beam, then switch the lamps off.
3. In order to obtain optimum results, it is recommended that the Lucas Beam Tester MKIII be used in accordance with the manufacturers instructions.
4. When the headlamps have been adjusted correctly, fit the headlamp seals and fairings ensuring that the seals do not foul the lamp fairings.

The lamps illustrated in Figures M50, M53 and M56 apply to early cars.

Foglamp bulb—To remove (see Fig. M50)

1. Remove the protective cover and unscrew the two lens securing screws.
2. Withdraw the lens unit complete with the chrome surround and detach the Lucar connector.
3. Remove the spring retaining clip and withdraw the bulb, taking care not to touch the glass.

Important If the glass envelope is accidentally touched by hand it must be cleaned with surgical spirit before fitting.

Front side/direction indicator bulbs —To remove

1. Remove the lens securing screw (see Fig. M52).
2. Remove the bulb.

Direction indicator repeater lamp bulb—To remove

1. Remove the two lens securing screws (see Fig. M51).
2. Remove the bulb.

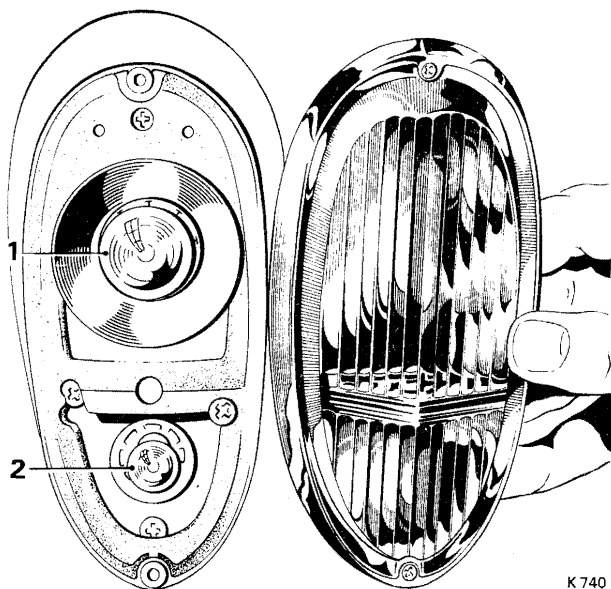


FIG. M51 ACCESS TO SIDE/DIRECTION INDICATOR BULBS

1 Direction indicator bulb 2 Side lamp bulb

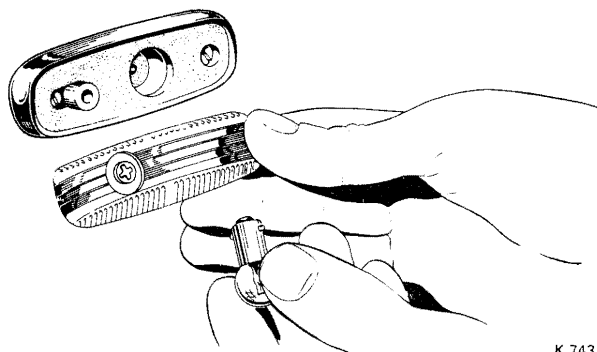
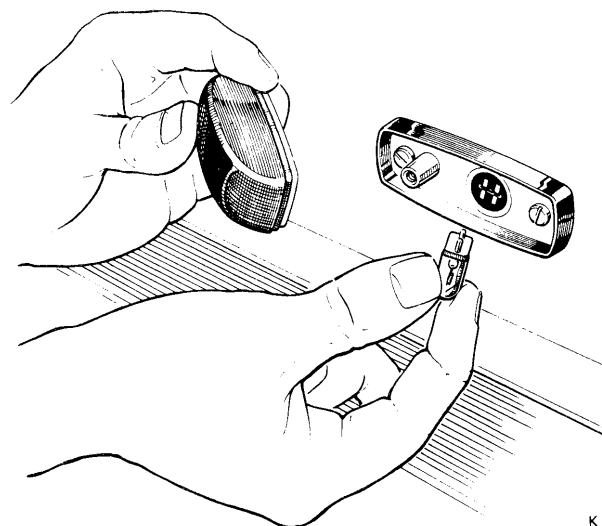


FIG. M52 ACCESS TO DIRECTION INDICATOR REPEATER BULB

Side marker lamp bulb—To remove

1. Remove the lens securing screw (*see Fig. M53*).
2. Pull out the capless bulb.



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FIG. M53 ACCESS TO SIDE MARKER LAMP BULB

Rear direction indicator, reversing and stop/tail lamp bulbs—To remove

1. Remove the trim panels in the luggage compartment, which cover the rear of the lamps.
2. Withdraw the appropriate bulb socket; the bulb socket is held in position by a spring clip which is integral with the socket (*see Fig. M54*).

Reversing lamp bulb—To remove

Left-hand drive cars from Car Serial Number 6000 and right-hand drive cars from Car Serial Number 5000

1. Remove the two lens retaining screws (*see Fig. M55*).
2. Remove the bulb.

Number plate lamp bulb—To remove

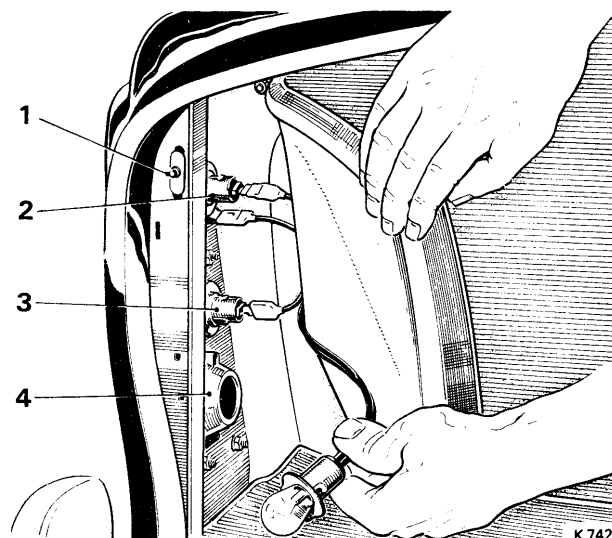
1. Remove the two lamp securing screws (*see Fig. M56*) and cover plate.
2. Peel back the rubber cover retaining the glass lens over the appropriate bulb, then remove the lens.
3. Remove the bulb.

Bonnet lamp bulb—To remove

1. Remove the two lens securing screws.
2. Remove the bulb.

Luggage compartment lamp bulb—To remove

1. Remove the two lens and finisher securing screws.
2. Remove the bulb.



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FIG. M54 ACCESS TO REAR WING LAMP BULBS

- 1 Trim fastener
- 2 Direction indicator lamp
- 3 Reversing lamp bulb
- 4 Stop/tail lamp bulb

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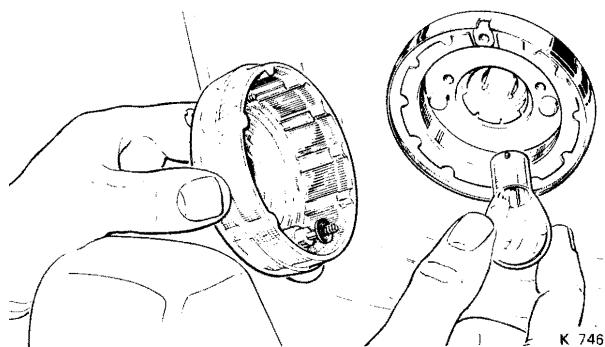


FIG. M55 ACCESS TO REVERSING LAMP BULB

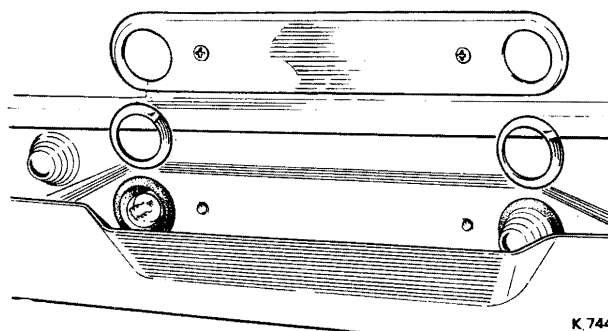


FIG. M56 ACCESS TO NUMBER PLATE LAMP BULBS

Section M8

INSTRUMENTS, INTERIOR LIGHTING
AND ACCESSORIES**Fuel/oil level indicator**

The fuel level indicator is controlled by a float operated rheostat unit in the fuel tank.

Faulty operation of the indicator may be due to insecure wiring or connections. If the instrument constantly indicates 'EMPTY', check the wiring and connections of the feed wires. If the instrument constantly reads 'FULL' check the earth connections to the indicator body, the fuel/oil change-over switch connections and the wiring of the fuel tank unit. Check the earthing of the fuel tank.

Inaccurate readings are usually caused by a distorted float arm on the rheostat unit. Take care not to foul the baffles in the fuel tank when fitting a new rheostat unit.

Fuel/oil level indicator—To remove
Right-hand drive cars prior to Car Serial
Number 6791

1. Remove the fuel/oil level change-over switch button.
2. Disconnect the battery.
3. Remove the small panel surrounding the handbrake.

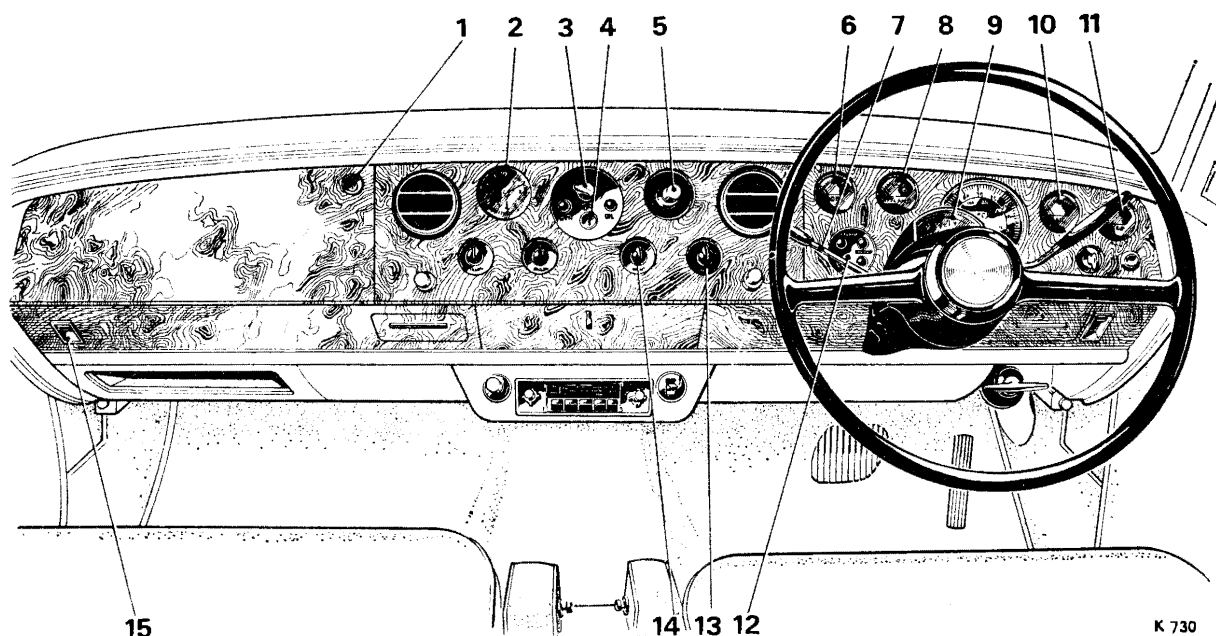


FIG. M57 SWITCHES & INSTRUMENTS, RIGHT-HAND DRIVE CARS

- | | | |
|--------------------------|--------------------------------|------------------------------------|
| 1 Facia compartment lock | 6 Fuel lever indicator | 11 Ammeter |
| 2 Clock | 7 Indicator switch | 12 Main warning lamp panel |
| 3 Switchbox | 8 Coolant indicator | 13 Windscreen wiper/washer switch |
| 4 Ignition switch | 9 Gear range selector quadrant | 14 Instruments illumination switch |
| 5 Cigar lighter | 10 Oil pressure/indicator | 15 Roof lamps switch |

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4. Release the nut and bolt securing the end of the top roll.
5. Remove the fresh air circular control knob grub screws, then remove the centre and right-hand facia panels, taking care not to damage the wood finish.
6. Unscrew and remove the two screws securing the indicator to the facia.
7. Disconnect the cables from the terminals on the rear of the indicator and withdraw the indicator.

Fuel/oil level indicator—To remove

Left-hand drive cars prior to Car Serial Number 6000

1. Remove the fuel/oil level change-over switch button.
2. Disconnect the battery.
3. Remove the small panel surrounding the hand-brake.
4. Release the nut and bolt retaining the end of the top roll.
5. Unscrew and remove the two circular fresh air outlet control knob grub screws, then remove the centre and left-hand facia panels, taking care not to mark the wood.
6. Unscrew and remove the two screws securing the indicator to the facia.
7. Disconnect the cables and withdraw the indicator.

Fuel/oil level indicator—To remove

Left-hand drive cars from Car Serial Number 6000

1. Gently prise away the left-hand knee trim pad, which is retained by upholstery clips, taking care not to damage the trim.
2. Disconnect the battery.
3. Unscrew and remove the circular fresh air outlet knob grub screws, then remove the knobs.
4. Remove the gear range selector cowl trim finisher.
5. Remove the centre and left-hand facia panels.
6. Unscrew and remove the two screws securing the indicator to the facia.
7. Disconnect the cables from the terminals on the rear of the indicator, and withdraw the indicator.

Fuel/oil level indicator—To remove

Right-hand drive cars from Car Serial Number 6791

1. Gently prise away from the facia, the right-hand knee trim pad, which is retained by upholstery clips, taking care not to damage the trim.
2. Disconnect the battery.
3. Unscrew and remove the circular fresh air outlet knob grub screws; then remove the knobs.
4. Remove the gear selector cowl trim finisher.
5. Remove the centre and right-hand facia panels.

6. Unscrew and remove the two screws securing the indicator to the facia.
7. Disconnect the cables from the terminals on the rear of the indicator; withdraw the indicator.

Fuel/oil level indicator—To fit

All cars

Reverse the procedure given for removal.

Coolant temperature indicator

No attempt should be made to carry out repairs on the coolant temperature system; any faults should be rectified by renewing faulty units. Any electrical overload is likely to render the indicator inaccurate, and if any errors in the readings still exist after changing the coolant probe, then the indicator should also be renewed.

Coolant temperature indicator—To remove

Right-hand drive cars prior to Car Serial Number 6791

Complete Operations 1 to 7 as for Fuel/Oil Level Indicator - To remove.

Coolant temperature indicator—To remove

Left-hand drive cars prior to Car Serial Number 6000

Complete Operations 1 to 7 as for Fuel/Oil Level Indicator - To remove; noting the following point, remove the left-hand facia board.

Coolant temperature indicator—To remove

Left-hand drive cars from Car Serial Number 6000

Complete Operations 1 to 7 as for Fuel/Oil Level Indicator - To remove (Cars from Car Serial Number 6000).

Coolant temperature indicator—To remove

Right-hand drive cars from Car Serial Number 6791

Complete Operations 1 to 7 as for Fuel/Oil Level Indicator - To remove (Cars from Car Serial Number 6791).

Coolant temperature indicator—To fit

All cars

Reverse the procedure given for removal.

Oil pressure indicator

No attempt should be made to carry out repairs on the oil pressure indicator system; repairs should be carried out only by renewing the faulty units.

To obtain an accurate oil pressure reading it is essential that the oil pressure transmitter is correctly assembled to the crankcase oil filter adaptor. The transmitter should be fitted so that the raised portion of the cover is toward the top, and within 60° either side of the vertical datum. Correct fitting of the transmitter can be attained by fitting additional copper washers to the threaded union; a maximum of two washers is permissible.

Oil pressure indicator—To remove

Right-hand drive cars prior to Car Serial Number 6791

Complete Operations 1 to 7 as for Fuel/Oil Level Indicator - To remove.

Oil pressure indicator—To remove

Left-hand drive cars prior to Car Serial Number 6000

Complete Operations 1 to 7 as for Fuel/Oil Level Indicator - To remove; noting the following point, remove the left-hand facia panel.

Oil pressure indicator—To fit

All cars

Reverse the procedure given for removal.

Switch box—To remove

Right-hand drive cars prior to Car Serial Number 6791

Complete Operations 1 to 5 as for Fuel/Oil Level Indicator - To remove, noting the following points.

1. Unscrew and remove the four switch box securing screws.
2. Disconnect the cables from the rear of the switch box.
3. Withdraw the switch box.

Left-hand drive cars from Car Serial Number 6000

Complete Operations 1 to 5 as for Fuel/Oil Level Indicator - To remove (Cars prior to Car Serial Number 6000), noting the following points.

1. Unscrew and remove the four switch box securing screws.
2. Disconnect the cables from the rear of the switch box.
3. Withdraw the switch box.

Switch box—To remove

Left-hand drive cars from Car Serial Number 6000

Complete Operations 1 to 5 as for Fuel/Oil Level

Indicator - To remove (Left-hand drive cars from Car Serial Number 6000), noting the following points.

1. Unscrew and remove the four switch box securing screws.
2. Disconnect the cables from the rear of the switch box.
3. Withdraw the switch box.

Switch box—To remove

Right-hand drive cars from Car Serial Number 6791

Complete Operations 1 to 5 as for Fuel/Oil Level Indicator - To remove (Right-hand drive cars from Car Serial Number 6791), noting the following points.

1. Unscrew and remove the four switch box securing screws.
2. Disconnect the cables from the rear of the switch box.
3. Withdraw the switch box.

Switch box—To fit

All cars

Reverse the procedure given for removal.

Direction indicator lever—To remove

1. Disconnect the battery.
2. Remove the four screws securing the two halves of the steering column cowl and carefully remove the two halves, taking care not to twist or force them apart.
3. Remove the two $\frac{7}{16}$ in. A.F. bolts securing the gear range selector switch to the steering column.
4. Unscrew and remove the two socket-headed screws.
5. Withdraw the direction indicator toe-board connection.

Note On cars assembled from Car Serial Number SRX 6000 and Car Serial Number SBH 6791, the steering column cowl trim finisher must be removed.

Direction indicator lever—To fit

Reverse the procedure given for removal.

The indicators flash at approximately 90 times per minute and are controlled by an indicator (flasher) unit.

If one of the indicator (flasher) bulbs fail, the warning lamp on the Speedometer face will illuminate only once, then remain extinguished.

Speedometer—To remove

Complete Operations 1 to 5 as for Fuel/Oil Level Indicator - To remove, noting the following points.

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1. Remove the four screws securing the speedometer to the fascia.
2. Disconnect the cables, speedometer drive cable, trip cable and warning lamps from the rear of the speedometer; withdraw the speedometer.

Speedometer—To fit

Reverse the procedure given for removal, noting the following point.

1. Ensure that the correct type of speedometer is fitted.

Ammeter—To remove

Right-hand drive cars prior to Car Serial Number 6791

Complete Operations 1 to 7 as for Fuel/Oil Level Indicator - To remove (Right-hand drive cars).

Ammeter—To remove

Left-hand drive cars prior to Car Serial Number 6000

Complete Operations 1 to 7 as for Fuel/Oil Level Indicator - To remove (Left-hand drive cars prior to Car Serial Number 6000), noting the following point.

1. Remove the left-hand fascia panel.

Ammeter—To fit

Reverse the procedure given for removal.

Speedometer drive cable—To remove

Right-hand drive cars with torque converter transmission

1. Place the car over a pit or ramp, apply the handbrake and chock the rear wheels.
2. Disconnect the battery.
3. Remove the top roll as described in Chapter S Body.
4. Remove the speedometer as described in Speedometer - To remove.
5. Disconnect the speedometer cable at the transmission end.
6. Remove the clips securing the speedometer cable to the transmission heat-exchanger pipes.
7. Remove the right-hand heater blower motor to heater box duct.
8. Remove the clip retaining the speedometer cable to the body side member.
9. Carefully remove the two large rubber grommets where the speedometer cable passes through the bulkhead.
10. Withdraw and remove the speedometer cable.

Speedometer drive cable—To remove

Left-hand drive cars with torque converter transmission

Carry out Operations 1 to 10 for Speedometer drive cable - To remove (Right-hand drive cars with Torque Converter Transmission), noting the following points.

1. Remove the left-hand blower to heater box duct.
2. Remove the 2 B.A. nut and bolt securing the speedometer cable to the accelerator cross-shaft.
3. Remove the clip securing the speedometer drive cable to the brake actuator undersheet.

Speedometer drive cable—To remove

Cars fitted with four-speed automatic gearbox

Carry out Operations 1 to 10 as for Speedometer drive cable - To remove (Right-hand drive cars with Torque Converter Transmission), noting the following points.

1. Remove the two clips securing the speedometer drive cable to the body underframe.

Speedometer drive cable—To fit

Reverse the appropriate procedure given for removal, noting the following point.

1. Fit the clips to the cable, ensuring they are fitted in the position denoted by white plastic tape or, in the case of left-hand drive cars, blue plastic tape.

Fuel filler door solenoid—To remove (see Fig. M58)

1. Disconnect the battery.
2. Unclip and remove the trim panel on the right-hand side of the boot.
3. Disconnect the two cables from the solenoid.
4. Open the petrol filler door and remove the split cotter pin and the 2 B.A. locking nut and bolt on the electrically operated catch.
5. Remove the three 2 B.A. nuts and washers, then remove the switch.

Fuel filler door solenoid—To fit

Reverse the procedure given for removal, noting the following point.

1. Do not fully tighten the 2 B.A. locking nut and bolt, until the fuel filler door closes correctly.

Clocks—To remove

1. Disconnect the battery.
2. Remove the small panel surrounding the handbrake.
3. Release the nut and bolt securing the end of the top roll.

4. Remove the two circular fresh air outlet control knob grub screws; remove the centre facia board.
5. Unscrew and remove the two screws securing the clock to the facia.
6. Disconnect the cables from the terminals on the rear of the clock; withdraw the clock.

Bulb renewal—Instrument and warning lamp

1. Disconnect the battery.
2. Remove the appropriate indicator (gauge).
3. Withdraw the bulb holder and renew the faulty bulb.

Gear range indicator illumination bulb—To renew

1. Disconnect the battery.
2. Remove the upper section of the cowl by releasing the four screws in the lower section of the cowl; slacken the screws securing the lower half, which are the longer of the screws; carefully lift off the upper section.

Note On left-hand drive cars from Car Serial Number 6000 the steering column cowl trim finisher must be removed.

3. Remove the screw at each end of the indicator scale, then remove the scale and filter, taking care not to damage the indicator needle.
4. Move the gear range selector switch so that the needle is at either of the two extremities. Remove the two screws securing the bulb holder bracket. The bulb can then be removed from its holder.

Facia compartment illumination—Bulb renewal

1. Disconnect the battery.
2. Unscrew and remove the screw at each end of the lens; then withdraw the lens.
3. Remove the festoon bulb.

Ignition switch illumination—Bulb renewal

Cars prior to Car Serial Number 6000

1. Disconnect the battery.
2. Unscrew and remove the two screws securing the green lens beneath the extended edge of the top roll; remove the lens.
3. Slide the bulb holder to the left until it is possible to withdraw the bulb holder through the aperture and unscrew the bulb.

Interior lamp bulb—To renew

1. Disconnect the battery.
2. Remove the lamp bezel together with the lens; the unit is held in position with two spring clips.
3. Remove the bulb.

Rear armrest lamp bulb—To renew

Left and right-hand drive cars prior to Car Serial Number 6000 & 6791 respectively

1. Disconnect the battery.
2. Unscrew and remove the two screws securing the lens beneath the arm rest.
3. Remove the festoon bulb.

Rear armrest lamp bulb—To renew

Left and right-hand drive cars from Car Serial Numbers 6000 & 6791

1. Disconnect the battery.
2. Gently pull the capless bulb, situated beneath the rear arm rest, from its holder.

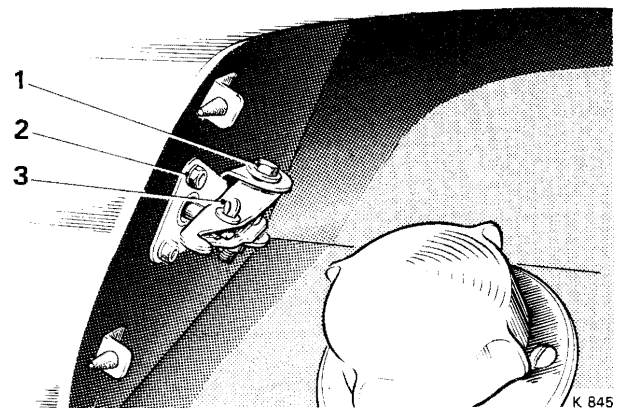


FIG. M58 ELECTRICALLY OPERATED FUEL FILLER DOOR

- 1 Pivot bolt
- 2 Securing nuts
- 3 Cotter pin

Section M9

INTERIOR SWITCHES

When a switch is suspected of being faulty, it must be replaced with a new unit.

All left and right-hand drive cars prior to Car Serial Numbers 6000 and 6791

(Radio balance control - To remove)

1. Disconnect the battery.
2. Pull off the knob.
3. Remove the securing nut and shakeproof washer.
4. Remove the two knobs, securing screws and the receiver facia finishers.
5. Unscrew and remove the two screws securing the receiver trim to the under-facia, lower the trim at the rear, then simultaneously withdraw the front of the trim until it is clear of the receiver spindles.
6. Disconnect the cables from the switch, noting the cable colours to facilitate fitting.

Windscreen wiper/washer switch—To remove

1. Disconnect the battery.
2. Remove the two circular air outlet control knobs, by removing the grub screw on the underside of each knob.
3. Remove the fuel/oil level test switch button by pulling outwards.
4. Remove the screws securing the outer and centre facia panels.
5. Insert a thin probe into the underside of the knob shank to release the tensioned retainer; pull off the knob.
6. Remove the facia panels.
7. Remove the four screws securing the picture plate and switch mounting plate.
8. Remove the picture plate, and carefully withdraw the switch and mounting plate forwards.
9. Unscrew and remove the hexagon headed extension nut and remove the cables from the switch, taking note of the colours to facilitate fitting.
10. Remove the switch.

Instrument illumination switch—To remove

Proceed as for Windscreen wiper/washer switch - To remove.

Air conditioning switches—To remove

1. Disconnect the battery.
2. Remove the two circular air outlet control knobs by removing the grub screw on the underside of each knob.
3. Carefully remove the fuel/oil level test switch knob by pulling outwards.
4. Unscrew and remove the screws retaining the outer and centre facia panels, then remove the panels.
5. Insert a thin probe into the underside of the knob shank to release the tensioned retainer, then pull off each knob.
6. Unscrew and remove the four screws securing the picture plate and switch mounting plate.
7. Remove the picture plate and carefully withdraw the switch mounting plate and switches forward.
8. Unscrew and remove the six small screws from the switch mounting plate, then remove the two socket connections from the rear of the switches.
9. Remove the switches.

Heating and demisting switches—To remove

Proceed as for Air conditioning unit switches - To remove.

Fuel/oil level and warning lamp test switch—To remove

1. Disconnect the battery.
2. Remove the fuel/oil level and warning lamp test switch button by pulling outwards.
3. Remove the outer facia panel by removing the two securing screws.

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4. Unscrew and remove the two screws securing the switch and switch mounting plate to the facia.
5. Disconnect the cables from the rear of the switch, noting the colours to facilitate fitting.
6. Remove the hexagon headed nut and shake-proof washer from the mounting plate and remove the switch.

Petrol filler door switch—To remove

1. Disconnect the battery.
2. Unscrew anti-clockwise the switch securing ring; remove the ring.
3. Push through the switch and disconnect the wiring.
4. Remove the switch.

Parking lamp switch—To remove

1. Disconnect the battery.
2. Carefully remove the fuel/oil level and warning lamp test switch button by pulling outwards.
3. Unscrew and remove the two securing screws from the outer facia panel; remove the facia panel.
4. Remove the three screws securing the picture plate and switch mounting plate to the facia.
5. Disconnect the cables from the rear of the switch, noting the colours to facilitate fitting.
6. Remove the hexagon headed nut and shake-proof washer from the mounting plate and remove the switch.

Blower motor switch and passengers roof lamp switches—To remove

1. Disconnect the battery.
2. Unscrew and remove the four locating screws securing the handbrake handle surround trim.
3. Remove the radio receiver trim and receiver as described in Section M15 of this Chapter.
4. Remove the top roll as described in Chapter S - Body.
5. Unscrew and remove the two socket-headed screws from the steering column clamp, and ease the column away from the facia.
6. Disconnect the main wiring at the rear of the facia, taking note of the colours to facilitate assembly.
7. Unscrew and remove the eight setscrews securing the facia/instrument panel.

One setscrew is situated adjacent to where the steering column clamp bracket fits and secures the instrument board to the mounting bracket. Another setscrew is located opposite the previous one described.

Two setscrews are located at each lower end of the instrument board, the remaining four setscrews are located on the top face of the instrument board and screw into the left-hand and right-hand mounting brackets.

8. Withdraw the facia/instrument board rearwards and disconnect the appropriate switch electrical connections.

9. Unscrew and remove the four screws securing the switch mounting plate to the instrument board; turn the switch through 90° and withdraw from the rear of the instrument board.

Rear window demister switch —To remove

1. Disconnect the battery.
2. Remove the four locating screws securing the handbrake handle surround trim.
3. Working from the rear of the facia, remove the four switch mounting plate securing screws.
4. Disconnect the electrical connections, noting the colours to facilitate assembly.
5. Rotate the switch through 90° and remove.

Hazard warning switch—To remove

1. Disconnect the battery.
2. Remove by rotating in an anti-clockwise direction the knob and securing ring.
3. Withdraw the trim rearwards.
4. Remove the four switch mounting panel securing screws.
5. Disconnect the electrical connections, noting the colours to facilitate assembly; remove the switch.

Dipswitch—To remove

1. Disconnect the battery.
2. Pull off the rubber shoe protector.
3. Remove the carpet.
4. Remove the two 'Philips' switch securing screws.
5. Disconnect the electrical connections, noting the colours to facilitate assembly; remove the switch.

**Left and right-hand drive cars from
Car Serial Numbers 6000 and 6791**

Radio balance control switch —To remove

1. Disconnect the battery.
2. Remove the top roll as described in Chapter S - Body.

3. Unscrew and remove the circular fresh air outlet knob grub screws; remove the knobs
4. Remove the gear range selector cowl trim finisher.
5. Remove the centre and left-hand or right-hand facia panels.
6. Unscrew and remove the four screws securing the picture plate and switch mounting plate.
7. Pull off the knob.
8. Remove the switch securing nut and shakeproof washer.
9. Disconnect the electrical connections, noting the colours to facilitate assembly.
10. Remove the switch.

Windscreen wiper/washer switch —To remove

Proceed as for Radio balance control switch - To remove, noting the following point.

1. Insert a thin probe into the underside of the knob shank to release the tensioned retainer; pull off the knob.

Instrument illumination switch —To remove

Proceed as for Radio balance control switch - To remove, noting the following point.

1. Insert a thin probe into the underside of the knob shank to release the tensioned retainer; pull off the knob.

Air conditioning switches—To remove

1. Disconnect the battery.
2. Carefully prise away from the centre console with a flat tool the triangular trim pads situated one on each side of the centre console.
3. Unscrew and remove the screws securing the wooden facia panel to the console and slide the facia until it clears the retaining clip at the base; remove the facia.
4. Insert a thin probe into the underside of the knob shank to release the tensioned retainer; pull off the knobs.
5. Disconnect the electrical connections.
6. Remove the four switch mounting plate screws and washers.
7. Carefully manoeuvre the switch out of the console.

Heating and demisting switches —To remove

Proceed as for Air conditioning unit switches - To remove.

Fuel/oil level and warning lamp switches—To remove

1. Disconnect the battery.
2. Remove the steering column cowl finisher.
3. Remove the switch button by pulling rearwards.
4. Unscrew and remove the outer facia panel securing screws; remove the facia panel.
5. Unscrew and remove the two switch mounting plate retaining screws.
6. Disconnect the electrical connections, noting the colours to facilitate fitting.
7. Remove the switch mounting plate by removing the hexagon headed nut; remove the switch and spacer.

Petrol filler door switch—To remove

1. Disconnect the battery.
2. Remove the steering column cowl finisher.
3. Remove the outer facia panel.
4. Remove the switchbox as described in Section M8 - Instruments.
5. Unscrew and remove the switch circular securing nut.
6. Disconnect the electrical connections, noting the colours to facilitate fitting.
7. Remove the switch.

Parking lamp switch—To remove

1. Disconnect the battery.
2. Using a suitably cranked probe, press in the tensioned knob retainer, simultaneously pull off the knob.
3. Unscrew and remove the two screws securing the escutcheon; remove the escutcheon.
4. Remove the handbrake handle trim panel.
5. Disconnect the electrical connections, noting the colours to facilitate fitting.
6. Remove the hexagon headed nut; remove the switch.

Heater blower switch—To remove

1. Disconnect the battery.
2. Carefully prise away from the centre console with a flat tool, the two triangular trim pads situated one each side of the centre console.
3. Unscrew and remove the screws securing the wooden facia to the console and slide the facia until it clears the retaining clip at the base; remove the facia.
4. Disconnect the electrical connections, noting the colours to facilitate fitting.

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5. Unscrew and remove the three screws retaining the switch to the console.
6. Rotate the switch through 90° and withdraw from the rear of the console.

Hazard warning lamp switch—To remove

1. Disconnect the battery.
2. Using a flat tool, carefully prise away from the centre console the triangular trim pads situated one each side of the centre console.
3. Unscrew and remove the screws securing the wooden fascia to the console and slide the fascia until it clears the retaining clip at the base; remove the fascia.
4. Disconnect the electrical connections, noting the colours to facilitate fitting.
5. Unscrew anti-clockwise the switch knob, then remove the bulb.
6. Using a suitable tool, remove the circular switch securing nut.
7. Remove the switch.

Rear window demister switch —To remove

1. Disconnect the battery.
2. Using a flat tool carefully prise away from the centre console the two triangular trim pads situated one each side of the centre console.

3. Unscrew and remove the screws securing the wooden fascia to the console, and slide the fascia until it clears the retaining clip at the base, then remove the fascia.
4. Disconnect the electrical connections, noting the colours to facilitate fitting.
5. Using a suitable tool remove the circular switch securing nut; remove the switch.

Rear interior lamps switch —To remove

1. Disconnect the battery.
2. Using a flat tool, carefully remove the vanity mirror and veneered surround.
3. Separate the electrical connections, noting the colours to facilitate fitting.
4. Unscrew and remove the four screws securing the switch mounting plate to the rear of the mirror veneered surround.
5. Remove the hexagon headed nut securing the switch to the switch mounting plate.

Note On cars from Car Serial Number 6000 a circular securing nut is used as opposed to a hexagon headed nut.

6. Remove the switch.

Section M10

RELAYS

The relay box, mounted to the bulkhead in the engine compartment, contains a printed circuit base to accommodate 'Lucas' Type 6RA relays.

Details of these relays, and others used on the car are given in the Data Table at the end of this section.

The relays connect through a printed circuit to loom sockets on the underside of the relay box. There are also relays fitted behind the front cover of the relay box (see Fig. M59).

Cars not fitted with refrigeration

There are four vacant relay positions on the printed circuit base (three for cars fitted with refrigeration, and one for cars fitted with headlamp dimming).

The relay box also houses a 'Lucas' RB340 current/voltage regulator, and a regulator condenser used to reduce radio interference.

The relay box contains the following relays.

On the main printed circuit base

On the main printed circuit base:

- Headlamp flashing relay
- Horn relay
- Headlamp safety relay
- Water tap relay
- Interior lamps relay
- Height control relay
- Headlamp dimming relay (fitted to certain early cars)

Behind the front cover

- Coolant probe relay
- Ignition warning lamp/Choke relay (except cars fitted with C.A.V. alternators)
- Brake pressure (accumulator) relay
- Head flick relay (not fitted to cars destined for U.S.A. and Canada)

Cars fitted with refrigeration

An alternator replaces the generator. The relay box houses a 4TR control box (for 'Lucas' 11AC alternator) and a warning lamp control unit. On later cars a C.A.V. 440 control box is used (for C.A.V. 512 alternator).

The relay box contains the following relays.

On the main printed circuit base:

- Headlamp flick relay (not fitted to cars destined for U.S.A. and Canada)
- Horn relay
- Headlamp safety relay

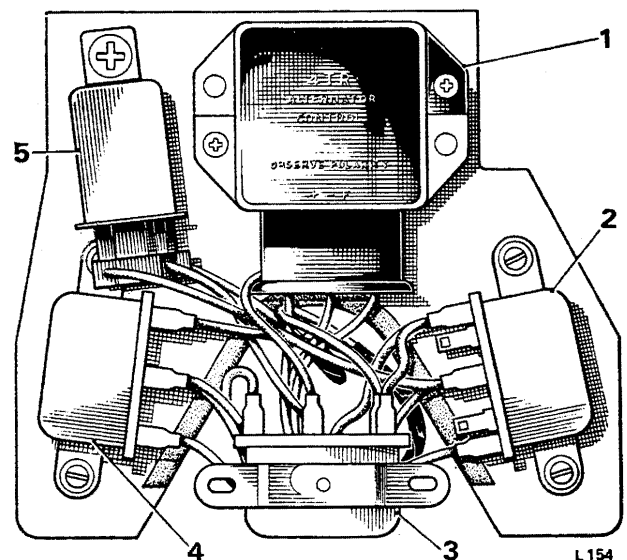


FIG. M59 RELAY BOX (REFRIGERATED CARS)

- 1 4TR alternator control unit
- 2 Brake pressure (accumulator) relay
- 3 Coolant probe relay
- 4 Ignition warning lamp/choke relay
- 5 3AW alternator warning lamp control unit

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Water tap relay
 Interior lamps relay
 Height control relay
 Additional water tap relay
 Alternator field relay (except on cars fitted with C.A.V. alternators)
 Rear window demister relay
 Headlamp dimming relay (fitted to certain early cars)

On later cars the relay printed circuit contains the following relays:
 Headlamp flasher relay (not fitted to cars destined for U.S.A. and Canada)
 Horn relay
 Headlamp safety relay
 Water tap relay
 Additional water tap relay
 Rear window demist relay

Also fitted within the relay box is a choke thermal delay switch and a regulator capacitor.

An alternator regulator is fitted behind the front cover.

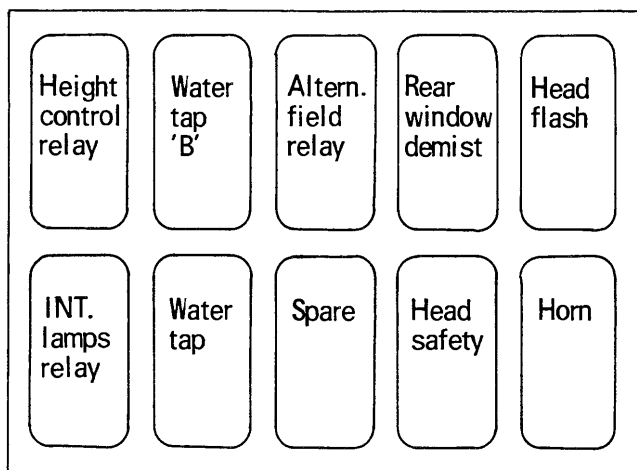


FIG. M60 EARLY REFRIGERATED CARS

The spare relay position was used for the headlamp dimmer relay on some early cars.

Note

To ascertain if a relay is fitted into a particular circuit and if so, what type, reference should be made to the appropriate theoretical wiring diagram.

Relays—To renew

1. Disconnect the battery.
2. Access to relays situated behind the front cover of the relay box is by removing the four hexagon-headed screws, then drawing forward the cover.

Note The coolant probe and head flick relays are secured to the cover, therefore it is essential that no attempt be made to remove the cover completely until the 'Lucar' connectors have been disconnected from the relay terminals.

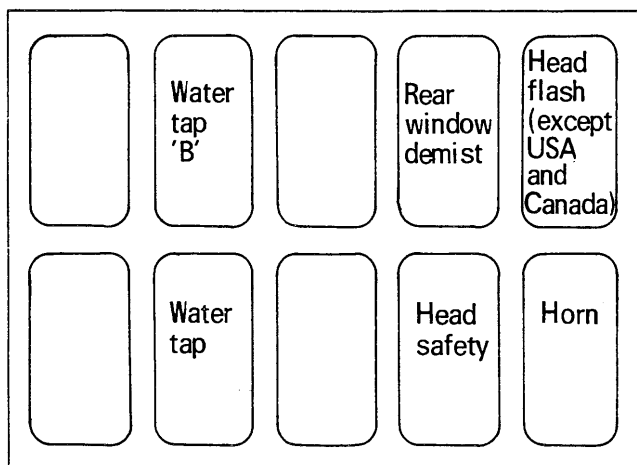


FIG. M60 LATER CARS

Head flick and coolant probe relays

Disconnect the 'Lucar' connectors from the relay terminals, then remove the nuts and bolts securing the relay to the box cover.

Fit a new relay ensuring that it is fitted correctly and that each cable is fitted to the correct terminal.

Brake pressure (accumulator) relay

Remove the relay in a similar manner used for the previous relay.

Ignition warning lamp—Choke relay (if fitted)

The relay is renewed in a similar manner to that described for the previous relay.

Relay box—To remove

1. To remove the relay box in order to renew one or more relays, proceed as follows.
2. Disconnect the battery.
3. Remove the windscreen washer bottle and cradle from the engine compartment.
4. Remove the two vertical screws and the two horizontal screws which secure the box to the bulkhead.
5. Draw the relay box forward sufficiently to enable the clip, securing the loom, to be removed from its location on the bulkhead; raise the box sufficiently to enable the loom sockets to be disconnected from the printed circuit base.
6. Remove the relay box assembly from the car.
7. Unscrew and remove the four screws securing the printed circuit base and carefully invert the base to gain access to the relays.

Note All relays have the terminals disposed at differing positions, making it impossible to fit a relay in an incorrect position, or to fit the correct relay the wrong way round.

Relay—To test

A simple test may be carried out on any model 6 RA relay as follows.

1. One method of checking for a faulty relay is by substituting for a relay known to be in good condition.
2. Another simple test is to connect the relay winding to a D.C. supply capable of being varied between Zero and 15 Volts, as indicated on a first-grade moving coil Zero to 20, volts Voltmeter.
3. A test lamp can be used to indicate contact opening and closing.

Printed circuit—To renew

To renew a faulty printed circuit, remove the relay box from the car as described in Relay box - To remove; then disconnect the looms and remove all the relays.

1. Remove the printed circuit by removing the four securing nuts and bolts; to fit a new printed circuit reverse the procedure given for removal.
2. Check all relays prior to fitting to the printed circuit, ensuring that the layer of 'Leatheroid' insulator is fitted between the relays and printed

circuit base, otherwise the exposed metallic parts of the circuit will contact the metal outer shell of the relays, causing a short(s) in the circuits.

Relay box—To fit

Reverse the procedure given for removal, noting the following point.

1. Clip the loom to the bulkhead behind the relay box.

Relays—Electrically operated seats

Four 'Lucas' 6 RA relays are incorporated in the circuit for the electrically operated front seats. They are situated between the front seats and are identified by the markings 6 RA and the number 33270 stamped on the outer shell, and by the terminal markings 'C2', 'C3', 'W1' and 'W2' (see Fig. M64).

Seat relays—To renew

The relays are sealed units and if a failure occurs, the faulty relay should be renewed.

For access to the printed circuit into which the relays fit, proceed as follows.

1. Disconnect the battery.
2. If the stowage compartment/occasional seat is in the raised (seat) position between the front two seats, lower the occasional seat into the stowage compartment position.
3. Remove the two 'Philips' headed screws securing the front trim panel. Lift from its support, then remove from the car.
4. The four relays will now be exposed. To facilitate relay removal, disconnect one or two of the cables above and adjacent to the relays; these should be fitted in their original positions.

Note It is important that the 'Leatheroid' insulator is fitted between the four relays and the printed circuit, otherwise electrical shorting will result.

Relays—To renew

Cars after Car Serial Number 6000

1. Disconnect the battery.
2. Remove the left-hand triangular trim pad from the console.
3. The relay board is adjacent to the left-hand side of the console together with the printed circuit.
4. Carefully remove the relays from the board by pulling from their sockets; note the position to facilitate fitting.

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Left-hand drive cars prior to car serial number 6000

To renew a faulty printed circuit proceed as follows.

1. Disconnect the battery.
2. Disconnect the cables adjacent to the relays at the 'Lucar' connectors and note the position of each for fitting.
3. Disconnect the 5-way plug situated at the centre of the printed circuit.
4. Remove the four self-tapping screws securing the printed circuit; then remove the circuit from the car.

Printed circuit—To fit

Cars prior to Car Serial Number 6000

When fitting the new printed circuit, it will be noted that the holes used to retain it to the stowage compartment are off-set. The circuit can be fitted one way only. Ensure that the layer of 'Leatheroid' insulator is fitted between the relays and printed circuit to eliminate electrical shorting.

It is necessary to align the distance tubes to the securing screws to facilitate correct fitting and enable the screws to engage the 'Spire' nuts.

Further fitting is achieved by reversing the procedure given for removal.

Should difficulty be encountered during the above procedure, i.e. with the distance tubes or 'Spire' nuts, an alternative procedure in addition to that previously described for removing the small trim panel, is as follows.

1. Remove the seat cushions and lift up sufficient carpet to expose the four feet of the stowage compartment/occasional seat assembly.
2. Disconnect the wiring socket situated adjacent to each seat mechanism and remove the clip securing the wiring loom to the seat mechanism.
3. Disconnect the incoming cables at the front of the stowage compartment.
4. The two brown cables have 'Lucar' connectors, the black cable and green cable have snap connector fittings.
5. Fit the stowage compartment/occasional seat by reversing the procedure given for removal.

Seat printed circuit—To remove

Cars after Car Serial Number 6000

To renew a faulty printed circuit proceed as follows.

1. Disconnect the battery, and remove the left-hand triangular trim pad on the console.
2. Disconnect the cables adjacent to the relays at the 'Lucar' connections and note the position of each to facilitate fitting.
3. Disconnect the 5-way plug situated at the centre of the printed circuit.
4. Carefully lift the printed circuit out of its retaining slot and withdraw through the left-hand side of the console.

Relays—Electrically operated windows

Four 'Lucas' 6 RA relays are incorporated in the wiring circuit for the electrically operated windows. The relay is rubber mounted on each door frame, adjacent to one of the apertures behind the trim and dust cover.

Relays—To renew

The relays are sealed units and if a failure occurs the faulty relay should be renewed.

1. Disconnect the battery.
2. To gain access to a relay; remove the door handles, door trim and dust cover as described in Chapter S - Body. This will expose the window lift mechanism and relay fixing positions.
3. When working on the rear doors, working space is improved if the window glass is raised to its fullest extent. If the window is partly or even fully lowered, due to the window lift being inoperative, there is still sufficient room for the hand to remove and renew the faulty relay.
4. The small apertures adjacent to the relays are not sufficiently large to enable the relay to pass through but are sufficient to enable the 'Lucar' terminals to be disconnected and to identify the cable colours and terminal identification marks for correct assembly.
5. When fitting the door trim, ensure that the water shield is fitted and that the door dust covering is sealed around its edges, if not, apply 'Dunlop' S81 adhesive to effect the sealing.

Relays—Stoplamp failure warning (where fitted)

One relay is fitted adjacent to the rear of each rear lamp cluster. The relays are rubber mounted to the body frame behind the side panels of the luggage compartment.

The function of each stop lamp relay is to indicate the failure of a stop lamp bulb.

With the ignition 'ON', the facia lamp performs two functions; it indicates to the driver that the handbrake is applied, or of a stop lamp bulb failure when the brake pedal is applied with the handbrake off.

Relays—To renew

When a failure occurs, the relays must be renewed.

1. Disconnect the battery.
2. Fold-back the luggage compartment trim and disconnect the cable 'Lucar' connectors from the faulty relay.
3. Note the cable colours to relay terminal positions to facilitate correct fitting.
4. Remove the rubbers which secure the relay to the body frame.

Note Although the relay terminal connections and cable colours are identical for each relay, it will be noted that the relay fitted to the left-hand side of the car is inverted for fitting.

Relay—To test

Connect the relay winding to a 12 Volt D.C. supply in series with an ammeter and variable resistance, and by adjusting the current flow, the relay contacts should open with a minimum current of 1.5 amp flowing through the energising coil of the relay.

Direction indicator (flasher) unit —To maintain

Flasher units are sealed during manufacture, therefore a defective unit must be renewed.

The unit is fitted to the fuse panel (distribution board) adjacent to the steering column (*see Section M2 - Fuse panel*) and is fitted directly into the printed circuit.

Fault diagnosis

In the event of a fault occurring in the direction indicator system, the following procedure should be used.

1. Check all indicator bulbs for broken filaments.
2. Refer to main wiring diagram and check all indicator circuit connections.
3. Switch on the ignition.
4. Using a voltmeter, check that 12 Volts is available at the flasher unit terminal marked 'B'.

Flasher unit renewal

1. Remove from the fuse panel (*see Section M2*) and fit the new unit.

Note Flasher units must be handled with care.

Dual relay—Automatic transmission electric actuator (Lucas 14 RA)

This is a complex unit and in the unlikely event of a failure it must be renewed.

Reverse gear lock relay—To renew

The reverse gear lock relay is secured to the instrument panel main support bracket by two screws.

Access to the relay is as follows.

1. Disconnect the leads from the battery, then remove the top roll as described in Chapter S - Body.
2. Disconnect the 'Lucar' connectors from the relay.
3. Remove the two screws securing the relay to the instrument board bracket; remove the relay from the car.

Relay—Fuel warning lamp dimming

The relay is mounted behind the facia panel and is identified by the number 33285 stamped on its outer shell, and by the terminal markings 'C2', 'C3', 'W1' and 'W2' (*see Fig. M69*).

Relay—To renew

This relay is a sealed unit and if found to be faulty it must be renewed.

The relay is mounted on a bracket which, in turn, is mounted on the instrument panel support bracket adjacent to the reverse gear lock relay. Access to the relay is similar to that described for the reverse gear lock relay.

Note If a hazard warning system is fitted to the car, the relay incorporated in the system occupies a similar mounting position, sharing the same mounting bolts.

To facilitate renewal, it is necessary to remove the relay(s) mounting bracket from the instrument panel support bracket and to raise the mounting bracket sufficiently to gain access to the faulty relay.

Relay—To test

The procedure for testing a fuel warning lamp dimming relay is the same as that described for other relays. Also, the warning lamp should dim when the side/tail lamp switch is operated. If this does not occur a fault in the internal resistor is indicated.

Relay-Hazard warning lamp

This 'Lucas' relay, mounted behind the facia panel, is identified by the number 33231 on its outer shell, and by the terminal markings 'W1', 'W2', 'C2' and 'C3' (*see Fig. M65*).

Relay—To renew

The relay is a sealed unit and if it is found to be faulty it must be renewed.

The relay is mounted to the bracket supporting the fuel warning lamp dimming relay, adjacent to the reverse gear lock relay, and shares the same mounting screws as the dimming relay.

Access to this relay is similar to the instructions given for the reverse gear lock relay.

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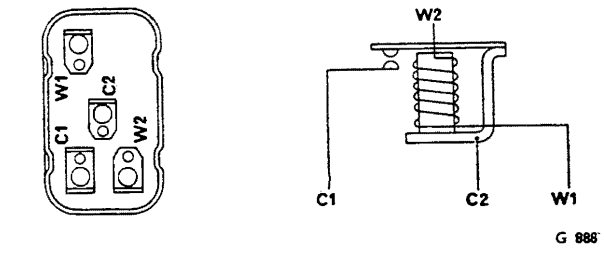
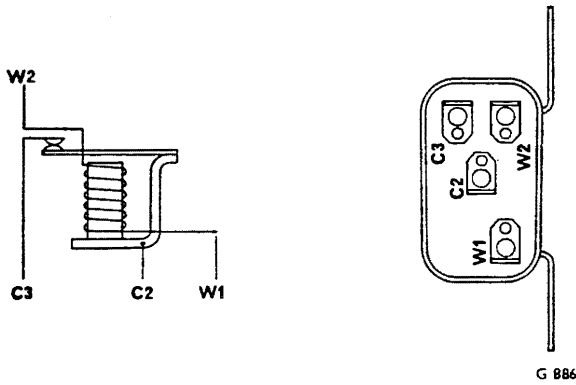


FIG. M64 HORNS AND ELECTRICALLY OPERATED FRONT SEATS RELAYS

FIG. M61 COOLANT LEVEL PROBE RELAY

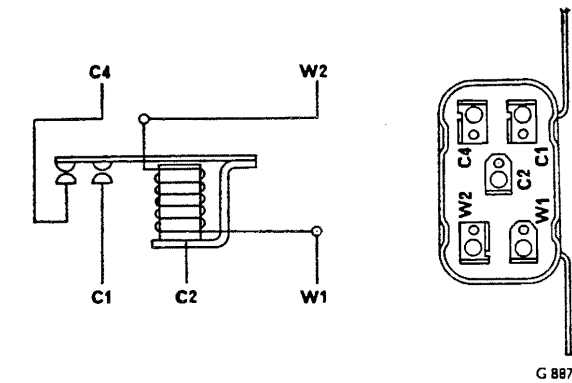
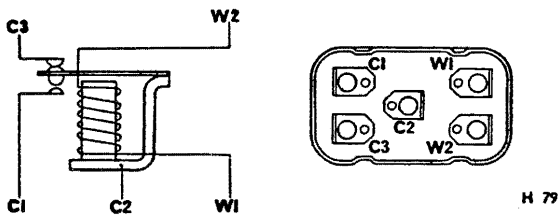


FIG. M65 BRAKE ACCUMULATOR AND HAZARD WARNING RELAYS

FIG. M62 HEIGHT CONTROL INTERIOR LAMPS, WATER TAP AND ALTERNATOR FIELD RELAYS

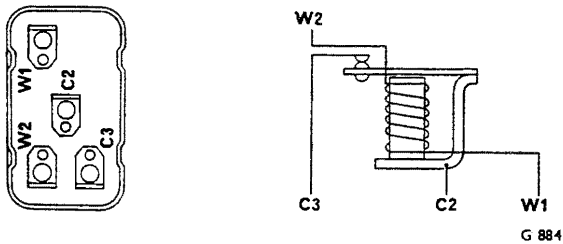
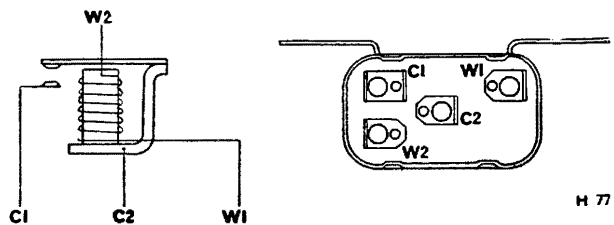


FIG. M63 HEADLAMP SAFETY, IGNITION WARNING LAMP AND CHOKE, ADDITIONAL WATER TAP AND ELECTRICALLY HEATED REAR WINDOW RELAYS

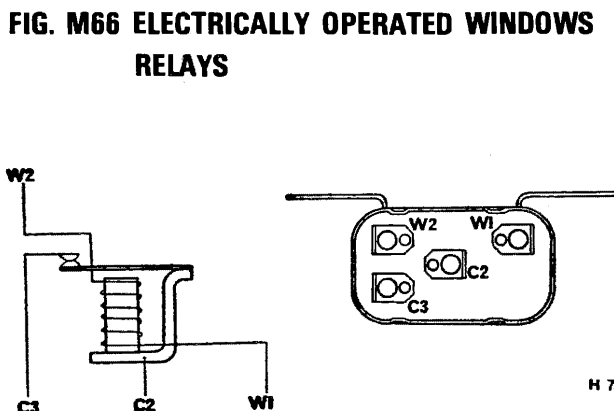
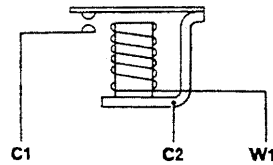
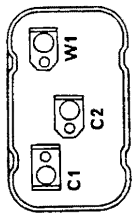
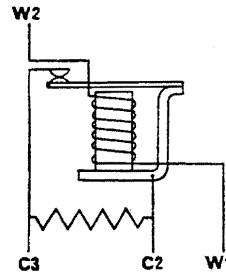


FIG. M67 STOP LAMP WARNING RELAYS



G 885

FIG. M68 HEADLAMP FLASHER RELAY



G 883

FIG. M69 FUEL WARNING LAMP DIMMING RELAY

DATA FOR LUCAS RELAYS MODELS 6 RA

Lucas Part No. and Application	Contact Arrangement	Terminal Markings ('C2' is always associated with the moving contact and is the common terminal in double-contact units)	Resistance of Winding (ohms)	Duty Rating	Cut-in Voltage or Current	Core gap to obtain above (Adjust back stop or top contact bracket)	Drop-off Voltage or Current	Core gap to obtain above (Contacts just making. Adjust height of lower contact bracket)
33271 Headlamp Flasher	One pair (Normally open)	'C1', 'C2', 'W' (Inner end of winding soldered to bobbin core; is therefore electrically common with armature and terminal 'C2')	$15 \pm 7\frac{1}{2}\%$	Intermittent	4 - 9 volts	0,89 mm. - 1,14 mm. (0.035 in. - 0.045 in.)	2.5 volts (min.)	0,30 mm. - 0,46 mm. (0.012 in. - 0.018 in.)
33209 Window Lift	One pair (Normally open)	'C1', 'C2', 'W1', 'W2'	$15 \pm 7\frac{1}{2}\%$	Intermittent	4 - 9 volts	0,89 mm. - 1,14 mm. (0.035 in. - 0.045 in.)	2.5 volts (min.)	0,30 mm. - 0,46 mm. (0.012 in. - 0.018 in.)
33272 Horns and Seats	One pair (Normally open)	'C1', 'C2', 'W1', 'W2'	$15 \pm 7\frac{1}{2}\%$	Intermittent	4 - 9 volts	0,89 mm. - 1,14 mm. (0.035 in. - 0.045 in.)	2.5 volts (min.)	0,30 mm. - 0,46 mm. (0.012 in. - 0.018 in.)
33223 Coolant Level Probe	One pair (Normally closed)	'C1', 'C3', 'W1', 'W2'	$76 \pm 7\frac{1}{2}\%$	Continuous	7 - 10 volts	0,51 mm. - 0,76 mm. (0.020 in. - 0.030 in.)	6 volts (max.)	Not applicable
33270 Headlamp safety Ignition Warning lamp and choke, Additional water tap and Rear window demister	One pair (Normally closed)	'C2', 'C3', 'W1', 'W2'	$76 \pm 7\frac{1}{2}\%$	Continuous	7 - 10 volts	0,51 mm. - 0,76 mm. (0.020 in. - 0.030 in.)	6 volts (max.)	Not applicable
33298 Alternator Field	One pair (Normally open)	'C1', 'C2', 'W1', 'W2'	$76 \pm 7\frac{1}{2}\%$	Continuous	5 - 9 volts	0,51 mm. - 0,76 mm. (0.020 in. - 0.030 in.)	2.5 volts (min.)	0,30 mm. - 0,46 mm. (0.012 in. - 0.018 in.)
33222	One pair (Normally closed)	'C2', 'C3', 'W1'	$76 \pm 7\frac{1}{2}\%$	Continuous	7 - 10 volts	0,51 mm. - 0,76 mm. (0.020 in. - 0.030 in.)	6 volts (max.)	Not applicable

Section M11

WINDSCREEN WIPERS,
MOTORS AND WASHERS**'Lucas' 6 W wiper motor self-parking—
To adjust**

Care should be taken to ensure that the parking procedure adjustments are carried out in strict accordance with the following procedure. Failure to do this may result in irreparable damage to the motor.

1. With the wiper motor and ignition switch off, adjust the parking switch by turning the knurled nut until the switch threads protrude 20,32 mm. (0.800 in.) from the cross-head (see Fig. M71). This check can be assisted with a gauge inserted behind the cross-head (see Fig. M71).

2. Remove the wiper arms and blades, switch on the motor and allow to operate for approximately 30 seconds, then switch to the parked position.

3. Fit one wiper arm and blade to the right-hand splined wheel box. The wiper blade and arm must point to the left-hand side of the car, with the rubber of the wiper blade lying alongside the rubber glazing seal.

4. Fit the other wiper arm and blade on to the left-hand spindle.

The wiper blade must lie across the parking gauge which should be held against the windscreen and rubber glazing seal in line with the wiper blade latch pivot (see Fig. M72). There will be some free movement of the wiper arm and blade due to 'sponge' in the rack drive. This movement can be ignored if the wiper blade can be set against the gauge as described previously without displacing the other blade. If the left-hand wiper blade cannot be set against the gauge without moving the right-hand wiper blade, it will be necessary to move the arm one spline further on the wheelbox spindle.

5. Ensure that the windscreen is clean and that a steady flow of water is directed on to the screen, then switch on the wiper motor for a few seconds and check that it parks satisfactorily.

Note The wiper motor must not be operated with a dry screen or scratching of the screen will result.

6. Ensure that the motor is not left in a stalled condition. Proceed as follows to ensure that the parking switch has operated, and that the wiper motor is switched off. Remove Number 2 fuse from the distribution board and connect a test lamp of not more than 12V. 2.2W. across the fuse retaining clips. The test lamp should not illuminate, thus indicating that the parking switch has operated and that no current is flowing.

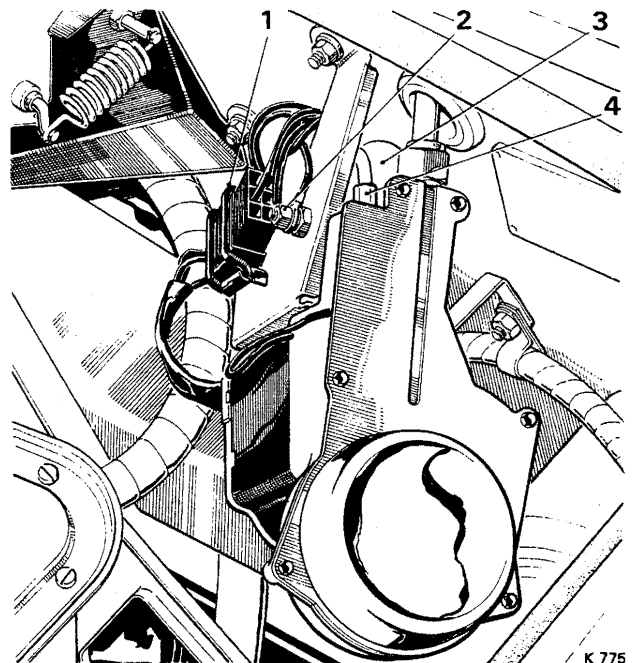


FIG. M70 'LUCAS' 6 W WIPER MOTOR

- 1 Wiper motor 5-way plug & socket
- 2 Earthing point
- 3 Condenser
- 4 Parking switch adjustment screw

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If the test lamp illuminates, this indicates that the motor is not switched off and that current is flowing and the wiper motor is in a stalled position. Should this occasion arise, the setting instructions previously described should be repeated. The correct settings provide an adequate margin for the parking switch to operate under service conditions.

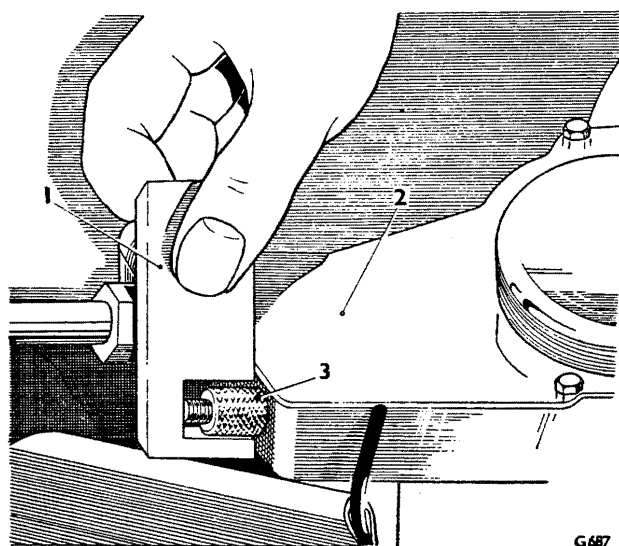


FIG. M71 WIPER MOTOR PARKING SWITCH SETTING

- 1 Parking switch gauge
- 2 Wiper motor cross head
- 3 Parking switch adjuster

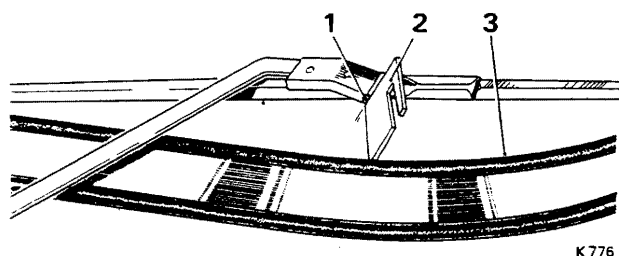


FIG. M72 WIPER BLADE PARKING GAUGE

- 1 Wiper arm latch pin
- 2 Parking gauge
- 3 Windscreen sealing rubber

Maintenance—Wiper blades

Excessive friction between apparently satisfactory wiper blades and the windshield may result in a marked reduction in wiping speed when the wiper blades are operating on a windshield that is only partially wet. A further symptom is that the blades become noisy at each end of the wiping arc.

If the wiper blades are suspect, they should be changed with a pair known to be in good condition; if this rectifies the fault, new wiper blades should be fitted.

'Lucas' 6 W wiper motor—To measure light-running current

1. Unscrew and remove the six self-tapping screws which secure the gearbox cover, then lift off the cover to expose the connecting rod and gearbox (see Fig. M73).
2. Remove the circlip securing the eccentric coupling to the final gear crankpin (for further information see Anti-streak mechanism).
3. Remove the connecting rod from the gearbox to release the cross-head and rack.
4. Connect a first grade moving-coil ammeter in series with the wiper motor supply cable and measure the light-running current. The light-running current at normal speed should read between 2.7 amp to 3.4 amp, and at high speed between 2.0 amp to 2.6 amp, with 12 volt supply measured at the motor.

Should the motor not conform to these figures the motor should be renewed.

'Lucas' 6 W wiper motor—To dismantle (see Fig. M73)

1. Unscrew and remove the six self-tapping screws securing the gearbox cover and remove the cover.
2. Remove the circlip securing the eccentric coupling to the final gear crankpin (for further information see Anti-streak mechanism).
3. Remove the connecting rod eccentric coupling and final gear.
4. Prise off the final gear shaft circlip and washer. Clean the circlip groove before removing the gear shaft from its bearing.
5. Remove the armature end-play stop plate.
6. Remove the intermediate gear circlip and washers. Clean out the circlip groove before removing the gear.
7. Examine all gear teeth for damage and if necessary renew the damaged gears.
8. Unscrew and remove the two through-bolts, insulating tubes and the commutator end bracket from the yoke.
9. Remove the fibre comb-shaped brush arm retainer plate from below the terminal assembly.

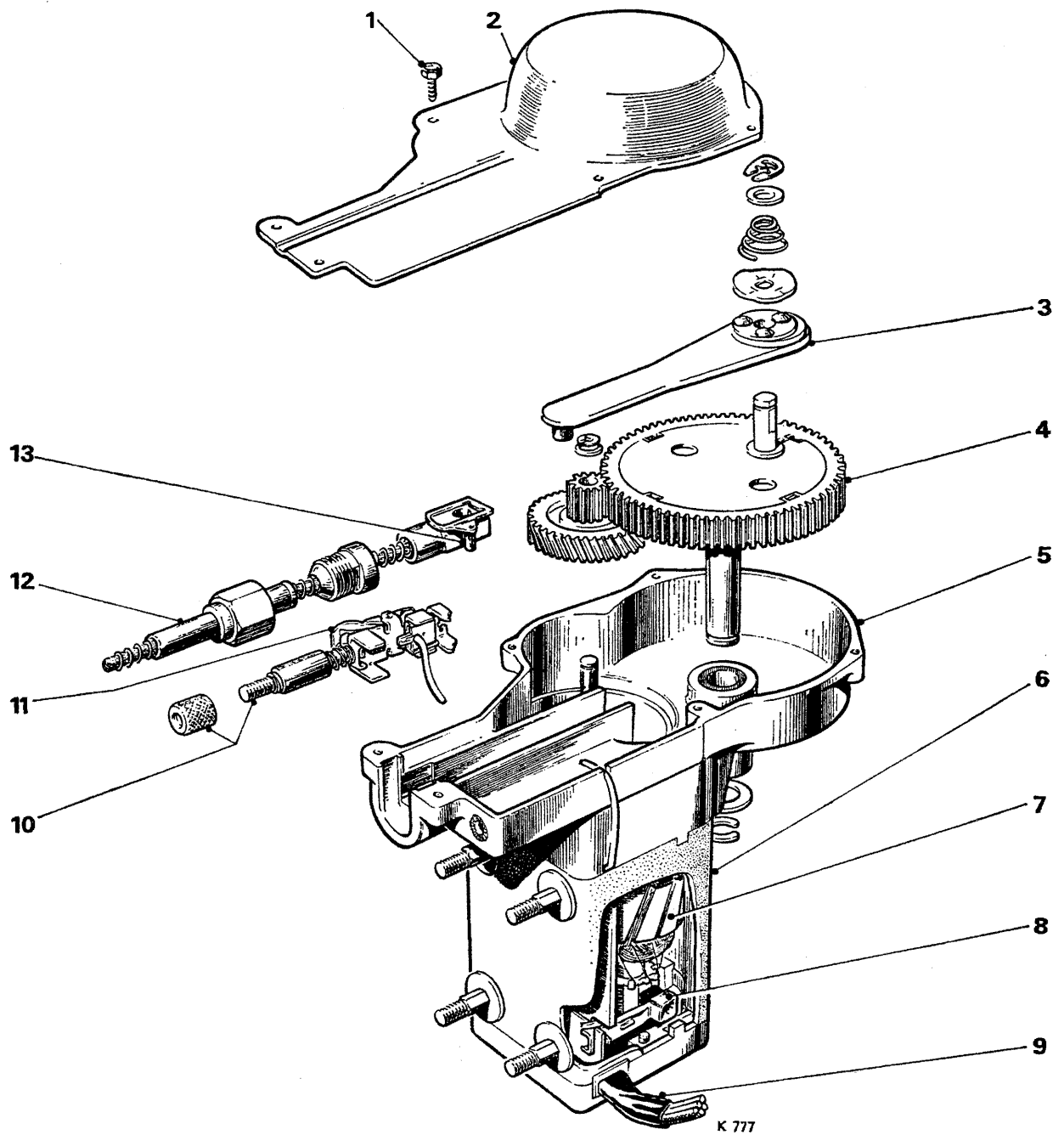


FIG. M73 EXPLODED VIEW OF 'LUCAS' 6 W WIPER MOTOR

- | | |
|------------------|-------------------------------------|
| 1 Screw | 8 Brushgear |
| 2 Gearbox cover | 9 Cables |
| 3 Connecting rod | 10 Parking adjuster |
| 4 Gear | 11 Cross head actuated limit switch |
| 5 Case | 12 Cable rack protective tubing |
| 6 Motor housing | 13 Switch striker pin |
| 7 Armature | |

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10. Before removing the brushes, note their position in order that they can be replaced correctly.

Note The ridges on the running face of each brush must be at right-angles to the commutator slots.

11. Lift the brush levers clear of their location at the pivots and remove the brushgear assembly from the yoke.

12. The armature may now be removed from the gearbox end bearing.

'Lucas' 6 W wiper motor—To assemble

Reverse the procedure given for dismantling, noting the following points.

1. Lubricate sparingly the final gear and armature bearings with 'Shell Turbo 41'.

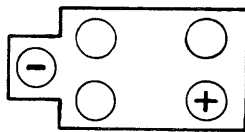
2. Grease liberally the cross-head guide channel, connecting rod assembly, cable rack and gearbox with 'Rocol' M.T. 265.

'Lucas' 16 W wiper motor—To measure light running current

Proceed as for 'Lucas' 6.W. wiper motor - To measure light-running current, noting the following points.

1. With 12V at the motor the light-running current at normal speed should read between 1 and 2 amps, and at high speed between 2 and 3 amps.

(The bottom right blade in the motor socket is the supply, the left offset blade is the return.).



Maintenance—'Lucas' 16 W wiper motor

The motor is of a permanent magnet design and the direction of rotation is dependent upon the polarity of the electrical supply to its terminals. If it becomes necessary to run the motor while it is removed from the car, the negative supply cable should be connected to terminal marked number one, and the positive supply cable to terminal marked number five for normal speed or terminal three for high speed.

'Lucas' 16 W wiper motor—To remove (see Fig. M74)

1. Disconnect the loom socket from the wiper motor plug.
2. Remove both wiper blades.

3. Release the nut which secures the rack tubing to the wiper motor.

4. Slacken the clip which secures the motor and withdraw the motor and rack from the car.

5. Remove the plastic cover and the cover plate from the wiper motor. It should be noted that care must be taken not to introduce dirt into the gearbox assembly.

6. Remove the circlip and washer from the outer end of the drive gear shaft (see Fig. M74). Discard the circlip.

7. Withdraw the gear and parking device assembly from the motor, ensuring that any burrs around the circlip groove of the gearshaft are removed before withdrawal.

Note One of the following procedures should now be followed dependant upon which part requires renewal.

Replacement of gear and parking device assembly, or renewal of motor (see Fig. M76)

1. Fit the gear and parking device assembly into the motor, locating the drive rack on the peg of the connecting rod and ensuring that the parking switch slide is fitted to the drive rack and is facing the correct way, as shown in Figure M74. Note the position of anti streak mechanism on output gear crankpin and ensure that it is refitted in the same position. If the pin is fitted 180° out, the tag will break on first park cycle.

2. Using grease from the motor gearbox, lubricate the gear teeth.

3. Fit the dished washer, plain washer and circlip to the outer end of the gear shaft.

4. Fit the plastic cover and the cover plate to the wiper motor.

5. Fit the motor and rack assembly to the car by reversing the procedure given for removal. Ensure that when the motor securing clip is tightened, the alignment between the motor and the rack tubing is not destroyed.

6. Connect the loom socket to the wiper motor and operate the wiper motor for a few seconds and then switch off. This will ensure that the wiper wheelboxes are in the parked position.

7. Fit the wiper blades to the wheelboxes in the parked position.

Drive-rack renewal

1. Withdraw the rack from the motor.

2. Fit the new rack, and replace the drive gear, fitting the dished washer, plain washer and using the new circlip provided. Ensure that the plastic parking switch operating slide is correctly located by the arm on the rack, and that the slide is fitted the correct way around as shown in Figure M74.

Note the position of anti streak mechanism and output gear crankpin.

3. Replace the motor covers and fit the motor and drive rack to the car by reversing the procedure given for removal. Ensure that when the motor securing clip is tightened, the alignment between the motor and the rack tubing is not destroyed.

4. Connect the loom socket to the wiper motor and operate the wiper motor for a few seconds and then switch off. This will ensure that the wiper wheelboxes are in the parked position.

5. Fit the wiper blades to the wheelboxes in the parked position.

'Lucas' 16 W wiper motor—To assemble

Reverse the procedure given for dismantling, noting the following points.

1. Lubricate sparingly the final gear and armature bearings with 'Shell Turbo 41'.
2. Grease liberally the cross-head guide channel, connecting rod assembly, cable rack and gearbox with 'Rocol' M.T. 265.
3. Ensure that the output gear crankpin is in the correct position.

Brushes—To renew - 'Lucas' 16 W wiper motor

Remove and dismantle the motor as described in 'Lucas' 16.W wiper motor - To dismantle. The original specified length of the brushes is sufficient to last the life of the motor. If it becomes necessary to renew the brushes the complete brushgear assembly must be fitted. The brushgear assembly must be renewed if the main (diametrically opposed) brushes are worn to or near 4,80 mm. ($\frac{5}{16}$ in.) or if the narrow section of the third brush is worn to the full width of the brush.

Ensure that the brushes move freely in their brush box.

Brush springs—To check - 'Lucas' 16 W wiper motor

1. Using a push-type spring gauge, press on the end face of the brush until the bottom of the brush is level with the bottom of the slot in the brush box.
2. The spring pressure should read 140 g. to 200 g. (5 oz. to 7 oz.), if the pressure reads below these figures the springs should be renewed.

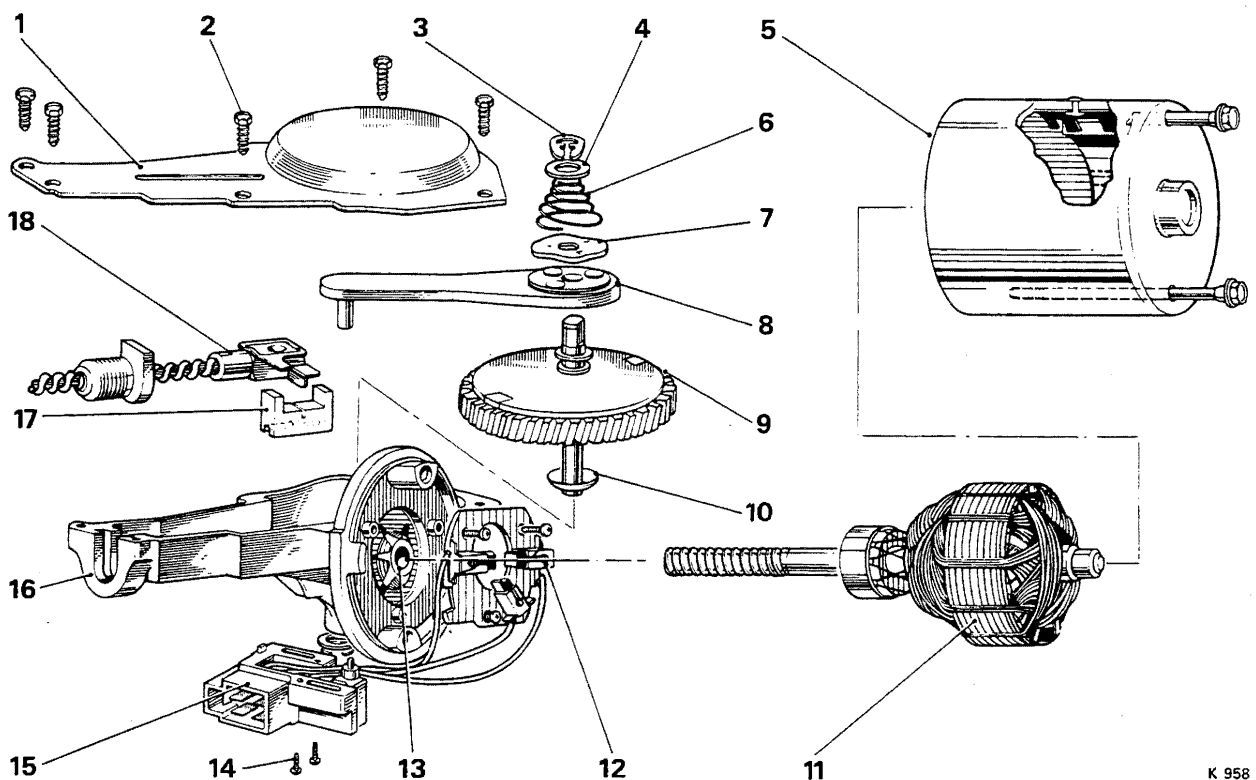


FIG. M74 EXPLODED VIEW OF 'LUCAS' 16 W WIPER MOTOR

- | | | |
|-----------------|-------------------|------------------------------|
| 1 Gearbox cover | 7 Friction plate | 13 Self-centring bearing |
| 2 Screws | 8 Connecting rod | 14 Securing screws |
| 3 Circlip | 9 Gear | 15 Limit switch assembly |
| 4 Washer | 10 Dish washer | 16 Gearbox |
| 5 Yoke | 11 Armature | 17 Slider block |
| 6 Spring | 12 Brush assembly | 18 Cable rack and cross-head |

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Armature insulation—To test (see Fig. M75)

1. Subject the armature to an insulation test.
2. Check the armature windings for short and open circuits.
3. If the commutator is worn, it can be lightly skimmed in a lathe using a diamond-tipped tool.
4. After skimming, undercut the armature slots and remove all burrs by lightly polishing with fine emery.

Cable rack and tubing—To examine

1. Badly kinked or flattened tubing must be renewed. Any bends of a radius less than nine inches must be reformed. Access to the cable rack tubing is gained by the removal of the top roll as described in Chapter S - Body, and by the removal of the refrigeration system evaporator box as described in Chapter C - Air Conditioning System.
2. Insert the hook of a spring balance into the hole on the cross-head (see Fig. M73) and withdraw the rack with the balance. The maximum permissible force required should not exceed 2,72 kg. (6 lb.).

Cable rack drive—To renew

1. Remove the wiper blades and arms.
2. Disconnect the rack from the wiper motor as described in Wiper motor - To remove.
3. Remove the rack from the tubing by carefully pulling from the motor end to release the rack from the wiper arm wheelboxes.
4. Lubricate the new rack with 'Rocol' M.T. 265 grease, then fit into the tubing. It may be necessary to rotate the wheelbox spindles slightly in order to engage the gears with the rack. Fit the rack to the motor.

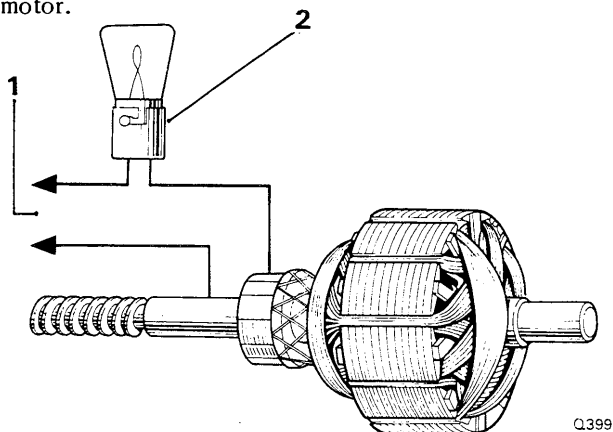


FIG. M75 ARMATURE INSULATION TEST

- 1 110V ~
- 2 15W

5. Fit the wiper arms and blades, then check the setting of the parking switch as described in Parking Switch - To adjust.

Wheelboxes

The wheelboxes are lubricated on initial assembly and do not require any maintenance. They are secured in position on the scuttle by a chromium plated nut fitted to the outside of the car.

Loose wheelboxes are a contributory factor to both noisy and faulty wiper operation, therefore ensure that they are secure at all times.

In the unlikely event of a failure of one of the wheelboxes, it must be renewed.

Wheelbox—To renew

1. Remove the top roll and instrument panel as described in Chapter S - Body.
2. Remove the air conditioning equipment located behind the facia, for full details refer to Chapter C - Heating, De-misting and Ventilating System.
3. Remove the wiper blade and arm.
4. Remove the flexible drive.
5. Unscrew and remove the chrome nut and withdraw the wheelbox.

Anti-streak mechanism

The anti-streak mechanism fitted to the 'Lucas' 6.W. and 16.W. wiper motors enables the wiper arms and blades to make a complete wiping cycle before coming to rest in the parked position, thus ensuring there are no streaks on the screen.

It is imperative, when the mechanism has been dismantled, that it is correctly assembled (see Fig. M76).

1. The tag on the driving plate and the recess in the wave washer face towards the outside of the gearwheel.

2. Rotate the eccentric so that the plastic slide is depressing the park switch, fit the wave washer with marks uppermost and just behind tag. Fit the driving plate bush and driving plate with the latch just behind the tag.

3. It is possible to assemble these components 180° from the position previously described. This must be avoided as the mechanism will lock and the driving plate will fracture before the motor is parked.

Windscreen washer jets—To clean

1. Unscrew the knurled portion of each screen jet to expose the slot.

2. Operate the washer motor for a few seconds to clean away any sediment present.
3. If a poor jet of fluid prevails, check the 'Telkathene' washer which may be mis-shapen; renew if necessary.

Washer unit—To maintain

1. This unit requires no maintenance other than to ensure that the electrical connections are clean and correctly tightened. Ensure that the container is kept clean.
2. If the motor unit fails it should be replaced by a new unit.

16 W wiper motor— Parking switch adjustment

The parking switch of this motor is provided with an adjustment to allow for different angles of park. When replacing a drive gear assembly it may be necessary to re-adjust the parking switch to suit the new assembly. Failure to do this may result in one of the following faults:

1. With the wiper switch in the intermittent position and the blades parked on the screen, moving the switch to the off position does not cause the blades to move to the off screen position.
2. When moving the wiper switch from off to intermittent, there is an 8 to 10 second delay before the wiper motor operates.

If a new gear assembly has been fitted and the wiper motor exhibits one of the above faults the relevant following procedure should be adopted.

Note Always ensure that the metal top plate is in position and the parking switch securing screws are tight before operating the motor.

Procedure for Fault 1

1. Loosen the rack tube nut and release the clamp from the wiper motor. Care must be taken to ensure that the tube is not completely disconnected otherwise the drive rack may become bent.
2. Rotate the motor until the parking switch is accessible (see Fig. M77). Tighten the rack tube nut. This will allow the motor to be operated and also permit adjustment of the switch.
3. Switch on the ignition and slacken the parking switch securing screws and move the parking switch fully inwards towards the gearwheel. Select intermittent wipe, and once the blades have moved, select off. The motor will not reverse and park.
4. Carefully move the limit switch outwards to a position where the motor will reverse and move the blades to the correct parking position. Scribe a line on the motor casing at this point as shown in Figure M77.

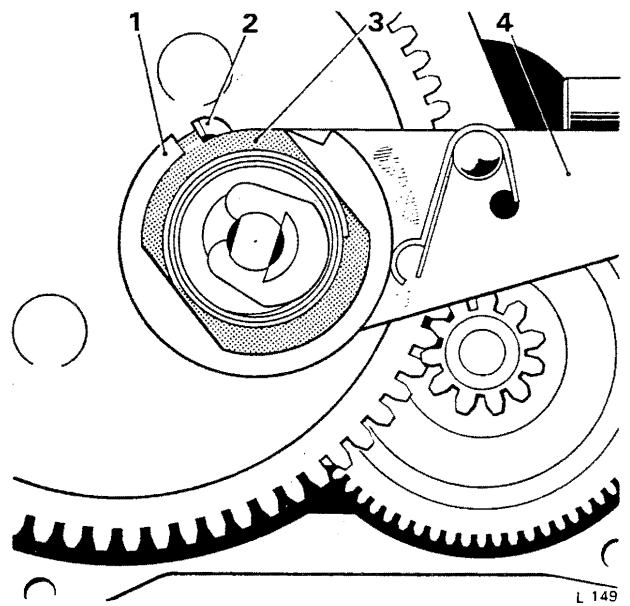


FIG. M76 ANTI-STREAK SETTINGS (FITTED TO ALL CARS FROM CAR SERIAL NUMBER SRX 2110)

- 1 Wave washer recess
- 2 Drive plate tag
- 3 Tag and eccentric
- 4 Crankpin with eccentric in the extended (Park) position

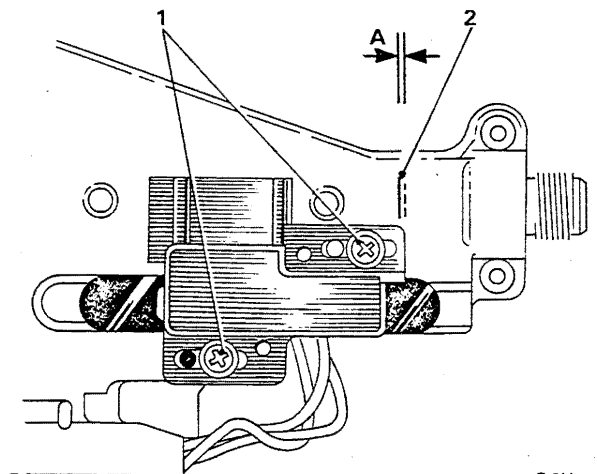


FIG. M77 PARKING SWITCH ADJUSTMENT

- 1 Parking switch securing screws
- 2 Point at which motor operates

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5. Move the limit switch 0.51 mm. (0.2 in.) further outwards from the scribe line (dimension A) and tighten the switch securing screws.
6. Switch off the ignition and re-fit the wiper motor to the mounting bracket.
7. Check all of the wiper functions for correct operations.

Prodedure for fault 2

Before attempting to correct this fault, ensure that the gear assembly fitted is of the latest type. The identification of the two gears is shown in Figure M78.

To adjust the parking switch, proceed as follows:

1. Unscrew the rack nut and release the clamp from the wiper motor.
2. Rotate the motor until the parking switch is accessible. Tighten the rack nut. This will allow the motor to be operated and also permit adjustment of the switch.
3. Switch on the ignition and slacken the parking switch securing screws and move the switch fully inwards towards the gearwheel. Select intermittent

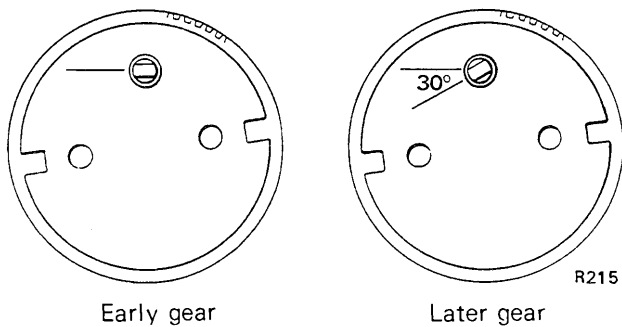


FIG. M78 IDENTIFICATION OF GEARS

wipe, and once the blades have moved, select off. The motor will not reverse and park.

4. Carefully move the limit switch outwards to a position where the motor will reverse and move the blades to the correct parking position. Scribe a line on the motor casing at this point as shown in Figure M77.

5. Disconnect the socket to the non-adjustable parking switch situated beneath the main gearwheel casing.

6. Move the limit switch fully outwards, select slow wipe and once the blades have moved, select off and allow the motor to reverse and stop.

7. Connect a circuit continuity tester across the non-adjustable switch terminals 2 and 4 (see Fig. M79).

8. If the previous test indicates a circuit, scribe a line on the motor casing at that point.

9. If no circuit exists move the parking switch slightly inwards and select slow followed by off.

10. Repeat this operation until circuit continuity is indicated and scribe a line on the casing.

11. Secure the parking switch at a point midway between the two scribed lines.

12. Switch off the ignition and replace the socket in the parking switch and refit the motor to the securing bracket.

13. Check all wiper functions for correct operation.

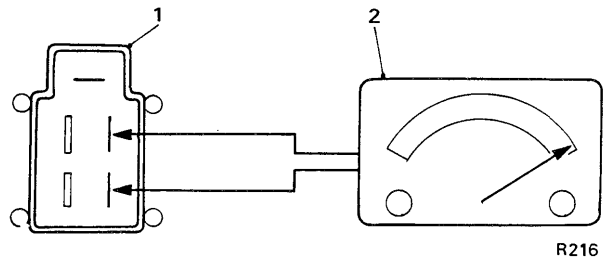


FIG. M79 CONTINUITY TESTING

- 1 On screen parking switch
- 2 Circuit tester

Chapter M

Windscreen Wipers, Motors and Washers Fault Diagnosis (Refer to Figs. M80 - 84)

Symptom	Possible Cause	Action
Wipers fail to operate on NORMAL or FAST speed. INTERMITTENT satisfactory.	No supply voltage at wiper switch.	Check supply from fuse 2 to terminal 8 of wiper switch.
	Wiper switch faulty.	With wiper switch on FAST or NORMAL, check for live feed at switch terminal 10.
Wipers fail to operate on any switch setting.	Supply faulty.	Operate wash/wipe switch, if washer fails to operate check supply at wash/wipe unit and fuse 2.
	Number 2 fuse 'blown'.	Replace fuse.
	Wiper motor faulty.	Disconnect the motor socket and test the motor. Check motor brushes.
	Faulty earth connection.	Check soundness of earth connections at right-hand 'A' post upper earth point, connection 2 of wash/wipe control box and 14B cable at wiper switch.
FAST speed inoperative NORMAL wipe, wash/wipe cycle and intermittent cycle satisfactory.	Wiper switch faulty.	Switch to FAST speed and check for live feed at terminal 5.
	Faulty cable connection.	Check continuity of 14YG cable at motor socket, motor condenser, toeboard socket and wiper switch.
INTERMITTENT wipe cycle inoperative, normal wipe and wash/wipe satisfactory.	Intermittent wipe unit faulty	Remove auxiliary switch plug from motor and check for continuity between terminals 1 and 3 on the intermittent wipe unit. Allow 7 seconds delay for circuit to charge.
	Faulty wiper switch.	At the wiper switch, check for continuity between connections 3 and 4, 12 and 13, 1 and 7 (see previous note).
INTERMITTENT wipe cycle runs continuously. Normal wipe and wash/wipe satisfactory.	Faulty intermittent wipe unit.	Verify that terminals 1 and 3 on the intermittent wipe unit are not made continuously.
INTERMITTENT wipe cycle operates one cycle only.	Intermittent wipe unit faulty.	Replace unit.
Wash cycle satisfactory but wipe cycle inoperative. Normal and Fast speed wipers inoperative.	Wash/wipe control unit faulty.	Switch to intermittent wipe cycle, if intermittent wipe operates, the wash/wipe unit is faulty.

Chapter M

Windscreen Wipers, Motors and Washers Fault Diagnosis (Refer to Figs. M80 - 84)

Symptom	Possible Cause	Action
Wash cycle inoperative, wipe cycle satisfactory. Normal and Fast speed wipers satisfactory.	Washer motor faulty.	Check for supply at washer motor terminals and also for correct polarity. Check the fluid level in the container and examine the jets and tubing for blockage and/or leaks.
Wash/wipe inoperative. Normal and intermittent wipe cycles satisfactory.	Faulty supply.	Check for live feed at 14G cable at washer bottle, toeboard socket D and wiper switch.
	Wash/wipe switch faulty.	Connect 14GB cable at washer motor to earth. With 14G connection 'live', the washer should operate indicating a faulty wash/wipe switch.
	Faulty earth from wash/wipe switch.	Check 14B cable at wash/wipe socket and left-hand 'A' post upper earth point.

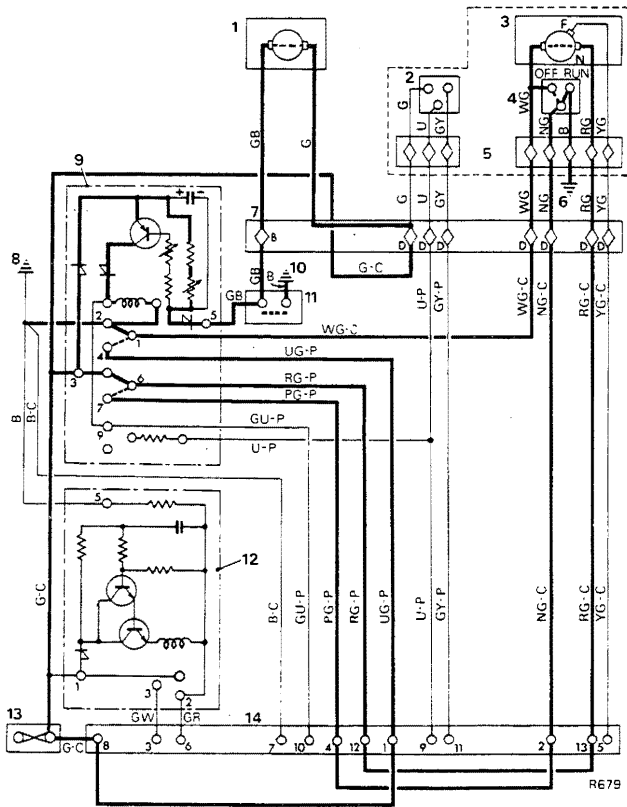


FIG. M80 'OFF' POSITION

**KEY FOR FIGURES M80 TO M84
WIRING DIAGRAMS**

- 1 Washer motor
- 2 'Park on screen' switch (Integral with motor)
- 3 Wiper motor
- 4 'Park off screen' switch (Integral with motor)
- 5 Wiper motor sockets
- 6 Right-hand valance earth
- 7 Toeboard sockets (A & D left-hand, H & K right-hand)
- 8 Left-hand 'A' post upper earth (Right-hand for RHD cars)
- 9 Wash/Wipe unit
- 10 Right-hand 'A' post upper earth (Left-hand for RHD cars)
- 11 Washer switch
- 12 Intermittent wipe unit
- 13 Fuse 2
- 14 Wiper switch

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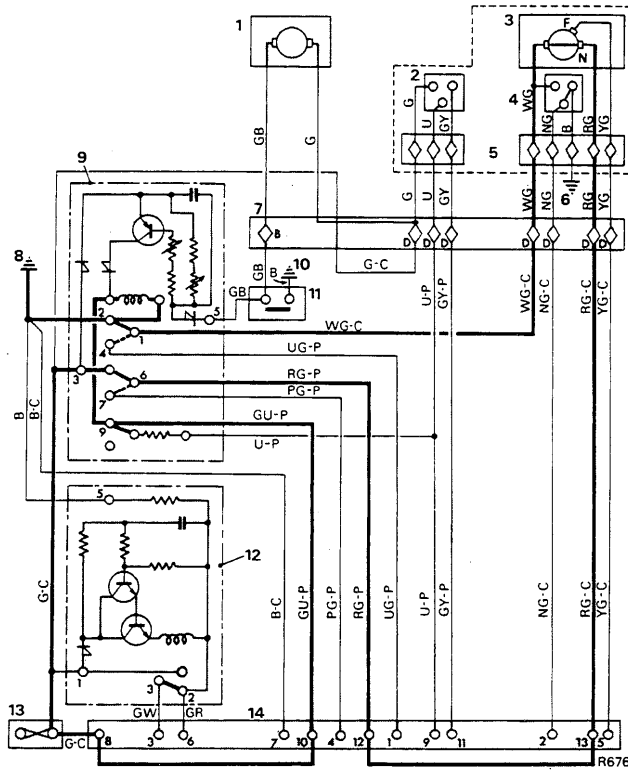


FIG. M81 NORMAL SPEED

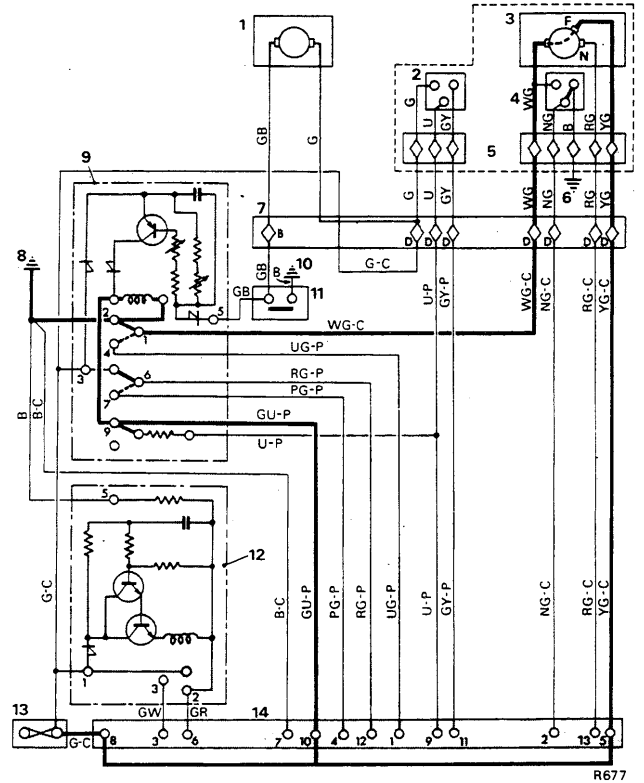


FIG. M82 FAST SPEED

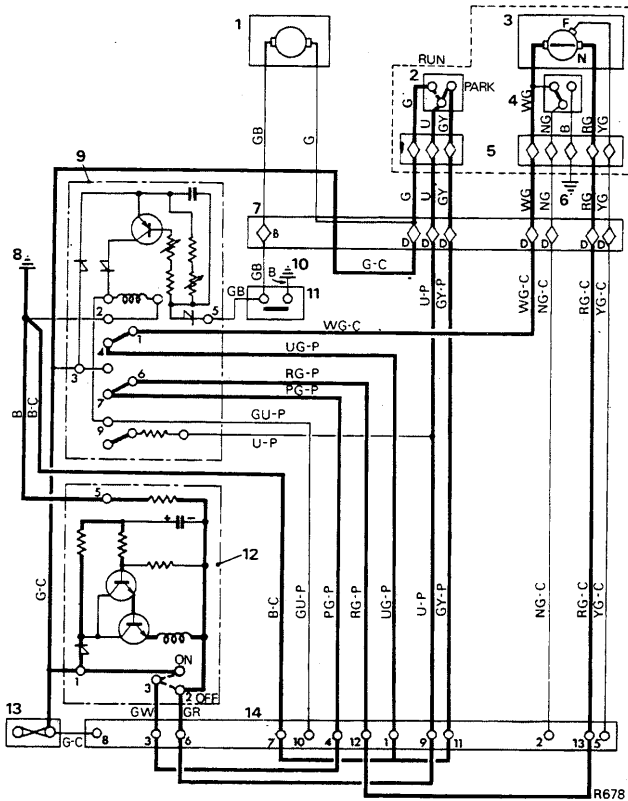


FIG. M83 INTERMITTENT WIPE

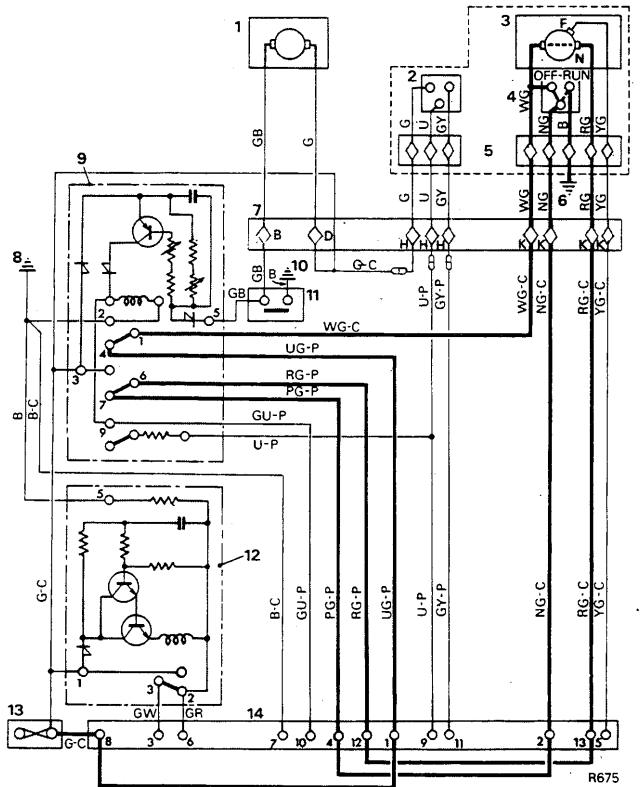


FIG. M84 WASH/WIPE

Section M12

HORNS

The horns are mounted beneath the left-hand front wing adjacent to the front of the body underframe.

Horns—To remove

1. Disconnect the battery.
2. Disconnect the leads to the horns.
3. Remove the four $\frac{7}{16}$ in. A/F setscrews (two per horn).
4. Carefully remove the horn(s).

Horns (WT 618 - Early cars)—To adjust

No adjustments are provided to alter the pitch of the horn. A poor note can be attributed to the condition of the contact points, insufficiently tightened mounting brackets or a low voltage at the horns.

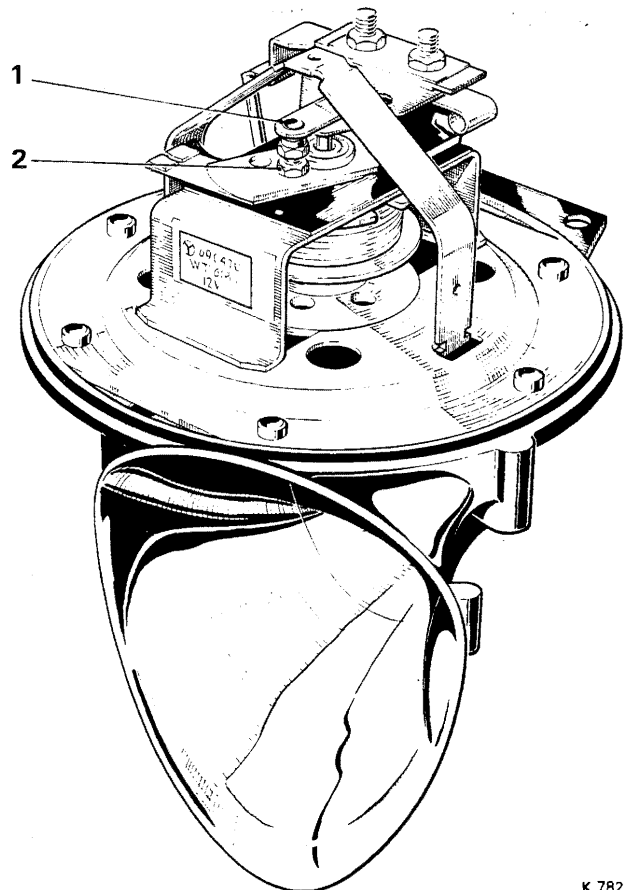
To rectify these faults proceed as follows.

1. Remove the horns as described in Horns - To remove.
2. Clean the contact points.
3. Insert an ammeter in series with the horn, and test with a voltage of 12 Volts at the horn.
4. Screw in the adjustable contact (*see Fig. M85*) until the horn just fails to sound.
5. Unscrew half-a-turn and lock.
6. Slight re-adjustment may be necessary to 'tune' the horn to obtain the correct pitch. The horn should operate correctly with a minimum voltage of 10 Volts, at the horn. Remove the ammeter. If the horns still give a poor note the horn in doubt should be renewed.

Horns (WT 7H - Late cars)—To test

The horns (*see Fig. M86*) are sealed units and the only maintenance required is adjustment to the contacts. These adjustments are effected in a similar manner to those described for the WT618 horns (*see Fig. M85*).

The mounting for the WT7H horns is different from that used for the WT618 horns. Replacement of a pair of WT618 horns by a pair of WT7H horns will necessitate a new mounting (*refer to the Spare Parts List*).



K 782

FIG. M85 WINDTONE HORN WT 618

- 1 Vibrating contact
- 2 Adjustable contact

Chapter M

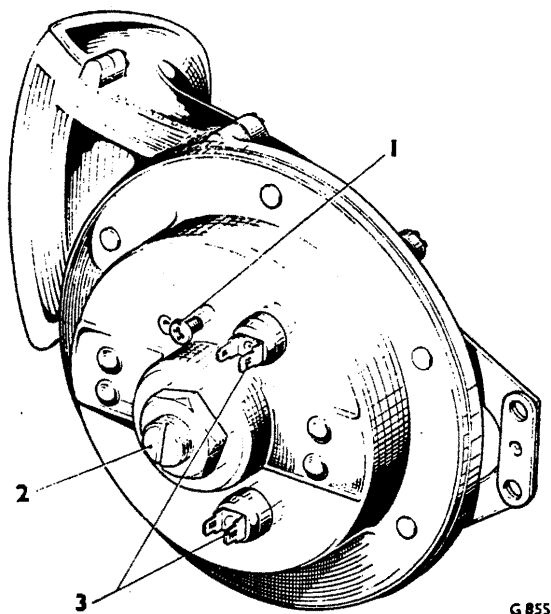


FIG. M86 WINDTONE HORN WT 7H

- 1 Adjustable contact
- 2 Vibrating contact
- 3 'Lucar' connectors

Horn circuit (All types)—To test

1. Connect the horn relay terminal 'C1' to the main battery terminal of the starter relay. If the horns do not operate, the fault lies in the circuitry forward of the relay.
2. If the horns produce a poor note, check using a voltmeter, the voltage at the horn terminal, the minimum value is 10 Volts for satisfactory operation.
3. To isolate a failure not produced in the previous test, short circuit the 'W2' terminal to earth. This isolates the push button, the lead or the earth connection. Failure of the horn to operate indicates a defective relay.

'Mixo' TR 129 High & Low

Note horns (where fitted)

These horns are sealed units and maintenance is unnecessary.

No attempt at adjustment should be made as the horns are manufactured to the relevant European standards

Section M13

ELECTRICALLY OPERATED WINDOW LIFTS

Window lift mechanism—To dismantle

If the mechanism has not already been removed from the door it should be removed as described in Chapter S - Body.

Care should be taken when handling the window lift, otherwise the special coating on the side of the channel may be partly removed and cause the slide to become noisy in operation.

1. Release the chain tension by slackening the two setscrews securing the upper sprocket chain carrier to the chain tunnel.
2. Remove one of the circlips from the upper sprocket spindle, then remove the spindle together with the remaining circlip; retain the two thin washers.
3. Slide the sprocket down the channel, then remove the two setscrews and washers securing the upper sprocket carrier to the chain channel; remove the carrier.
4. Unscrew and remove the 2 B.A. bolt securing the channel slide to the chain pick-up plate; withdraw the slide.
5. Remove the chain spring link, withdraw the chain from the channel together with the upper sprockets and pick-up plate.
6. Unscrew and remove the nuts securing the buffer mounting plate to the aluminium casing and remove the mounting plate together with the distance tubes; remove the upright chain channel.
7. Unscrew and remove the three nuts and fitted bolts securing the spindle end housing to the aluminium casing; remove the end housing.
8. Collect the thrust washer from the inner face of the end housing, also collect the adjusting washer(s).
9. Remove the large rubber seal.
10. Withdraw the spindle from the casing together with the gear wheel, 'Metalastic' bush and lower chain sprocket.
11. Using a press and applying pressure to the sprocket end of the spindle, remove the gear wheel and sprocket from the spindle.
12. Remove the thrust washer from the casing.

13. Unscrew and remove the setscrews securing the electric motor to the aluminium casing; remove the motor.

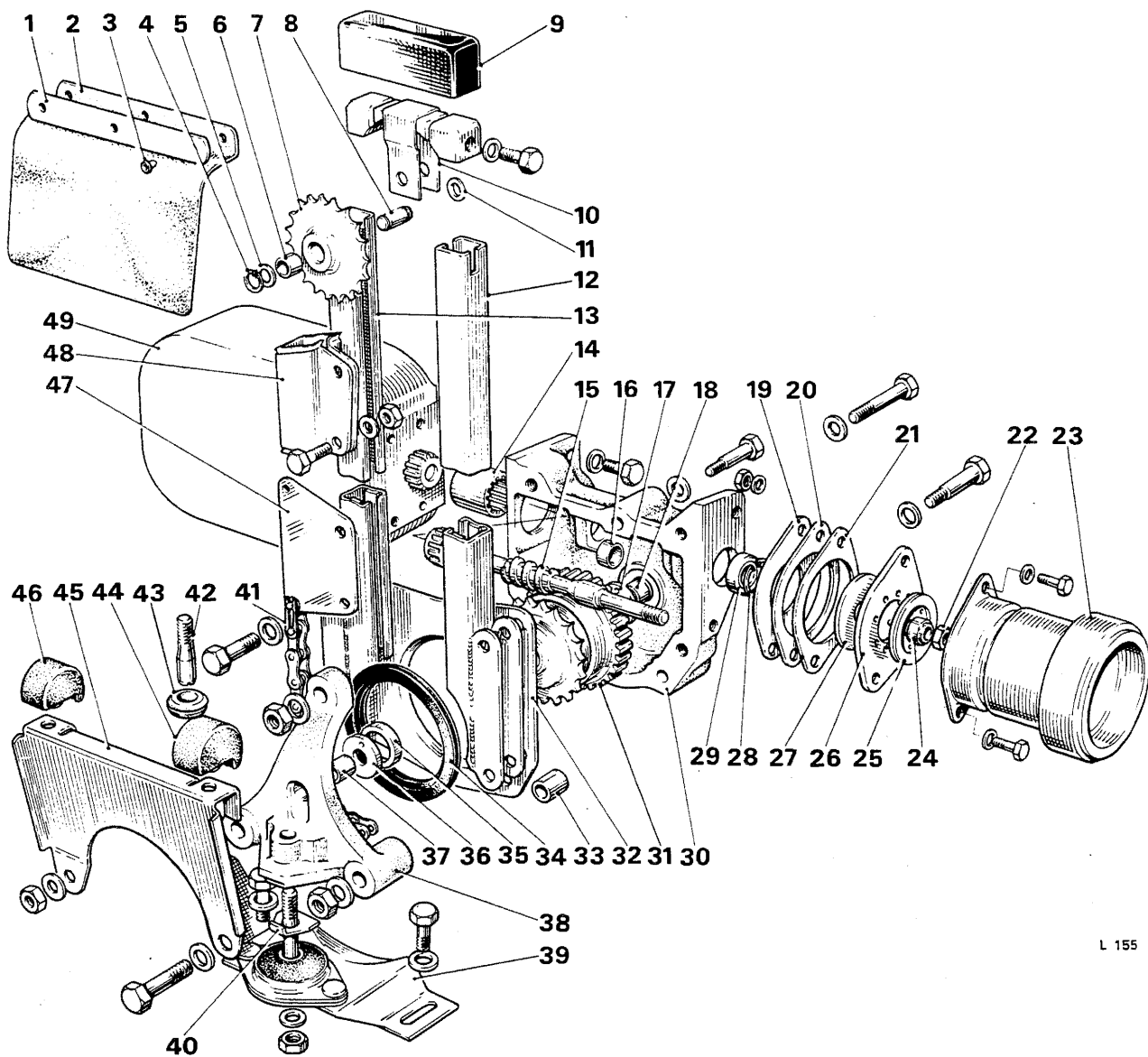
On later cars with permanent magnet motors, it is sufficient to disconnect the Lucar connectors and remove the two setscrews securing the motor to the adapter plate.

14. Remove the nylon coupling.
15. Unscrew and remove the 2 B.A. bolts and washers securing the brake solenoid to the casing; remove the solenoid.
16. Remove the brake pad.
17. Remove the brake guide plate, shims and spacer.
18. Using the special spanner (RH 7819), hold the worm shaft firm by fitting the spanner to the splined end of the shaft and removing the nut and washer from the opposite end of the shaft.
19. Withdraw the disc and closing plate.
20. Remove the distance piece.
21. Press the worm drive shaft out of the ball bearing and remove the shaft from the housing.
22. Remove the circlip retaining the ball bearing; press out the ball bearing.

Electric window lift mechanism —To inspect

1. Examine all bearing bushes for signs of excessive wear and renew if necessary. Before removing worn bushes, note their position relative to their respective housing faces to ensure the correct assembly of new bushes.
2. Examine the thrust washers for signs of wear and cracking and ensure that their retaining pins are in good condition.
3. Examine the worm and wheel for worn and damaged teeth. When the gears are assembled into position, the backlash should be between 0,08 mm. and 0,18 mm. (0.003 in. and 0.007 in.).
4. Examine the chain for excessive wear by visually inspecting the link pins and by comparing its length against that of a new chain.

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FIG. M87 EXPLODED VIEW ELECTRICALLY OPERATED WINDOW LIFT

- | | | |
|----------------------------------|-------------------------------|------------------------------|
| 1 Water shield retaining plate | 16 Bearing bush | 33 Distance piece |
| 2 Water shield | 17 Thrust washer | 34 Dust shield |
| 3 Rivet | 18 Bush | 35 Sprocket adjusting washer |
| 4 Bearing pin circlip | 19 Closing plate—brake flange | 36 Thrust washer |
| 5 Bearing pin washer | 20 Thrust plate spacer | 37 Bearing bush |
| 6 Bearing bush | 21 Shim | 38 Tripod |
| 7 Sprocket | 22 Worm shaft nut | 39 Bracket assembly |
| 8 Sprocket bearing pin | 23 Brake solenoid | 40 Washer |
| 9 Anti-rattle cap | 24 Distance piece | 41 Chain |
| 10 Bracket assembly—top sprocket | 25 Washer | 42 Steady pin |
| 11 Wave washer—bearing pin | 26 Brake shoe guide plate | 43 Grommet |
| 12 Chain channel (left-hand) | 27 Thrust plate | 44 Stop |
| 13 Chain channel (right-hand) | 28 Bearing circlip | 45 Bracket—lower mount |
| 14 Splined coupling | 29 Bearing | 46 Stop |
| 15 Wormshaft assembly—gearcase | 30 Gearcase | 47 Pick-up plate |
| | 31 Driven wheel and sprocket | 48 Pick-up plate slider |
| | 32 Closing plate | 49 Motor unit |

5. Examine the rubber seal for perishing, damage and signs that it is losing its resilience.

6. Examine the chain sprockets for wear by comparing them with a new one.

7. Visually check the brake pad for cracks and for excessive wear by comparing with a new one. Also ensure that the pad projections move freely in the guide plate.

8. Thoroughly wash the small ball bearing in clean petrol or white spirit (not paraffin) and examine for corrosion and signs of pitting. If the condition of the bearing is satisfactory it should be smeared with 'Rocol' MT 265 grease then wrapped in greaseproof paper until required for use.

9. Peel back the rubber cover surrounding the electric motor and examine the general condition of the brushgear and commutator. If these components are in poor condition or if their serviceable life is limited, a service exchange motor should be fitted.

If the general condition of the motor is satisfactory, the commutator and brushgear should be cleaned with a petrol soaked cloth and any particles of carbon dust remaining blown off with dry compressed air; ensure that the spent air is directed away from the working parts of the motor.

10. If the brush contact surface of the commutator is lightly scored or blackened by embedded carbon, the brushes should be lifted away from the contact surface and a piece of fine glass paper wrapped around the commutator; the working surface of the paper should be towards the commutator, on no account should emery cloth or a similar abrasive be used.

11. Apply light pressure to the glass paper and simultaneously rotate the armature; continue to do this until the surface of the commutator is thoroughly clean and free from score marks. Remove particles of dust and dirt, using dry compressed air and ensuring that the spent air is directed away from the working parts of the motor.

12. Check that the carbon brushes are perfectly free in their holders; if any tight spots are felt, the brushes should be manipulated until they move freely.

13. Fit the rubber covering.

Important When peeling back the rubber cover, care must be taken not to touch the thermal cut-out; if the blade is flexed, the accuracy of the setting cannot be guaranteed.

14. On later cars having permanent magnet motors, if a motor is faulty or suspect it should be replaced by a serviceable motor.

Electrically operated window lift

—To assemble

Reverse the procedure given for dismantling, noting the following points.

1. The end float in the lower sprocket spindle should be between 0,13 mm. and 0,25 mm. (0.005 in. and 0.010 in.). To obtain this end float an adjustment washer is provided between the thrust washer and the lower sprocket.

2. The nut securing the brake disc to the worm drive spindle should be tightened to the standard figure quoted in Chapter P - Torque Tightening Figures.

Note that the spanner (RH 7819) will be required to hold the serrated end of the worm shaft while the nut is being tightened.

3. The chain tension should be set so that, with finger pressure, the chain can be moved approximately 6,35 mm. (0.25 in.) on either side of its normal running position.

4. This adjustment should be carried out by using the special tool (RH 7769). Fit the tool over the top of the upper sprocket bracket so that the feet of the tool locate under the sprocket centre boss. Slacken the two setscrews securing the upper sprocket bracket and rotate the centre of the special tool until the above mentioned setting is obtained, after which the two setscrews should be tightened and the tool removed.

5. Shims should be fitted between the spacer and the brake guide plate to give a 0,25 mm. (0.010 in.) minimum clearance between the brake disc and the brake guide plate.

6. The sprocket bearing and chain should be lubricated with 'Rocol' MT 265 grease; the worm, worm bearing and worm wheel teeth should be lubricated with either 'Esso Beacon' or 'Aeroshell' grease.

Section M14

ELECTRICALLY OPERATED FRONT SEATS**Electrically operated seat mechanism—
To remove and dismantle
(see Fig. M88)****Early cars**

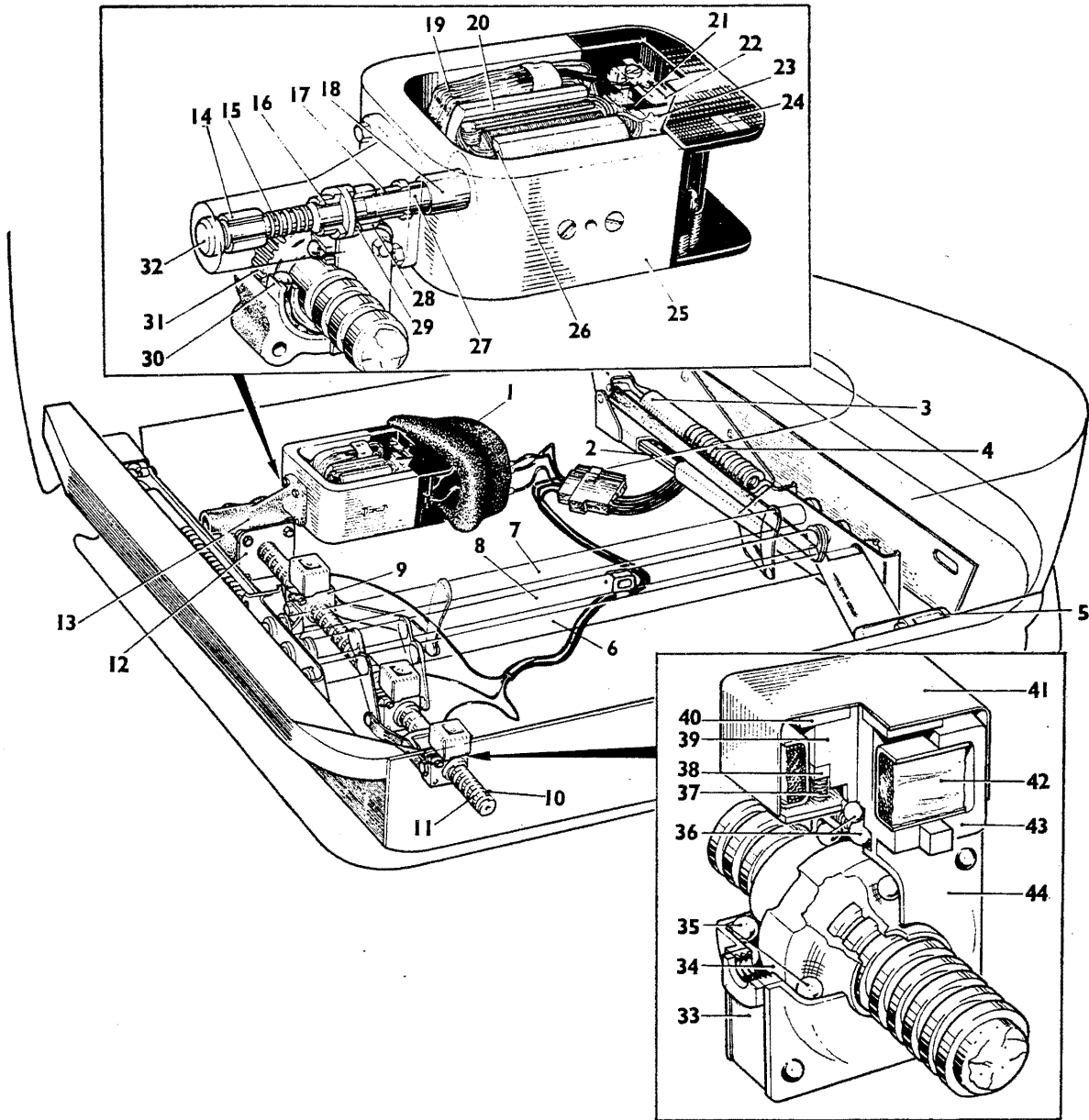
1. Remove the seat cushion.
2. Remove the four 'Plasti-rings' and pins securing the seat mechanism, then remove the seat together with the rake mechanism.
3. Operate the seat switch to move the seat mechanism fully forward, then remove the two socket-headed cap screws and washers securing the seat mechanism to the floor. Then again operate the seat switch to move the seat fully rearward and remove the two socket-headed cap screws and washers securing the seat mechanism to the floor.
4. Disconnect the battery.
5. Disconnect the leads to the solenoids and the electric motor.
6. Remove the extension setscrews securing the clutches to the seat actuating levers.
7. Remove the split-pin and washer retaining the electric motor and worm shaft to their pivot; withdraw the assembly from the pivot.
8. Unscrew and remove the four 2 B.A. setscrews securing the electric motor to the drive housing, then separate the two units.
9. Remove the first four roll pins on the large worm shaft.
10. Rotate in turn each clutch nut, anti-clockwise (as viewed from the front of the seat), and remove the three clutches and solenoids from the worm shaft. Note the position of the clutch nuts in relation to the worm shaft to ensure correct assembly.
11. Remove the four 2 B.A. setscrews securing the cover plate to the drive housing.
12. Withdraw the shaft together with the bearing and gear assembly.
13. Using a punch, tap out the pin securing the worm gear to the shaft.

14. Using either a press or a 'Claw' type extractor, remove the gear and ball bearing from the shaft.
15. Remove the spacer, thrust washer and small worm shaft from the gear housing.

**Electrically operated seat mechanism
To remove and dismantle****Late cars**

1. Remove the seat from the car as described in Chapter S - Body
2. Remove the setscrews securing the clutches to the seat actuating levers.
3. Remove the screw securing the motor to the motor support strut.
4. Remove the split pin and washer retaining the motor gear housing to the pivot; withdraw the assembly from the pivot.
5. Unscrew and remove the four 2 B.A. setscrews securing the motor to the gear housing then separate the two units.
6. Remove the first 4 roll pins from the actuating screw (counting from the front of the seat).
7. Rotate each clutch nut anti-clockwise (viewed from the front of the seats) and remove the three clutch assemblies from the actuating screw. Note the position of each clutch assembly on the actuating screw to ensure correct assembly.
8. Remove the four 2 B.A. setscrews securing the cover plate to the gear housing.
9. Withdraw the actuating screw together with the bearing and gear assembly.
10. Using a punch, tap out the pin securing the worm gear to the actuating screw.
11. Using either a press or 'claw' type extractor, remove the gear and bearing from the shaft.
12. Remove the spacer, thrust washer and small worm shaft from the gear housing.

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FIG. M88 VIEW OF ELECTRICALLY OPERATED FRONT SEATS

- | | | |
|---|----------------------|--------------------------|
| 1 Rubber cover | 13 Gear housing | 29 Thrust washer |
| 2 Seat slide | 14 Bearing | 30 Bearing |
| 3 Polythene tube | 15 Small worm shaft | 31 Wormwheel |
| 4 Spring | 16 Bush | 32 Plug |
| 5 Pin and plastic ring | 17 Bush | 33 Nut casing |
| 6 Cross-shaft (for up and down movement at front of seat) | 18 Bush | 34 Nut |
| 7 Cross-shaft (for fore and aft movement of seat) | 19 Field winding | 35 Ball race |
| 8 Cross-shaft (for up and down movement of rear of seat) | 20 Pole | 36 Operating balls |
| 9 Solenoid operated clutch assembly | 21 Brushgear | 37 Plunger return spring |
| 10 Roll pin | 22 Thermo cut-out | 38 Retainer |
| 11 Worm shaft | 23 Commutator | 39 Plunger |
| 12 Cover plate | 24 End housing | 40 Plunger top |
| | 25 Motor casing | 41 Cover |
| | 26 Pole | 42 Coil winding |
| | 27 Motor drive shaft | 43 Coil holder |
| | 28 Spacer | 44 Cover plate |

Seat mechanism—To inspect**All cars**

1. Examine the links and link pins for wear and fracture; worn pins will cause the mechanism to rattle.
2. Peel back the rubber covering surrounding the motor and examine the general condition of the brush gear and commutator. If these components are in poor condition or if their serviceable life is limited, a service exchange motor should be fitted.
3. If the general condition of the motor is satisfactory, the commutator and brushgear should be cleaned with a petrol-soaked cloth and any particles of carbon dust remaining should be blown away with dry compressed air; ensure that the spent air is directed away from the working parts of the motor.
4. If the surface of the commutator is lightly scored or blackened by embedded carbon, the brushes should be lifted away from the commutator and the commutator cleaned with a piece of fine glasspaper. Do not use emery cloth or similar abrasive.
5. Apply light pressure to the glass paper and rotate the armature until the surface of the commutator is thoroughly clean and free from score marks. Remove particles of dust and dirt using dry compressed air, ensure that the spent air is directed away from the working parts of the motor.
6. Verify that the carbon brushes are free in the holders.
7. Fit the rubber covering.
8. Thoroughly wash the bearing in clean petrol or white spirit (not paraffin), then examine the bearing for signs of pitting, corrosion or cracking of the balls or tracks.
9. Examine the bearing bushes for signs of excessive wear and replace if necessary. Before removing worn bushes, note their position relative to their respective housing face to ensure correct assembly of the new bushes.
10. Examine the worm and wheel for worn or damaged teeth.

non-electrical working parts should be lubricated with 'Rocol' MT 265 grease, the actuating screw should be lubricated with 'Moly tone' anti-scuffing paste.

Extreme care must be taken not to disturb the thermal cut-out (bi-metal blade, slightly concave, approximately 12.70 mm. x 19.05 mm. (0.5 in. x 0.75 in.) with a contact at the centre). Do not attempt to operate this switch by hand, any cold mechanical operation will alter the current/thermal switching characteristics.

Seat mechanism—To assemble and fit**All cars**

Reverse the procedure given for removal and dismantling, noting the following points:

1. The worm and wheel gear should have a backlash of between 0,08 mm. and 0,18 mm. (0.003 in. and 0.007 in.).
2. With the exception of the actuating screw all

Section M15

RADIO RECEIVER, CARTRIDGE PLAYER, LOUDSPEAKERS AND AERIAL

Receiver—To remove

Left and right-hand drive cars prior to
Car Serial Numbers 6000 & 6791

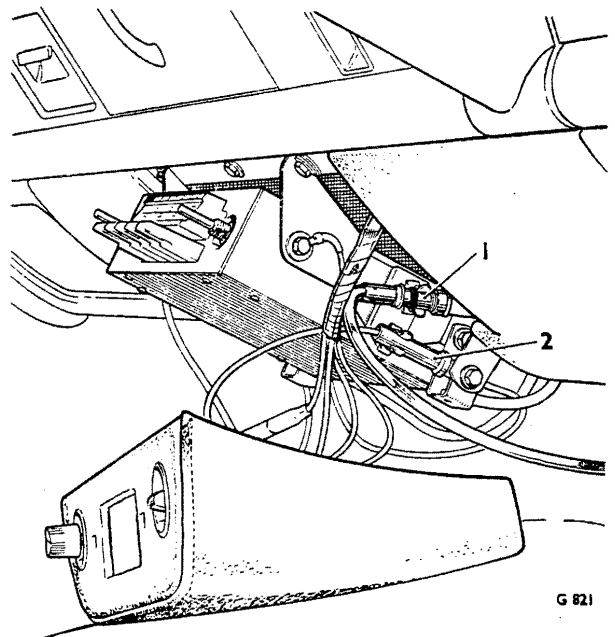
1. Disconnect the battery.
2. Pull off the control knobs from their spindles. (it is not necessary to remove the aerial and balance control knobs). Remove the spindle lock nuts and receiver facia finisher.
3. Unscrew and remove the two screws securing the receiver trim to the under-facia.
4. Lower the rear of the receiver trim and simultaneously withdraw the front of the trim clear of the receiver control spindles (*see Fig. M89*).
5. Disconnect the receiver current supply by disconnecting the in-line 'Lucar' connection (Green/Brown); ensure that the blade remains in the fuse lead.
6. Disconnect the loudspeaker connections from the in-line 'Lucar' connector block.
7. Remove the aerial lead from the receiver socket.
8. Unscrew and remove the four screws securing the receiver to the mounting brackets; accessibility may be improved if the brackets are completely removed.

Receiver—To remove

Left and right-hand drive cars from
Car Serial Numbers 6000 & 6791

1. Disconnect the battery.
2. Pull the control knobs off their spindles. Unscrew and remove the spindle lock-nuts.
3. **Right-hand drive cars only**, remove the two screws securing the air conditioning unit control knobs, remove the two screws securing the wooden facia panel and carefully lift off.
- Left-hand drive cars only**, carefully lift off the wooden facia panel.
4. Carefully prise away, using a flat tool, the triangular trim pads situated one each side of the console.

5. Disconnect the receiver current supply by disconnecting the in-line 'Lucar' connection (Brown/Green).
6. Disconnect the loudspeaker connections by disconnecting the in-line 'Lucar' connections and remove the aerial lead from the receiver.
7. Unscrew and remove the four extended-head setscrews securing the receiver brackets to the console.
8. Carefully withdraw the lead connection plugs for the air conditioning unit control switches and lay the plugs safely within the console.
9. Remove the two setscrews securing the receiver brackets to the receiver.
10. Carefully manoeuvre the receiver out of the console.



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FIG. M89 RECEIVER WITH COVER REMOVED

1 Aerial connection 2 Fuse container

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Receiver—To remove

Cars fitted with cartridge player

1. Disconnect the battery.
2. Remove the control knobs and spindle nuts.
3. Remove the ash-tray and unscrew the 2 B.A. bolts securing the receiver brackets.
4. Withdraw the receiver and disconnect the Lucar connectors, aerial lead and earth braid.

Receiver fuse—To renew

1. Remove the trim as described in Receiver - To remove.
2. Remove the white coloured fuse holder from its clip on the receiver and depress one end of the fuse container against spring pressure and turn anti-clockwise, then remove the fuse.

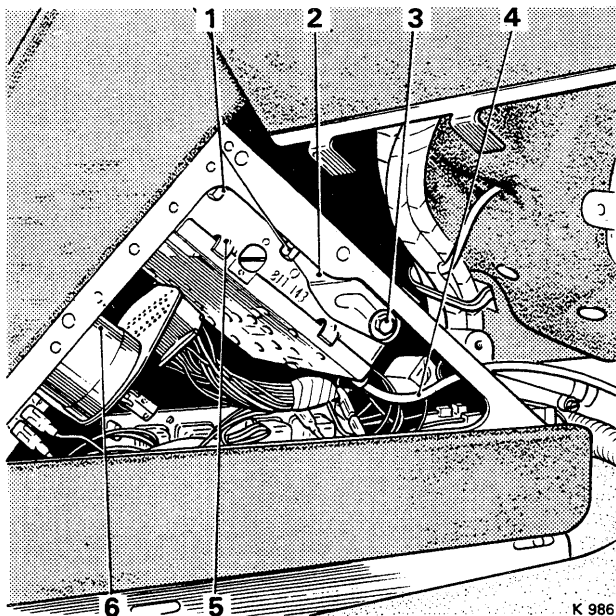


FIG. M90 RECEIVER IN CONSOLE TRIM REMOVED

- 1 Securing setscrews (extended head)
- 2 Receiver mounting bracket
- 3 Mounting bracket securing setscrew
- 4 Aerial lead
- 5 Receiver
- 6 Heating & demisting switch

Receiver bulb—To renew

Radiomobile

1. Remove the receiver as described in Receiver - To remove.
2. Unscrew and remove the two screws securing the scale retainer and remove the embellisher and scale.
3. Using a screwdriver, carefully lift the small metal lamp shield. Removal of this exposes the blue filter for the bulb.
4. Carefully withdraw the filter and bulb holder; remove the bulb from the holder.

Pye

1. Remove the receiver as described in Receiver - To remove.
2. Rotate the manual tune spindle to bring the scale pointer to one end of the scale.
3. Unscrew and remove the two screws securing the back-plate, and carefully slide the back-plate sideways to clear the pointer and rest on the flats of the selector push buttons.
4. Push a piece of 4 mm. P.V.C. sleeving over the bulb; unscrew the bulb from its holder.

Motorola

1. Remove the receiver as described in Receiver - To remove.
2. Unscrew and remove the screw which secures the top cover of the receiver and remove the cover. This screw is positioned at the rear of the receiver.
3. Turn the bulb anti-clockwise.

Cartridge player—To remove

1. Disconnect the battery.
2. Remove the knobs and spindle nuts.
3. Remove the console trim side cheeks, and remove the two nuts securing the mounting bracket.
4. Withdraw the cartridge player and disconnect the leads.

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Front loudspeaker—To remove

1. Disconnect the battery.
2. Remove the top roll as described in Chapter S - Body.
3. Unscrew and remove the four 2 B.A. nuts and bolts securing the plywood mounting board in position.
4. Disconnect the leads to the loudspeaker, taking note of the colour of the leads to ensure correct phasing on re-connection.
5. Remove the loudspeaker together with its mounting board.

Door loudspeaker—To remove

1. Disconnect the battery.
2. Remove the door trim as described in Chapter S - Body.
3. Remove the screws securing the loudspeaker.
4. Disconnect the leads and withdraw the speaker.

Aerial—To trim**Radiomobile 980 and 982 VSY**

1. Pull the two control knobs off their respective spindles; unscrew and remove the reach nut and black finisher.
2. The aerial trimmer is adjacent to the manual tuning spindle, access is through the small hole.
3. Extend the aerial to its full extent, then select a weak signal of about 200 metres (1.5 megacycles). Insert a small screwdriver into the hole and turn either anti-clockwise or clockwise. Turn the trimmer until a setting is reached where the signal, having increased in strength, stops increasing and further rotation brings decrease.

Philips 22 RM 686 - 681

Proceed as for Aerial - To trim (Radiomobile).

Motorola ZM 200 A

1. Carefully prise away, using a flat tool, the triangular trim pads situated one each side of the console.
2. The aerial trimmer is situated at the rear of the receiver and is adjusted by turning the knurled knob in the desired direction.
3. Trim as for Aerial - To trim (Radiomobile 980 and 982).

Philips N6X/16T

1. Carefully lever away, using a flat tool, the triangular trim pads which are situated one each side of the console.
2. The aerial trimmer is assembled into the aerial connection flying lead socket and is adjusted by rotating the metal sleeve spirally along the socket.

Radiomobile 1080/VRR

1. Pull the two control knobs off their spindles; carefully lift off the wood fascia panel.
2. Proceed as for Aerial - To trim (Radiomobile 980 and 982).

Receiver aerial—To remove

1. Disconnect the battery and remove aerial leads.
2. If difficulty is found locating these leads, their position will be obvious once the undersheets have been removed from the right-hand front wing. To remove the undersheets, proceed as follows.
3. Apply the handbrake and chock the rear wheels.
4. Using the lever specially provided in the tool kit, carefully remove the embellishers from the right-hand front wheel.
5. Slacken the front wheel nuts; the nuts on the right-hand side of the car have right-hand threads.
6. Position a jack fitted with a hardwood block beneath the front triangle levers pivot points. Jack up the car so that the front wheels of the car are clear of the floor. Support the front of the car on two sets of wooden blocks placed underneath the extremities of the lower triangle levers adjacent to the ball joints.
7. Unscrew and remove the wheel nuts; remove the wheel.
8. Remove the screws securing the rear part of the undersheets.
9. Remove the bonding lead from the valance earth point. (On early cars this may be secured on the engine side of the valance).
10. Remove the aerial feeder from the aerial mast by unscrewing the hexagon nut. (Knurled nut on early cars).
11. Disconnect the two supply leads at the 'Lucar' connectors.
12. Disconnect the earth return braid from the mounting bracket across the anti-vibration mount.

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13. Unscrew and remove the chromium plated bush fitted to the top of the wing. Take care not to damage the chromium plating.
14. Slacken the lower mounting nut securing the aerial assembly to its mounting bracket. It is then possible to slide the assembly free from its mounting.
15. Remove the aerial from underneath the wing together with its mounting rubbers and distance collar.

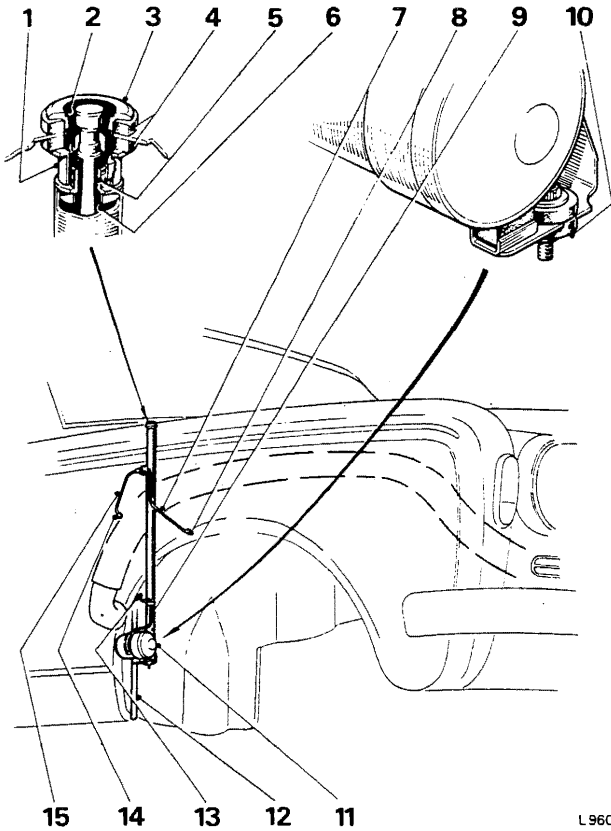


FIG. M91 POSITION OF RADIO AERIAL

- | | |
|--------------------|-------------------------|
| 1 Distance collar | 9 Electric supply leads |
| 2 Seal | 10 Mounting rubber |
| 3 Chrome finisher | 11 Motor |
| 4 Mounting rubbers | 12 Heating system drain |
| 5 Threaded adapter | 13 Grommet |
| 6 Seal | 14 Grommet |
| 7 Earth lead | 15 Aerial lead |
| 8 Grommet | |

Receiver aerial—To fit

Reverse the procedure given for removal, noting the following point (on early cars).

1. Ensure that the distance collar abuts the under-wing surface over the bright metal area around the wing crown hole.

Note (Early cars) on re-fitting, ensure that the bonding braid is fitted between the distance collar and valance earth.

Electrical bonding of the car

Bonding leads are fitted to minimise radiation from the ignition system and prevent radio receiver reception interference. Figures M92 to M97 show the positions where the tinned copper braided bonding leads are fitted.

It is important that good metal-to-metal contact is maintained between the bonding lead ends and the components or part of body which they adjoin, otherwise the function of the lead is lost.

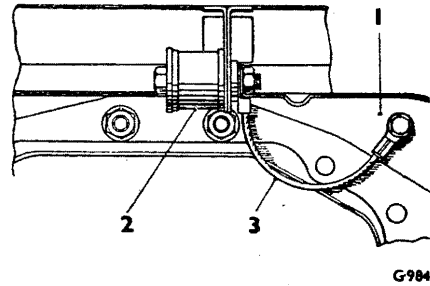


FIG. M92 FINAL BONDING LEAD

- 1 Final drive cross-member
- 2 Bracket spare wheel carrier
- 3 Bonding lead

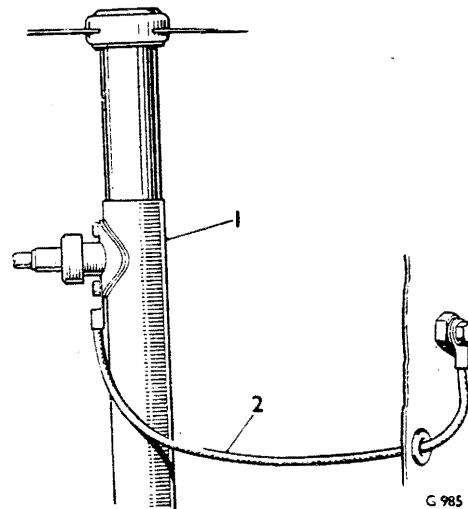


FIG. M93 AERIAL BONDING LEAD

- 1 Underwing aerial
- 2 Bonding lead

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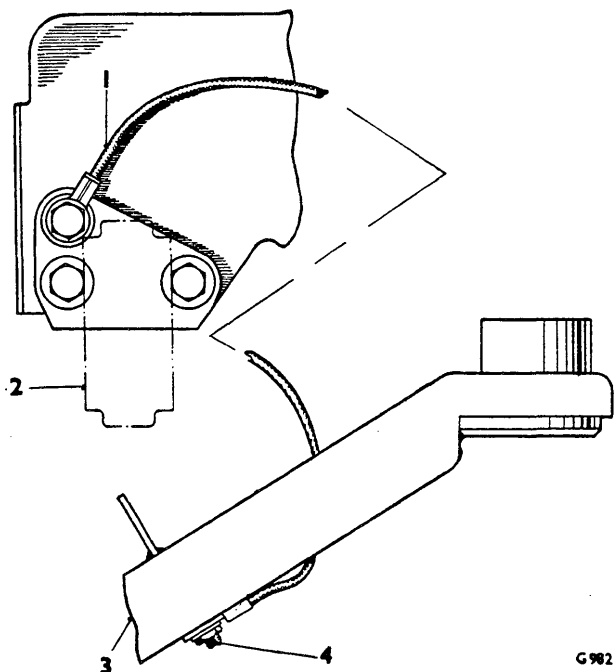


FIG. M94 RIGHT-HAND TRAILING ARM BONDING LEAD

- 1 Bonding lead
- 2 Exhaust mounting
- 3 Trailing arm
- 4 Earth

G 982

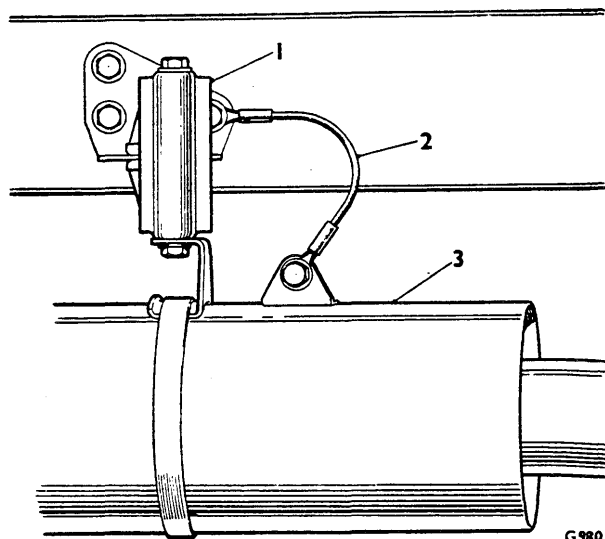


FIG. M96 REAR DAMPER BOX BONDING LEAD

- 1 Damper box mounting
- 2 Bonding lead
- 3 Damper box

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November 1976

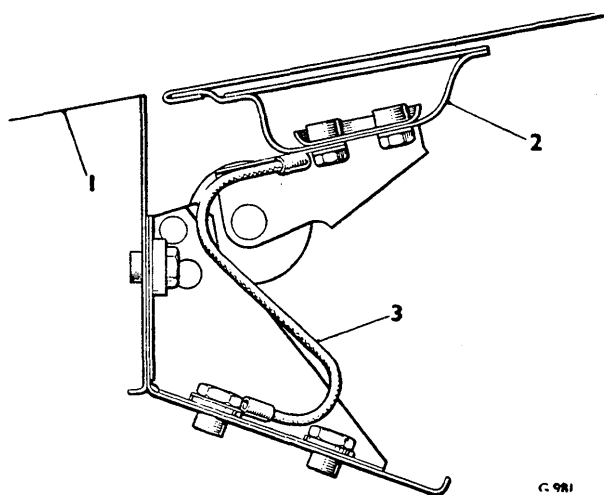


FIG. M95 BONNET BONDING LEAD

- 1 Radiator shell
- 2 Bonnet
- 3 Bonding lead

G 981

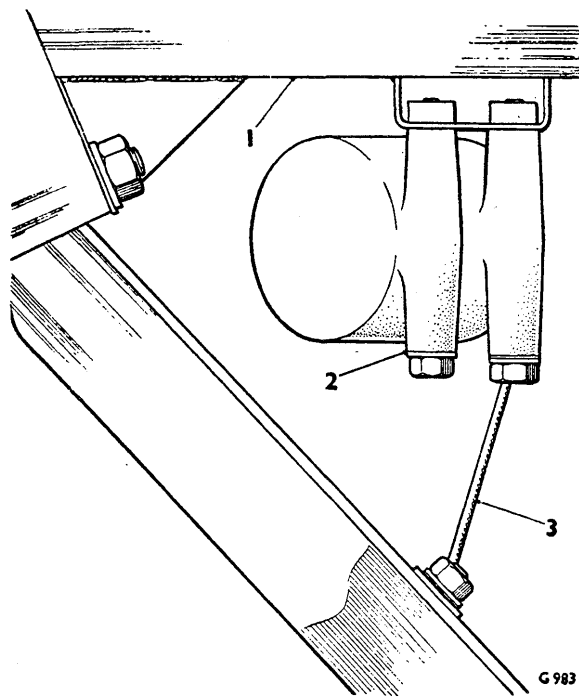


FIG. M97 LEFT-HAND TRAILING ARM BONDING LEAD

- 1 Rear suspension cross-member
- 2 Height control solenoid
- 3 Bonding lead

G 983

T.S.D. 2476

Chapter M

Fault Diagnosis

The Fault Diagnosis deals with minor radio faults only. Should the fault be proved beyond the scope of this diagnosis, the radio should be returned to Rolls-Royce Motors Limited, Crewe or London; or to a Distributor whose facilities include radio servicing.

Symptom	Possible Cause	Action
1. Receiver dead - no dial light	1. (a) Blown fuse (b) Faulty fuse holder	1. (a) Fit new fuse (b) Check that the contacts are clean and the spring pressure adequate
2. Receiver dead - dial illuminated	2. (a) Aerial lead has an open circuit or short circuit (b) Speaker circuit disconnected	2. (a) Check aerial lead by substitution and renew aerial lead if this check rectifies fault (b) Check connections at speakers and connecting block
3. Weak reception	3. (a) Radio aerial circuit not tuned to aerial (b) Poor aerial connections	3. (a) Tune by adjustment to aerial trimmer. Adjust the trim until a setting is reached where the signal, having increased in strength stops increasing and further rotation brings a decrease (b) Clean and tighten connections
4. Intermittent reception	4. (a) Loose aerial connections (b) Faulty fuse holder assembly	4. (a) Tighten connections (b) Check fuse holder
5. Interference	5. (a) Faulty speaker(s) (b) Regulator noise . A 'grating' sound with no regular pattern is an indication of a faulty suppressor capacitor (c) Generator noise. A whirring sound which rises in frequency with engine speed indicates a faulty suppressor capacitor (d) Ignition noise. A vibration or crackle that increases in frequency as the engine is accelerated and varies with engine speed	5. (a) Adjust balance control to determine whether any difference in response of front and rear speakers. Renew one or both as necessary. (b) Check the capacitor by substitution and renew if necessary (c) Fit a suppressor capacitor to the positive output terminal. This effectively parallels existing capacitor built into generator (d) Check the coil capacitor by substitution and renew if necessary Check the distributor high-tension lead knurled nuts Check sparking plug connections and spark plug gaps

Chapter M

Symptom	Possible Cause	Action
	(e) Petrol pump noise. A ticking sound which corresponds to the frequency of pump operation	(e) Check petrol pump capacitors by substitution and renew if necessary.
	(f) Wiper motor noise. A continuous 'buzzing' sound	(f) Check wiper motor capacitors by substitution and renew if necessary

Section M16

LONG WHEELBASE CARS FITTED WITH CENTRE DIVISION

(Car Serial Number 6598 onwards)

When carrying out any work on the centre division, the utmost precautions in cleanliness must be observed. The trim, being cloth, is easily marked if carelessly handled.

To renew any electrical item fitted to the division console, the console must be detached from the division.

Division console—To remove

1. Disconnect the battery.
2. Remove each pocket adjacent to either side of the division console, by removing the three nuts found at the lower edge of each pocket; the console securing bolts will now be visible.
3. Unscrew and remove the four bolts securing the division console to the division and carefully allow the console to separate from the division.
4. Disconnect the electrical connections and place the console on a clean working surface.

Radio—To remove

1. Pull the two control knobs from their spindles.
2. Remove the wooden fascia panel.
3. Unscrew and remove the four screws securing each hot and cold air blower switch.
4. Rotate the switches clear of the receiver.
5. Unscrew and remove the four screws securing the receiver to the console (two screws situated either side of the receiver).
6. Remove the receiver, taking care to retrieve the knob spindle spacers, noting that the small end fits towards the receiver.

Radio—To trim the aerial

To trim the aerial, proceed as described in Section M15 - Radio Receivers and Loudspeakers.

Division glass lift switch—To remove

Remove the division console from the division as described in Division console - To remove.

1. Disconnect the electrical connections, noting the colours to facilitate assembly.
2. Remove the two small 'Philips' screws securing the switch mounting plate to the console.
3. Remove the switch.

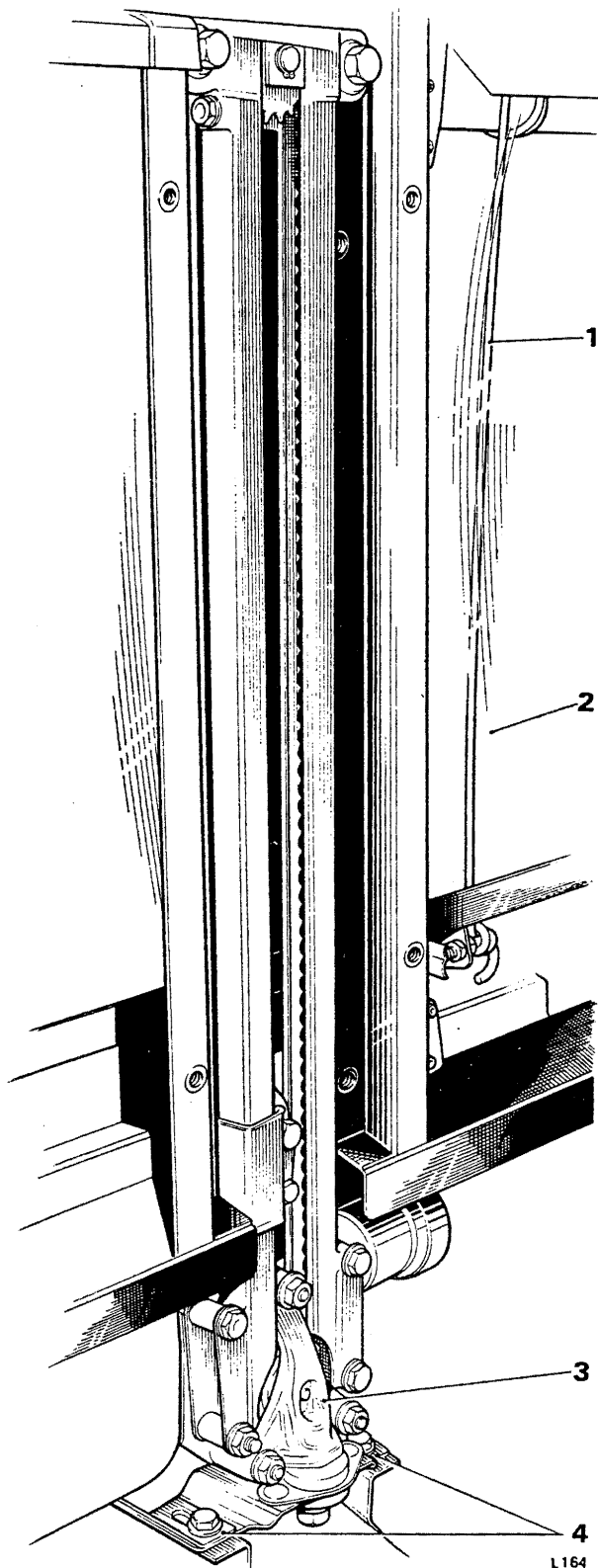
Aerial switch—To remove

Proceed as for Division glass lift switch - To remove.

Hot and cold air blowers switch —To remove

1. Remove the division console as described in Division console - To remove.
2. Remove the receiver as described in Receiver - To remove.
3. Rotate the switch through 90° and remove.

Chapter M



**Division glass lift motor—To remove
(see Fig. M98)**

1. Disconnect the battery.
2. Remove the two front seats as described in Chapter S - Body.
3. Remove the centre buttress panel covering the division glass motor by removing the four $\frac{7}{8}$ in. A/F setscrews from the vertical piece of the buttress, the four $\frac{7}{8}$ in. A/F nuts situated at the base and the two $\frac{9}{16}$ in. A/F setscrews securing the buttress to the tunnel.
4. Remove the two upper chain guard setscrews.
5. Remove the two lower motor retaining setscrews, noting the earth strap fitted to the near-side setscrew.
6. Support the division glass with a suitable prop.
7. Withdraw the motor unit, lower end first, so that the lift tongue disengages from between the two rollers on the division glass frame.
8. Remove the division glass lift motor.

Division glass lift motor —To overhaul

Proceed as for Window lift mechanism - To overhaul, as described in Section M13 - Electrically operated window lifts.

**FIG. M98 DIVISION GLASS LIFT MOTOR
IN POSITION**

- | | |
|---------|---------------------|
| 1 Cord | 3 Motor unit tripod |
| 2 Glass | 4 Mounting points |

Section M17

COACHBUILT CARS

The Rolls-Royce and Bentley T Series Corniche cars are fitted with the same major electrical components as the standard saloon, i.e. instruments, alternator, dynamo, starter motor, ignition equipment, radio receiver and electrically operated seat motors.

In this Section the overhaul, repair and maintenance of the components special to Coachbuilt cars are described; all other information is given in the appropriate Sections of this Chapter.

In the unlikely event of a Power Operated Hood electrical component becoming faulty, it should be replaced with a new unit.

Access to power-operated hood components

The electrically operated hood, solenoid valves, motor/pump unit, switch and reservoir are located behind the trim pad situated at the front of the luggage compartment.

To gain access to the components the following procedure must be used.

1. Disconnect the battery.
2. Remove the luggage compartment floor coverings and stow in a safe place.
3. Remove the trim pad situated at the front of the luggage compartment by removing the six screws. Remove the two adjacent trim pads.
4. Unscrew and remove the four 2 B.A. setscrews situated on each side of the assembly box.
5. Carefully withdraw the assembly box.
6. The electrical components will now be accessible for removal or inspection.

Note If any electrical component is found to be faulty, it should be replaced with a new unit.

Motor/pump unit—To remove (see Fig. M99)

1. Remove all hydraulic fluid from the pump reservoir as described in Chapter S - Body.
2. Disconnect the electrical connections from the motor/pump unit, noting the positions to facilitate assembly.
3. Disconnect the hydraulic fluid feed pipe and the hydraulic high pressure supply hose from the motor/pump unit.
4. Fit suitable blanking plugs into the vacant holes to prevent ingress of foreign matter.
5. Remove the two motor/pump unit securing straps secured by four $\frac{7}{16}$ in. A/F nuts.
6. Remove the motor/pump unit.

Solenoid valves—To remove (see Fig. M99)

1. Disconnect the battery.
2. Using a syringe, remove all hydraulic fluid from the reservoir.
3. Disconnect the appropriate cable at the junction box (see Fig. M99).
4. Disconnect the hydraulic connections.
5. Remove the two $\frac{7}{16}$ in. A/F nuts and bolts securing the solenoid valve to the assembly box.
6. Remove the solenoid valve.

Motor/pump unit switch —To remove

1. Disconnect the battery.
2. Disconnect the electrical connections, noting the position to facilitate assembly.
3. Unscrew and remove the two switch securing nuts and bolts.
4. Remove the switch.

Chapter M

Window lift motor—To remove

All cars from Car Serial Number 6000
(see Fig. M100)

If the window lift motor is found to be faulty, it must be replaced with a new unit.

1. Disconnect the battery.
2. Remove the two screws securing the emergency winder embellisher; remove the embellisher.
3. Lift off the door arm rest.
4. Remove the two arm rest mounting plate securing screws; remove the plate.
5. Remove the six screws located at the lower edge of the door trim pad.
6. Remove the three screws securing the door garnish rail.
7. Lifting vertically, remove the garnish rail.
8. Remove the door trim pad by placing the hands at the centre of the upper and lower edges of the door trim pad. Exert pressure at these points causing the trim pad to 'bell-out'. This operation releases the door trim pad from the two stainless steel retainers at the leading and trailing edges of the door; remove the dust cover.
9. Remove the setscrew securing the drop window to the pick-up plate.

Note It is advisable to tape the glass over the window frame to prevent the glass from suddenly dropping (2-Door Saloons only).

10. Remove the screws securing the chainguard to the inner door panel.
11. Disconnect the electrical connections from the terminal box situated on the face of the motor assembly, noting the positions to facilitate fitting.
12. Remove the two setscrews securing the window lift motor to the base of the door.
13. Remove the window lift motor.

Window lift motor—To remove

All cars prior to Car Serial Number 6000

1. Disconnect the battery.
2. Remove the ventilator window knob by unscrewing the small grub screw situated on the knob shaft.
3. Remove by carefully prising away, the window lift switch finisher.
4. Remove the switch embellisher by removing the two screws.

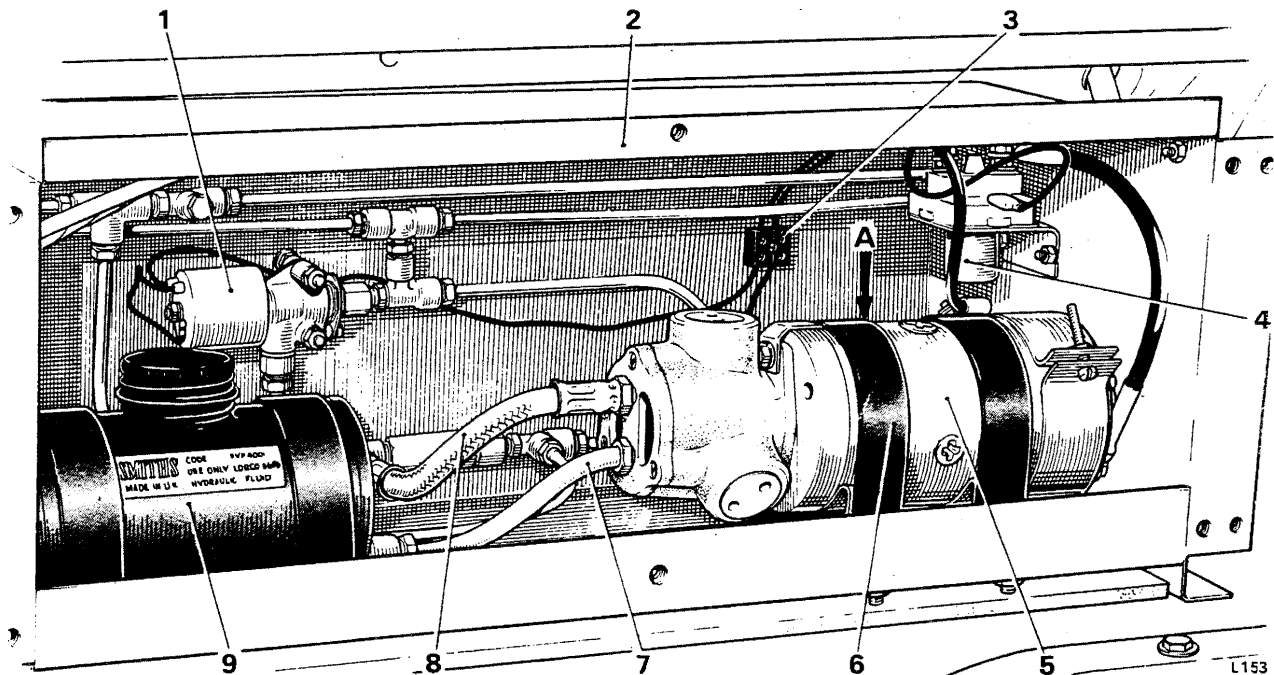


FIG. M99 ELECTRICALLY OPERATED HOOD COMPONENTS IN POSITION

- | | | |
|--|---|----------------------|
| A Solenoid situated behind motor/pump unit | 3 Connector block | 6 Securing strap |
| 1 Solenoid | 4 Electrically operated switch (4.S.T.) | 7 Low pressure pipe |
| 2 Components box assembly | 5 Motor/pump unit | 8 High pressure pipe |
| | | 9 Reservoir |

5. Remove the window lift master switch embellisher in the same manner as described in Operation 3.
6. Remove the remote control handle.
7. Remove the emergency window winder embellisher by unscrewing the two securing screws.
8. Lift off the door arm rest.
9. Remove the two screws securing the arm rest mounting plate.
10. Remove the three screws securing the door garnish rail.
11. Lifting vertically, remove the door garnish rail.
12. Remove the door trim pad by placing the hands at the centre of the upper and lower edges of the door trim pad. Exert pressure at these points causing the trim pad to 'bell-out'.

This operation releases the door trim pad from the two stainless steel retainers at the leading and trailing edges of the door; remove the dust cover.

13. Remove the setscrews securing the drop window to the pick-up plate.
14. Remove the screws securing the chainguard to the inner door panel.
15. Disconnect the electrical connections from the terminal box situated on the face of the motor assembly, noting the positions to facilitate fitting.
16. Remove the two setscrews securing the electric window lift motor to the base of the door.
17. Remove the window lift motor.

Heater blowers switch—To remove

Cars prior to Car Serial Number 6000

Proceed as described in Section M9 - Interior switches.

Heater blowers switch—To remove

Cars from Car Serial Number 6000

1. Disconnect the battery.
2. Remove the centre console wooden finisher by removing the four screws.
3. Roll back the floor covering from the centre console.
4. Remove the eight screws securing the console to the floor.
5. Place the console on its side and disconnect the electrical connections; lift out the console.
6. Place the console on a clean working surface; remove the screws securing the switch to the console.
7. Turn the switch through 90° and withdraw from the rear of the console.

Hazard warning switch—To remove

Cars prior to Car Serial Number 6000

Proceed as described in Section M9 - Interior switches.

Hazard warning switch—To remove

Cars from Car Serial Number 6000

1. Disconnect the battery.
2. Remove the hazard warning switch knob, by unscrewing in an anti-clockwise direction.
3. Remove the bulb.
4. Remove the ashtray by lifting vertically.
5. Remove the switch circular securing nut and withdraw the switch downwards and out through the ashtray aperture.

Radio receiver—To remove

Cars prior to Car Serial Number 6000

Proceed as described in Section M15 - Radio Receivers and Loudspeakers.

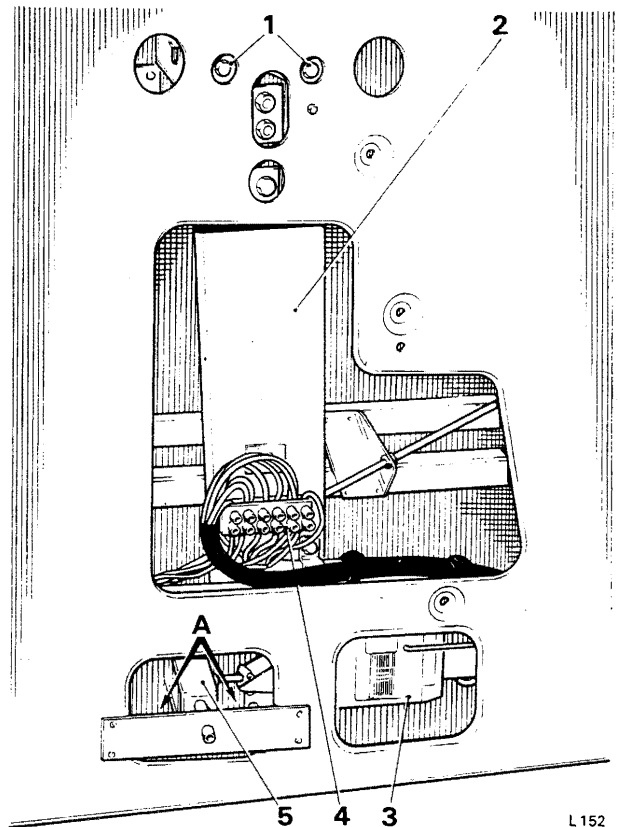


FIG. M100 ELECTRICALLY OPERATED WINDOW LIFT MOTOR IN POSITION

- A Lower mounts (hidden)
- 1 Upper mounts
- 2 Chain guard
- 3 Motor
- 4 Connector block
- 5 Emergency winder mechanism

Chapter M

Radio receiver—To remove

Cars from Car Serial Number 6000

1. Disconnect the battery.
2. Remove the two screws situated at the rear edge of the radio receiver console centre panel.
3. Pull the receiver knobs off their spindles.
4. Carefully lift off the wooden fascia.
5. Remove the screws situated at the top edge of the receiver console centre panel; lift off the centre panel.
6. Remove the three screws at the base of the receiver tray, and support the receiver with one hand.
7. Remove the two screws at the top of the receiver adjacent to the fresh air outlet grille.
8. Lower the receiver and remove all electrical connections, noting the colours to facilitate assembly.
9. Remove the aerial lead.
10. Remove the receiver and tray.

Quarter-light window lift motor —To remove

Convertible

1. Ensure that the quarter light is in the 'up' position.
2. Disconnect the battery.
3. Remove the rear seat cushion.
4. Unscrew and remove the two screws at the base of the back rest squab, lift the squab vertically and remove.
5. Remove the wood finisher from the arm rest by removing the four securing screws (remove the ash-tray and remove three screws on later cars).
6. Remove the rear quarter light wood finisher.
7. Remove the side trim pad securing screws and remove the trim pad.

8. Remove the 'Allen' screw securing the drive to the emergency winder mechanism.
9. Remove the four setscrews securing the whole assembly to the body frame.
10. Disconnect the electrical connections, noting the colours to facilitate assembly.
11. Remove the assembly from the body, taking care not to mark the glass.
12. Remove the motor from the assembly.

Rear opening quarter-light motor—To remove

All two-door saloons

1. Disconnect the battery.
2. Remove the rear seat cushion.
3. Remove the two screws at the base of the back rest squab, lift the squab vertically and remove from the car.
4. Unscrew and remove the two screws securing the wood finisher to the arm rest. On later cars, remove the ashtray and the three securing screws.
5. Remove the three self-tapping screws securing the trim pad to the body frame.
6. Remove the rear quarter light finisher and trim pad.
7. Disconnect the mechanical window lift drive bolts securing the mechanical drive to the motor drive.
8. Remove the setscrew from the quarter light swivel linkage; open fully the quarter light.
9. Remove the setscrews securing the brass block on the driveshaft, separate the two halves of the block and lift out the drive-shaft.
10. Disconnect the leads to the motor; remove the four screws securing the mechanism to the panel.
11. Remove the motor.

Electrical Fault Finding Analysis for Power Operated Hood

Symptom	Possible Cause	Remedy
1. The system will not function when the switch is operated	1. (i) Battery voltage has fallen below 9 Volts (ii) The electrically operated switch for the pump motor is faulty (iii) Faulty operating switch (iv) Faulty fuse (v) Faulty motor/pump unit (vi) Break in circuitry (vii) Incorrectly tightened or dirty electrical connections	1. (i) Check battery condition, and replace if necessary (ii) Test the switch as described in Section M4 - Starter Motor (iii) Substitute with one known to be in good condition (iv) Check the fuse on the Distribution board (No. 6) (v) a. Inspect the brushgear, and replace if necessary b. Replace if necessary the motor/pump unit (vi) Check all circuitry for continuity (vii) Check all terminals for tightness
2. Power unit working correctly, but the hood will not open or close	2. (i) Both solenoid valves faulty (ii) Incorrectly tightened or dirty electrical connections (iii) Lack of hydraulic fluid	2. (i) Renew solenoid valves (ii) Check electrical connections (iii) Check level of hydraulic fluid in reservoir
3. The hood will not open although the pump is working	3. (i) The UP solenoid is faulty (ii) Incorrectly tightened or dirty electrical connections (iii) Lack of hydraulic fluid	3. (i) Renew the solenoid valve (ii) Check the electrical connections (iii) Check the level of hydraulic fluid in reservoir
4. The hood will not close although the pump is working	4. (i) The DOWN solenoid is faulty (ii) Incorrectly tightened or dirty electrical connections (iii) Lack of hydraulic fluid	4. (i) Renew the solenoid (ii) Check the electrical connections (iii) Check level of hydraulic fluid in reservoir

Section M18

HEATER BLOWER MOTORS

The heater blower motor is a sealed unit for which no maintenance is required other than to ensure that the electrical connections are clean and correctly tightened and that the motor flexible mounts are in good condition.

In the unlikely event of a blower motor failure, the motor should be renewed.

Heater blower motor—To remove

All cars prior to Car Serial Number 6000

1. Disconnect the battery.
2. Disconnect the motor electrical connections.
3. Unscrew and remove the three 2 B.A. nuts securing the blower motor to its housing.
4. Carefully withdraw the motor and impeller from its housing.

Heater blower motor—To remove

Left-hand drive cars from Car Serial Number 6000

1. Disconnect the battery.
2. Disconnect the motor electrical connections.
3. Remove the wiper motor (only when removing the right-hand blower motor).
4. Unscrew and remove the three 2 B.A. nuts securing the blower motor to its housing.
5. Carefully withdraw the motor unit and impeller from its housing.

Heater blower motor—To fit

All cars

Reverse the procedure given for removal, noting the following points.

1. Ensure that the cables are correctly connected to the motor. The yellow/green cable is connected to the terminal marked positive (+ve) and the black

cable is connected to the terminal situated on the opposite side of the blower motor.

Note It is imperative that the yellow/green cable is connected to the correct terminal otherwise blower motor rotation will be reversed.

2. Ensure that the seal is in good condition; renew if necessary.
3. Ensure that the motor flexible mounts are in good condition; renew if necessary.

**Blower motor impellor (fan)—
To remove**

Early cars

1. With the blower motor removed, unscrew and remove the hexagon headed cone nut securing the impeller to the motor shaft.
2. Remove the impeller from the shaft.

Blower motor impellor (fan)—To fit

Early cars

Reverse the procedure given for removal, noting the following point.

1. When the cone nut is fully tightened, the distance measured from the end face of the nut to the end of the motor drive shaft must read 15,875 mm. (0.625 in.).

**Blower motor impellor (fan)—
To remove**

Later cars

1. With the blower motor removed, remove the small 'Allen' screw located on the side of the impeller boss.
2. Remove the impeller from the shaft.

Chapter M

Blower motor impellor (fan)—To fit

Later cars

Reverse the procedure given for removal, noting the following point.

1. When the impeller is secured to the motor drive shaft, the distance measured from the end face of the impeller boss to the end of the motor drive shaft must read 15,875 mm. (0.625 in.).

Chapter N

POWER ASSISTED STEERING SYSTEM

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N2 The Steering Column (Later Cars)	N9
N3 Steering Pump (Hobourn Eaton) and Hoses	N13
N4 Steering Pump (Saginaw) Fluid Cooler and Hoses	N19
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Chapter N

POWER ASSISTED STEERING SYSTEM

Section N1

THE STEERING COLUMN (early cars) (cars prior to number SRX 6001)

Overhaul

Lower steering column—To remove

The lower steering column is removed from underneath the car.

1. Place the car on a ramp then unscrew and remove the two bolts and nuts from the in-line joint located below the toe-board.
2. Remove the pinch bolt from the splined clamp connecting the column to the steering box input shaft and ease the clamp off the shaft splines.
3. Remove the lower column from the car, taking care not to extend the lower joint otherwise its internal components will come apart.

Lower steering column universal joint— To dismantle

Remove the lower steering column from the car as described previously under 'Lower steering column—To remove'.

1. Mark the splined clamp and universal joint body with correlation marks to ensure that on assembly, the same relative positions are maintained.
2. Slacken and remove the clips from either end of the convoluted boot.

3. Ease both ends of the convoluted boot from their location on the joint body and the knuckle end piece.

4. Holding the boot away from the joint and using a small screwdriver remove the circlip from the universal joint and ease the ball and trunnion assembly out of the housing. Alternatively deflect the joint, as far as possible parallel to the cross-pin then carefully pull apart over the circlip which need not be removed.

Note To prevent the bearing and retainers from disintegrating, the housing must be held so that the trunnion pin assembly is horizontal as it is removed.

5. Remove the convoluted boot, carefully easing it over the trunnion buttons.

6. Remove the trunnion buttons, Belleville washers, bearings, retainers and thrust washers from the trunnion pin. The individual bearing and button assemblies should be retained together as assemblies and it should be noted from which side of the trunnion pin each was removed.

Lower steering column universal joint— To inspect

1. Wash all components in paraffin and dry them prior to inspection. Inspect the bores of the housing

**Fig. N1 Cut-away view of steering box—all cars—and
steering column—early cars**

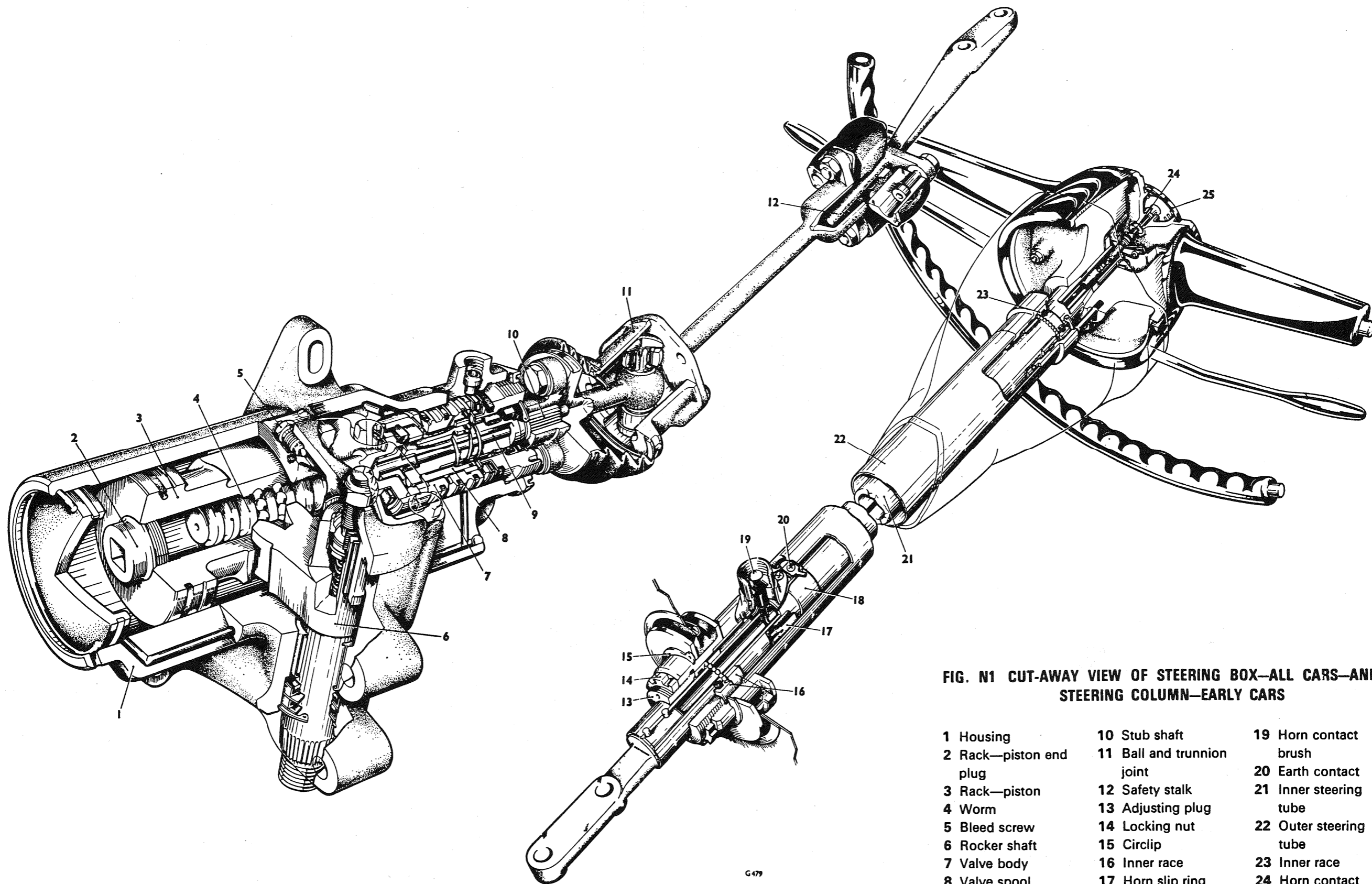


FIG. N1 CUT-AWAY VIEW OF STEERING BOX—ALL CARS—AND STEERING COLUMN—EARLY CARS

- | | | |
|------------------------|----------------------------|------------------------|
| 1 Housing | 10 Stub shaft | 19 Horn contact brush |
| 2 Rack—piston end plug | 11 Ball and trunnion joint | 20 Earth contact |
| 3 Rack—piston | 12 Safety stalk | 21 Inner steering tube |
| 4 Worm | 13 Adjusting plug | 22 Outer steering tube |
| 5 Bleed screw | 14 Locking nut | 23 Inner race |
| 6 Rocker shaft | 15 Circlip | 24 Horn contact |
| 7 Valve body | 16 Inner race | 25 Horn button |
| 8 Valve spool | 17 Horn slip ring | |
| 9 Torsion bar | 18 Earth slip ring | |

Chapter N

Steering wheel—To remove

1. Remove the gear selector cowling, which is in two pieces, by unscrewing and removing the six Phillips setscrews located in the cowl lower half; the upper section of the cowl is secured by the four outer setscrews and the lower section by the remaining two setscrews.
2. Unscrew the three nuts located behind the steering wheel and remove the horn button assembly from the steering wheel centre.
3. Withdraw the horn contact plate and disconnect the electrical plug.
4. Unlock the tab washer then unscrew and remove the nut which secures the steering wheel to the column.
5. Before removing the wheel, the centre of the column and the steering wheel inner boss face should be suitably marked to ensure that the wheel is replaced in the same relative position on assembly.
6. Replace the nut to prevent possible damage to the threaded end of the column, then, using special tool (RH 7870), extract the wheel. Remove the tool and the wheel securing nut and lift away the wheel.

Horn button assembly—To dismantle

Remove the horn button assembly as described above under 'Steering wheel—To remove'.

1. Depress the button and remove the circlip which secures the button and plunger assembly to the housing.
2. Remove the button and plunger assembly and the return spring.

Horn button assembly—To assemble

1. To assemble the horn button assembly reverse the procedure given for its dismantling ensuring that the return spring and the securing circlip are located correctly. Lightly lubricate the horn button guide stems with Rocol 204G Ragosine or equivalent grease.

Gearchange selector switch—To remove

(see Fig. N2)

1. Disconnect the battery.
2. Remove the screws retaining the upper and lower halves of the cowling. These halves should always be retained as a set. Carefully remove the upper half of the cowling.

3. Remove the two screws retaining the lower half of the cowling to its clamping bracket; remove the lower half of the cowling.
4. Disconnect the indicator lamp.
5. Disconnect the micro-switch(es).
6. Remove the screws securing the switch insulating plate.
7. Remove the gearchange selector.

Gearchange selector switch—To dismantle

1. Remove the screws securing the micro-switch(es) to the rear face of the base assembly and remove the micro-switch(es).
2. Remove the operating arm from the spindle of the quadrant.
3. Remove the single 'Phillips' screw securing the pointer to the quadrant boss and remove the pointer.
Note Care must be taken not to scratch the pointer or the indicator scale.
4. Remove the two 'Phillips' screws and shake-proof washers securing the indicator support bracket to the two bosses on the base assembly, then remove the indicator support bracket assembly.
5. Remove the two hexagon-headed 3 B.A. screws securing the gate assembly to the underside of the base.
6. Remove the circlip, clevis pin and spring securing the gear selector lever to the quadrant, then remove the lever with the gate assembly attached.
7. Remove the two 'Phillips' screws securing the phosphor-bronze contact to the base plate. Retain the two insulating dowels and the two insulating strips.
8. Remove the circlip from the other end of the rocking arm.
9. Remove the rocking arm to quadrant tension springs; remove the rocking arm assembly.
10. Remove the $\frac{1}{4}$ in. U.N.F. nut and washer from the quadrant spindle and remove the quadrant assembly from the base assembly.

Gearchange selector switch—To assemble

1. Fit the quadrant assembly onto the base and nip the $\frac{1}{4}$ in. U.N.F. nut and washer onto the spindle. Check that the quadrant is free to rotate.

Chapter N

for signs of wear, pitting or damage. The diameter of the two outer button location bores should be 1.000 in. to 1.001 in. (2,54 cm. to 2,542 cm.).

2. The trunnion button and bearing retainers should be smooth and free from surface defects. The inside and outside diameters of the retainers should be 0.3937 in. and 0.5512 in. (0,998 cm. and 1,40 cm.) respectively.

3. The roller bearing and the trunnion pin surface should be smooth and free from defects. The diameter of the rollers is 0.999 in. to 0.9995 in. (2,5374 cm. to 2,5375 cm.) and the trunnion pin diameter at the bearing areas is 0.39345 in. to 0.3937 in. (0,9983 cm. to 0,9984 cm.).

4. The Belleville washer should be free from cracks or distortions. It should have a minimum free height of 0.016 in. (0,041 cm.).

5. The trunnion pin should be inspected for position with a depth micrometer or by placing the knuckle end between centres and checking the pin ends with a dial test indicator. The pin should be within 0.006 in. (0,0152 cm.) of the centre line of the knuckle end piece.

6. If the trunnion pin position is inspected by using a dial test indicator with the knuckle piece between centres, it will be necessary to remove the splined clamp from the end of the knuckle. The two setscrews which secure the clamp lie in slotted holes in the splined coupling flange which provides a small degree of fine adjustment when steering wheel centralisation is being carried out. It is therefore advisable to mark the coupling with correlation marks before disconnecting it to facilitate fitting it in the same relative position on assembly.

7. In the unlikely event of the trunnion pin requiring replacement, it must be pressed out and a new one pressed in squarely to conform with the above information, on central position.

Note Heat should not be applied to remove or fit a trunnion pin.

The interference between the trunnion pin and knuckle is 0.003 in. (0,076 mm.).

Steering column universal joint— To assemble

To assemble the steering column universal joint reverse the procedure given for its dismantling, noting the following points.

1. The alignment marks previously made on the body and joint housing should be lined up before entering the pin and bearing assembly.

2. On assembly, the trunnion bearings, housing bores and buttons should be lubricated with a liberal application of Retinax 'A' grease, and care should be taken to ensure that the clip and sealing boot are fitted and located correctly. New clips must be used to attach the boot and must hold it tightly.

3. If the splined coupling has been disconnected from the knuckle piece it must be replaced in its correct position according to the correlation marks made before dismantling.

Lower steering column bonded coupling— To renew

Remove the lower steering column from the car as previously described under 'Lower steering column—To remove'.

1. Mark the steering column on both sides of the bonded coupling to ensure that the wheel position remains unchanged on assembly.

2. Remove the four socket-headed setscrews and nuts from the bonded coupling, withdraw the safety stalk and remove the coupling.

3. Fit a new bonded coupling reversing the procedure given for its removal, noting that the marks made on each half of the column should be lined up and the nuts on the socket-headed screws should be torque tightened to between 16 lb. ft. and 18 lb. ft. (2,21 kg.m. to 2,48 kg.m.).

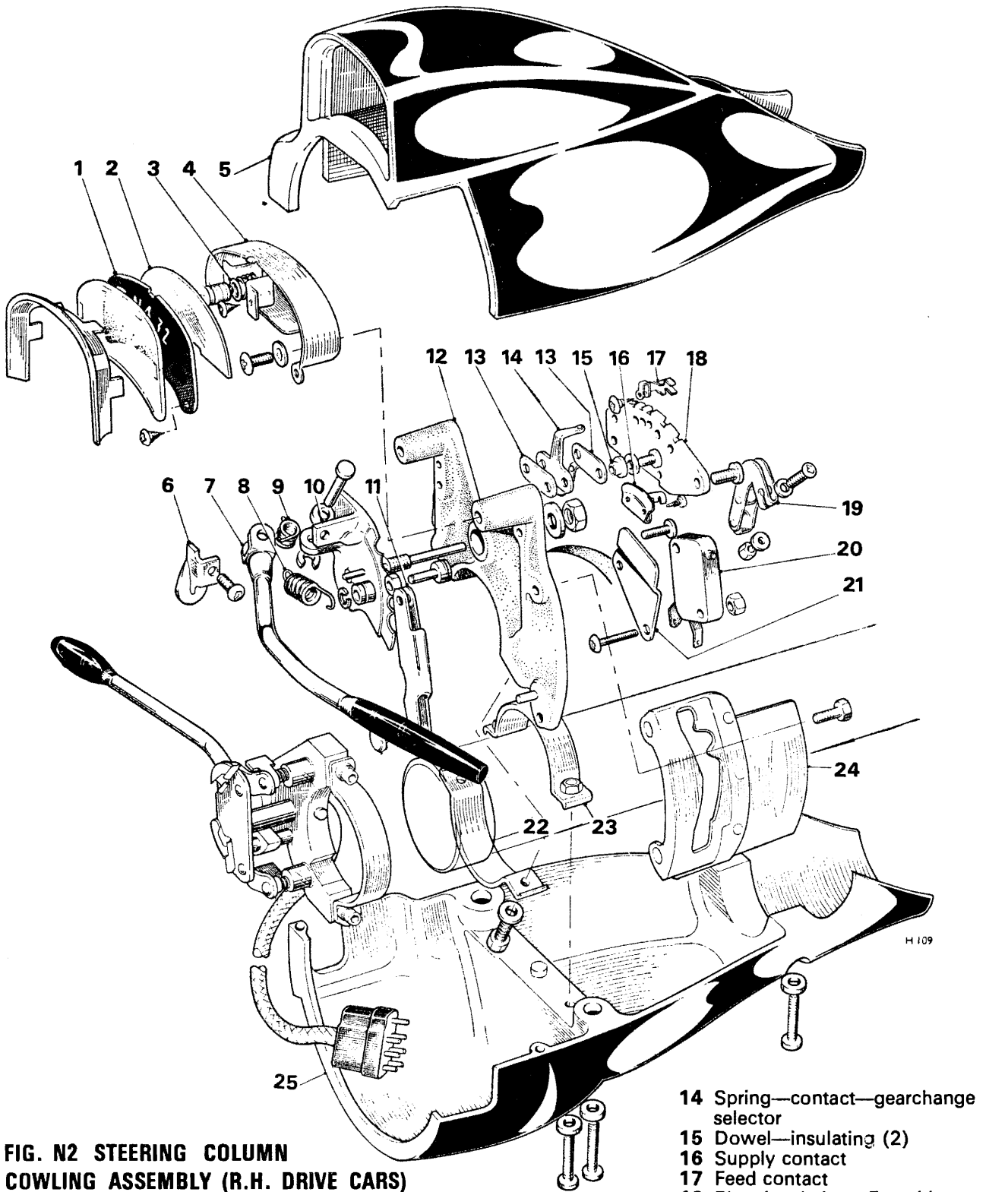
Lower steering column—To fit

To fit the lower steering column reverse the procedure given for its removal, noting the following points.

1. It will be noted that the splined clamp has a flat machined in the splined bore which corresponds with a flat machined on the steering box input shaft. This ensures that the steering wheel position remains unchanged, provided that the clamp has not been disconnected from the universal joint. If the clamp has been disconnected from the universal joint, the wheel must be set relative to the steering box (see Steering wheel—To set).

2. The two bolts and nuts securing the joint at the toe-board should be torque tightened to between 16 lb. ft. and 18 lb. ft. (2,21 kg.m. and 2,48 kg.m.) and the splined clamp pinch bolt torque tightened to between 16 lb. ft. and 18 lb. ft. (2,21 kg.m. and 2,48 kg.m.).

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**FIG. N2 STEERING COLUMN COWLING ASSEMBLY (R.H. DRIVE CARS)
(REMOTE GEARCHANGE AND DIRECTION INDICATOR MECHANISMS)**

- 1 Indicator scale
- 2 Filter—indicator lamp
- 3 Bulb holder
- 4 Bracket—indicator support
- 5 Cowl halves—upper and lower
- 6 Pointer—gearchange selector
- 7 Lever—assembly—gear selector

- 8 Spring—tension—rocking arm
- 9 Spring—lever—gear selector
- 10 Quadrant assembly—5 position
- 11 Rocking arm
- 12 Base assembly—gear selector
- 13 Insulating strips (2)

- 14 Spring—contact—gearchange selector
- 15 Dowel—insulating (2)
- 16 Supply contact
- 17 Feed contact
- 18 Plate insulating—5 position
- 19 Operating arm—reversing lamp
- 20 Micro-switch
- 21 Bracket micro-switch mounting
- 22 Clamp—gearchange selector base
- 23 Clamp—cowl to steering column
- 24 Bracket—support assembly—5 position

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2. Remove the quadrant and lubricate the spindle with Ragosine 204G or equivalent grease. Refit the quadrant and finally tighten the $\frac{1}{4}$ in. U.N.F. nut.

3. Do not overtighten the nut, since the bearing boss tends to spread slightly and a tight bearing may be formed.

4. Fit the rocking arm assembly, then check to ensure that the roller lines up correctly with the quadrant detent form.

5. Remove the rocking arm and hook the tension spring onto the anchor pin roller on the underside of the quadrant and onto the spring anchor on the underside of the rocking arm.

This operation is made easier by rotating the quadrant anti-clockwise beyond its normal travel, so that the spring is not under tension. Rotate the quadrant clockwise whilst holding the rocking arm clear, then allow the roller to locate on the detent forms. Fit the spring on the top side of the quadrant and rocking arm.

Note Do not fit the retaining clip to the rocking arm at this stage. (They are difficult to remove, should the need arise).

6. Move the quadrant to a mid-way position and fit the phosphor-bronze contact. This contact is assembled between two insulating strips which are located by two insulating dowels. This sandwich assembly is then secured to the quadrant by two screws and washers.

Important Extreme caution must be taken with the moving contact, so that it is not bent or damaged in any way.

7. Before fitting the selector lever assembly carry out the following checks.

Check that the clevis pin will slide through both the fork end on the lever and the holes in the mounting bosses on the quadrant, then check that the fork end will slide between these bosses.

8. Lightly smear Ragosine 204G or equivalent grease on the outside of the fork end, the inside of the bosses, the clevis pin and the clevis pin holes, then locate the fork end in the bosses by the clevis pin and fit the spring inside the fork end and over the clevis pin. Push home the pin and fit the circlip. Check that the lever will return easily under the load of the spring.

9. Secure the gate assembly to the underside of the base by means of the two hexagon-headed 3 B.A. screws.

Check that, when the position of the lever is controlled by the detents, it lines up with the profile of the gate liner and that the extreme positions of the lever are not limited by the gate.

10. Fit the insulating plate complete with the feed and supply contacts fitted to it.

When the unit is screwed down by the three screws, check that the inside leg of the moving contact is pressing onto the supply contact and that at the extremities of its travel the hemispherical head is still making good contact with the supply contact.

11. Each selection should then be made in turn, checking that the outside leg on the moving contact lines up correctly with each of the feed contacts.

12. Mount this assembly on the two bosses on the base by means of the two screws and shake-proof washers.

13. Fit the blue filter with its flattened end in front of the bulb and behind the bracket mounting screw heads. Bend the radiused top end over the bulb and check that it follows the contours of the support bracket.

14. Hold the filter in this position by means of a 0.025 in. (0.64 mm.) feeler gauge held from the front of the unit, fit the indicator scale over the support bracket and secure it with two self-tapping screws. The scale should drop onto the bracket and its lip must not be forced down.

15. Feed the pointer under the indicator scale, then with '3 range' selected use a thin-blade 'Phillips' head screwdriver, to feed the single 5 B.A. screw through the pointer leg and screw it into the quadrant boss. Care should be taken not to scratch either the pointer or the indicator scale.

16. Each selection should then be made and the alignment of the pointer checked.

17. Fit the micro-switch(es) onto the two bosses on the rear face of the base assembly. Fit the operating arm onto the spindle of the quadrant. **On a car not fitted with refrigeration** set the operating arm so that the single micro-switch is depressed when the selection is 'R'. **On a car fitted with refrigeration** the two micro-switches require setting so that the fast-idle micro-switch is depressed just as the selector is engaging 'N'. Check that the 'R' micro-switch is operated satisfactorily.

Note On left-hand drive cars with refrigeration the fast-idle cam is engaged in both N and P positions.

18. Fit the retaining clip to the rocking arm pivot.

19. Lightly smear Ragosine 204G or equivalent grease on the quadrant detents, then operate the switch several times to ensure that the Ragosine is spread evenly.

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Gearchange selector switch—To fit

1. Fit the gearchange selector switch onto the steering column taking care to locate the switch dowel in the hole provided.

Note To facilitate assembly it is advisable to place the bottom cowl clamp on the steering column before tightening the selector switch assembly.

2. Connect the insulating pad and contact assembly, the micro-switch(es) and the indicator lamp wiring.

3. Fit the lower half of the cowling onto its clamping bracket then fit the upper half of the cowling.

Note Care must be taken before tightening the cowling retaining screws to ensure that the wiring looms are not trapped between the cowl and cover.

Direction indicator switch—To remove

1. Disconnect the battery.

2. Remove the gearchange selector switch as described previously.

3. Disconnect the wiring loom.

4. Remove the two Allen screws securing the switch clamp to the column; remove the switch.

Direction indicator switch—To fit

1. To fit the direction indicator switch reverse the procedure given for its removal.

Note The indicator switch has a dowel in its base which locates in the steering column tube.

Upper steering column—To remove

1. Remove the steering wheel as previously described under 'Upper steering column—To remove'.

2. Disconnect the battery which is located in the boot.

3. Unscrew and remove the two bolts from the in-line joint situated just below the toe-board in the engine compartment.

4. Remove the circlip from the lower end of the upper column and remove the seal plate.

5. Unplug the steering column wiring looms from the main fuse box.

6. Disconnect the horn contact wires which are located part way up the outer column.

7. Support the steering column and unscrew and remove the two Allen screws securing the steering column support clamp cap; remove the cap and withdraw the column into the car and out through the door aperture.

Note Care should be taken when manoeuvring the steering column inside the saloon to avoid damage to the woodwork and trim, etc.

Upper steering column—To dismantle

1. Remove the steering wheel gearchange selector and direction indicator switch as previously described.

2. Remove the two screws securing the horn contact brush assembly to the column then remove the assembly.

3. Remove the screw securing the earth contact strip to the column then remove the strip.

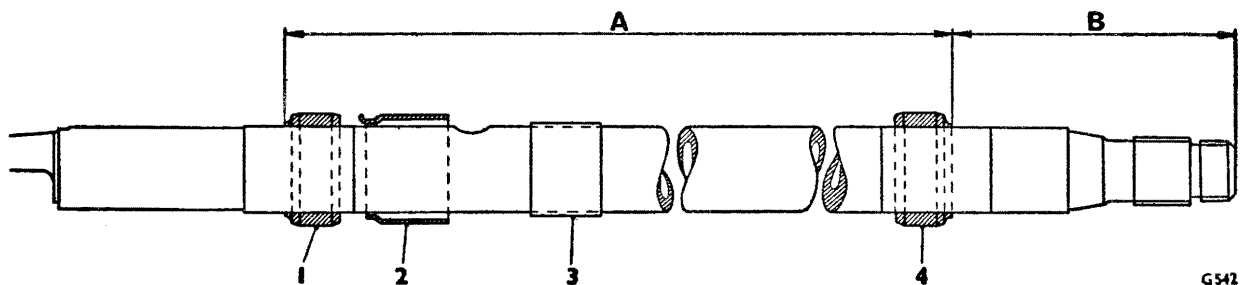


FIG. N3 ASSEMBLY OF INNER STEERING TUBE

1 Inner race

2 Slip ring

3 Earth slip ring

4 Inner race

A 28.525 in. ± 0.005 in. (72.45 cm. ± 0.12 mm.)

B 3.000 in. ± 0.010 in. (7.62 cm. ± 0.25 mm.)

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4. Using spanners (RH 7871 and RH 7872), remove the lock-nut and plug from the lower end of the column, then remove the circlip which retains the bearing at the upper end of the column.

5. Holding the column, lower end downwards, gently tap it around the base to jar the lower bearing race from its location within the tube.

6. Care must be taken when this operation is carried out to ensure that as the bearing drops out of the tube the ball bearings do not scatter.

7. When this has been accomplished repeat the operation on the upper bearing, again taking precautions against losing the ball bearings.

Upper steering column thrust races— To renew

Remove the inner column from the outer tube as follows.

1. Discard the felt seals fitted in the thrust races and the seal fitted in the top of the steering column.

2. After the column has been removed and dismantled, remove the bearing races from the inner column after marking their positions with a pencil line.

3. Press the new races into position on the inner column. The races must be positioned to conform with the dimensions given in *Figure N3*; the pencil marks provide a useful guide.

Upper steering column—To assemble

1. Fit a new felt seal into the top of the outer steering tube and into each thrust race.

2. Lubricate the earth contact slip ring with Gulf Elvolube grease or its equivalent.

3. Insert the inner column into the outer tube.

4. Grease the inner races with Rocol T 265 or equivalent grease and place 27 ball bearings in the grease on the bearing track of the upper race; fit the outer race and circlip, then fit the lower balls and race in a similar manner. Using spanner (RH 7871), screw in the end plug until the end float in the column is just taken up, then using spanner (RH 7872), tighten the lock-nut. **Do not** overtighten the end plug or damage to the races will result. Do not lose balls between inner and outer columns.

5. Fit and secure the earth contact strip also the horn button contact brush assembly to the column.

6. Secure the gearchange selector and direction indicator mechanism clamp to the outer column by means of the two setscrews.

7. Fit the steering wheel as outlined under 'Steering wheel—To fit and set'.

Upper steering column—To fit

1. To fit the upper steering column reverse the procedure given for its removal under 'Upper steering column—To remove'.

Steering wheel—To fit and set

1. To fit the steering wheel reverse the procedure given for its removal. Ensure that the correlation marks (see Page N3—'Steering wheel—To remove' Operation 5) on the steering wheel inner boss face and the centre of the column are aligned.

Section N2

STEERING COLUMN (later L.H.D. cars) (car number SRX 6001 onwards)

Overhaul

Lower steering column—To remove (see Fig. N4)

The lower steering column linkage joints are removed from beneath the car as follows.

1. Place the car on a ramp, apply the handbrake and/or chock the road wheels.
2. Disconnect the battery leads.
3. From beneath the car, remove the two nuts, bolts and single washer retaining the halves of the in-line joint situated between the upper and lower steering columns.
4. To facilitate assembly, note that the washer removed, fits beneath the nut of the upper bolt. Lower and support the linkage then proceed to disconnect the opposite end.
5. Remove the pinch bolt of the slotted flange behind the ball and trunnion joint where it fits onto the splined input shaft of the steering box.
6. Suitably scribe or mark correlation markings on the steering box input shaft, clamping plate and ball and trunnion joint to facilitate assembly.
7. Remove the lower steering linkage from the car taking care not to extend the ball and trunnion joint too much.

Lower steering column ball and trunnion joint—To dismantle, To inspect, To assemble

Refer to page N1 of Section N1.

Lower steering column universal joint—To dismantle

If the universal joint is unserviceable through excessive wear and/or grease leakage, the joint must be dismantled and a replacement kit fitted, comprising a cruciform, seals and bearings.

Proceed as follows.

1. Using circlip pliers remove the circlips which retain the needle roller bearing races, then using a hide or wooden mallet, tap the yokes until each bearing in turn is driven out of the yoke eyes. Remove the cruciform.

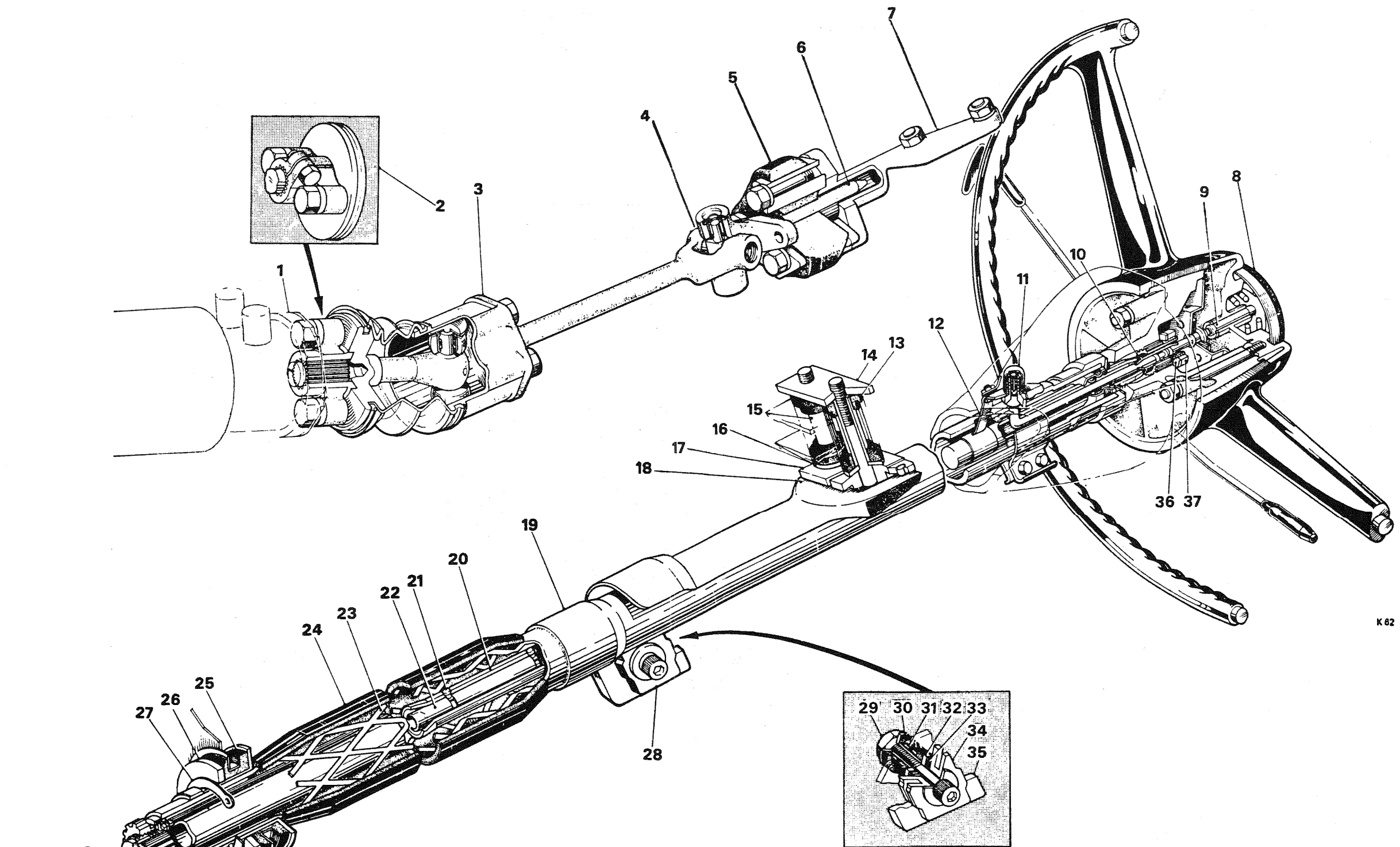
Lower steering column universal joint—To assemble

1. Smear the bearing surfaces of the new cruciform with grease and fit a new seal to the inner end of each surface diameter.
2. Support the cruciform centrally in the yokes, then carefully press each new bearing assembly into its respective yoke eye. Each bearing must be pressed into the yoke such that it clears the circlip groove.
3. Fit each circlip into its respective groove ensuring that each is fully seated.
Test the joint by moving it through its maximum angular movement.

Lower steering column rubber/bonded coupling—To renew

Refer to page N2 of Section N1 except for the following notes

Fig. N4 Cut-away view — energy absorbing steering column and lower linkage



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FIG. N4 CUT-AWAY VIEW—ENERGY ABSORBING STEERING COLUMN AND LOWER LINKAGE

- | | | | |
|---|-----------------------------------|-----------------------------------|---------------------------------------|
| 1 Steering box | 12 Earth contact | 21 Injected plastic rivets | 30 Plain washer |
| 2 Pinch bolt—splined flange | 13 Rubber bushes (4)—upper mount | 22 Upper column upper inner tube | 31 Rubber bushes (2) |
| 3 Ball and trunnion (Detroit) joint | 14 Tapped plate—upper mount | 23 Meshed section of outer column | 32 Plain washer |
| 4 Universal joint | 15 Distance tubes (2)—upper mount | 24 Plastic outer covering | 33 Shim washers (as required) |
| 5 Rubber bonded coupling | 16 Washer—(2)—upper mount | 25 Toe-board grommet | 34 Capsule |
| 6 Safety stalk—bonded coupling | 17 Capsule—upper mount | 26 Washer—grommet | 35 Mounting bracket |
| 7 In-line joint—upper column to lower linkage | 18 Upper column mounting bracket | 27 Circlip | 36 Washer |
| 8 Horn button | 19 Upper column | 28 Column lower mounting point | 37 Column steering wheel securing nut |
| 9 Horn contact | 20 Upper column lower inner tube | 29 Nut | |

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The coupling of cars fitted with the energy absorbing steering column and universal (Hardy Spicer) coupling, is fitted with four setscrews and washers. These are tightened to standard torque figures quoted in Chapter P of this Manual.

Note that the coupling is fitted with the 'fail safe' stalk toward the upper link.

Lower steering column assembly—To fit

Reverse the procedure given for its removal, ensuring that the correlation marks align. Small adjustment can be made later at the front joint flange with slotted holes to correct steering wheel spokes alignment.

Upper steering column—To remove

Note Use only the special steering wheel removal tool (RH 7870). Use of any other tool or method might damage and possibly shear the plastic rivets of a serviceable steering column rendering it unserviceable.

Some early service tools (RH 7870) had a single diameter pressure pad attached to the lower end of the centre screw.

It is essential that a **later tool** having the same number be used. This tool has an extension on the pressure pad measuring 0.500 in. diameter by 0.500 in. length (12,7 mm. by 12,7 mm.).

1. Disconnect the battery leads.
2. Lower the distribution board (fuse panel) to gain access to the screws securing the trim fairing and knee pads adjacent to the column; remove the trim fairing and knee pads. The trim and pads also incorporate spring clips.
3. Remove the steering column cowling by first removing the four outer 'Phillips' headed screws.
4. Remove the three screws securing the gearchange wiring contact plate to the selector; detach the wiring and contact plate from the selector.
5. Remove the top roll trim pad as follows.
 - (i) Remove the polished veneer facia panels secured by chromium plated screws. The upper screws of the panels also secure the upper edge of the roll.
 - (ii) Lower the cubby box lid and from behind the forward edge, remove two screws.
 - (iii) Remove the two remaining screws situated behind the lower edge of the roll at each end.
 - (iv) Remove the roll.

6. Detach the plug from the socket of the direction indicator switch loom.

7. Remove the two remaining screws securing the cowling lower half to the column; collect the washers and brackets.

8. Remove the three nuts located behind the steering wheel and remove the horn button assembly from the steering wheel centre.

(i) Withdraw the horn contact plate and detach the horn cable.

9. Unscrew and remove the nut and washer securing the wheel to the column.

10. Prior to fitting the steering wheel extraction tool, scribe suitable markings on the wheel hub and column to facilitate correct alignment on assembly if the original column is to be refitted.

11. Fit the extraction tool (RH 7870) to the wheel, the pressure plate bearing centrally on the column inner tube. It will be necessary to push the horn cable into the tube.

(i) Remove the steering wheel then remove the service tool.

12. Detach the horn earth contact from the upper column outer tube.

(i) Remove the screw securing the earth contact strip to the column and remove the strip.

13. Remove the large circlip and washer from the base of the upper column.

14. Using an Allen key, remove the screw from the lower column support; collect the nut, washers and any fitted slotted shims.

(i) Using the same Allen key, remove the two screws from the upper bracket; collect the tapped plate and plain washers. Access to the plate is from behind the instrument panel.

15. Support the detached column and remove by pulling it out of the rubber grommet in the toe-board.

No servicing is possible on the upper column and if damaged it must be discarded and a new column fitted.

Upper steering column—To fit

1. Examine the toe-board rubber grommet and renew if necessary.

2. Examine and renew if necessary, the four rubber bushes of the upper support bracket and ensure that the two distance tubes are fitted.

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3. Examine and renew if necessary, the two rubber bushes of the lower support bracket and ensure that the distance tube is fitted.

4. Examine the large circlip and groove into which it seats at the base of the column. The circlip and groove must be clean and free of paint, the circlip should be checked in the groove to see that it will seat correctly.

5. Fit the column through the rubber grommet in the toe-board. Take extra care not to knock either end of the inner column, thus causing possible damage to the injected plastic rivets, rendering the column unserviceable.

6. Take the weight of the column by fitting the two screws of the upper mounting bracket with a washer fitted to each side of the capsule. Pass the screws through the respective capsules and distance tubes and locate and finger tighten the tapped plate.

7. Fit the large diameter thick washer to the column on the underside of the toe-board and fit the large circlip. It is important that the circlip is fully seated in its groove on the column.

8. Fit a washer to either side of the lower capsule and slide the screw, from the column side, through the assembly, i.e. distance piece, rubbers, capsule and washers, and secure with a plain washer and nut.

9. Temporarily fit the knee pads to either side of the column. Also, temporarily fit the lower half of the cowl on to the column and centralise the bottom edge of this with the knee pads. When this position has been achieved, remove the lower cowl and trim and tighten the upper mounting bracket screws.

10. Making sure that there is no pre-load on the bolt of the lower mounting bracket, measure the gap between the centre washer and the capsule using feeler gauges, and add to the measured gap 0.28 in. (0.71 mm.) for rubber compression.

Refer to the following chart for washer selection.

Note These washers are slotted to enable them to be inserted without the necessity of having to remove the cap screw.

It is permissible, if there is a shortage of slotted adjustment washers, or, if a large quantity of washers have to be fitted, that a plain washer similar to the ones fitted beneath the nut and head of the cap screw be substituted for every two adjusting washers required. The substitute washer(s) must be situated at the capsule side of the adjusting washers (*see inset*

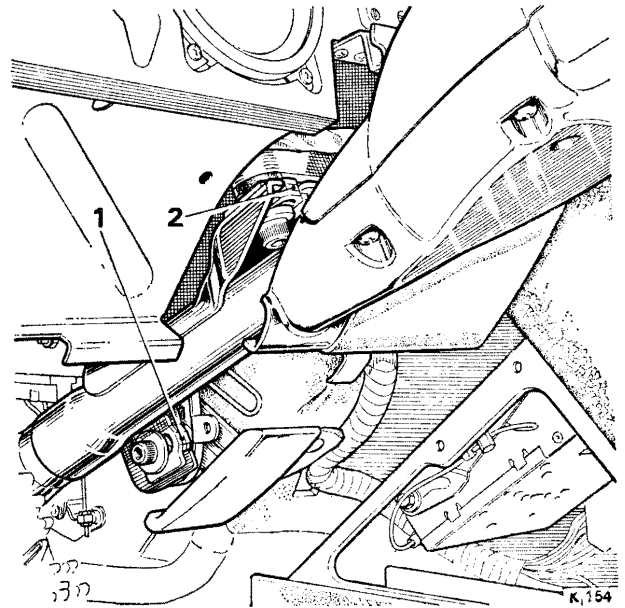


FIG. N5 MOUNTING POINTS—ENERGY ABSORBING STEERING COLUMN

1 Lower mounting point

2 Upper mounting point

Fig. N4) thus sandwiching the remaining washers between the plain washers. To insert a plain washer(s) it will be necessary to withdraw the cap screw.

Washer (shim) selection chart

Measured Clearance	Clearance + 0.028 in. (0.71 mm.) for rubber Compression	Number of Adjusting Washers
Zero–0.014 in. (Zero–0.35 mm.)	0.028 in.–0.042 in. (0.70 mm.–1.06 mm.)	1
0.015 in.–0.043 in. (0.38 mm.–1.09 mm.)	0.043 in.–0.071 in. (1.09 mm.–1.80 mm.)	2
0.044 in.–0.072 in. (1.11 mm.–1.83 mm.)	0.072 in.–0.100 in. (1.83 mm.–2.54 mm.)	3
0.073 in.–0.101 in. (1.85 mm.–2.57 mm.)	0.101 in.–0.129 in. (2.57 mm.–3.27 mm.)	4
0.102 in.–0.130 in. (2.59 mm.–3.30 mm.)	0.130 in.–0.158 in. (3.30 mm.–3.91 mm.)	5
0.131 in.–0.159 in. (3.33 mm.–3.94 mm.)	0.159 in.–0.187 in. (3.94 mm.–4.75 mm.)	6
0.160 in.–0.188 in. (4.06 mm.–4.78 mm.)	0.188 in.–0.216 in. (4.78 mm.–5.48 mm.)	7
0.189 in.–0.217 in. (4.80 mm.–5.51 mm.)	0.217 in.–0.245 in. (5.51 mm.–6.22 mm.)	8

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11. Fit the required adjusting washer(s) **between the capsule and the centre washer** of the lower column support bracket and using a torque spanner fitted with an attachment suitable for tightening cap screws, torque tighten to 21 lb. ft. (2,90 kg.m.), the cap screw together with the two cap screws of the upper bracket.

12. Fit the steering wheel using the combined extraction and insertion tool (RH 7870) remembering to align the markings inscribed on the column and wheel hub prior to removal. Fit the washer and torque tighten the nut to between 25 lb. ft. (3,48 kg.m.) and 28 lb. ft. (3,87 kg.m.).

Note It is important that the service tool (RH 7870) be used to draw fully, the wheel on to the splines. On no account should a mallet, or force be used by the fitter to partially engage the wheel on to the column splines. Do not exceed the torque figure quoted for the steering wheel securing nut.

13. With the road wheels in the straight-ahead position, check that the spokes of the steering wheel are centralised. If any misalignment is evident, minor adjustment can be made at the splined flange clamped to the steering box input shaft, as follows.

Slacken the two setscrews adjacent to the steering box and rotate the steering wheel sufficiently to centralise it; re-tighten the setscrews.

14. Fit the horn button and plate, steering column lower cowling, the electrical wiring, the upper cowling, wooden fascia panels, top roll, column fairing, knee pads and trim by reversing the procedure given for their removal.

Fit the horn earth connection and earthing strip to the upper steering column outer tube.

Section N3

STEERING PUMP (Hobourn Eaton) AND HOSES

Overhaul

Steering pump—To remove

1. If the pump is to be dismantled or the pulley removed from the pump, it is advisable to slacken the pulley retaining setscrew while the pump is in position and the belts are tight.

2. Slacken the belt adjuster and remove the belts.

3. Using a syringe draw off and discard the fluid from the pump.

Note When inserting a syringe take care not to damage the filter support plate.

4. Clean the area around the pump hose connections on the steering pump.

5. Disconnect the pump hoses and blank the end to prevent fluid spillage and the ingress of dirt.

6. To completely drain the pump of fluid, place a container under the discharge pipe and rotate the steering pump by hand in the normal direction of rotation.

7. Remove the two nuts securing the pump mounting bracket to the engine and remove the pump.

Steering pump—To test

If facilities exist, it is advisable to test the pump to ensure that it is delivering the correct pressure and flow.

Test data

Flow	2.2 gal. to 2.5 gal. (10,00 litres to 11,36 litres) per minute at 3,000 (pump) r.p.m. and 50 lb/sq. in. to 60 lb/sq. in. (3,515 kg/sq. cm. to 4,218 kg/sq. cm.).
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Pressure Min. 1,000 lb/sq. in. (70,30 kg/sq. cm.) at 600 (pump) r.p.m. at no fluid flow.

Max. 1,050 lb/sq. in. (73,82 kg/sq. cm.) at 3,000 (pump) r.p.m. at no fluid flow.

Note The pump must not be held at full pressure for more than 5 seconds during Rig Testing.

If the steering pump is not delivering the correct pressure and flow, check that the flow control valve is not sticking. If the flow control valve is found to be operating satisfactorily, it will be necessary to dismantle and inspect the pump.

Steering pump—To dismantle and inspect

For identification of detail components refer to *Figure N7*.

1. Thoroughly clean the exterior of the pump, taking care that no foreign matter enters the inlet or outlet ports.

2. Clamp the pump mounting bracket in a vice fitted with protective grips.

3. Remove the reservoir cover. Lift off the spring and filter retaining washer and withdraw the filter.

4. Fit a $\frac{5}{16}$ in. U.N.F. nut and setscrew to the centre pedestal, tighten the nut and remove the pedestal.

5. If this method is unsuccessful, a pair of grips may be used to remove the pedestal. Leave the bolt screwed in and grip on that part of the pedestal to which the bolt is fitted, otherwise it will collapse.

6. Remove any burrs caused by the grips otherwise the filter retaining washer will not retain the filter in position.

7. Remove the filter support plate.

8. Remove the setscrew and the $\frac{3}{4}$ in. U.N.F. blanking plug, then withdraw the clamp plate.

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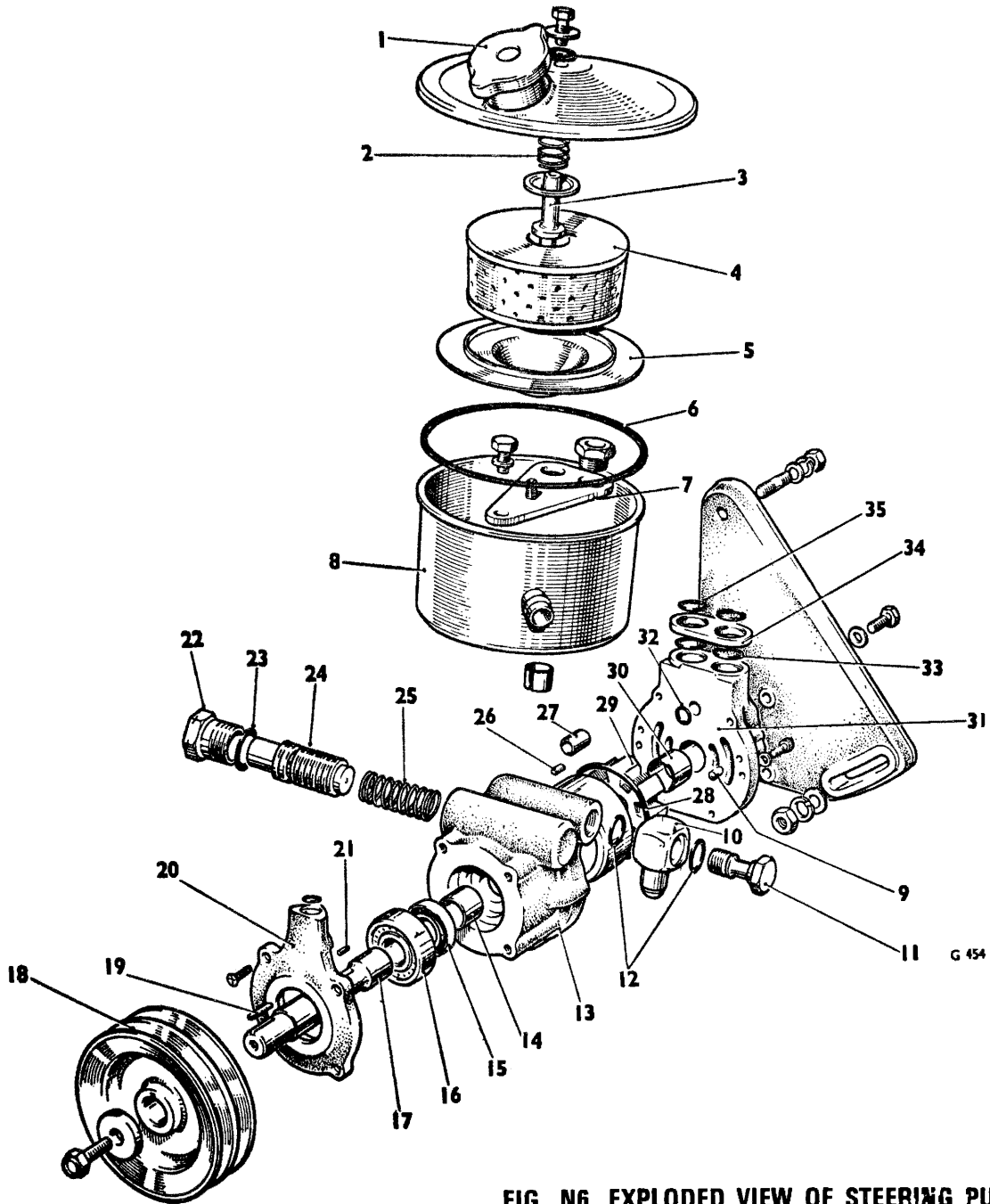


FIG. N6 EXPLODED VIEW OF STEERING PUMP

- | | | | |
|------------------------|------------------|--|-------------------|
| 1 Filler cap | 10 Banjo adaptor | 19 Key | 27 Roller |
| 2 Spring | 11 Adaptor bolt | 20 End plate | 28 Sealing ring |
| 3 Pedestal stud | 12 Sealing rings | 21 Driving pin | 29 Rotor |
| 4 Filter | 13 Pump body | 22 Plug | 30 Bush |
| 5 Filter support plate | 14 Bush | 23 Sealing ring | 31 Cover |
| 6 Sealing ring | 15 Oil seal | 24 Combined oil flow and pressure relief valve | 32 Sealing ring |
| 7 Clamping plate | 16 Bearing | 25 Valve spring | 33 Sealing ring |
| 8 Reservoir | 17 Shaft | 26 Key—cam ring | 34 Distance piece |
| 9 Dowel | 18 Pulley | | 35 Sealing ring |

9. Lift off the reservoir body taking care not to misplace the rubber sealing rings and distance plate located beneath the body.

10. Withdraw the split sleeve from the inlet port of the pump, but do not attempt to withdraw the venturi beneath it. If this is loose, the rotor and cam ring will probably be damaged and will cause noisy pump operation. The venturi is an interference fit between its largest diameter and its bore. If it is loose, swell the interference diameter by pressing a large ball-bearing into the end of the venturi. Examine the rotor, rollers and cam ring for pitting and wear and renew them if necessary. Also, if the pump makes a chattering noise, audible from outside the car, the rotor, rollers and cam ring should be renewed.

11. If necessary, remove the pump pulley; take care to retain the Woodruff key.

12. Using an Allen key unscrew the six socket-headed screws which secure the two halves of the pump body together.

13. Separate the pump from the cover and collect the sealing ring.

14. Before removing the rotor, rollers and cam ring take note of the direction in which the rotor is fitted.

Using a straight edge across the body of the pump, check, with a feeler gauge, the end clearance of the rotor and rollers. This should be within the range 0.001 in. to 0.0018 in. (0.025 mm. to 0.046 mm.).

15. Remove the rotor, rollers and cam ring from the pump body, taking care not to misplace the rotor driving key from the shaft.

16. Unscrew the four countersunk-headed screws and remove the bearing retaining plate.

17. Remove the shaft from the housing, then gently tap the oil seal of the housing.

18. Inspect the bearing for wear or damage; if excessively worn the bearing should be removed from the shaft and a new one fitted.

19. Remove the flow control valve plug from the side of the pump body and withdraw the combined flow control and relief valve, taking care to retain the flow control valve spring.

20. Inspect the pump body and cover for wear or scoring by the rotor; if excessive wear or scoring has taken place and the end clearance of the rotor in the body exceeds 0.0018 in. (0.046 mm.), the body and cover should be renewed and a matched set of rotor, rollers and cam ring fitted.

Steering pump—To assemble

1. Thoroughly clean all parts in paraffin and dry them using a high pressure air line.

2. After greasing the lip of the new seal, insert it into the pump body. Care should be taken not to damage the seal.

3. Insert the drive-shaft, at the same time turning it so as to minimise the risk of damage to the oil seal. Tap the bearing into the body, then fit the bearing retaining plate and the four countersunk-headed screws.

4. Fit the cam ring, ensuring that it is located correctly on the pin in the pump body.

5. Fit the key and slide the rotor on to the shaft. The rotor should be fitted so that when viewed from the rear of the pump, the angled face of the rotor blades should face anti-clockwise.

6. Insert the six rollers into the spaces between the rotor blades. Fit new rubber sealing rings in the annular groove formed on the end of the cam ring and in the recess formed in the flow control by-pass port.

7. Fit the six Allen setscrews and secure the cover to the pump body. Whilst tightening the setscrews rotate the shaft to ensure that no binding takes place.

8. Fit the flow control valve spring and the combined flow control and relief valve into the pump body, ensuring that it moves freely in its bore.

9. Fit the flow control valve cap using a new 'O' ring.

10. Fit the reservoir to the pump body ensuring that new sealing rings are fitted to each side of the distance plate. Fit the sleeve into the inlet port of the pump, then using the $\frac{3}{4}$ in. U.N.F. blanking plug and the $\frac{1}{16}$ in. U.N.F. setscrews and 'O' ring secure the reservoir firmly to the pump body.

11. Fit the filter support plate and the centre pedestal, then tighten the pedestal (see method given for removal).

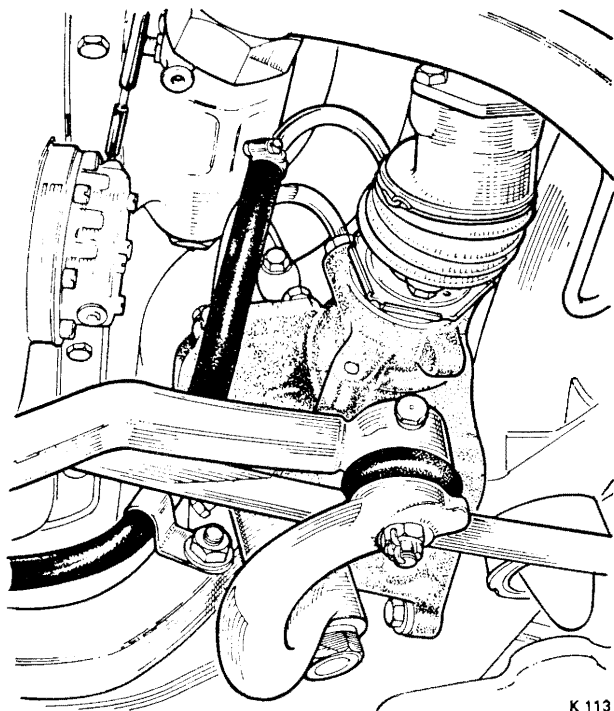
12. Fit the filter, filter retaining washer, spring and reservoir cap ensuring that the reservoir cap seal and the securing screw seal are in good condition.

Steering pump—To fit

To fit the steering pump to the engine, reverse the procedure given for its removal, noting the following points.

1. After fitting, check the belt tension and fill and prime the system as described later.

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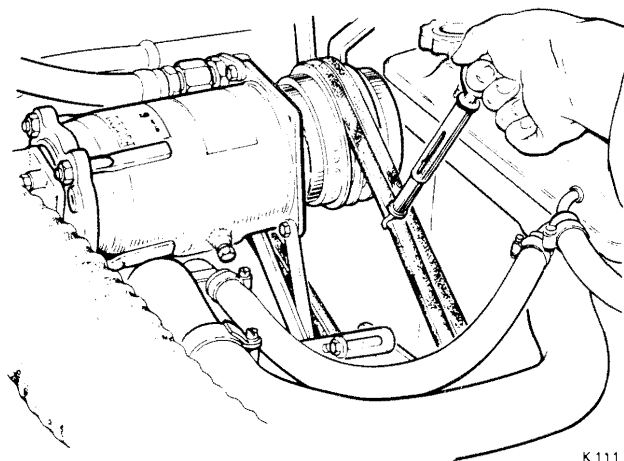


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FIG. N7 STEERING BOX HOSE CONNECTIONS

Steering pump hoses

On right-hand drive cars, the supply and return hoses connecting the steering pump to the steering box, drop vertically from the pump to a clip on the upper triangle lever mounting bracket; from there they pass across the front engine cross-member, being clipped to it at two points. A shield is fitted to protect the hoses from heat given off by the exhaust pipe. From the front engine cross-member the hoses pass to the steering box (see Fig. N7).



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FIG. N8 STEERING PUMP—BELT TENSION CHECK

On left-hand drive cars the supply and return hoses connecting the steering pump to the steering box, drop vertically from the steering pump to the steering box. They are secured to each other by a plastic clip mid-way along their length.

With the engine running and the road wheels on the ground, turn the steering from lock-to-lock and check that the hoses do not distort.

Maintenance

Steering pump fluid level—To check

1. Start the engine and run it at idle-speed and if necessary top-up with the approved fluid (see Chapter D), until the fluid level is just above the lowest point of the top face of the filter.

2. Road test the car.

3. Re-check fluid level.

Note It is of the utmost importance that only clean fluid be used to top-up the steering pump reservoir.

Filter element—To renew

1. Using a syringe, draw off and discard as much fluid as possible from the pump.

2. Unscrew the setscrew securing the cover then remove the cover and spring; discard the filter element. Fit the new element in the pump reservoir.

3. Examine the seal in the cover; renew if necessary. Care should be taken to ensure that the oil sealing ring is seating correctly.

4. Fit the cover squarely on to the pump and tighten the setscrew.

Belt tension—To check

The steering and refrigeration pumps are driven by a matched pair of belts from the two front grooves of the engine pulley.

1. Check the tension of the belts by applying a force of 8 lb. (3,63 kg.) at the centre of the run between the coolant pump and steering pump. Each belt should show a deflection of 0.375 in. (9,53 mm.).

2. If the tension of the two belts differs markedly, a new matched pair of belts should be fitted.

3. To adjust the belts slacken the pump securing nuts and move the pump until the correct belt tension is obtained; tighten the nuts.

A slipping belt will emit a 'squeal' and produces also 'judder' at the steering wheel, especially when approaching each full lock.

No dressing of any kind should be applied to the belts to prevent slip.

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Priming and filling the system

1. Fill the steering pump reservoir with clean fluid until the fluid level is just above the top of the filter.
2. Start the engine and run it at 'idle' speed.
3. Move the steering wheel from lock-to-lock in order to expel the air from the system. The level of the fluid in the steering pump reservoir must be checked continually and kept topped-up to the correct level.

A considerable amount of noise may be apparent during the initial priming of the system.

Movement of the steering wheel should be repeated until all the air is expelled. All joints should be inspected for leaks and rectified if necessary.

4. Finally, return the steering wheel to the central position and check the level of the fluid in the steering pump reservoir.

Note Care should be taken to avoid spilling fluid on the pump driving belts.

5. On completion of the priming and filling operation, the pump belts should again be checked for correct tension, the car road tested and the fluid level rechecked.

Section N4

STEERING PUMP (SAGINAW), FLUID COOLER
AND HOSES

Overhaul

Introduction

This pump was first introduced on cars with full refrigeration equipment, from the following numbers.

Standard Cars —SRX 2982, SRH 2297, SBX 3002,
SRX 3003, SRX 3005 and on-
wards

Coachbuilt Cars—CRH 3132 and onwards

Steering pump—To remove

1. If the pump is to be removed for dismantling purposes, it will first be necessary to remove the pulley. In order to slacken the pulley retaining nut, use the tension of the pump driving belts to prevent the pulley from rotating while a spanner is used to slacken the nut.

2. Using a syringe, draw off as much fluid as possible from the steering pump reservoir into a container.

3. Slacken the pump belts by loosening the locking screw in the slotted adjustment bracket, the nut on the pivot bracket at the rear of the pump and the pressure hose connection at the rear of the pump. Remove the belts.

4. Disconnect the two hoses, one at a time. Mask or cap the pump orifices for the hoses to prevent further drainage of fluid and secure the ends of the hoses in a raised position to prevent fluid drainage from them. Mask or blank the ends of the hoses to prevent the ingress of dirt.

5. Remove the nut, bolt, spring washer and chamfered washer from the top hole of the mounting brackets.

6. From the rear side of the pump, remove the two retaining nuts (the lower one with distance piece).

7. Support the pump and remove the locking setscrew of the slotted adjustment bracket. Remove the pump and collect the slotted distance piece located on a dowel fitted to the pump front lower bracket which remains on the engine.

Steering pump—To dismantle

1. Drain any fluid remaining in the pump.
2. Remove the nut and washer from the drive-shaft. Remove the pulley from the keyed shaft. If necessary use a suitable pulley extractor to remove the pulley. Never use a hammer to drive the pulley from the shaft as this will cause damage to the pulley and pump.

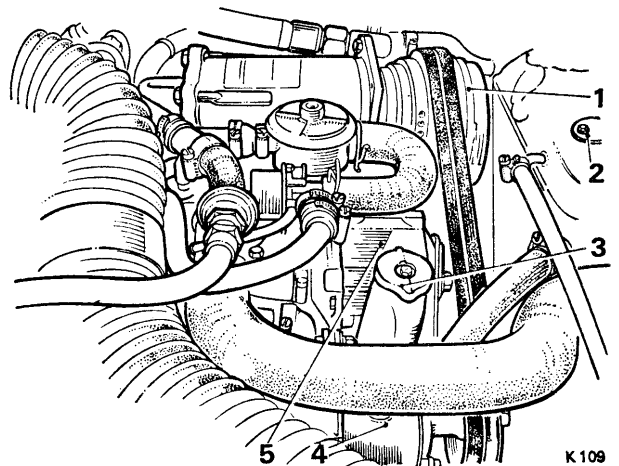


FIG. N9 STEERING PUMP IN POSITION

- 1 Refrigeration pump
- 2 Pressure valve—header tank
- 3 Steering pump filler cap
- 4 Steering pump
- 5 Air injection pump (if fitted)

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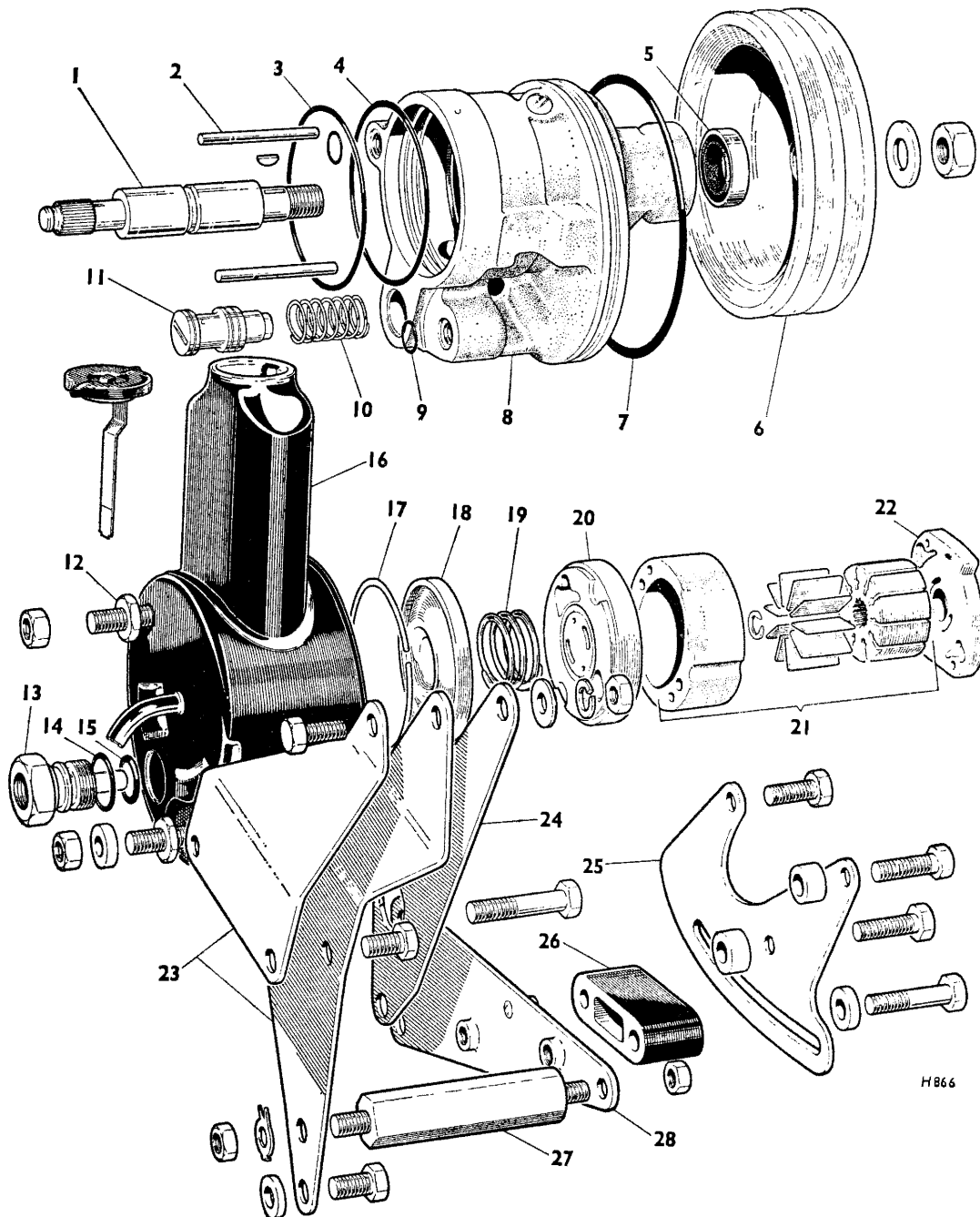


FIG. N10 EXPLODED VIEW—STEERING PUMP (SAGINAW) AND MOUNTING BRACKETS

- | | | |
|--|--|---|
| 1 Drive-shaft | 11 Combined flow control/
pressure relief valve | 21 Pump ring, snap ring, vanes
and rotor (supplied in kit
form as spares) |
| 2 Dowel pins | 12 Securing studs—reservoir to
pump housing | 22 Thrust plate |
| 3 Sealing ring—end plate | 13 Pressure union fitting—pump
to steering box | 23 Pump rear mounting brackets |
| 4 Sealing ring—pressure plate | 14 Pressure fitting | 24 Pump rear pivot bracket—
belt tensioning |
| 5 Shaft lip-type seal | 15 Sealing rings | 25 Pump front pivot bracket—
belt tensioning |
| 6 Pulley | 16 Combined reservoir/cover | 26 Pivot bracket distance piece |
| 7 Sealing ring—reservoir | 17 End plate retaining ring | 27 Extension piece |
| 8 Pump housing | 18 End plate | 28 Pump front lower mounting
bracket |
| 9 Sealing ring—reservoir to
pump housing securing studs | 19 Pressure plate spring | |
| 10 Return spring—flow control
valve | 20 Pressure plate | |

3. Remove the three setscrews securing the bracket to the front of the pump. Two of the setscrews are fitted with distance pieces, note the positions to facilitate assembly.

4. Using suitable soft vice grips, **lightly clamp** the pump drive-shaft downward in a vice.

5. Remove the union from the pump cover/reservoir.

Care must be taken not to exert too much pressure on the shaft when removing fittings as this may distort the shaft bearing.

6. Remove the pump rear mounting bracket and bolts.

7. Remove the cover/reservoir from the pump housing by rocking it back and forth until it clears the sealing 'O' ring.

8. Remove the sealing 'O' rings from the mounting bolts and the union (*see Fig. N11*).

9. Remove the end plate retaining ring of the pump housing. This is achieved by depressing the retaining ring using a punch inserted through the $\frac{1}{8}$ in. (3,18 mm.) hole in the pump housing (*see Fig. N12*).

10. When the ring is depressed, remove the ring from the housing with a screwdriver as shown in *Figure N12*. Withdraw the punch.

11. Remove the end plate. The plate is spring-loaded from beneath and will normally seat above the pump housing level after removal of the retaining ring. If sticking occurs, a slight rocking action will free the plate.

12. Remove the pump from the vice and invert it. The flow control valve and valve spring can be collected as they emerge from the bore (*see Fig. N13*).

13. Remove the end plate 'O' ring.

14. Invert the pump housing to leave the shaft uppermost then, using a soft-headed mallet, tap on the end of the shaft until the pressure plate falls free into the hand.

Important DO NOT drive the shaft downward into the housing more than is necessary to free the pressure plate.

15. Remove the pressure plate, pump ring and vanes, taking care not to drop the smaller components.

16. Reposition the pump housing in the vice with the open end uppermost.

17. Remove the snap ring (*see Fig. N14*) from the inner end of the drive-shaft then remove the rotor and thrust plate.

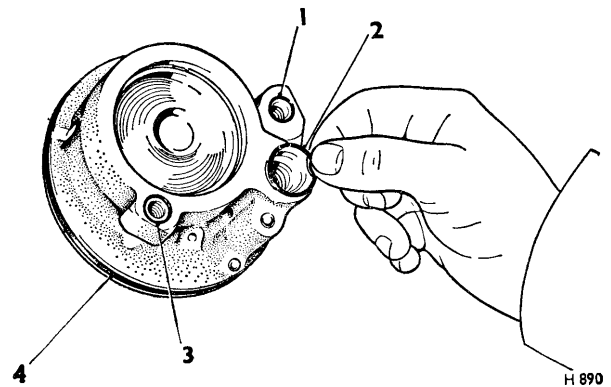


FIG. N11 POSITION OF PUMP EXTERNAL SEALING RINGS

- 1 'O' ring—cover/reservoir securing studs
- 2 'O' ring—adaptor—pressure fluid
- 3 'O' ring—cover/reservoir securing studs
- 4 'O' ring—cover/reservoir to pump housing

18. Remove the drive-shaft by passing it through the front of the housing.

19. Remove the lip-type seal from the front of the housing only if, on inspection, it is found that it requires renewal.

The dowel pins remain in the pump housing.

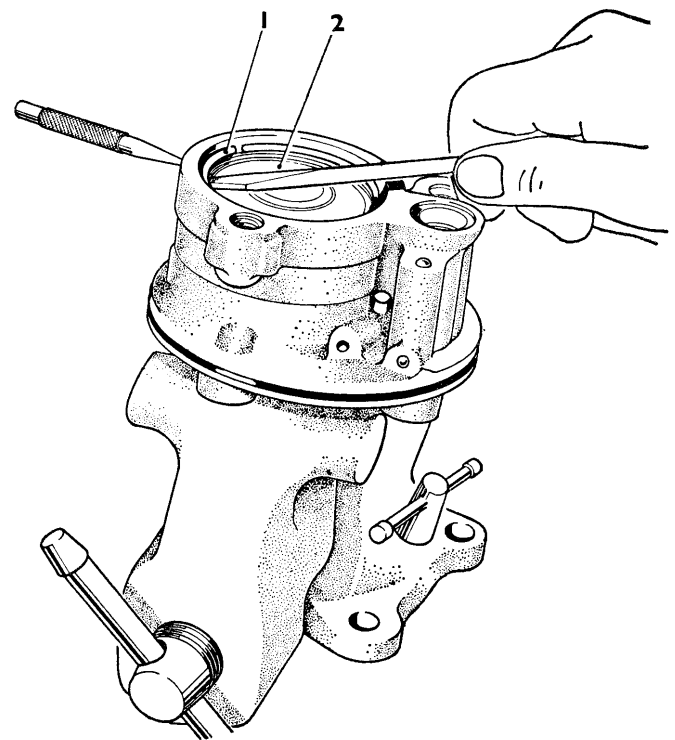


FIG. N12 METHOD OF REMOVING END PLATE RETAINING RING

- 1 Retaining ring
- 2 End plate

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FIG. N13 REMOVING OR FITTING THE FLOW CONTROL/RELIEF VALVE

Steering pump—To inspect

1. Clean all components prior to inspection. Apply an air pressure line to the pump housing to clean out all the fluid passages.
2. Check the pressure plate, thrust plate and rotor for scoring. Light scoring may be removed by lapping with a fine carborundum stone. Heavy scoring necessitates renewal of the component concerned.

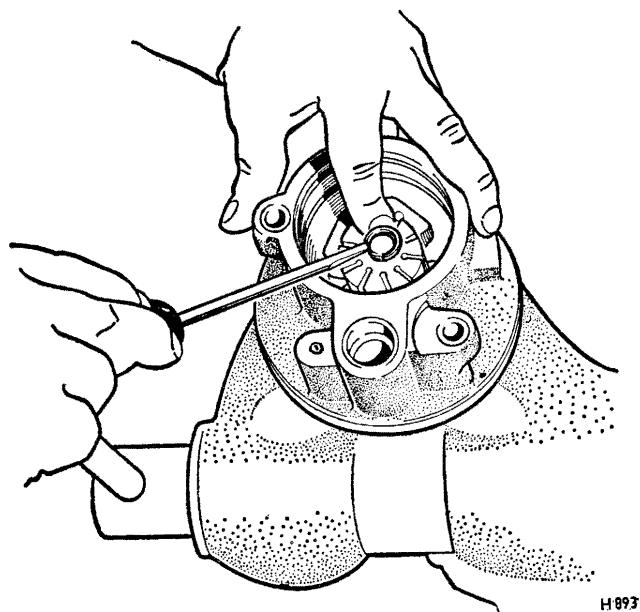


FIG. N14 REMOVING THE ROTOR SNAP RING

3. Ensure that the pressure plate is flat by checking it against the abutting surface of the pump ring.

Note A high polish is always present on the inner faces of the thrust and pressure plates as a result of normal wear. This must not be confused with scoring.

4. Check the contour surface of the pump ring for extreme wear. Normally there may be some scuff marks and uniform wear. This does not increase pump noise and is not detrimental to its function. However, if the wear comprises chatter marks or gouges that can be felt with the finger, renew the pump ring, rotor and rotor vanes (these items are supplied as a set).

5. Check the condition of the shaft bearing (bushing).

Note The bearing is rarely, if ever, responsible for noisy pump operation.

6. Check the flow control valve for burrs or dirt which may cause the valve to stick in its bore. Check the bore.

7. Check the small screw on the end of the control valve for tightness. If loose, tighten, but be extremely careful not to damage the machined surfaces.

Steering pump—To assemble

1. Before assembly, carefully clean all components with the exception of the 'O' rings which should be renewed.

Do not immerse the drive-shaft lip-type seal in a cleaning solvent as this could damage it.

2. Smear the new 'O' rings and shaft seal with petroleum jelly to facilitate correct location and fitting. Lubricate the internal metal components to be assembled with steering fluid.

3. Insert the drive-shaft into the front of the pump housing, the splined end leading and passing through the lip-type seal.

4. Fit the thrust plate over the dowel pins and into position in the housing with the ported face uppermost, i.e. to the rear of the pump housing (see Fig. N15).

5. Fit the rotor to the splines on the shaft with the counterbore toward the shaft and thrust plate. The rotor must be a slide fit on the splines.

6. Position the pump ring on the dowel pins with the direction of rotation arrow (see Fig. N16) uppermost indicating the pump direction of rotation.

The direction of rotation is anti-clockwise when viewed from the pump rear as shown in Figure N16.

7. Fit the drive-shaft snap ring to retain the rotor.

8. Fit the vanes into the rotor slots with the radiused edge facing outwards (see Fig. N17).

9. Fit the pressure plate 'O' ring. Lubricate the outside diameter of the pressure plate with petroleum jelly to prevent damage to the fitted 'O' ring, then locate it on the dowels, with the port face towards the pump ring.

10. Apply pressure to the plate at its outer edges (see Fig. N18). Never apply great pressure or hammer the centre of the pressure plate as this will cause permanent distortion resulting in pump failure. The pressure plate will compress the seal by approximately $\frac{1}{16}$ in. (1.59 mm.).

11. Position the pressure plate spring, locating the leading coil in the groove on the upper side of the plate.

12. Fit the end plate 'O' ring into the pump housing groove.

13. Lubricate the outer diameter of the end plate to prevent damage to the fitted 'O' ring. Position the pump under a suitable arbor press (see Fig. N19) and press the end plate into the housing sufficiently to allow the retaining ring to be fitted (see Fig. N12).

14. Fit the retaining ring ensuring that it is fully seated, then remove the pump from the press and tap the end plate to ensure correct seating.

15. Fit the flow control valve and spring as shown in Fig. N13.

16. Fit the smaller 'O' ring seals to the stud and flow control valve holes.

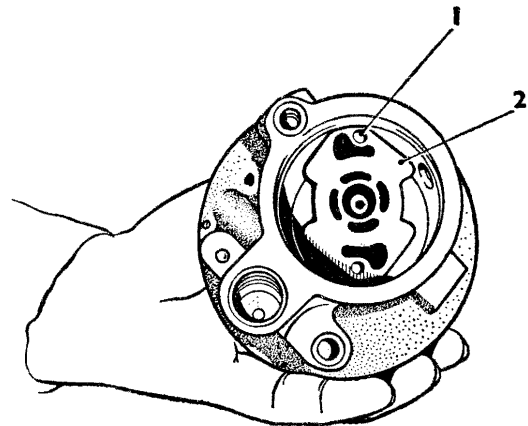
17. Fit the large 'O' ring seal to the groove on the outer diameter of the pump housing then fit the cover/reservoir.

18. Fit and tighten the two studs and union.

Note The cover/reservoir must be fully seated prior to tightening the studs and union to prevent damage to the reservoir.

19. Fit the pump front mounting (adjusting) bracket using the three setscrews. Two of the three setscrews are fitted with distance pieces.

20. If the existing shaft key requires renewal, support the drive-shaft by lightly clamping it in a vice then replace the old key.



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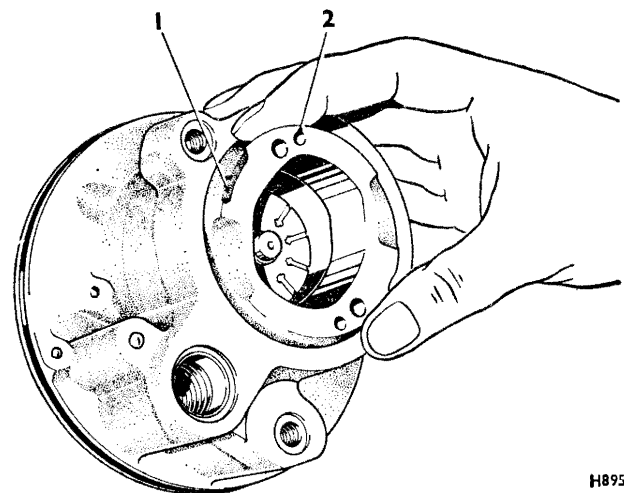
FIG. N15 CORRECT POSITIONING OF THRUST PLATE

1 Dowel pin (2) 2 Thrust plate

21. Fit the pulley on to the shaft, locating the slot on the shaft key then fit the washer and nut. Partially tighten the nut. The nut can be fully tightened only when the pump is fitted to the engine complete with tightened drive belts.

Steering pump—To fit

1. Before attempting to fit the pump to the engine, check that all the steering system hoses and pipes are serviceable; renew any that are damaged or appear to have deteriorated.



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FIG. N16 CORRECT POSITIONING OF PUMP RING

1 Arrow on edge of pump ring
2 Dowel hole (2)

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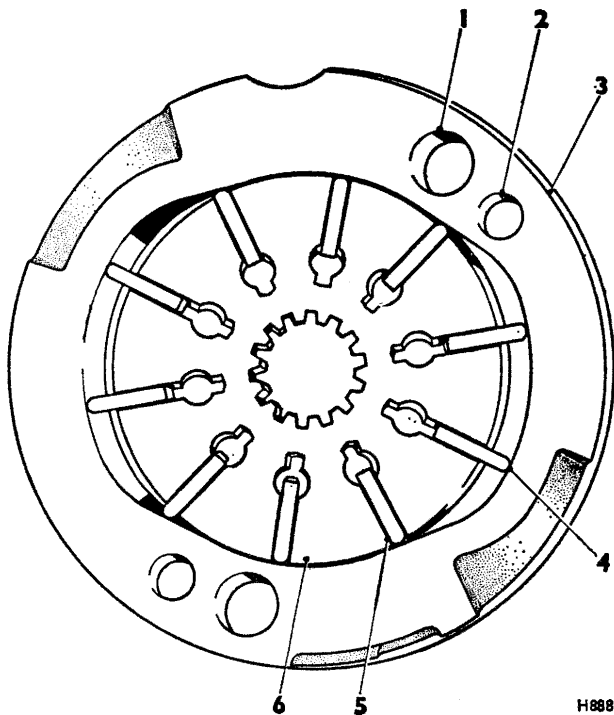


FIG. N17 PLAN VIEW—ROTOR, VANES AND PUMP RING

- | | |
|-------------------------|-------------------------|
| 1 Oil transfer hole (2) | 4 Radiused edge of vane |
| 2 Dowel hole (2) | 5 Vane (10) |
| 3 Pump ring | 6 Rotor |

Reverse the procedure adopted for the removal of the steering pump, noting the following points.

2. Prior to fitting the pump to the mounting brackets, connect but do not tighten the pressure hose to the rear of the pump.

3. Ensure that the bolt distance pieces are fitted to their respective positions.

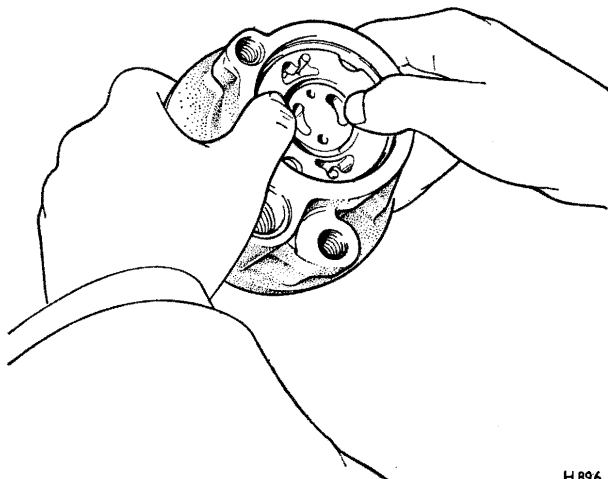


FIG. N18 FITTING THE PRESSURE PLATE

4. Tighten the pump driving belts then proceed to tighten the pulley retaining nut.

5. Adjust the driving belts to the correct tension as described in 'Belt tension—To check'.

6. Fit and tighten the hoses to the rear of the pump, then proceed to prime and fill the steering system as described in 'Priming and filling the steering system'. For reference purposes the hoses connection torque tightening figures are:

Steering pump pressure connection 25 lb. ft. to 40 lb. ft. (3,46 kg.m. to 5,53 kg.m.).

Steering box (both connections) 20 lb. ft. to 30 lb. ft. (2,77 kg.m. to 4,15 kg.m.).

Maintenance

Belt tension—To check (see Fig. N20)

A matched pair of belts drive the steering and refrigeration pumps from the two front grooves of the engine pulley.

1. The tension of these belts when correct is 70 lb. (31,75 kg.). This is checked by applying a spring balance load of 8 lb. (3,6 kg.) to cause a $\frac{3}{8}$ in. (9,5 mm.) deflection of the belts when applied to a point midway between the steering and refrigeration pumps.

If the tension in one belt differs markedly from the other, a new **matched set** must be fitted.

2. To adjust the tension, slacken the setscrew of the slotted swivel bracket at the front of the pump, the nut and bolt of the bracket to the rear and above the pump and slacken the union of the supply hose connected at the rear of the pump; move the pump the required amount. Tighten the setscrew, nut and bolt and the supply hose union.

Note A slipping belt(s) will emit a 'squeal' and produce 'judder' at the steering wheel, especially when approaching each full lock.

Dressing of any type must not be applied to the belts to prevent belt slip.

Steering pump fluid level—Routine check and correction

1. Remove the filler cap and check that the fluid level is at least up to the 'ADD' mark on the dipstick. If necessary add steering fluid. Use only the approved steering fluids quoted on the chart in Chapter D of this Manual.

2. Start the engine and run until normal operating temperature is reached (170°F., 77°C.) then stop the engine.

3. Remove the filler cap and check the fluid level on the dipstick. Add fluid to raise the level to the 'FULL' mark if necessary. Do not overfill. Fit the filler cap.

Priming and filling the steering system

Introduction

The Saginaw pump has a tendency to froth the steering fluid when air is present in the system. The following procedure is intended to reduce this frothing to a minimum.

If frothing of the fluid does occur, the pump will cavitate and emit a harsh buzz. This is quite usual and should cease when all the air is expelled from the system. When cavitation is audible, the pump must not be run at high speed otherwise the pump internal components may be damaged.

During the filling operation, the pump should not be required to deliver full pressure for more than 5 seconds or damage to the pump may result.

Use only the approved 'steering fluids'; these are to be found on the Lubrication Chart of Chapter D of this Workshop Manual.

Procedure

1. Turn the steering wheel to the full right-hand lock position on right-hand drive cars or full left-hand lock position on left-hand drive cars.

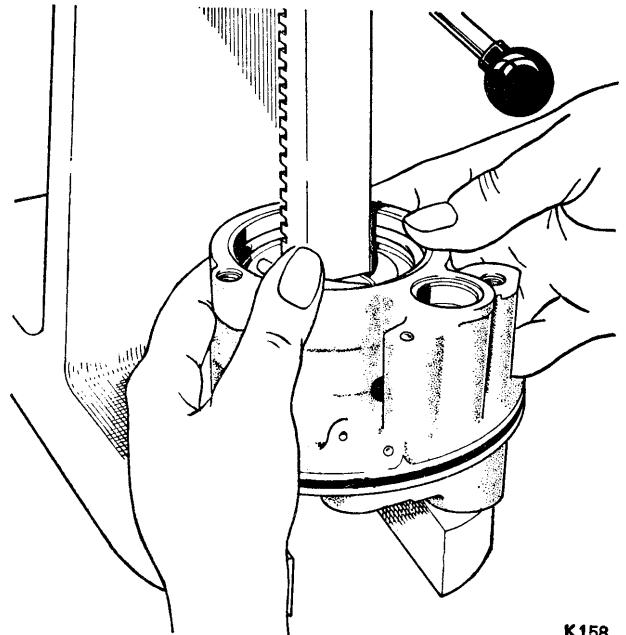
2. Remove the pump filler cap. Add sufficient clean steering fluid to raise the fluid level in the pump reservoir to the 'ADD' mark on the dipstick.

3. Start the engine and allow it to run at normal fast-idle. Add more steering fluid to the reservoir to maintain the level at the 'ADD' mark on the dipstick.

Do not allow the level of fluid to fall below the internal pump housing otherwise air will be pumped into the system and the procedure will become excessively prolonged.

4. Bleed air from the system by turning the steering wheel slowly from side to side, but **do not abut the full lock stops**, as the increased pressure will cause severe frothing of the aerated fluid.

5. Maintain the fluid level at the 'ADD' mark.

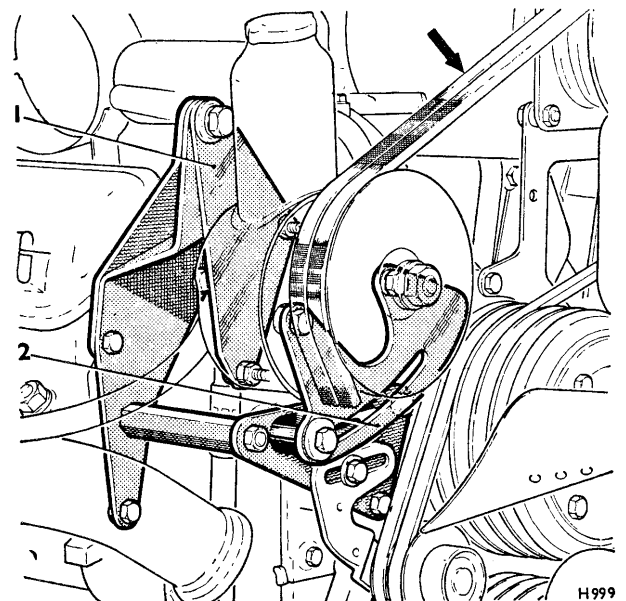


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FIG. N19 METHOD OF FITTING THE END CAP AND RETAINING RING

While air remains in the system, the fluid will have a light tan coloured appearance and correct steering action will not be obtained.

6. When satisfied that the fluid is no longer aerated, return the steering to the centre position and run the engine for two or three minutes, then stop the engine.



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FIG. N20 PUMP MOUNTING POINTS AND BELT TENSIONING ARRANGEMENT

- 1 Pump rear mounting/pivot bracket
- 2 Pump front mounting/pivot bracket
- Arrow indicates belt tension checking point

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7. The fluid level indicated on the filler cap dipstick should be raised to the 'FULL' mark by the addition of more fluid. Do not overfill. Fit the filler cap.

- Note** (1) If the fluid level in the reservoir rises more than $\frac{1}{4}$ in. (6,35 mm.) when the engine is switched 'off', some residual air is present in the system and the bleeding operation should be repeated.
- (2) Considerable heat is generated in the steering system during the bleeding operation therefore it should not be prolonged for more than 5 minutes.

**Steering system hoses and pipes
Right-hand drive cars (see Fig. N21)**

The flexible **supply** hose, connected to the high pressure outlet at the rear of the steering pump, drops vertically down the side of the engine then, sweeps rearward along the side of the engine to a clip on the rear mounting point of the front suspension upper triangle levers. The hose then curves through 180° and sweeps forward to connect to the inlet (front) connection of the steering box.

The **return** line from the steering box to the fluid cooler and then to the steering pump comprises lengths of flexible and rigid pipes connected by worm-drive clips. The rigid pipes are suitably shaped to follow the intended run.

The return pipe connected to the outlet (rearward) connection of the steering box sweeps forward to a mounting clip at the front end of the steering box; the pipe is rubber sleeved at this point to prevent metal-to-metal contact. After sweeping upward a short distance, the rigid pipe ends and connects to a flexible hose which continues the sweep upward to join a second rigid pipe by the wheel arch.

The second rigid pipe turns through 180° and sweeps forward to follow the contour of the wheel arch then downward toward the radiator matrix. The pipe then curves to continue vertically to meet the body cross-member which crosses between the two front wings then, turns through 90° to lie along the cross-member to join the cooler inlet (lower) connection.

A short length of flexible hose is used between the rigid pipe and fluid cooler to connect the two.

The second rigid pipe is clipped at two points, the first on the wheel arch, the second on the outer end of the cross-member.

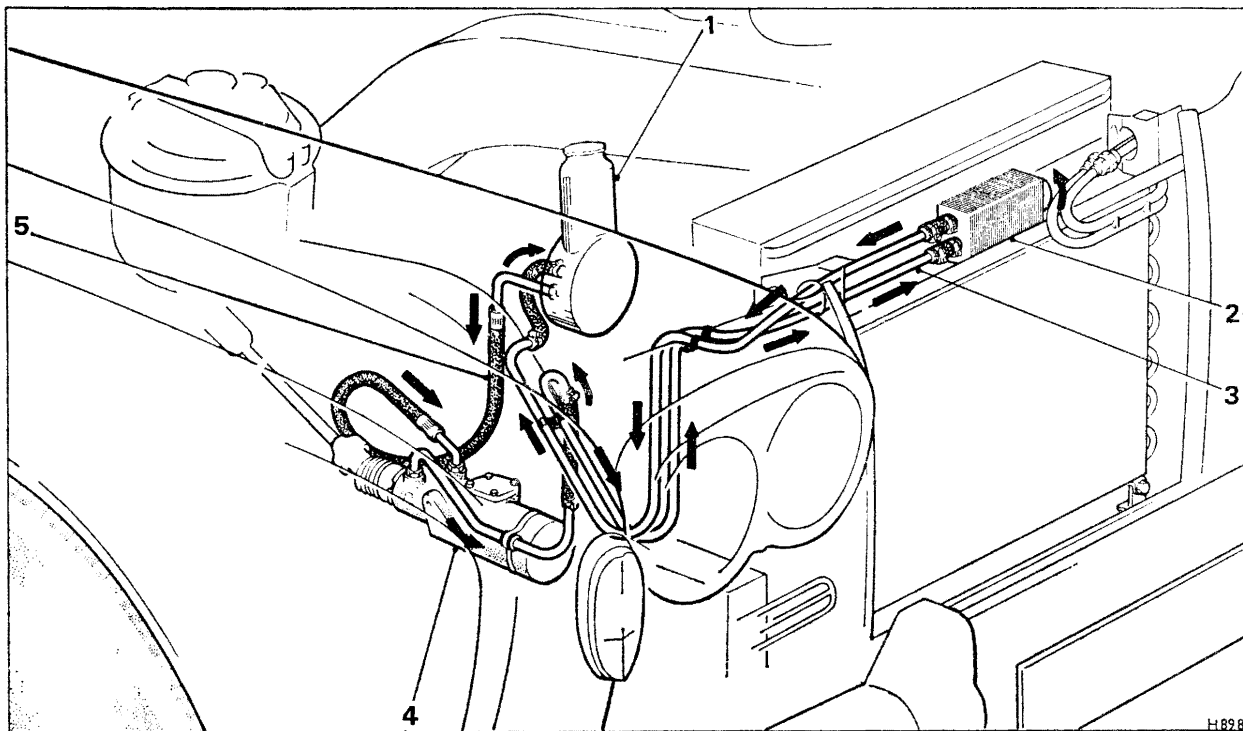


FIG. N21 STEERING SYSTEM PIPES AND HOSES—RIGHT-HAND DRIVE CARS

- 1** Steering pump **2** Fluid cooler **3** Fluid return line **4** Steering box **5** Pressure hose

Arrows indicate direction of flow of fluid

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The return line from the fluid cooler (upper connection) to the steering pump, follows the same run as the former and shares the same clipping points on the cross-member and wheel arch respectively. The rigid pipe joins a flexible hose which in turn sweeps downward and inward to the engine then, sweeps upward to the inlet connection at the rear of the pump.

Left-hand drive cars (see Fig. N22)

The flexible **supply** hose, connected to the high pressure outlet connection at the rear of the steering pump drops vertically down the engine, sweeps beneath the engine behind the engine front mounting cross-member, then sweeps upwards on the left-hand side of the engine to connect to the inlet (front) connection of the steering box. Three clips secure the hose to the engine cross-member, one at the centre and one at each end. A heat shield is secured to the member at its centre between the hose and exhaust pipe to prevent heat transference which would cause damage to the rubber hose.

The **return** line from the steering box, which comprises lengths of rigid pipes and flexible hoses, commences as a rigid pipe which sweeps forward along

the steering box from the outlet (rear) connection, to a clip situated at the front of the box. The pipe, rubber sleeved at this point in order to prevent metal-to-metal contact, continues its run and sweeps upward to join a flexible hose which is clipped at one end to the wheel arch. The other end of the hose joins a second rigid pipe in the upper left-hand corner of the engine compartment. This pipe curves to lie along the body cross-member between the front wings to eventually join up with the inlet (lower) connection of the fluid cooler. The pipe is clipped adjacent to, and shares a clip mounting point with the refrigeration system pipes at the front left-hand side of the engine compartment and, after turning through 180° at the end of its run, utilises a short length of flexible hose to adjoin the cooler.

From the fluid cooler (upper) outlet connection, the return line continues as a short length of flexible hose then, as a rigid pipe which travels along the body cross-member to the right-hand front wing. The pipe is clipped at this point, and then turns through 90° and sweeps vertically downward to the wheel arch then curves to follow the contour of the wheel arch to a point in-line with the steering pump. At this point the pipe turns inward toward the engine, connects to a

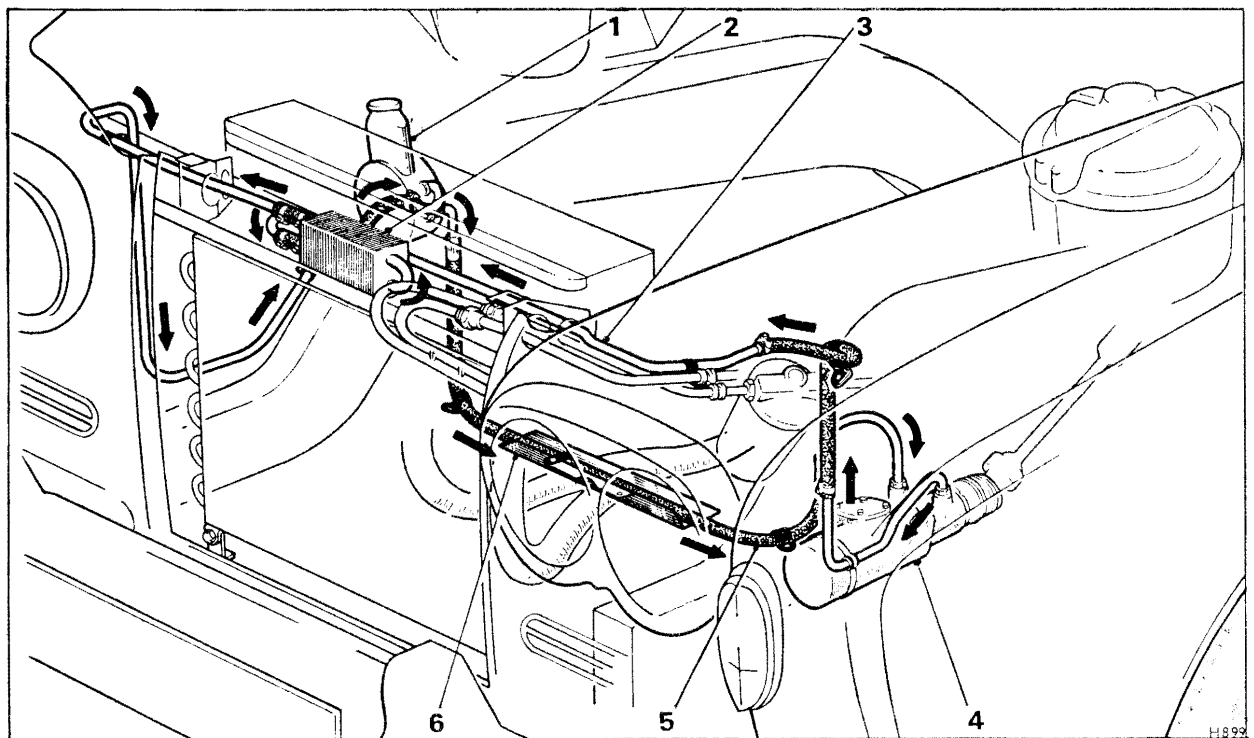


FIG. N22 STEERING SYSTEM PIPES AND HOSES—LEFT-HAND DRIVE CARS

- | | | | | |
|-----------------|----------------|---------------------|----------------|-----------------|
| 1 Steering pump | 2 Fluid cooler | 3 Fluid return line | 4 Steering box | 5 Pressure hose |
| | | 6 Heat shield | | |

Arrows indicate direction of flow of fluid

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flexible hose which sweeps downward and finally curves upwards to join the pump inlet connection. The rigid pipe is clipped to the wheel arch.

All cars

Note The correct run of hoses must be maintained in order to prevent kinking of the flexible hoses thus restricting the flow of steering fluid.

The worm-drive clips and pipe connections must be correctly tightened to prevent fluid leakage.

Metal-to-metal contact between rigid and flexible pipes and the car body and components must be avoided, except at the clipping points, to prevent chafing, rubbing and noise transference.

Steering Pump Test Data

Minimum output 1.46 Imp. gallons per minute (1.75 U.S. gallons per minute, 6.64 litres per minute) of fluid at 170°F. (76.7°C.) when operating at 465 pump r.p.m. against 665 lb/sq. in. to 735 lb/sq. in. (46.75 kg/sq. cm. to 51.68 kg/sq. cm.) pressure.

Maximum output 2.33 Imp. gallons per minute (2.80 U.S. gallons per minute, 10.68 litres per minute) of fluid at 170°F. (76.7°C.) when operating at 1500 r.p.m. against 50 lb/sq. in. (3.52 kg./sq. cm.) pressure.

Maximum sustained speed of pump	}	5,800 r.p.m. (maximum peak speed to be 7,500 r.p.m.).
Pressure relief valve		Opens between 1100 lb/sq. in. (77.34 kg/sq. cm.) and 1200 lb/sq. in. (84.37 kg/sq. cm.).

Fault Diagnosis

(For quick reference chart see Page N49 and onwards)

Pump noise

The power steering pump is not completely noiseless. Some noise may be present whenever the wheels are on full lock. The noise usually becomes greater as engine speed is increased as is the case when the car is making a full lock turn. The noise is caused by the system relief valve and is normal.

Momentary aeration of the fluid is sometimes noticeable under these conditions. Some noise may also be present under parking conditions.

Power steering pump noise can be confused with noises from other units of the car. To determine whether excessive noise is present in the pump, start the engine and increase the engine speed to 1000 r.p.m. A medium pitch 'moan' is emitted from the pump which lowers in tone and increases in volume as the steering column is loaded, i.e. the road wheels are turned toward lock; this is normal. The engine r.p.m. decreases also as the road wheels are turned from the straight ahead position. This is normal. As the refrigeration compressor is driven from the same belts, it will be necessary to determine whether or not the noise is to be found in the compressor, this can be achieved by engaging and disengaging the compressor clutch.

If it is determined that the excessive noise is present in the steering pump, the following steps should be taken in the order given.

1. Check the driving belts for correct tensioning
2. Check the fluid level, filling to the required level if necessary.
3. Check that the run of the hoses is correct.
4. Check for presence of air in the fluid. Air will show up as bubbles or, the fluid will appear frothy or tan coloured. Small amounts of air can cause extremely noisy operation. If air is present—
 - (i) Check all fittings and bolts for tightness.
 - (ii) Check the entire system for the source of the air leak. Air can leak into the system at any place but usually occurs at hoses or pipe connections or, at the drive-shaft seal.

After each step in an attempt to eliminate air from the system, the pump should be operated at idle speed while the road wheels are turned occasionally from lock-to-lock.

5. If after step (4) there is no air present, insert a pressure gauge in the high pressure line between the steering pump and steering box. If, when increasing the engine speed to 1000 r.p.m. with the front wheels straight-ahead and without turning the steering wheel, the fluid pressure exceeds 125 lb/sq. in. (8.79 kg/sq. cm.) it will be necessary to remove the pump from the car then dismantle and inspect it as outlined under 'Pump—To inspect'.

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Pump leakage

1. Tighten all fittings and bolts.
2. Try to determine the source of leakage by cleaning the exterior of the pump assembly.
3. Possible sources of pump leakage are as follows:

SOURCE OF LEAKAGE	CAUSE	REMEDY
Top of reservoir.	Reservoir too full. Excessive air present in fluid.	Adjust to correct level. Proceed as in 1(d) under 'Pump Noise'.
At reservoir.	'O'-ring damaged or incorrectly fitted.	Renew 'O'-ring and fit correctly.
At the pressure fitting or bolts.	Not tightened sufficiently. Cross-threaded fitting or defective seal on fitting or hose, or damaged seals.	Torque tighten to between 25 lb. ft. and 40 lb. ft. (3,46 kg.m. and 5,53 kg.m.). Correct where necessary.
At shaft seal.	Defective seal or damaged shaft.	Renew seal. Renew shaft if seal surface is scratched or damaged.
Leakage from metal parts.	Defective casting or reservoir.	Renew defective part.

Power assistance poor or negligible or pump inoperative

1. Check driving belt(s) tension.
2. Check and fill the pump reservoir and bleed the steering system.
3. Determine the source of fault, i.e. the pump, steering box or hoses. Fit the pressure gauge in the pressure line between the steering pump and steering box.

First test—fluid circuit open

1. Apply the handbrake, start the engine then, turn the steering wheel through full turns from lock-to-lock holding the wheels momentarily against each lock stop and note the pressure on the gauge. This maximum pressure reading should not be less than 665 lb/sq. in. (46,75 kg/sq. cm.) with the engine idling at 500 r.p.m. (refrigeration system switched off), the gear selector in 'P' or 'N' position and the fluid temperature

in the reservoir between 150°F. (65.6°C.) and 170°F. (76.7°C.) (normal operating temperature).

Note To obtain the fluid temperature required for this test, turn the wheels from lock-to-lock several times.

Do not hold the wheels against their respective lock-stops for any extended period of time.

If the maximum pressure is below specification, this indicates that a fault is present in the hydraulic circuit. To determine whether the fault lies in the pump or control valve, proceed with the second test. It will not be necessary to proceed with the second test if the pressure differential between each full lock is more than 40 lb/sq. in. (2,81 kg/sq. cm.), since this indicates that the steering box valve is at fault.

Second test—fluid circuit closed

1. Apply the handbrake, run the engine at idle speed (500 r.p.m.), the gear lever in 'P' or 'N' position and the refrigeration system switched off.
2. Turn the valve of the gauge to the closed position.
Note The gauge cut-off valve must be located between the gauge and steering box.
3. Observe and compare the maximum pump pressure at idle. It should not be less than that specified.

Test comparison

By comparing the reading in 3 above, it is possible to determine whether the fault lies in the pump or steering box or both.

If the **first test** is below specification, and the **second test** is equal or greater to the specification, the steering box is at fault.

If the **first test** is below specification, and the second test is not more than 50 lb/sq. in. (3,5 kg/sq. cm.) greater, the steering pump is at fault and a full inspection of the pump is necessary.

If the steering box is at fault, refer to Section N5—The Steering Box for overhaul procedure.

Section N5

THE STEERING BOX (all cars)

Overhaul

Introduction

A higher ratio steering box is now fitted to **right-hand drive cars** having the following number and onwards.

Standard cars 4315—Coachbuilt cars 5023.

The difference in ratio is as follows:

Early cars 22.5:1—Later cars 19.3:1.

The servicing of both types of box is similar although there are minor changes to certain internal parts. This means that some parts usually provided as matched sets are not interchangeable, although the complete unit is interchangeable. Always refer to the current parts list for differences and available parts.

Steering box rocker shaft seal— To remove (steering box in position)

1. Place the car on a ramp or over a pit.
2. Remove the pendulum lever as described in 'Steering box—To remove'.
3. Remove the rocking shaft seal retaining ring.
4. Place a container under the steering box to catch the steering box fluid. Start the engine and turn the steering wheel to full right-hand lock (right-hand drive cars) left-hand lock (left-hand drive cars); fluid pressure will force the seals and backing washers out of the steering box housing. To prevent fluid loss and steering pump wear do not hold the steering wheel in the full lock position for more than a few seconds at a time. Stop the engine as soon as the seals are forced out; inspect the seals for damage.
5. If the outside diameter of the seal is scored inspect the internal bore of the steering box housing for burrs and if necessary remove them using a fine emery stone.

Steering box rocker shaft seal—To fit (steering box in position)

1. Thoroughly wash the rocking shaft bore and splines to remove any particles of dirt or metal.
2. Wrap one layer of tape around the rocking shaft splines to prevent damage to the seals as they are fitted.

3. Lubricate the rocking shaft bore and single lip seal with power steering fluid.

4. Fit the seal into the rocking shaft bore (*see Fig. N29*) using seal fitting tool (RH 7779). Do not drive the seal more than $\frac{1}{8}$ in. (3,18 mm.) above the lip of the rocking shaft bore.

5. Remove the seal fitting tool and place one of the steel backing washers over the shaft; drive the seal a further $\frac{1}{8}$ in. (12,7 mm.) into the rocking shaft bore.

6. Lubricate the double lip seal with power steering fluid and fit over the rocking shaft.

7. Drive the seal into the rocking shaft bore until the bottom of the seal is flush with the retaining ring groove.

8. Place the other steel backing washer and the retaining ring in the rocking shaft bore.

9. Drive both seals up into the rocking shaft bore until the circlip locates in the circlip groove.

Note Do not drive the seals further than is necessary for the circlip to engage with the circlip groove.

Steering box—To remove

1. Place the car on a ramp or over a pit.
2. Disconnect the battery.
3. Using a syringe drain the steering pump (both types) taking care not to damage the filter support plate (Hobourn Eaton pump only).
4. Remove the two flexible hoses from the upper section of the steering box housing; blank the hose ends and the steering box ports against the ingress of dirt.
5. On left-hand drive cars disconnect the hoses from the two steering box extension pipes.
Note A certain amount of fluid will drain from the two hoses when they are disconnected from the steering box.
6. Remove the front exhaust pipe and silencer assembly.

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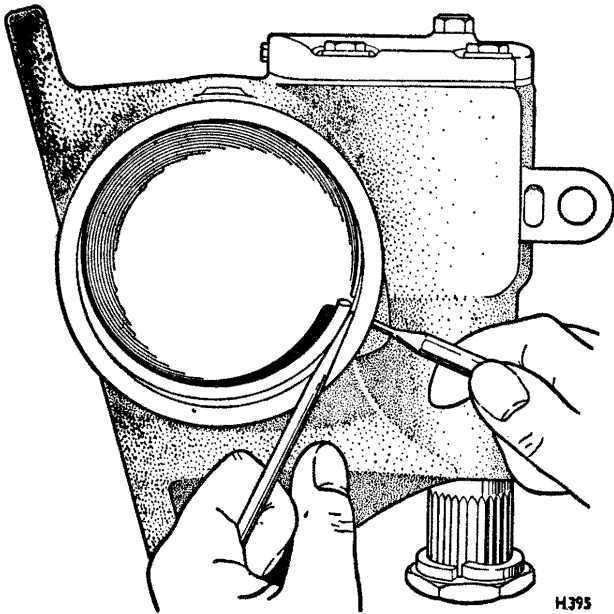


FIG. N23 REMOVING END PLUG RETAINING RING

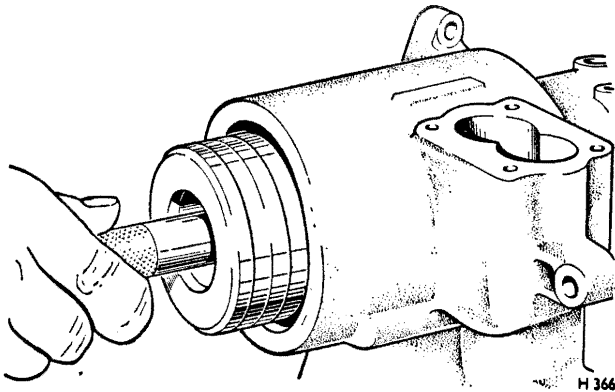


FIG. N24 INSTALLING RACK-PISTON ARBOR TOOL IN END OF WORM

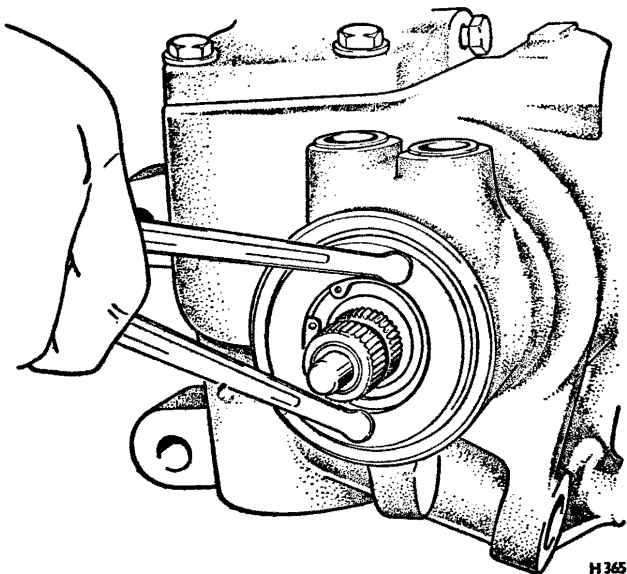


FIG. N25 REMOVING ADJUSTER PLUG ASSEMBLY

7. Remove the lower steering column assembly (see 'Lower steering column assembly—To remove').
8. Support the engine with either a sling or a jack and wooden pad.
9. Remove the two nuts and washers securing the engine front mounting.
10. Remove the nuts and bolts securing the steering box pipes to the engine front cross-member.
11. Remove the split pin and nut from the pendulum lever joint on the steering cross-beam then, using extractor (RH 8100), partially extract the ball pin from the lever.
12. Remove the nut securing the pendulum lever to the rocking shaft; remove pendulum lever using extractor (RH 8023).
13. Remove the four bolts, nuts and washers securing the engine cross-member to the steering box and the steering idler/damper housing; remove the cross-member.
14. Remove the three setscrews and washers securing the steering box to the front suspension sub-frame.
Remove the steering box.

Steering box—Removal of major components

1. Position the steering box assembly in a vice with the end plug facing upwards.
2. Rotate the end plug retaining ring so that one end of the ring is over the hole in the housing. Spring one end of the ring with a punch to allow a screwdriver to be inserted and lift the ring out (see Fig. N23).
3. Rotate the stub shaft anti-clockwise (left-hand drive cars) and clockwise (right-hand drive cars), until the rack-piston just forces the end plug out of the housing.
Note Do not rotate the flange any further than necessary otherwise the balls will fall out of their circuit and the rocker shaft teeth and rack-piston will become disengaged.
Remove the end plug and discard the 'O' ring.
5. Remove the rack-piston end plug using a $\frac{1}{2}$ in. (1.27 cm.) square drive.
Note To facilitate removal, tap the rack-piston end plug with a mallet to unseat the threads. This is important as the end plug is torque tightened to 50 lb. ft. (6.9 kg.m.) during initial assembly and could break during removal if not handled carefully.

6. Remove and discard the lock-nut from the rocking shaft adjuster screw.

7. Remove the four screws and lock washers which secure the rocking shaft cover to the housing.

8. Rotate the rocking shaft adjuster screw with an Allen key until the rocking shaft cover is lifted from the housing.

9. Separate the rocking shaft cover from the rocking shaft. Discard the rocking shaft cover 'O' ring seal.

10. Turn the coupling flange until the rocking shaft teeth are centred in the housing.

11. Tap the end of the rocking shaft with a soft mallet and slide the rocking shaft out of the housing.

12. Insert Rack-piston Arbor (RH 7787), into the rack-piston against the end of the worm shaft. Turn the coupling flange anti-clockwise, (left-hand drive cars) and clockwise (right-hand drive cars) while holding the tool tightly against the worm to force the rack-piston on to the arbor, then remove the rack-piston from the gear housing (see Fig. N24).

13. Remove the screw retaining the stub shaft to the coupling flange and remove the coupling flange assembly.

14. Wrap the splines with one thickness of tape.

15. Remove the adjuster plug lock-nut by breaking it loose with a hammer and punch, then remove the lock-nut from the housing.

16. Unscrew the adjuster plug assembly, using Wrench (RH 7788) (see Fig. N25), and remove the adjuster plug assembly together with the valve assembly by pulling out the stub shaft.

17. Remove the worm, the lower thrust bearing, and the races from the upper end of the housing.

Steering box housing, rocking shaft needle bearing and seals— To dismantle

1. Remove the rocking shaft seal retaining ring from the steering box housing and withdraw the outer backing washer.

2. Insert a screwdriver between the outer seal and the inner backing washer then prise out the seal and remove the backing washer.

3. Insert a screwdriver between the inner seal and shoulder of the steering box housing and prise out the seal. Care must be taken to prevent damage to the seal bore. Discard the seals.

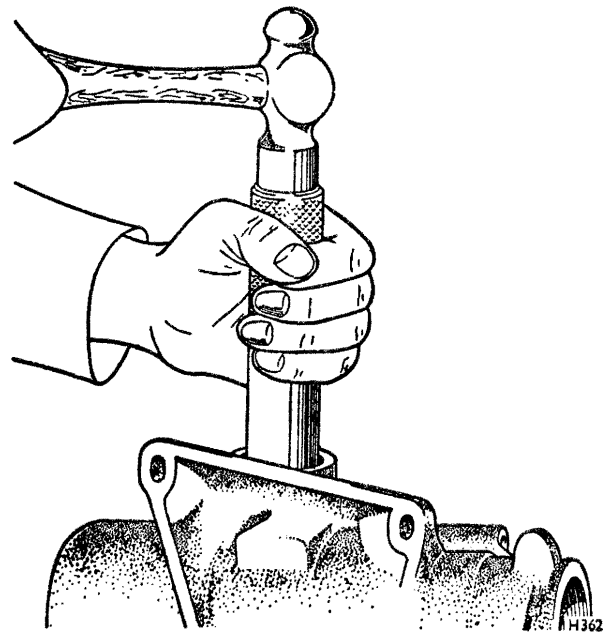


FIG. N26 REMOVING AND INSTALLING ROCKER SHAFT BEARING

4. Inspect the rocking shaft needle bearing and if the rollers are broken or pitted, remove the needle bearing from the steering box housing using the rocking shaft bearing extraction and insertion tool (RH 7781) (see Fig. N26).

Steering box housing rocking shaft needle bearings and seals—To inspect

1. Inspect the housing bore. If badly scored or worn, renew the housing.

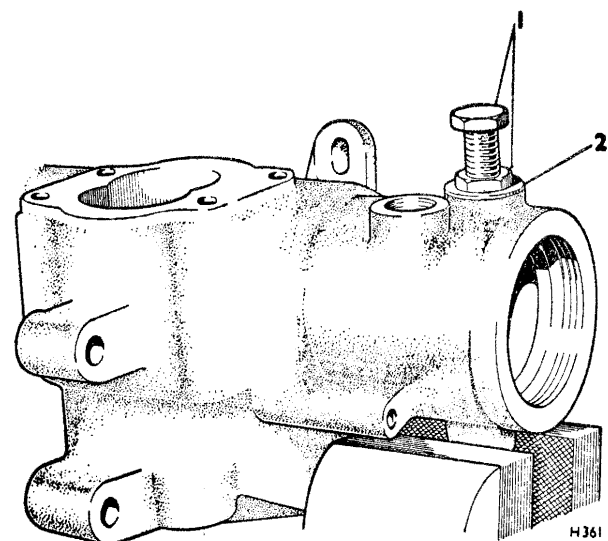


FIG. N27 REMOVING HOSE CONNECTOR SEAT WITH BOLT

1 $\frac{5}{16}$ in. bolt and nut 2 Flat washer

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2. Inspect the high and low pressure line hose connector seats, the poppet valve and seat in the steering box housing. Renew if they are badly scored, cracked or distorted.

3. Inspect the ball plug in the valve body end of the housing. If it is leaking or raised above the surface it should be seated flush or $\frac{1}{16}$ in. (1.59 mm.) below the surface. Lightly peen over the end of the bore to secure the ball.

4. Inspect all retaining ring grooves and seal surfaces for damage or failure.

Hose connectors—To remove

1. To prevent metal particles from becoming lodged in the valve assembly, pack the inside of the connector seat with petroleum jelly

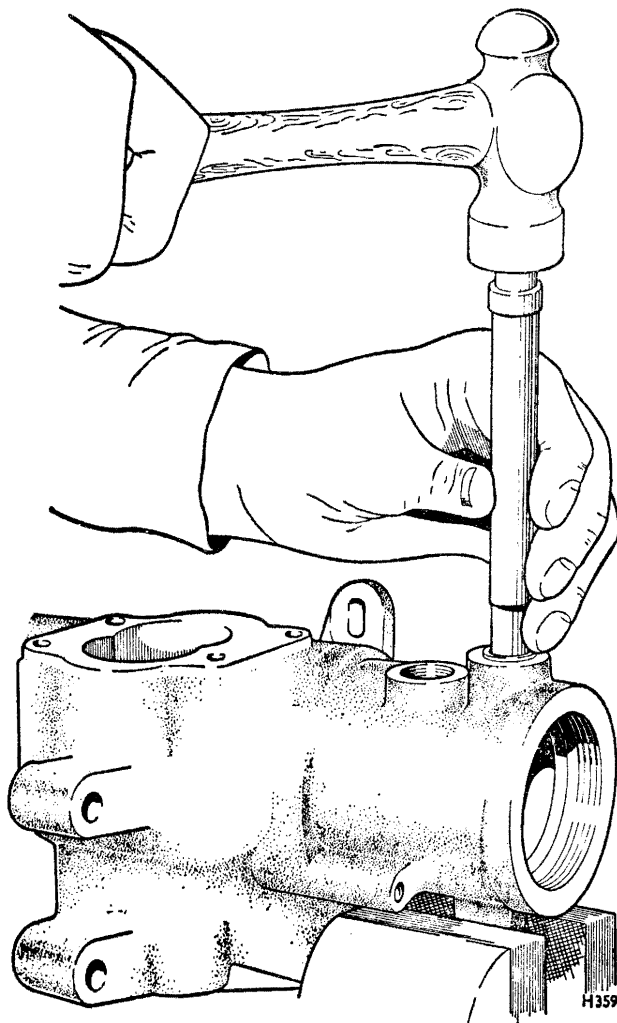


FIG. N28 INSTALLING HOSE CONNECTOR SEAT

2. Tap threads in the connector seats using a $\frac{5}{16}$ in. thread tap.

Note Do not tap threads too deeply in the pressure hose connector seat as the tap will bottom the poppet valve against the housing and damage it. It is necessary to tap only 2 or 3 threads deep.

3. Insert a $\frac{5}{16}$ in. threaded bolt with a nut and suitable flat washer into the tapped hole (see Fig. N27).

4. To extract the connector seat, prevent the bolt from rotating while screwing the nut off the bolt. This will extract the connector from the housing. Discard the connector seat.

5. Remove and discard the poppet valve and spring from the pressure port.

6. Wipe all the petroleum jelly from the housing and clean the housing thoroughly to remove any metal swarf or dirt.

7. Insert a new poppet valve spring in the pressure port with its large end downwards.

8. Make sure the spring is seated in the counter-bore in the pressure port. Insert a new poppet valve over the spring with its tangs pointing downwards. Make sure that the valve is centred on the small end of the spring.

9. Fit new connector seats using petroleum jelly to hold the connector seat on the poppet valve in the pressure port. Bed the connector seats lightly in place using valve connector seat insertion tool (RH 7786) (see Fig. N28).

10. Check the operation of the valve by pushing lightly against the valve with a pencil point or small rod. The valve should re-seat itself against the connector seat when the rod is removed.

Steering box housing rocking shaft needle and bearing seals—To assemble

1. Thoroughly clean all the components and lubricate them with the approved power steering fluid.

2. If the rocking shaft needle bearing was previously removed fit new bearings on the end of the rocking shaft bearing extraction and insertion tool (RH 7781) with the letters on the bearing against the tool. Position the bearing and tool in the housing and drive the bearing into the housing (see Fig. N26). The upper edge of the bearing should be approximately 0.03 in. (0.762 mm.) below the shoulder in the bore of the housing.

3. Lubricate the rocking shaft bore and single lip rocking shaft seal with the approved power steering fluid and insert the seal into the bore using the rocking shaft seal insertion tool (RH 7779) (*see Fig. N29*). Do not drive the seal more than $\frac{1}{8}$ in. (3,18 mm.) below the face of the housing.

4. Remove the insertion tool and place a steel washer on top of the seal. Using insertion tool (RH 7779) drive the seal approximately $\frac{1}{2}$ in. (12,7 mm.) further into the bore.

5. Lubricate the double lip seal with the approved power steering fluid and insert it into the bore (*see Fig. N29*). Using rocking shaft seal insertion tool (RH 7779) drive the seal into the bore until the top edge of the seal is flush with the bottom edge of the circlip groove.

6. Remove the seal insertion tool and place a steel washer and circlip over the seal. Using the seal insertion tool drive both seals down into the bore until the circlip seats into the circlip groove.

Note In order to avoid possible damage to the sealing surface of the lower seal, it is important that the seals and washers are driven down only far enough to allow the circlip to seat into the ring groove.

Adjuster plug assembly—To dismantle

1. Remove the thrust bearing retainer with a screwdriver (*see Fig. N30*), taking care not to score the needle bearing bore, discard the thrust bearing retainer.
2. Remove the thrust bearing spacer, thrust bearing and bearing races.
3. Remove and discard the adjuster plug 'O' ring seal.
4. Remove the stub shaft seal retaining circlip.
5. Remove and discard the combination washer, dust seal and stub shaft fluid seal.

Adjuster plug assembly—To inspect

1. Inspect the needle bearing in the adjuster plug. If the rollers are broken or pitted, remove the needle bearing by pressing out from the thrust bearing end, using the adjuster plug bearing extraction and insertion tool (RH 7783) (*see Fig. N31*).
2. Inspect the thrust bearing spacer for cracks.
3. Inspect the thrust bearing rollers for signs of wear, pitting, scoring or cracking. If any of these conditions are found, renew the thrust bearing, bearing races and check the condition of the thrust bearing spacer.

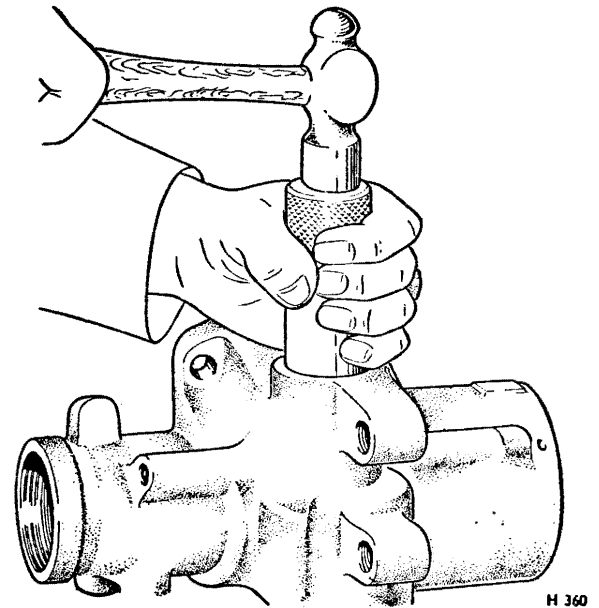


FIG. N29 INSTALLING ROCKER SHAFT SEAL

Adjuster plug assembly—To assemble

1. If the adjuster plug needle bearing was previously removed, fit a new needle bearing on to the adjuster plug bearing extraction and insertion tool (RH 7783) with the letters on the bearing against the tool.
2. Position the bearing and tool over the thrust bearing end of the plug and drive the bearing into the plug (*see Fig. N31*). The end of the bearing must be flush with the bottom surface of the stub shaft seal bore.
3. Lubricate the new stub shaft fluid seal with the approved power steering fluid and, using adjuster plug seal insertion tool (RH 7780) (*see Fig. N32*) install the seal far enough to provide clearance for the dust seal and retaining ring.

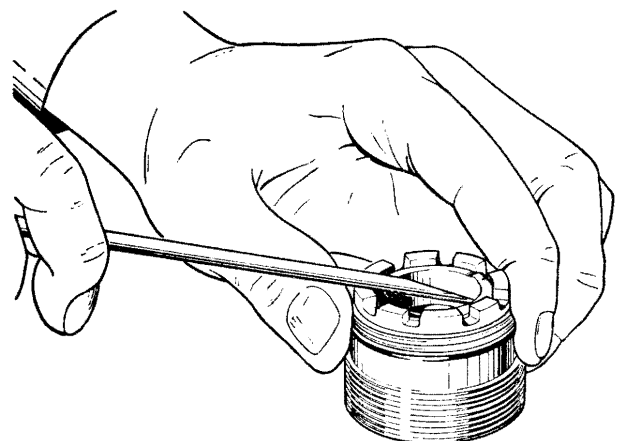
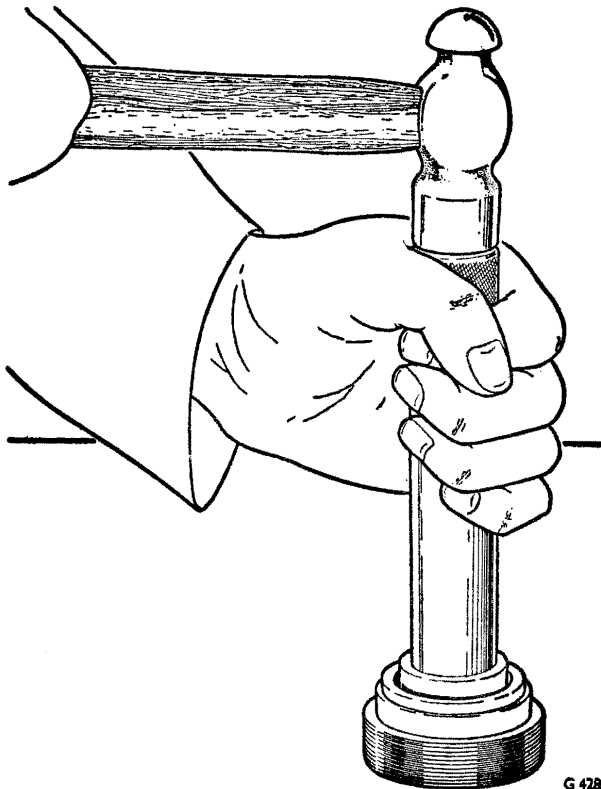


FIG. N30 REMOVING THRUST BEARING RETAINER

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**FIG. N31 REMOVING AND INSTALLING
ADJUSTER PLUG NEEDLE BEARING**

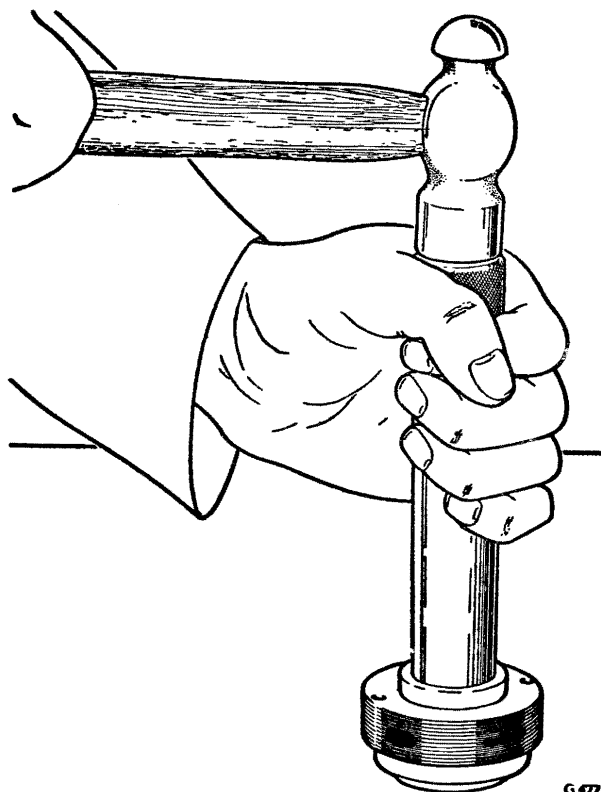


FIG. N32 INSTALLING OIL SEAL

4. Lubricate the new dust seal with the approved power steering fluid and install in the plug with the rubber face outward.

5. Fit the retaining circlip, making certain that it is correctly seated.

6. Lubricate the new 'O' ring seal with the approved power steering fluid and fit it in the groove on the adjuster plug.

7. Assemble the large outside diameter thrust race and thrust bearing, small thrust race, and thrust bearing spacer on the adjuster plug. Press the needle bearing into the needle bearing bore using a brass drift.

Note Location of circumferential dimples is not important.

Stub shaft and valve

1. The complete valve assembly is a precision unit with selectively fitted parts and is hydraulically balanced during assembly. If replacement of any valve part other than rings and seals is necessary, the complete rotary valve assembly must be renewed as a unit.

To avoid the possibility of damage to the assembly, do not dismantle the valve unless absolutely necessary.

2. If the valve spool damping 'O' ring requires replacement, remove the valve spool as described in the following paragraphs, renew the 'O' ring and fit the spool.

Stub shaft and valve—To dismantle

1. Remove and discard the worm to cap 'O' ring.
2. Remove the spool spring, using a small screwdriver.
3. Ease the spring on to the bearing diameter of the stub shaft then slide the spring off the stub shaft. **Do not score the bearing surface.**

4. Remove the valve spool from the valve body.

Note Clearance between the valve body and spool may be as low as 0.0004 in. (0.010 mm.). Slight cocking of the spring may cause it to stick in the valve body.

5. To remove the valve spool hold the valve assembly in both hands with the stub shaft pointing downwards. Place the fingers under the valve body and thumbs on the valve body cap, holding it securely against the valve body. Lightly tap the end of the torsion bar against a work bench. This will expose the spool sufficiently to enable it to be withdrawn from the valve body. Withdraw the spool with a

steady twisting pull to prevent jamming. If slight sticking occurs, carefully work the spool back into the valve body. If this does not free the spool it has become cocked in the valve body bore, and no attempt should be made to force the spool in or out. Continue to dismantle the valve assembly as follows and remove the spool as described later.

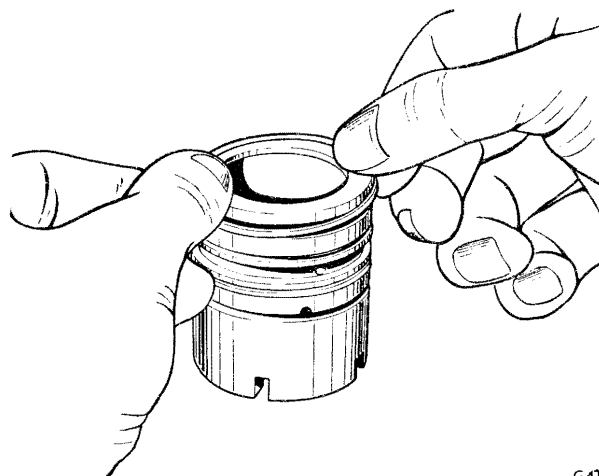
6. Remove the stub shaft, torsion bar, and valve cap assembly by holding the valve assembly in both hands as before, only with the thumbs on the valve body. Lightly tap the torsion bar against a work bench. This will dislodge the cap from the valve body-to-cap pin. The stub shaft torsion bar and valve cap assembly can now be removed from the valve body.

7. If the valve spool has become cocked as described earlier, it can now be freed. Visual inspection on a flat surface will show in which direction the spool is cocked. A few very light taps with a light hide mallet should align the spool in the bore and free it.

Note Do not tap the spool with anything metallic.

Stub shaft and valve—To inspect

1. If there is evidence that the torsion bar 'O' ring seal inside the stub shaft has been leaking, the entire valve assembly should be renewed.
2. Check the pin in the valve body that engages the cap. If it is severely worn, cracked or broken, the entire valve assembly should be renewed.
3. Check the smaller of the two worm pin grooves in the valve body. If this is severely worn, the entire valve assembly should be renewed.
4. Check the spool drive pin on the stub shaft. If it is severely worn, cracked or broken, the entire valve assembly should be renewed.
5. Examine the spool outside diameter for nicks, burrs, or badly worn spots. If evidence of any of these is found, the entire valve assembly should be renewed. A slight polishing effect on valve surfaces is normal.
6. Check the fit of the spool in the valve body before inserting the valve spool damping 'O' ring seal.
7. When lubricated with the approved power steering fluid the spool should rotate freely. If binding or catching occurs the entire valve assembly should be renewed.
8. Measure the length of the spool spring; the free length should be 0.83 in. (21.0 mm.). The inner diameter of the top loop of the spring should be between 0.76 in. and 0.8 in. (19.44 mm. and 20.24 mm.). Renew the spring if the measurements are not as specified.



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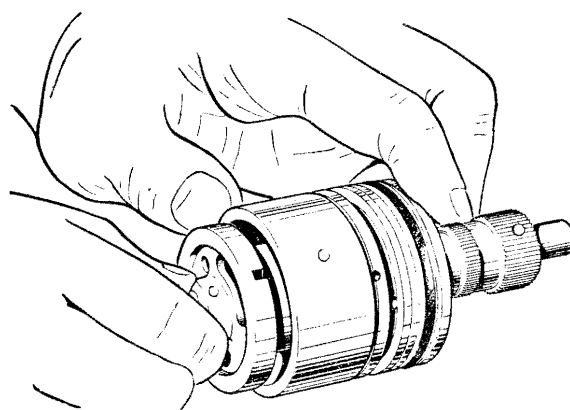
FIG. N33 INSTALLING VALVE RING

9. Examine the needle bearing diameter of the stub shaft. If it is badly worn or scored, the entire valve assembly should be renewed.

10. Examine the valve body rings, if damaged, carefully cut the valve rings and 'O' ring backing seals. Remove and discard them.

Stub shaft and valve—To assemble

1. If new valve body ring backing 'O' rings seals are necessary lubricate them with the approved power steering fluid and fit them in the ring grooves on the valve body. Do not allow the seals to become twisted. If new valve body rings are necessary, lubricate them with the approved power steering fluid and fit the valve rings in the ring grooves over the backing 'O' ring seals by carefully slipping the rings over the valve body (see Fig. N33). The rings may appear to be loose in the grooves, but the heat of the fluid after assembly will cause them to tighten.



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FIG. N34 INSTALLING STUB SHAFT IN VALVE BODY

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2. Lubricate the new valve spool damping 'O' ring seal with the approved power steering fluid and insert the seal into the valve spool groove.

3. Insert the stub shaft into the valve body, aligning the groove in the valve cap with the pin in the valve body (see Fig. N34). Tap lightly on the cap with a hide mallet until the cap is against the shoulder in the valve body, with the valve body pin in the cap groove. Hold these parts together during the remainder of the assembly procedure.

4. Lubricate the valve spool with the approved power steering fluid and slide the spool over the stub shaft with the notch towards the valve body. Align the notch with the spool drive pin in the cap groove stub and carefully engage the spool in the valve body bore.

Note Because the clearance between the spool and valve body is very fine, extreme care must be taken when assembling these parts. Push the spool evenly and slowly, with a slight twisting motion, until it reaches the drive pin. Rotate the spool slowly with pressure until the notch engages the pin. Before pushing the spool completely in, make sure that the damping 'O' ring seal is evenly distributed in the spool groove. Slowly push the spool completely in, taking care not to cut or pinch the 'O' ring seal by inserting the spool beyond its normal position.

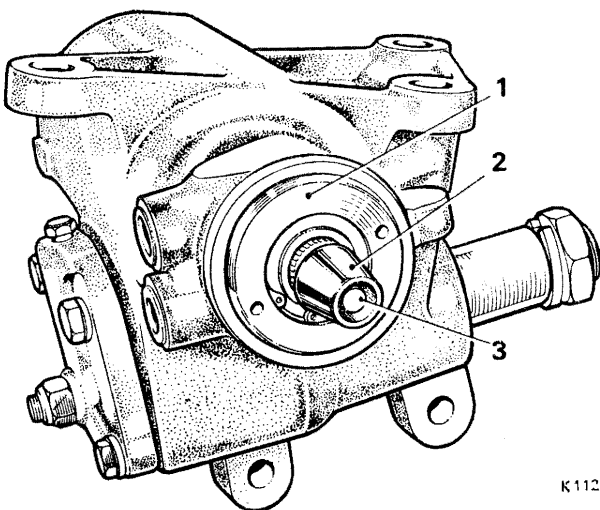


FIG. N35 INSTALLING ADJUSTER PLUG ASSEMBLY

- 1 Adjuster plug assembly
- 2 Seal protector
- 3 Stub shaft

5. Slide the spool spring over the stub shaft and, using a small screwdriver, ease the spool spring down until it is seated in the stub shaft groove.

6. Lubricate the new cap-to-worm 'O' ring seal with the approved power steering fluid and insert it into the valve body.

Note Do not fit the upper thrust bearing assembly to the valve assembly at this stage.

Rocking shaft gear and rocking shaft cover— To inspect

1. Inspect the rocking shaft bearing surface in the rocking shaft cover for excessive wear or scoring. If badly worn or scored, renew the rocking shaft cover.

2. Examine the rocking shaft sector teeth and bearing and the seal surface. If excessively worn, pitted or scored, renew the rocking shaft.

3. Check the rocking shaft for excessive wear or for a broken spring as follows.

4. Clamp the rocking shaft in a vice.

5. Using a torque wrench with a $\frac{7}{32}$ in. (5,56 mm.) Allen key, measure the torque required to turn the adjuster screw. The torque reading should be between 1 lb. in. and 5 lb. in. (0,012 kg.m. and 0,173 kg.m.). If the reading is not within this range, the rocking shaft must be renewed.

Rack—piston and worm assembly— To dismantle

1. Remove the return guide clamp screws and remove the clamp.

2. Place the assembly on a clean cloth and remove the ball return guides and rack-piston arbor (RH 7787). Make sure that all the 22 balls are caught in the cloth.

Rack-piston and worm assembly— To inspect

1. Inspect the worm and rack-piston grooves and all the balls for excessive wear or scoring. If either the worm or the rack-piston require renewal, both must be renewed as a matched assembly.

2. Inspect the ball return guides, ensuring that the ends where the balls enter and leave the guide are not damaged.

3. Inspect the lower thrust bearing and races for wear, pitting, scoring or cracking. If any of these conditions are found renew the thrust bearing and races and check the worm shaft.

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4. Inspect the rack-piston and end plug to ensure that the threads are not damaged.
5. Inspect the rack-piston teeth and rack-piston outside diameter for abnormal wear, scoring or burrs.
6. Examine the piston ring; if damaged, remove and discard the ring and backing 'O' ring seal.

Rack-piston and worm assembly— To assemble

1. Thoroughly clean the parts and lubricate them with the approved power steering fluid.
2. Lubricate the new backing 'O' ring seal and insert it in the piston ring groove on the rack-piston. Do not allow the seal to become twisted. Fit the new piston ring into the groove over the 'O' ring seal.
3. Insert the worm into the end of the rack-piston, from the end opposite the piston ring, until the worm is against the rack-piston shoulder.
4. Load 16 balls into the guide hole nearest to the piston ring while rotating the worm anti-clockwise to feed the balls through the circuit. Alternate black balls with white balls throughout the circuit.
5. Apply a liberal amount of petroleum jelly to one ball return guide and load the remaining 6 balls into the guide. Place the outer guide over the balls and ball guide and insert the guides into the guide holes of the rack-piston. Ensure that black ball in the guide is installed next to the white ball in the rack-piston. The guides should fit loosely.
6. Place the return guide clamp over the guides and secure it with two screws and lockwashers; torque tighten to 12 lb. ft. (1,66 kg.m.).

The worm groove is ground with a high point in the centre. When the rack-piston passes over this high point a load of between 1 lb. in. and 4 lb. in. (0,12 kg.m. and 0,46 kg.m.) should be obtained. To measure

the pre-load of the worm and rack-piston ball assembly proceed as follows.

7. Clamp the rack-piston in a suitably protected vice with the worm shaft pointing upwards. Do not distort the rack-piston by over-tightening the vice.

8. Place the valve assembly on the worm shaft, engaging the worm shaft drive pin. Rotate the worm shaft until it extends 1.25 in. (3,17 cm.) from the rack-piston to the thrust bearing face. This is the centre position.

9. Apply a torque wrench with $\frac{3}{4}$ in. (19,05 mm.) socket to the stub shaft and rotate the wrench several times through an arc of approximately 60° in both directions then take a torque reading. The highest average reading obtained with the worm rotating should be between 1 lb. in. and 4 lb. in. (0,012 kg.m. and 0,046 kg.m.).

If the reading is below 1 lb. in. (0,012 kg.m.) a new set of balls must be fitted. Service replacement balls are available in sizes listed in the following chart.

Note the ball size stamped on the rack-piston and fit the next size larger balls to increase the pre-load.

Note If a number cannot be found on the rack-piston, the original ball size was 7.

A change of one ball size (higher size code) will increase the pre-load approximately 1 lb. in. (0,012 kg.m.). Final pre-load on replacement balls should be between 2 lb. in. and 3 lb. in. (0,023 kg.m. and 0,035 kg.m.).

10. Remove the valve assembly from the worm.
11. Remove the rack-piston from the vice.
12. Insert the rack-piston arbor until it registers against the worm shaft and turn the rack-piston on to the arbor. Do not allow the arbor to separate from the worm shaft until the rack-piston is fully on the arbor.

Piston ball sizes

SIZE CODE	MEAN DIA.	SIZE RANGE OF BALL
7	0.28125 in. (0,71437 cm.)	0.28120-0.28130 in. (0,71425 cm.-0,71450 cm.)
8	0.28133 in. (0,71457 cm.)	0.28128-0.28138 in. (0,71427 cm.-0,71452 cm.)
9	0.28141 in. (0,71486 cm.)	0.28136-0.28146 in. (0,71451 cm.-0,71490 cm.)
10	0.28149 in. (0,71498 cm.)	0.28144-0.28154 in. (0,71485 cm.-0,71511 cm.)

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Steering box—To assemble

1. Position the steering box housing in a protected vice with the adjuster plug end facing upwards.

2. Lubricate the worm shaft, lower thrust bearing, and races with the approved power steering fluid then position the thrust bearing and races on the worm shaft.

3. Align the valve body drive pin on the worm shaft with the narrow pin slot on the valve body. Ensure that the 'O' ring seal is fitted between the valve body and the worm head.

4. Position the valve assembly and worm shaft in the housing as an integral unit.

Note Do not push against the stub shaft as this may cause the stub shaft and cap to pull out the valve body, allowing the spool seal to slip into the valve body fluid grooves. The valve assembly can be installed by pushing on the outer diameter of the valve body housing with the fingers of both hands. Ensure that the white plastic rings are not binding on the inside of the housing. The valve assembly is correctly seated when the fluid return in the housing is fully visible.

5. Place the adjuster plug seal protector (RH 7782) over the end of the stub shaft.

6. Fit the adjuster plug assembly over the end of the stub shaft (*see Fig. N35*), and tighten just sufficiently to make certain that all parts are correctly seated in the housing. Remove the seal protector (RH 7782).

Note If the seal protector (RH 7782) is removed too soon, the stub shaft seal will be damaged by the shaft splines.

7. Fit the adjuster plug lock-nut loosely on the adjuster plug.

Note Do not adjust the thrust bearing pre-load at this time.

8. Insert rack-piston seal compressor (RH 7785) into the steering box housing (*see Fig. N36*), holding it tightly against the shoulder in the housing.

9. Insert the rack-piston into the housing until the arbor engages with the worm. Turn the stub shaft clockwise using a $\frac{3}{4}$ in. (19,05 mm.) socket or box spanner to draw the rack-piston into the housing. When the piston ring is in the housing piston bore the rack-piston arbor (RH 7787) and the seal compressor (RH 7785) can be removed.

10. Turn the stub shaft as necessary until the middle rack groove in the rack-piston is aligned with the centre of the rocking shaft needle bearing. Lubricate the new side cover 'O' ring seal and fit it into the groove in the face of the side cover.

11. Secure the rocking shaft cover to the rocking shaft by screwing the cover to rocking shaft adjuster screw until the rocking shaft cover bottoms on the rocking shaft, then back off $\frac{1}{2}$ a turn.

12. Install the rocking shaft so that the centre tooth in the sector meshes with the centre groove of the rack-piston. Ensure that the rocking shaft cover 'O' ring is in place before pushing the side cover down on the steering box housing.

13. Fit the rocking shaft cover screws and lock washers and torque tighten to 30 lb. ft. (4,148 kg.m.). Hold the adjuster screw with an Allen key and fit the adjuster lock-nut halfway on to the adjuster screw.

14. Insert the rack-piston end plug into the rack-piston.

15. Torque tighten the end plug to 50 lb. ft. (6,91 kg.m.).

16. Lubricate the new end plug 'O' ring seal and insert it into the groove in the end plug.

17. Insert the end plug into the steering box housing and seat it against the 'O' ring seal. Light tapping with a mallet may be necessary to seat the end plug correctly.

18. Snap the end plug retainer ring into place by hand. Light tapping may be required to bottom the retainer ring securely in the steering box housing.

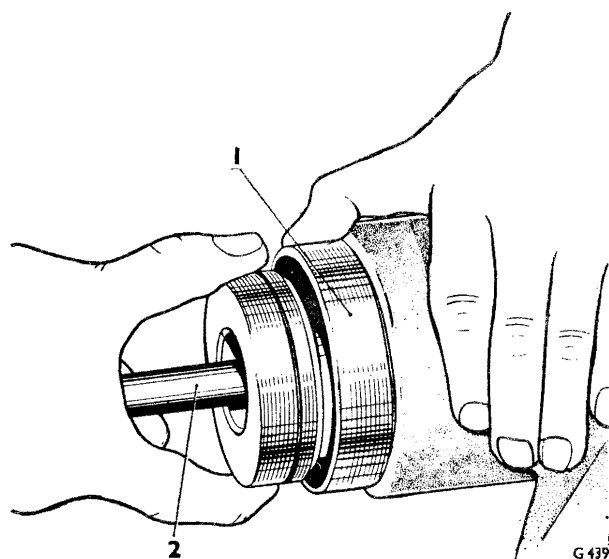


FIG. N36 INSTALLING RACK-PISTON SEAL COMPRESSOR

1 Seal compressor 2 Rack-piston arbor

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19. Position the gear assembly with the stub shaft end uppermost and adjust the thrust bearing pre-load as follows.

20. Using spanner-wrench (RH 7788), lightly tighten the adjuster plug and then back off $\frac{1}{8}$ of a turn.

21. Fit a 0 lb. in. to 25 lb. in. (0 kg.m. to 0,288 kg.m.) torque wrench with a $\frac{3}{4}$ in. (19,05 mm.) socket to the stub splines.

22. Rotate the stub shaft to either the left or right turn stop, then back off from the stop $\frac{1}{2}$ a turn.

23. Rotate the torque wrench in a 45° arc and note the highest reading. Tighten the adjuster plug with spanner wrench (RH 7788) until there is a pre-load of 1 lb. in. to 3 lb. in. (0,012 kg.m. to 0,035 kg.m.) higher than the initial load reading just measured.

24. Securely tighten the adjuster plug lock-nut with a punch and hammer.

25. Check the pre-load to ensure that it still reads 1 lb. in. to 3 lb. in. (0,012 kg.m. to 0,035 kg.m.) higher than the initial load.

26. Adjust the rocking shaft end play as described in Operations 27 to 30 inclusive.

27. Rotate the stub shaft from one stop to the other to locate the centre of travel.

28. With the steering box on centre, check the combined ball and thrust bearing pre-load with a torque wrench fitted with a $\frac{3}{4}$ in. (19,05 mm.) point socket and note the highest reading.

29. With the steering box on centre and the adjuster screw lock-nut backed off, adjust the rocking shaft so that pre-load is 8 lb. in. to 10 lb. in. (0,09 kg.m. to 0,12 kg.m.) in excess of the total pre-loading and drag.

Note These readings should be made by rotating the torque wrench in a 20° arc. The total pre-load of the steering box should not exceed 20 lb. in. (0,23 kg.m.).

30. With the steering box on centre and the correct reading achieved, torque tighten the adjuster screw lock-nut to 30 lb. ft. (4,15 kg.m.).

31. Fit the coupling flange assembly to the stub shaft and insert the flange screw to the coupling; torque tighten the screw to 30 lb. ft. (4,15 kg.m.).

Steering box—To fit

1. Secure the steering box to the front suspension sub-frame with the three setscrews and washers.

2. Fit the front engine cross-member, lower the engine and tighten the front engine mounting nuts.

3. Connect the lower steering link splined coupling to the steering box input shaft and tighten the pinch

bolt. The coupling has an internal flat machined on the splines to correspond with a flat on the steering box input shaft and can only be fitted in one position.

4. Connect the upper steering column link to the main steering column assembly.

5. Turn the steering wheel to either full lock position and turn back approximately $2\frac{1}{8}$ turns.

6. Fit the pendulum lever (pointing to the rear of the car) to the rocking shaft; do not tighten the nut on the rocking shaft.

Note The pendulum lever can only be fitted to the rocking shaft in one position, this being determined by a number of master splines and the steering box 'tight spot' position.

7. To align the steering box 'tight spot' position with the road wheels refer to Section N6.

8. Fit the cross-beam ball joint to the pendulum lever and torque tighten the nut to between 29 lb. ft. and 32 lb. ft. (4,0 kg.m. and 4,4 kg.m.) and fit the split pin.

Note Do not slacken the nut to fit the split pin.

9. Connect the two flexible hoses to the ports in the steering box, ensuring that the pressure line is connected to the foremost port.

10. On left-hand drive cars fit the flexible hoses to the steering box extension pipes.

Important If the steering box or steering housing is disturbed at any time refer to 'Chapter H—Front suspension settings'.

11. Check the position of the steering wheel. If it is slightly mis-aligned in the 'straight-ahead' position slacken the two securing setscrews connecting the splined flange to the universal knuckle, and move the flange in the slots. Torque tighten the setscrews to between 29 lb. ft. and 32 lb. ft. (4,0 kg.m. and 4,4 kg.m.).

12. Ensure that the bolts securing the steering box to the front suspension sub-frame are torque tightened to between 42 lb. ft. and 45 lb. ft. (5,8 kg.m. and 6,2 kg.m.).

13. Fit the packing between the engine stop-plate and the engine if the steering box and damper are more than halfway down their slots.

14. Secure the front engine mount to the torque arm; the torque tightness of the two securing bolts should be 65 lb. ft. (8,98 kg.m.).

15. Check the level of the steering pump reservoir then prime the system as described previously.

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Checking steering box pre-load (steering box on car)

1. When the steering gear is thought to be out of adjustment a quick check can be made by moving the steering wheel to and fro with short slow motions at the 'on centre' position with the ignition switched off. Excessive looseness felt or heard indicates that either the rocking shaft or the thrust bearing requires adjustment. These adjustments can be made on the car by using the following procedure.

Thrust bearing pre-load check (2 turns off-centre)

1. Remove the pendulum lever from the cross-beam using pendulum lever puller (RH 8100).

2. Turn the steering wheel two turns 'off-centre'; just away from the stops, and use a spring tension gauge with a piece of wire or strong cord to measure the pull on the steering wheel rim through an arc not exceeding one inch (see Fig. N37). The total pull should be between 4 oz. and 12 oz. (0,113 kg. and 0,340 kg.) (thrust bearing and friction). If the 'off-centre' pull is greater or less than specified, loosen the adjuster plug lock-nut and back off the adjuster plug $\frac{1}{8}$ of a turn using a spanner wrench (RH 7788).

Note If the position of the holes in the adjuster plug is such that there is insufficient clearance for using the spanner wrench, insert a bolt $\frac{3}{4}$ in. (19 mm.) long in one of the adjuster plug holes and rotate the coupling flange until the lower flange contacts the bolt. Then back off the adjuster plug $\frac{1}{8}$ of a turn.

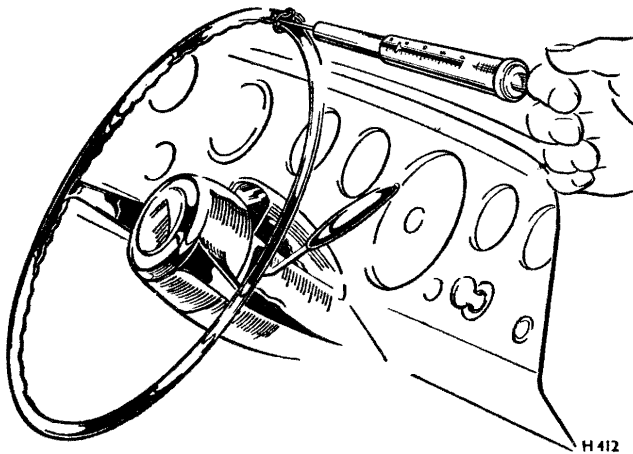


FIG. N37 CHECKING THE STEERING BOX PRE-LOAD

3. Recheck the steering wheel 'pull' with the wheel two turns 'off-centre'. Adjust the pre-load by tightening the adjuster plug to obtain 2 oz. to 6 oz. (0,056 kg. to 0,170 kg.) (at the rim of the wheel) in excess of the total drag that was just measured with the adjuster plug backed-off $\frac{1}{8}$ of a turn.

4. Tighten the adjuster plug lock-nut and recheck the pre-load to ensure the plug did not move when the nut was tightened.

Checking rocking shaft end play (On centre)

1. Find the exact centre of the steering wheel travel. The tight spot due to the rocking shaft should extend for $\frac{1}{4}$ of a turn to either side.

2. With the steering wheel 'on-centre' measure and record the total pull through an arc of three inches or less.

This reading should not be more than 36 oz. (1,02 kg.), but should be at least 8 oz. (0,226 kg.) but never more than 20 oz. (0,566 kg.) more than a reading taken $\frac{1}{2}$ a turn 'off-centre'.

Note On new steering boxes the factory setting with ball bearing pre-loads and new seal drag may cause a total pull to be as high as 40 oz. (1,13 kg.). Within the first 100 miles (160 km.) of operation the seals seat themselves and the ball bearings polish the rack-piston and worm shaft grooves sufficiently to meet the service specifications.

If the rocking shaft end play is not within limits, it should be adjusted so that 'on-centre' pre-load is between 16 oz. and 18 oz. (0,453 kg. and 0,510 kg.) more than the $\frac{1}{2}$ turn 'off-centre' load but still not more than 36 oz. (1,02 kg.).

3. Adjust the pre-load by loosening the lock-nut and turning the adjusting screws as required. Recheck the pull after tightening the lock-nut. Check for rough spots in the rocking shaft sector and power piston rack by turning the wheel a $\frac{1}{4}$ of a turn to the left and a $\frac{1}{4}$ of a turn to the right.

4. A visual inspection of the gear teeth will reveal necessary correction, if rough spots are found. Remember, however, that the teeth are not absolutely smooth, but are machined to hold lubricant.

5. When the steering adjustments are completed, remove the spring tension gauge and wire or cord connection. Then connect the pendulum lever to the cross-beam and tighten the cross-beam nut to between 35 lb. ft. and 40 lb. ft. (4,83 kg.m. and 5,33 kg.m.).

Section N6

STEERING LINKAGE

Overhaul

Steering linkage—To remove

1. Remove the split pins and nuts from the ball joints on the outer ends of the cross-tubes.
2. Using extractor tool (RH 8080) extract the cross-tubes outer ball pins from the side steering levers.
3. Remove the nut and washer which secure the pendulum lever to the steering box rocking shaft.
4. Unlock the tab washer and remove the nut and

washer securing the steering idler/damper lever to the idler/damper shaft.

Do not remove the idler/damper lever from the steering damper unless absolutely essential, otherwise the idler/damper will have to be partially dismantled to re-position it if a splined lever is not fitted.

5. Remove the linkage from the car.

Note When removing any part of the steering linkage ensure that the rubber seals are not accidentally damaged by trapping or impact.

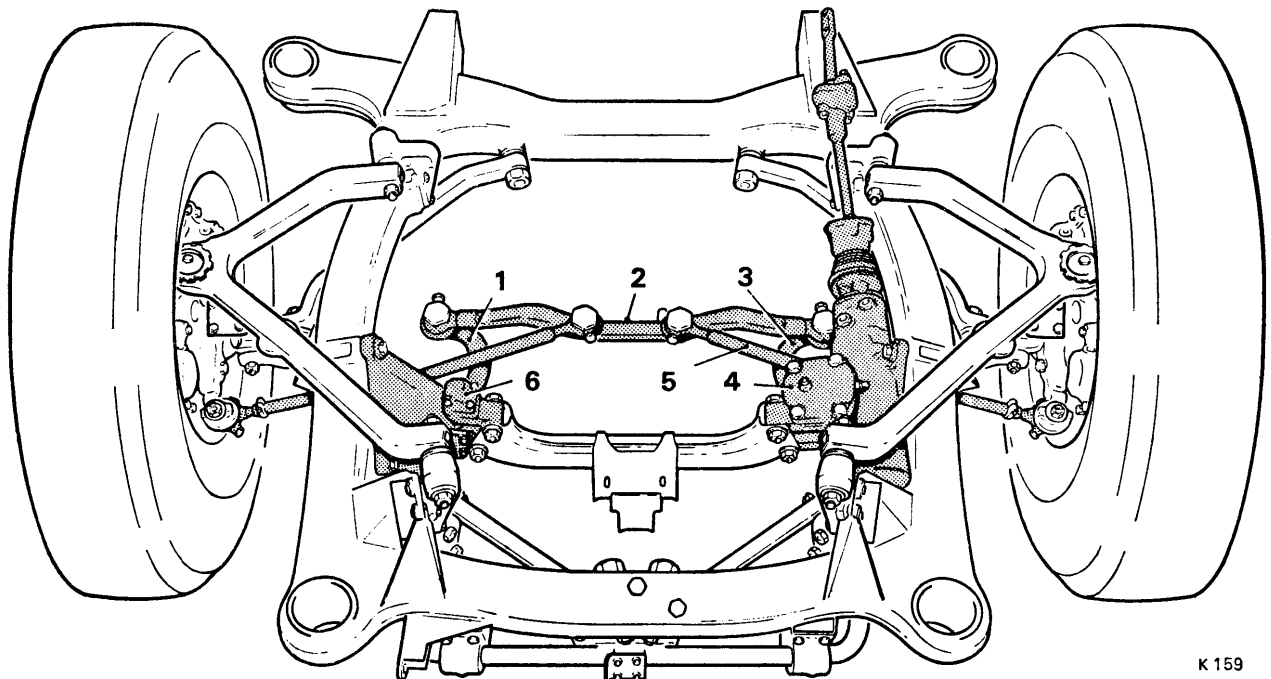


FIG. N38 STEERING LINKAGE AND IDLER/DAMPER

- | | | |
|---------------------|------------------|-------------------------|
| 1 Idler lever | 3 Pendulum lever | 5 Track rods |
| 2 Cross-beam member | 4 Steering box | 6 Steering idler/damper |

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Steering linkage—To dismantle

1. The linkage can be readily dismantled by removing the split pins and nuts from the ball joints and extracting the pins from their sockets using extractor (RH 8080).

Ball joints—To renew

The ball joints are fitted with grease nipples and can be dismantled and renewed if necessary.

1. To facilitate removal of any link assembly, the car should be placed on a ramp or over a pit; alternatively the front of the car should be jacked up.

2. Remove the split pin and castellated nut from the ball pin end, and using the special tool (RH 8100), extract the ball pin from the eye of the lever. Remove the ball pin from the opposite lever eye in a similar manner.

3. Remove the plug retaining the ball pin and collect the seal washer; the spring, spring seat and steel ball can then be removed together with the ball pin.

4. The rubber seals between the socket and lever eye should always be renewed if the joints have been disturbed.

5. A press must be used to remove and fit the ball seat, which is squarely pressed in position against the socket shoulder. The pressure required to fit the seat should be between 800 lb. and 1250 lb. (402,8 kg. and 566,9 kg.). It is important not to damage the chamfered top edge of the seat during the pressing operation, otherwise the sealing feature of the seat will be destroyed.

6. When the seat has been pressed squarely into position the ball pin should be lightly lubricated with an approved grease and inserted, followed by the steel ball, spring seat and the spring. Fit the aluminium joint washer and the plug.

7. Repeat this procedure to install any other ball pins which require renewal.

8. Check that all seal faces are free from burrs, then fit the seal and spring, after applying Rocol T 265 grease to the seal faces. Ensure that the tapers of the ball pins are free from lubricant, then locate the ball pin tapers in position; torque tighten the castellated nuts to between 35 lb. ft. and 40 lb. ft. (4,84 kg.m. to 5,53 kg.m.) and fit the split pin.

Note The seals fitted to the inner ends of the cross-tubes are not secured to the cross steering tube track rod ends.

9. Using Wanner grease gun (RH 7202), lubricate

the ball joints with the approved grease (see Chapter D), until it exudes from the seals.

10. Each joint will require approximately $\frac{3}{4}$ oz. (9,5 gm.) of lubricant for the initial filling operation, but this quantity will be reduced for periodic servicing.

Note It will be noted that the steering cross-beam ends have a 20° 'set' and if the cross-beam is removed, care must be taken to replace it in the correct position i.e. with the 'set' pointing towards the rear of the car (see Fig. N38). Care must be taken when fitting the track rods to ensure that the adjustable end is placed outwards towards the wheels.

11. Both of the adjustable ends of the track rods are right-hand threaded for adjustment of the toe-in. Toe-in must always be checked whenever any replacement parts have been fitted to the track rods.

Steering idler/damper—To remove

The steering idler/damper can be removed from the car without disturbing the rest of the steering linkage.

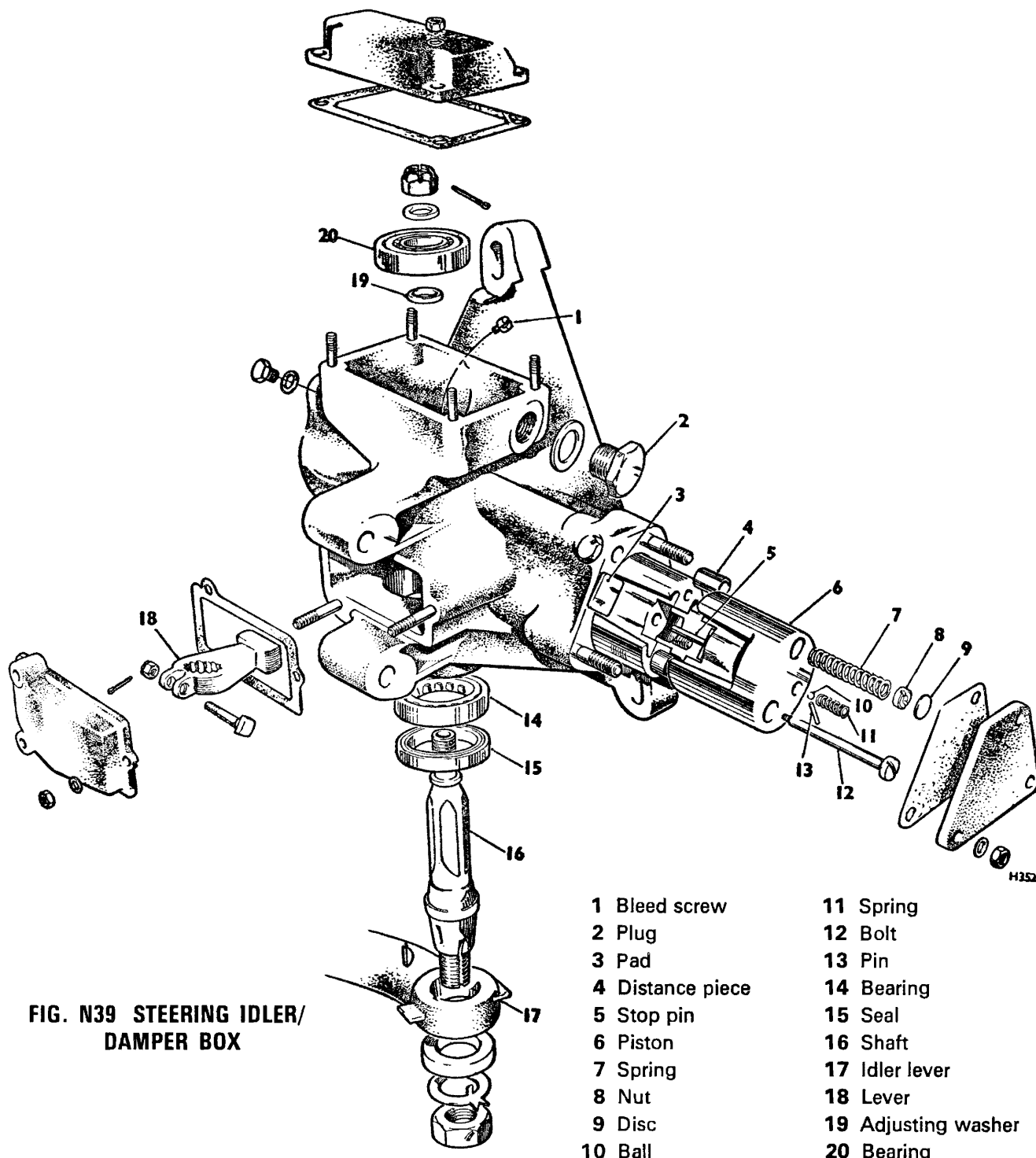
1. Place the car on a ramp.
2. Disconnect the battery.
3. Remove the front exhaust pipe assembly.
4. Support the engine with either a sling or a jack and wooden pad.
5. Remove the two nuts and washers securing the engine front mounting.
6. Remove the nuts and bolts securing the steering box pipes to the front engine cross-member.
7. Remove the split pin and nut from the idler/damper lever joint on the steering cross-beam then, using extractor (RH 8100) partially extract the ball pin from the lever.
8. Remove the four bolts, nuts and washers securing the engine cross-member to the steering box and the steering idler/damper housing; remove the cross-member.
9. Remove the three setscrews and washers securing the steering idler/damper box to the sub-frame.

Steering idler/damper—To dismantle (see Fig. N39)

1. Clean the housing to remove all traces of dirt.
2. Remove the filler plug and the plug from either end of the cylinder bore; drain the fluid.
3. Unscrew and remove the washers and nuts securing the cover of the lever access hole then remove the cover together with the joint. Discard the joint.

Chapter IV

4. Slacken the actuating lever pinch bolt.
5. Unscrew the four 2 B.A. nuts and remove the washers securing the top cover; remove the cover together with the joint. Discard the joint.
6. Remove the split pin, nut and washer from the top of the idler/damper shaft.
7. Remove the upper bearing cage and rollers from the housing.
8. Carefully remove the idler/damper shaft and lever from the housing and collect the chamfered adjusting washer from the top of the shaft.
9. Remove the fluid seal from the base of the housing and discard it.



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10. Remove the lower bearing cage and rollers from the housing.
11. Remove the operating lever.
12. Unscrew the nuts and remove the washers securing the end cover and remove the cover together with the joint. Discard the joint.
Remove the piston assembly from the housing.

Bearings, actuating lever, piston shaft— To inspect

1. Wash all components thoroughly in paraffin prior to inspection.
2. Inspect the bearings, shaft, operating lever and piston assembly for signs of excessive wear, scoring or pitting, and renew if necessary.

Note If it is necessary to renew any part of the damper piston, parts may be obtained to build either a piston half or a complete piston.

Steering idler/damper—To assemble

1. Thoroughly clean all parts to be assembled.
2. If it is necessary to renew the bearings, the bearing outer tracks must be pressed from the housing and the new ones pressed squarely into position up to their abutment faces.
3. The interference between the housing and the bearing outer tracks should be 0.002 in. (0,051 mm.) and the diameter of the upper surface of the idler/damper shaft should be 0.500 in. (12,7 mm.) minus 0.005 in. (0,13 mm.).
4. Fit the Woodruff key, the idler/damper lever, lock washer and nut to the idler/damper shaft.
5. Torque tighten the nut to between 80 lb. ft. and 90 lb. ft. (11,06 kg.m. and 12,44 kg.m.) and bend over the lock washer.
6. Fit the two bearing outer races into the idler/damper housing and lightly coat with steering box fluid.
7. Place the lower thrust bearing on to the idler/damper shaft.
8. Fit the shaft through the idler/damper box.
9. Fit the thrust washer with the chamfer facing the lower thrust bearing.
10. Fit the upper bearing followed by the plain steel washer and castellated nut.

11. The pre-load on the bearings is to be adjusted by altering the thickness of the pre-load washer so that $\frac{1}{2}$ lb. to 1 lb. (0,227 kg. to 0,454 kg.) pull exerted at right angles to the idler/damper lever is required to rotate the shaft. Hold the assembly with the idler/damper shaft vertical while making this check.
12. If adjustment is required to alter the pre-load then it will be necessary to grind the flat surface of the pre-load washer.
13. Having found the adjustment, remove the idler/damper shaft and bearing cages and rollers, but do not mislay the adjusting washer.
14. Fit the lower bearing cage and rollers into the housing and then fit the shaft oil seal into the housing.

Piston—To assemble

1. Fit the ball followed by the spring on to its seat in the piston head.
Note The spring is fitted with the small coil pressing on the ball.
2. Depress the coil spring and insert the taper pin into the piston wall. The pin should be pressed in until the pin head is below the piston wall surface.
3. Carefully peen over the pin hole.
4. Repeat the above operation for the other piston half.
5. Fit the piston pads with their maximum width between the piston skirt extensions.
6. To assemble the two piston halves hold the piston so that looking at the piston crown the valve port is at the top.
7. Insert a bolt in the right-hand bore.
8. Repeat this operation for the other piston half.
9. Insert the operating lever stop pin into the outer hole of one of the piston halves.
10. Place a distance piece over each bolt and join the piston halves together.
11. Fit a spring and nut on each bolt.
12. Tighten the nut and fit a welch washer into the bore groove.
13. Punch the centre of the welch washer to flatten it and locate it in its groove.
14. Polish the piston with fine emery strip to remove any burrs.
15. Fit the piston with the actuator stop pin at the back opposite the lever cover aperture.
16. Fit the air bleed screw and two blanking plugs and aluminium washers.
17. Smear the shaft oil seal with grease (Retinax A).

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18. Fit the pinch bolt and nut on to the actuator lever and fit the actuator lever in position between the piston with the offset to the top of the damper.

19. Insert the idler/damper shaft and lever assembly with the lower bearing in position and pass it through the square in the actuator shaft. Do not damage the seal while inserting the shaft.

20. The idler/damper shaft should be fitted so that the Woodruff key is lined up with the split in the actuator lever.

21. Fit the pre-loading washer, upper bearing, washer and nut, and torque tighten to between 42 lb. ft. and 45 lb. ft. (5,80 kg.m. and 6,22 kg.m.). Tighten to the next nearest split pin hole and fit the split pin.

22. Torque tighten the pinch bolt on the actuator lever to between 35 lb. ft. and 38 lb. ft. (4,84 kg.m. and 5,25 kg.m.).

23. Fit the actuator lever access hole cover.

24. Fit the piston bore end cover.

25. Mount the assembly in its normal operating position and fill it with the approved power steering fluid to the level of the bottom of the filler plug. Work the idler/damper lever slowly backwards and forwards over its full stroke and keep the level of fluid topped-up while doing so. Work the lever to and fro until the fluid level ceases to drop and until there is no free movement around the central position.

26. Fit the filler plug and fit the top cover and joint.

Steering idler/damper—To fit

1. Installation of the idler/damper is the reverse procedure given for its removal.

Note After fitting the steering idler/damper to the sub-frame it is important that the steering geometry is reset as detailed in Chapter H.

Toe-in—To set

To adjust the toe-in refer to 'Chapter H—Suspension Settings'.

Aligning the steering box 'tight spot' to road wheel straight ahead position

1. Place each front wheel on a turntable.
2. Disconnect the pendulum lever ball joint from the cross-beam using the special tool (RH 8100).
3. Turn the steering wheel to either full lock position.
4. Turn the steering wheel slowly towards the opposite lock whilst the second operator attempts to 'rattle' the pendulum lever.
5. Note the position of the steering wheel when the free play in the pendulum lever disappears.
6. Turn the steering to the other full lock position and repeat the above operation.
7. To find the steering box 'tight spot', position the steering wheel mid-way between the two positions previously recorded.
8. Note the steering wheel position and connect the pendulum lever ball joint to the cross-beam.
9. Position the steering wheel in the 'tight spot' position and alter the track rods by equal lengths until the road wheels are in the 'straight ahead' position.
10. Align the steering wheel spokes to the road wheels 'straight ahead' position.
11. To check the steering geometry (toe-in, lock stop adjustment and castor/camber angles) refer to 'Chapter H—Suspension settings'.

Section N7

FAULT DIAGNOSIS

SYMPTOM	POSSIBLE CAUSE	ACTION
<p>Noisy steering system</p> <p>1. Steering pump (Hobourn Eaton)</p> <p>Steering pump (Saginaw) As in 1(a), (b), (c) and (d) above, plus the following:</p>	<p>1. (a) Low fluid level</p> <p>(b) Loose drive belt(s)</p> <p>(c) Pressure hose not correctly fitted</p> <p>(d) Excessive back pressure due to partially blocked pipes or resistance to steering gear movement</p> <p>(e) Scored rotor or rollers</p> <p>(f) Excessive wear on cam ring</p> <p>(g) Defective flow control valve</p> <p>(h) Scored pressure plate</p> <p>(j) Vanes incorrectly fitted</p> <p>(k) Vanes sticking in rotor slots</p> <p>(l) Extreme wear on pump ring</p> <p>(m) Face of thrust plate scored</p> <p>(n) Scored rotor</p>	<p>1. (a) Fill reservoir to correct level with an approved fluid and bleed system by operating steering</p> <p>(b) Correctly adjust drive belt(s)</p> <p>(c) Ensure correct run of hose</p> <p>(d) Locate restriction and correct if necessary</p> <p>(e) Renew rotor and rollers or fit new pump if required</p> <p>(f) Fit new steering pump</p> <p>(g) Renew valve</p> <p>(h) Lap to remove light scoring. Renew heavily scored components</p> <p>(j) Fit vanes correctly</p> <p>(k) Free by removing burrs or dirt</p> <p>(l) Renew pump ring, rotor and vanes</p> <p>(m) Lap to remove light scoring. Renew rotor, vanes and pump ring if rotor is heavily scored.</p> <p>(n) Lap to remove light scoring. Renew heavily scored components.</p>
2. Steering box	2. (a) Incorrect straight ahead adjustment	2. (a) Correctly adjust tight spot in straight ahead position Note A slight rattle may occur in 'off-centre' positions because of increased clearance of the 'tight spot'. This is normal and straight ahead clearance must not be reduced below the specified limits in an effort to eliminate the noise
3. Steering linkage	3. (a) Steering box loose on front sub-frame (b) Steering linkage loose (c) Spool valve flutter on releasing steering wheel after full lock turn	3. (a) Check torque tightness of securing bolts (b) Examine linkage pivot points for wear. Renew worn parts if required (c) Ensure that fluid is correct to specification. Examine spool valve 'O' rings for correct size and general condition

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SYMPTOM	POSSIBLE CAUSE	ACTION
<p>Excessive play in steering</p> <p>4. Excessive play in steering wheel</p>	<p>4. (a) Excessive play in steering linkage</p> <p>(b) Steering arm backlash in 'straight-ahead' position</p> <p>(c) Incorrect thrust bearing pre-load</p> <p>(d) Incorrect worm and ball pre-load</p> <p>(e) Steering box loose on front sub-frame</p> <p>(f) Front wheel bearings incorrectly adjusted or worn</p> <p>(g) Worn check valve in pressure connection</p> <p>(h) Steering damper faulty</p>	<p>4. (a) Adjust steering linkage or renew parts if required</p> <p>(b) Correctly adjust rocking shaft gear backlash</p> <p>(c) Correctly adjust thrust bearing pre-load</p> <p>(d) Correctly adjust pre-load between worm shaft and recirculating balls</p> <p>(e) Examine steering box mountings. Check torque tightness of securing bolts</p> <p>(f) Correctly adjust bearings or renew if required</p> <p>(g) Renew check valve</p> <p>(h) Renew damper</p>
<p>Oil leaks</p> <p>5. Oil leaks from steering box linkage</p>	<p>5. (a) Top cover 'O' ring seal leaking</p> <p>(b) Rocking shaft seals leaking</p> <p>(c) Housing end plug seals leaking</p> <p>(d) Rocking shaft backlash adjuster seal leaking</p> <p>(e) Torsion bar seal leaking</p>	<p>5. (a) Renew seal</p> <p>(b) Renew seals. Examine shaft for damage or wear</p> <p>(c) Renew seals</p> <p>(d) Renew seal</p> <p>(e) Renew seal. Examine torsion bar for damage</p>
<p>6. Oil leaks from steering pump and reservoir (Hobourn Eaton)</p>	<p>6. (a) Reservoir cover seal or filler cap seal leaking due to fluid level being too high or air in fluid</p> <p>(b) Reservoir to pump 'O' rings leaking</p> <p>(c) Flow control valve plug 'O' rings leaking</p> <p>(d) Steering pump bearing seal leaking</p> <p>(e) Reservoir or filler cap seals damaged</p>	<p>6. (a) Check oil level and top-up if required. Bleed system to remove air by operating steering. Examine cap and cover for damage or distortion</p> <p>(b) Renew 'O' rings</p> <p>(c) Renew 'O' rings</p> <p>(d) Renew seal. Examine shaft for wear or damage</p> <p>(e) Renew seals</p>
<p>7. Hoses and connections leaking</p>	<p>7. (a) Loose hose connections or damaged 'O' rings</p> <p>(b) Damaged hose</p>	<p>7. (a) Tighten hose connections. If tightening fails to cure leak, examine ends of hoses for cracks or damage. Renew 'O' rings if necessary</p> <p>(b) Examine hose for fretting, fraying or deterioration. Renew hose if required. Ensure that correct hose run is obtained and that hose clips are correctly fitted.</p>

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SYMPTOM	POSSIBLE CAUSE	ACTION
8. Car pulls to one side or the other	8. (a) Front end geometry misaligned (b) Pump drive belt(s) slipping (c) Flow control valve sticking	8. (a) Check steering geometry (b) Correctly adjust steering pump belt(s) (c) Examine flow control valve. Renew valve if necessary
9. Momentary increase in effort when turning wheel quickly to right or left	9. (a) Low fluid level in reservoir (b) Pump drive belt(s) slipping (c) Heavy internal fluid leak	9. (a) Check fluid level. Top-up if required. Examine system for leaks (b) Correctly adjust pump drive belt(s) (c) Check pump outlet pressure. If pressure is low renew combined flow control and relief valve. If pressure remains low, check system for internal leaks by dismantling steering box
10. Heavy steering	10. (a) Incorrect tyre pressures (b) Loose pump drive belt(s) (c) Low fluid level in reservoir (d) Lack of lubricant in steering joints (e) Insufficient fluid pressure (f) Faulty or obstructed flow control valve (g) Incorrect front wheel alignment (h) Excessive castor or toe-in (i) Incorrect camber angle (j) Rocking shaft gear too tightly meshed (k) Distorted flexible coupling or defective universal joint (l) Triangle levers misaligned (m) Front sub-frame distorted (n) Kinks in hoses (o) Obstruction in hose. Inner bore of hose swollen, caused by overheated or incorrect fluid (p) Pressure loss in steering box cylinder caused by worn ring or scored bore (q) Leakage at valve rings or valve body to worm seal	10. (a) Check and correct tyre pressures (b) Correctly adjust drive belt(s) (c) Check level of fluid in reservoir. Top-up if required. Examine system for leaks. (d) Examine all steering joints. Grease with approved lubricant if required (e) If the preceding checks do not reveal the cause of heavy steering check pump pressure (f) Renew or replace if necessary (g) Check and adjust if required (h) Adjust castor or toe-in to within specified limits (i) Correct camber angle to within specified limits (j) Disconnect track rods at steering arm. Check steering for stiffness. Adjust gear mesh if required (k) Examine flexible coupling. Renew if necessary. Examine universal joint in lower steering column. Renew if necessary (l) Check wheel castor and camber (m) Check sub-frame for correct alignment. Correct or renew if required (n) Ensure correct run of hoses (o) Renew hose (p) Overhaul steering box (q) Overhaul steering box

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SYMPTOM	POSSIBLE CAUSE	ACTION
Heavy steering— <i>continued</i>	(r) Spool loose in valve body or leaking valve body (s) Damaged check valve in pressure hose connection (t) Flow control valve stuck or inoperative (u) Column bearings incorrectly adjusted	(r) Renew valve (s) Renew check valve (t) Examine flow control valve. Renew valve if necessary (u) Disconnect upper column from lower column. Correctly adjust column bearings. Grease bearings with approved lubricant
11. Steering wheel side play	11. (a) As in 10 (u)	11. (a) As in 10 (u)
12. Horn inoperative	12. (a) Sticking brush or dirty slip ring on steering column	12. (a) Examine brush and spring for freedom of movement
13. Horn blows continuously	13. (a) Short in horn button switch assembly in steering wheel centre	13. (a) Examine horn button. Examine wires and connections. Check travel of horn button
14. Steering column noisy in operation	14. (a) Dry thrust bearings (b) Dry horn contact	14. (a) Lubricate bearings (b) Lubricate horn contact

Notes on steering system noise

It is improbable that the hydraulic side of the power assisted steering system will be absolutely quiet under all conditions and steering wheel positions. A slight hissing sound may be audible when the car is at parking speeds and attitudes, also when turning the steering wheel with a front road wheel against the kerb.

For fault diagnosis, Saginaw steering pump and hoses, refer also to Section N4.

Section N8

WORKSHOP TOOLS

Tool Number	Description
RH 7202	'Wanner' Grease Gun—Steering Linkage
RH 7674	Pliers—Two-way—Circlip and Snap Ring—Steering Column and wheel
RH 7779 (J-6219)	Fitting Tool—Rocking Shaft Seal—Steering Box
RH 7780 (J-5188)	Fitting Tool—Adjuster Plug Seal—Steering Box
RH 7781 (J-6657)	Extraction and Fitting Tool—Rocking Shaft Bearing—Steering Box
RH 7782 (J-6222)	Seal Protector—Adjuster Plug Assembly—Steering Box
RH 7783 (J-6221)	Extraction and Fitting Tool—Adjuster Plug Needle Bearing—Steering Box
RH 7785 (J-7576)	Piston Seal Compressor—Steering Box
RH 7786 (J-6217)	Fitting Tool—Valve Connector Seat—Steering Box
RH 7787 (J-7539)	Piston Arbor—Steering Box
RH 7788 (J-7624)	Spanner—Steering Box
RH 7870	Extractor—Steering Wheel
RH 7871	Flat Pin Spanner—Steering Column (For use on non-collapsible columns only)
RH 7872	'C' Spanner—Steering Wheel and Column (For use on non-collapsible columns only)
RH 8023	Extractor—Pendulum Lever—Steering Linkage
RH 8080	Extractor—Ball Pin—Track Rods—Steering Linkage
RH 8100	Extractor—Ball Pin—Cross-beam—Steering Linkage

Chapter P
TORQUE TIGHTENING FIGURES

Chapter P

TORQUE TIGHTENING FIGURES

SETSCREWS, unless otherwise stated, should be tightened to the figures given for **FULL** nuts.

To ensure that the correct torque tightening figures are obtained when fitting **PLATED** parts, all burrs and foreign matter (e.g. grit, grease, oil and paint) must be removed from the abutment faces of the nuts, setscrews, washers and components.

The threads and nut and bolt abutment faces of **NON-PLATED** parts should first be smeared with engine oil before tightening to the quoted torque figures.

All unified nuts having an identification groove on one end are to be fitted with the grooved end away from the mating face.

Tighten all components to the figures listed below for 'Standard Parts', except those components listed under 'Special Parts'.

TORQUE TIGHTENING FIGURES FOR STANDARD PARTS

Full nut torque

SIZE	LB.FT.	KG.M.	SIZE	LB.FT.	KG.M.
2 B.A.	48 to 60 lb. in.	0,5 to 0,7	$\frac{7}{16}$ in. dia. U.N.F.	42 to 45	5,8 to 6,2
$\frac{1}{4}$ in. dia. U.N.F.	8 to 10	1,1 to 1,4	$\frac{5}{8}$ in. and $\frac{11}{16}$ in. A/F		
$\frac{7}{16}$ in. A/F			$\frac{1}{2}$ in. dia. U.N.F.	60 to 65	8,3 to 9,0
$\frac{5}{16}$ in. dia. U.N.F.	16 to 18	2,2 to 2,5	$\frac{3}{4}$ in. A/F		
$\frac{1}{2}$ in. A/F			$\frac{5}{8}$ in. dia. U.N.F.	85 to 90	11,7 to 12,4
$\frac{3}{8}$ in. dia. U.N.F.	29 to 32	4,0 to 4,4	$\frac{7}{8}$ in. A/F		
$\frac{9}{16}$ in. A/F					

Half nut torque

SIZE	LB.FT.	KG.M.	SIZE	LB.FT.	KG.M.
2 B.A.	30 to 36 lb. in.	0,3 to 0,4	$\frac{7}{16}$ in. dia. U.N.F.	33 to 36	4,5 to 5,0
$\frac{1}{4}$ in. dia. U.N.F.	5 to 7	0,7 to 1,0	$\frac{5}{8}$ in. and $\frac{11}{16}$ in. A/F		
$\frac{7}{16}$ in. A/F			$\frac{1}{2}$ in. dia. U.N.F.	48 to 52	6,6 to 7,2
$\frac{5}{16}$ in. dia. U.N.F.	13 to 15	1,8 to 2,0	$\frac{3}{4}$ in. A/F		
$\frac{1}{2}$ in. A/F			$\frac{5}{8}$ in. dia. U.N.F.	73 to 78	10,0 to 10,8
$\frac{3}{8}$ in. dia. U.N.F.	22 to 25	3,0 to 3,4	$\frac{7}{8}$ in. A/F		
$\frac{9}{16}$ in. A/F					

Chapter P

TORQUE TIGHTENING FIGURES FOR SPECIAL PARTS

FINAL DRIVE

SIZE	COMPONENT	LB.FT.	KG.M.
1 $\frac{1}{8}$ in. dia. U.N.F. 1 $\frac{11}{16}$ in. A/F	Nut — Input flange to input pinion	275 to 300	38,0 to 41,5
$\frac{7}{16}$ in. dia. U.N.F. $\frac{11}{16}$ in. A/F	Bolt — Rear axle cross-member mounting ..	34 to 37	4,7 to 5,1
$\frac{7}{16}$ in. dia. U.N.F. $\frac{5}{8}$ in. A/F	Bolt — Torque arm	34 to 37	4,7 to 5,1
$\frac{1}{4}$ in. dia. U.N.F. $\frac{7}{16}$ in. A/F	Lock-nut — Differential trunnion bolt	12 to 14	1,6 to 1,9
$\frac{3}{8}$ in. dia. U.N.F. $\frac{9}{16}$ in. A/F	Nut — Crown wheel to differential housing ..	42 to 45	5,8 to 6,2

PEDALS

SIZE	COMPONENT	LB.FT.	KG.M.
1 $\frac{1}{4}$ in. dia. U.N.F. 1 $\frac{3}{8}$ in. A/F	End plug — Brake pressure limiting valve ..	25 to 35	3,5 to 4,8
$\frac{7}{8}$ in. dia. U.N. 1 $\frac{1}{8}$ in. A/F	End plug — Distribution valve	60 to 65	8,3 to 9,0
$\frac{1}{4}$ in. dia. U.N.F. $\frac{7}{16}$ in. A/F	Setscrew — Brake distribution valve mounting ..	8 to 10	1,1 to 1,4
$\frac{1}{4}$ in. dia. U.N.F. $\frac{7}{16}$ in. A/F	Castellated nut — Brake distribution valve mounting (early cars)	3 to 5	0,4 to 0,7
2 B.A.	Nut — Master cylinder on-stop	2 to 3	0,3 to 0,4

FRONT AND REAR SUB-FRAMES AND FITTINGS

SIZE	COMPONENT	LB.FT.	KG.M.
2 $\frac{5}{8}$ in. dia. U.N.	Pre-compliant suspension		
	Metal mount — Front sub-frame	125 to 150	17,3 to 20,7
2 $\frac{5}{8}$ in. dia. U.N.	Compliant suspension		
	Rubber mount — Front sub-frame	100 to 120	13,8 to 16,6
$\frac{3}{4}$ in. dia. U.N.F. $\frac{7}{8}$ in. A/F	Adapter — Housing — Height control valve ..	29 to 32	4,0 to 4,4
1 $\frac{1}{16}$ in. dia. U.N. 1 $\frac{5}{16}$ in. A/F	Nut — Adapter — Roll restrictor valve	29 to 32	4,0 to 4,4
	Plug — Sealing — Height control ram (Later cars are fitted with a circlip)	60 to 65	8,3 to 9,0

FRONT AND REAR SUSPENSION AND DAMPERS

SIZE	COMPONENT	LB.FT.	KG.M.
1 $\frac{3}{4}$ in. dia. U.N. 2 in. A/F	Assembly ball joint — Lower triangle levers Torque to rotate ball pin prior to fitting shims Final assembly torque tightening	35 to 75 lb.in. 250 to 300	0,4 to 0,8 34,6 to 41,5
1 $\frac{1}{2}$ in. dia. U.N. 1 $\frac{3}{4}$ in. A/F	Assembly ball joint — Front damper Torque to rotate ball pin prior to fitting shims Final assembly torque tightening	30 to 60 lb.in. 120 to 130	0,3 to 0,7 16,6 to 18,0
$\frac{5}{8}$ in. dia. U.N.F. $\frac{1}{2}$ in. A/F	Bolt — Lower triangle levers	85 to 90	11,7 to 12,4
$\frac{1}{2}$ in. dia. U.N.F. $\frac{3}{4}$ in. A/F	Bolt — Lower triangle lever bearing pin housing	60 to 65	8,3 to 9,0
$\frac{7}{16}$ in. dia. U.N.F. $\frac{5}{8}$ in. A/F	Bolt — Caliper to stub axle — Front Cars prior to Car Serial Number 1800 Cars after and including Car Serial Number 1800	42 to 45 55 to 60	5,8 to 6,2 7,6 to 8,3
$\frac{1}{2}$ in. dia. U.N.F. $\frac{3}{4}$ in. A/F	Bolt — Caliper to stub axle — Rear Cars prior to Car Serial Number 1800 Cars after and including Car Serial Number 1800	60 to 65 90 to 95	8,3 to 9,0 12,4 to 13,1
$\frac{7}{8}$ in. dia. U.N.F. 1 $\frac{5}{16}$ in. A/F	Nut — Bearing pins	147 to 153	20,3 to 21,1
	Pre-compliant suspension		
1 $\frac{1}{16}$ in. dia. U.N.F.	Nut — Slotted — Upper triangle levers ..	150 to 175	20,7 to 24,2
	Compliant suspension		
1 $\frac{1}{16}$ in. dia. U.N.F.	Nut — Slotted — Upper suspension lever ..	150 to 175	20,7 to 24,2
$\frac{5}{8}$ in. dia. U.N.F. 1 $\frac{1}{8}$ in. A/F	Nut — Eccentric adjuster — Upper lever	73 to 78	10,1 to 10,8
$\frac{5}{8}$ in. dia. U.N.F. $\frac{1}{2}$ in. A/F	Nut — Jaw bolt — Upper lever	73 to 78	10,1 to 10,8
$\frac{5}{8}$ in. dia. U.N.F. $\frac{1}{2}$ in. A/F	Nut — Castor adjuster — Compliance rod ..	73 to 78	10,1 to 10,8
$\frac{3}{8}$ in. dia. U.N.F. $\frac{9}{16}$ in. A/F	Nut — Compliance rod mount	29 to 32	4,0 to 4,4
1 in. dia. U.N. 2 in. A/F	Ball joint housing — Yoke Note (1) Thread locked with 'Casco MLF 13' (2) Special spanner required	140 to 160	19,3 to 22,1
1 $\frac{1}{8}$ in. dia. U.N.F. 1 $\frac{1}{16}$ in. A/F	Nut — End yoke to drive shaft — Rear hubs .. All cars prior to Car Serial Number SRX 1916 and Coachbuilt cars prior to Car Serial Number CRX 1937	450 to 475	62,2 to 65,7
1 $\frac{1}{8}$ in. dia. U.N.F. 1 $\frac{1}{16}$ in. A/F	Nut — End yoke to drive shaft — Rear hubs .. All cars from Car Serial Number SRX 1916 and Coachbuilt cars from Car Serial Number CRX 1937 up to and including Car Serial Number SRX 6544, SRH 5156 and Coachbuilt cars Car Serial Number CRX 6571.	525	72,6
1 $\frac{1}{8}$ in. dia. U.N.F. 1 $\frac{1}{16}$ in. A/F	Nut — End yoke to drive shaft — Rear hubs .. All cars after Car Serial Numbers SRX 6544, SRH 5156 and Coachbuilt cars Car Serial Number CRX 6571.	500	69,5
3 $\frac{1}{4}$ in. dia. U.N.	Lock-nut — Isolator tube — Rear suspension (early cars) Lock-nut — Isolator tube — Rear suspension (later cars)	80 to 90 100 to 150	11,1 to 12,4 13,8 to 20,7
$\frac{1}{2}$ in. dia. U.N.F. $\frac{1}{16}$ in. A/F	Nut — Front and rear road wheels	45 to 50	6,2 to 6,9

Chapter P

HYDRAULIC PIPES AND FITTINGS

SIZE	COMPONENT	LB.FT.	KG.M.
$\frac{5}{8}$ in. dia. U.N.F. $\frac{3}{4}$ in. A/F	Adapter — Solenoid valve restrictor	22 to 25	3,0 to 3,5
$\frac{3}{8}$ in. dia. U.N.F. $\frac{7}{16}$ in. A/F	Blanking plug — Solenoid valve high pressure restrictor (No longer fitted on later cars)	8 to 10	1,1 to 1,4
$\frac{3}{8}$ in. dia. U.N.F. $\frac{1}{2}$ in. A/F	Pipe nut — Front pump to accumulator ..	8 to 10	1,1 to 1,4
$\frac{3}{8}$ in. dia. U.N.F. $\frac{1}{2}$ in. A/F	Pipe nut — Rear pump to accumulator	8 to 10	1,1 to 1,4
$\frac{5}{8}$ in. dia. U.N.F. $\frac{7}{8}$ in. A/F	Pipe nut — Pump to accumulator	20 to 25	2,8 to 3,4
$\frac{3}{8}$ in. dia. U.N.F. $\frac{7}{16}$ in. A/F	Nut—Flexible pipe—Front accumulator to frame	5 to 7	0,7 to 1,0
$\frac{3}{8}$ in. dia. U.N.F. $\frac{7}{16}$ in. A/F	Nut — Flexible pipe — Rear accumulator to frame	5 to 7	0,7 to 1,0
$\frac{3}{8}$ in. dia. U.N.F. $\frac{9}{16}$ in. A/F	Nut—Flexible pipe—Body to sub-frame—Brakes (face seal type)	12 to 15	1,7 to 2,2
$\frac{3}{8}$ in. dia. U.N.F. $\frac{9}{16}$ in. A/F	Nut—Flexible pipe—Height control valve—Body to sub-frame (face seal type)	12 to 15	1,7 to 2,2
$\frac{3}{8}$ in. dia. U.N.F. $\frac{3}{4}$ in. A/F	Brake line restrictors	12 to 15	1,7 to 2,2
$\frac{3}{8}$ in. dia. U.N.F. $\frac{9}{16}$ in. A/F	Lock-nut — Flexible hose to support plate ..	10 to 12	1,4 to 1,7
$\frac{3}{8}$ in. dia. U.N.F. $\frac{9}{16}$ in. A/F	Male pipe nut — $\frac{3}{16}$ in. dia. Bundy tubing ..	5 to 7	0,7 to 1,0
$\frac{3}{8}$ in. dia. U.N.F. $\frac{9}{16}$ in. A/F	Female pipe nut — $\frac{3}{16}$ in. dia. Bundy tubing ..	8 to 10	1,1 to 1,4
$\frac{7}{16}$ in. dia. U.N.F. $\frac{1}{2}$ in. A/F	Male pipe nut — $\frac{1}{4}$ in. dia. Bundy tubing ..	8 to 10	1,1 to 1,4
$\frac{9}{16}$ in. dia. Whit. $\frac{1}{2}$ in. dia. U.N.F.	Pipe nut — Brake pump inlet pipe	12 to 15	1,7 to 2,1
$\frac{1}{2}$ in. dia. U.N.F. $\frac{3}{4}$ in. A/F	Nut — Brake fluid filters	20 to 25	2,8 to 3,4
$\frac{3}{4}$ in. A/F	(Cars after Car Serial Number SRX 3367, and Coachbuilt cars after Car Serial Number CRH 3489. Cars prior to these Car Serial Numbers are torque tightened to the lower figure)	8 to 10	1,1 to 1,4

Chapter P

BRAKE PUMP AND ACCUMULATOR

SIZE	COMPONENT	LB.FT.	KG.M.
$\frac{3}{8}$ in. dia. U.N.F. $\frac{7}{16}$ in. A/F	Bleed screw	8 to 10	1,1 to 1,4
$\frac{3}{8}$ in. dia. U.N.F. 1 in. A/F	Pressure switch	12 to 15	1,7 to 2,1
$\frac{3}{8}$ in. dia. U.N.F. $\frac{9}{16}$ in. A/F	Adapter — Inlet hose	12 to 15	1,7 to 2,1
$1\frac{1}{8}$ in. dia. U.N.F.	Accumulator sphere to valve body	55 to 60	7,6 to 8,3
$\frac{5}{8}$ in. dia. U.N.F. $\frac{3}{4}$ in. A/F	Charging valve cap	20 to 25	2,8 to 3,5
$1\frac{1}{8}$ in. U.N.F.	Brake pump to engine — Castellated nut ..	32 to 35	4,4 to 4,8
	Ring — Clamping — Accumulator	265 to 275	36,6 to 38,0
	Adapter — Brake pump — High pressure outlet	50 to 55	6,9 to 7,6
	Plug — Accumulator — Bobbin retaining ..	55 to 60	7,6 to 8,3

STEERING AND IDLER BOXES, CROSS-BEAM AND TRACK RODS

SIZE	COMPONENT	LB.FT.	KG.M.
$\frac{3}{4}$ in. dia. U.N.F. $1\frac{1}{8}$ in. A/F	Nut — Idler shaft	80 to 90	11,0 to 12,4
$\frac{7}{8}$ in. dia. U.N.F. $1\frac{1}{2}$ in. A/F	Nut — (Saginaw) — Rocking shaft	160 to 210	22,1 to 29,0
$\frac{7}{16}$ in. dia. U.N.F. $\frac{11}{16}$ in. A/F	Nut — Ball pin — Track rod	35 to 40	4,8 to 5,5
$\frac{1}{2}$ in. dia. U.N.F. $\frac{3}{4}$ in. A/F	Nut — Adjusting — Idler shaft	42 to 45	5,8 to 6,2
$\frac{5}{16}$ in. dia. U.N.F. $\frac{1}{2}$ in. A/F	Bolt — Track rod clamping	15 min.	2,1 min.
$\frac{11}{16}$ in. dia. U.N.F. $1\frac{1}{8}$ in. A/F	Nut — Steering wheel (Cars up to and including Car Serial Number SRX 6000)	40 to 45	5,5 to 6,2
$\frac{11}{16}$ in. dia. U.N.F. $1\frac{1}{8}$ in. A/F	Nut — Steering wheel (Cars assembled after Car Serial Number SRX 6000)	25 to 28	3,4 to 3,9
$\frac{7}{16}$ in. dia. U.N.F. $\frac{5}{8}$ in. A/F	Nut — Pressure supply hose to steering box ..	20 to 30	2,8 to 4,1
$\frac{7}{16}$ in. dia. U.N.F. $\frac{11}{16}$ in. A/F	Nut — Return pipe to steering box	20 to 30	2,8 to 4,1
$\frac{7}{16}$ in. dia. U.N.F. $\frac{5}{8}$ in. A/F	Nut — Pressure supply box to steering pump — (Saginaw)	25 to 40	3,4 to 5,5
$\frac{3}{8}$ in. dia. U.N.F. $\frac{9}{16}$ in. dia. A/F	Setscrew — Steering column mounting	21 to 24	2,9 to 3,3

Chapter P

ENGINE

SIZE	COMPONENT	LB. FT.	KG. M.
$\frac{1}{2}$ in. dia. U.N.F. $\frac{3}{4}$ in. A/F	Nut — Main bearing cap	45 to 50	6.2 to 6.9
$\frac{3}{8}$ in. dia. U.N.F. $\frac{9}{16}$ in. A/F	Bolt — Big-end	35 to 40	4.8 to 5.5
$\frac{1}{4}$ in. dia. U.N.F. $\frac{7}{16}$ in. A/F	Bolt — Oil pump intake strainer	24 to 30 lb.in.	0.3
$\frac{3}{8}$ in. dia. U.N.F. $\frac{9}{16}$ in. A/F	Setscrew — Drive plate to crankshaft	29 to 32	4.0 to 4.4
* $1\frac{3}{4}$ in. dia. U.N.S. 1.308 in. dia. U.N.S.	Slotted nut — Crankshaft pinion (left-hand)	280 to 320	38.7 to 44.2
$\frac{3}{8}$ in. dia. U.N.F. $\frac{9}{16}$ in. A/F	Slotted nut — Crankshaft damper drive	95 to 100	13.1 to 13.8
$\frac{3}{8}$ in. dia. U.N.F. $\frac{9}{16}$ in. A/F	Setscrew — Crankshaft balance weight	30 to 35	4.1 to 4.8
$\frac{7}{16}$ in. dia. U.N.F. $\frac{5}{8}$ in. A/F	Setscrew — Crankshaft balance weight	48 to 52	6.6 to 7.1
$\frac{7}{16}$ in. dia. U.N.F. $\frac{1}{2}$ in. A/F	Nut — Cylinder head	Initial Tightening Stage 1 20 to 25 Final Tightening Stage 2 50 to 55	2.8 to 3.5 6.9 to 7.6
$\frac{1}{4}$ in. dia. U.N.F. $\frac{7}{16}$ in. A/F	Setscrew — Rocker shaft pedestal	8 to 10	1.1 to 1.4
$\frac{1}{4}$ in. dia. U.N.F. $\frac{7}{16}$ in. A/F	Nut — Rocker cover retaining	10 to 12 lb.in.	0.1
$\frac{1}{4}$ in. dia. U.N.F. $\frac{7}{16}$ in. A/F	Setscrew — Tappet block	8 to 10	1.1 to 1.4
$\frac{1}{4}$ in. dia. U.N.F. $\frac{7}{16}$ in. A/F	Setscrew — Camshaft gear	8 to 10	1.1 to 1.4
$\frac{3}{8}$ in. dia. U.N.F. $\frac{5}{16}$ in. dia. U.N.F.	Castellated nut — Brake pump to engine	32 to 35	4.4 to 4.8
$\frac{1}{2}$ in. A/F	Nut — Oil pump drive gear	23 to 27	3.2 to 3.7
$\frac{1}{4}$ in. dia. U.N.F. $\frac{7}{8}$ in. A/F	Bolt — Oil filter centre	10 to 12	1.4 to 1.6
$\frac{5}{16}$ in. dia. U.N.F. $\frac{1}{2}$ in. A/F	Setscrew — Exhaust manifold retaining	23 to 25	3.2 to 3.4
3 B.A. $\frac{1}{4}$ in. dia. U.N.F.	Setscrew — Oil level indicator	20 to 22 lb.in.	0.2
$\frac{7}{16}$ in. A/F	Bolt — Clamp — Distributor plate	48 to 52 lb.in.	0.6
$\frac{1}{2}$ in. dia. U.N.F. $\frac{3}{4}$ in. A/F	Nut — Dynamo pulley	24 to 27	3.3 to 3.7
$\frac{1}{2}$ in. dia. U.N.F. $\frac{3}{4}$ in. A/F	Nut — Alternator pulley	35 to 40	4.8 to 5.5
$\frac{1}{2}$ in. dia. U.N.F. $\frac{3}{4}$ in. A/F	Sparking plug	13 to 17	1.8 to 2.3
$\frac{3}{8}$ in. dia. U.N.F. $\frac{9}{16}$ in. A/F	Nut — Saginaw — Steering pump pulley	45 to 50	6.2 to 6.9
$\frac{9}{16}$ in. dia. U.N.F. $\frac{5}{8}$ in. A/F	Setscrew—Hobourn Eaton—Steering pump pulley	18 to 22	2.5 to 3.0
$\frac{5}{16}$ in. dia. U.N.C. $\frac{1}{2}$ in. A/F	Nut — Viscous fan retaining	10 to 15	1.4 to 2.1
$\frac{3}{8}$ in. dia. U.N.F. $\frac{9}{16}$ in. A/F	Bolt — Refrigeration compressor extension pipe assembly	10 to 25	1.4 to 3.4

TORQUE CONVERTER TRANSMISSION

SIZE	COMPONENT	LB.FT.	KG.M.
$\frac{1}{4}$ in. dia. U.N.C. $\frac{7}{16}$ in. A/F	Setscrew — Solenoid to case	10	1,4
$\frac{1}{4}$ in. dia. U.N.C. $\frac{7}{16}$ in. A/F	Setscrew — Control valve unit to case	8	1,1
$\frac{5}{16}$ in. dia. U.N.C. $\frac{1}{2}$ in. A/F	Setscrew — Control valve unit to case	8	1,1
$\frac{5}{16}$ in. dia. U.N.C. $\frac{1}{2}$ in. A/F	Line pressure plug $\frac{1}{8}$ in. dia. pipe	10	1,4
$\frac{5}{16}$ in. dia. U.N.C. $\frac{1}{2}$ in. A/F	Setscrew — Pump body to cover	18	2,5
$\frac{5}{16}$ in. dia. U.N.C. $\frac{1}{2}$ in. A/F	Setscrew — Pump to case	18	2,5
$\frac{5}{16}$ in. dia. U.N.C. $\frac{1}{2}$ in. A/F	Setscrew — Rear servo case to cover	18	2,5
$\frac{5}{16}$ in. dia. U.N.C. $\frac{1}{2}$ in. A/F	Setscrew — Governor cover to case	18	2,5
$\frac{5}{16}$ in. dia. U.N.C. $\frac{1}{2}$ in. A/F	Setscrew — Parking pawl cover to case	18	2,5
$\frac{5}{16}$ in. dia. U.N.C. $\frac{1}{2}$ in. A/F	Setscrew — Vacuum modulator retainer to case	18	2,5
$\frac{5}{16}$ in. dia. U.N.C. $\frac{1}{2}$ in. A/F	Setscrew — Speedometer drive to case retainer ..	18	2,5
$\frac{5}{16}$ in. dia. U.N.C. $\frac{1}{2}$ in. A/F	Setscrew — Sump to case	12	1,7
$\frac{3}{8}$ in. dia. U.N.C. $\frac{9}{16}$ in. A/F	Setscrew — Rear extension to case	23	3,2
$\frac{3}{8}$ in. dia. U.N.F. $\frac{9}{16}$ in. A/F	Nut — Manual shaft to detent lever	18	2,5
$\frac{3}{8}$ in. dia. U.N.C. $\frac{9}{16}$ in. A/F	Nut — Gearchange lever to manual shaft ..	18	2,5
$\frac{3}{8}$ in. dia. U.N.C. $\frac{3}{4}$ in. Thin wall socket	Setscrew — Case to centre support	23	3,2
$\frac{3}{8}$ in. dia. U.N.C. $\frac{9}{16}$ in. A/F	Setscrew — Engine flex plate to torque converter	30	4,1
$\frac{5}{16}$ in. dia. U.N.F. $\frac{1}{2}$ in. A/F	Setscrew — Adapter to engine	18	2,5
$\frac{7}{16}$ in. dia. U.N.F. $\frac{3}{8}$ in. A/F	Setscrew — Bell housing to adapter plate ..	45	6,2
$\frac{3}{8}$ in. dia. U.N.F. $\frac{9}{16}$ in. A/F	Setscrew — Crankcase to adapter plate	32	4,4
$\frac{5}{16}$ in. dia. U.N.F. $\frac{1}{2}$ in. A/F	Setscrew — Mounting plate to adapter	18	2,5
$\frac{1}{4}$ in. dia. U.N.F. $\frac{7}{16}$ in. A/F	Setscrew — Bottom cover to heat exchanger (if fitted)	10	1,4
$\frac{7}{16}$ in. dia. U.N.C. $\frac{3}{8}$ in. A/F	Setscrew — Actuator mounting bracket to rear extension	38	5,3
$\frac{5}{16}$ in. dia. U.N.F. $\frac{1}{2}$ in. A/F	Bolt — Actuator to mounting bracket	18	2,5

Chapter P

4-SPEED AUTOMATIC GEARBOX

SIZE	COMPONENT	LB.FT.	KG.M.
1/4 in. dia. U.N.F. 7/16 in. A/F	Plug — Fluid coupling drain	5 to 7	0,7 to 1.0
	Plug — Sump drain	40 to 50	5.5 to 6.2
1/4 in. dia. U.N.F. 7/16 in. A/F	Setscrew — Control valve unit to gearbox ..	6 to 8	0,8 to 1.1
7/16 in. dia. U.N.F. 5/8 in. A/F	Setscrew — Parking pawl support	25 to 28	3.5 to 3.9
3/8 in. dia. U.N.F. 9/16 in. A/F	Blanking plug — Front servo	6 to 7	0,8 to 0.9
1/2 in. dia. U.N.F. 3/4 in. A/F	Lock-nut — Band adjusting screw	45 to 50	6.2 to 6.9
1 5/8 in. dia. U.N.F. 1 1/4 in. A/F	Plug — Pressure control valve	45 to 50	6,2 to 6.9
5/16 in. dia. U.N.F. 7/16 in. A/F	Setscrew — Front pump to gearbox casing ..	10 to 13	1.4 to 1.8
1 in. dia. U.N.F. Slotted nut	Nut — Output shaft to coupling flange	150 to 180	20,7 to 24.9
7/16 in. dia. U.N.F. 9/16 in. A/F	Setscrew — Centre bearing cap to gearbox case	29 to 32	4.0 to 4.4
No. 10 AM—NC	Setscrew — G2 Valve retaining plate	3 to 4	0.4 to 0.5
	Screws — Cheese head		
	Annulus gear to rear drum	3 to 4	0,4 to 0.5
	Rear servo valve body to main body	3 to 4	0,4 to 0.5
	Front body to inner body (Control valve unit)	3 to 4	0,4 to 0.5
	Outer body to inner body (Control valve unit)	3 to 4	0,4 to 0.5
	3-2 Timing valve body to inner body (Control valve unit)	3 to 4	0,4 to 0.5
	Overspeed valve body to inner body (Control valve unit)	3 to 4	0.4 to 0.5
	Compensator valve plate to outer body (Control valve unit)	3 to 4	0,4 to 0.5
	Cover plate to front body (Control valve unit)	3 to 4	0,4 to 0.5
	Detent plunger retainer to outer valve body (Control valve unit)	3 to 4	0.4 to 0.5
	Cover plate to manual valve body (Control valve unit)	3 to 4	0,4 to 0.5
	Front servo valve body to main body	3 to 4	0,4 to 0.5

Chapter P

SPEED CONTROL

SIZE	COMPONENT	LB.FT.	KG.M.
$\frac{1}{4}$ in. dia. U.N.C. $\frac{7}{16}$ in. A/F	Nut — Bellows to mounting bracket Regulator mounting	4 to 6	0.5 to 0.8
$\frac{1}{4}$ in. dia. U.N.C. $\frac{7}{16}$ in. A/F	Bolt — Regulator to mounting bracket Note Use with lock-washer Regulator mounting	4 to 6	0.5 to 0.8
$\frac{1}{4}$ in. dia. U.N.C. $\frac{3}{8}$ in. A/F	Setscrew — 'Whiz-Tite' — Regulator to mounting bracket Note Locking serrations under setscrew head	14 to 16	1.9 to 2.2

SEAT BELTS

SIZE	COMPONENT	LB.FT.	KG.M.
$\frac{7}{16}$ in. dia. U.N.F. $\frac{13}{16}$ in. A/F	Bolt — Seat belt anchorage	21 to 23	2.9 to 3.2

BODY

	LB.FT.	KG.M.
$\frac{5}{16}$ in. C/S screw — striker plate	16 to 18	2.2 to 2.5
Clamping screw — sun visor	12 to 18	1.7 to 2.5
$\frac{5}{16}$ in. dia. U.N.F. — Screw — Front door top hinges	16 to 18	2.2 to 2.5
$\frac{1}{4}$ in. C/S screw — Door lock	8 to 10	1.1 to 1.4
screw — Interior rear view mirror stem head	20 to 25 lb.in.	0.2 to 0.3
screw — Interior rear view mirror friction-joint	13 to 15 lb.in.	0.1 to 0.2

ITEMS WHICH ARE NOT TO BE TORQUE TIGHTENED

1.	Nuts which are locked by riveting.
2.	Wood screws.
3.	Stub axle nuts (front and rear)
4.	All threads less than 2 B.A. (except items listed in this Chapter).
5.	Front Door private lock-nuts.

Chapter Q

EXHAUST SYSTEM

SECTION

- Q1** Introduction
- Q2** Exhaust pipes, silencers and grass-fire shields
(Single pipe, four box system)
- Q3** Exhaust pipes and silencers (Twin pipe,
six box system)
- Q4** Exhaust manifolds

Chapter Q

EXHAUST SYSTEM

Section Q1

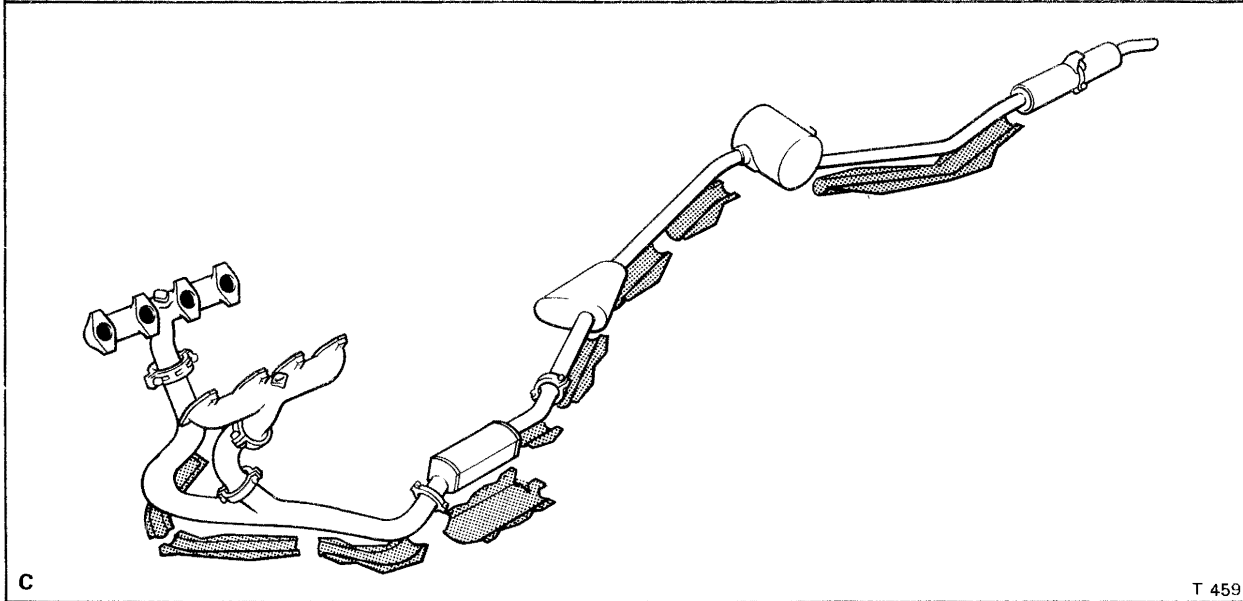
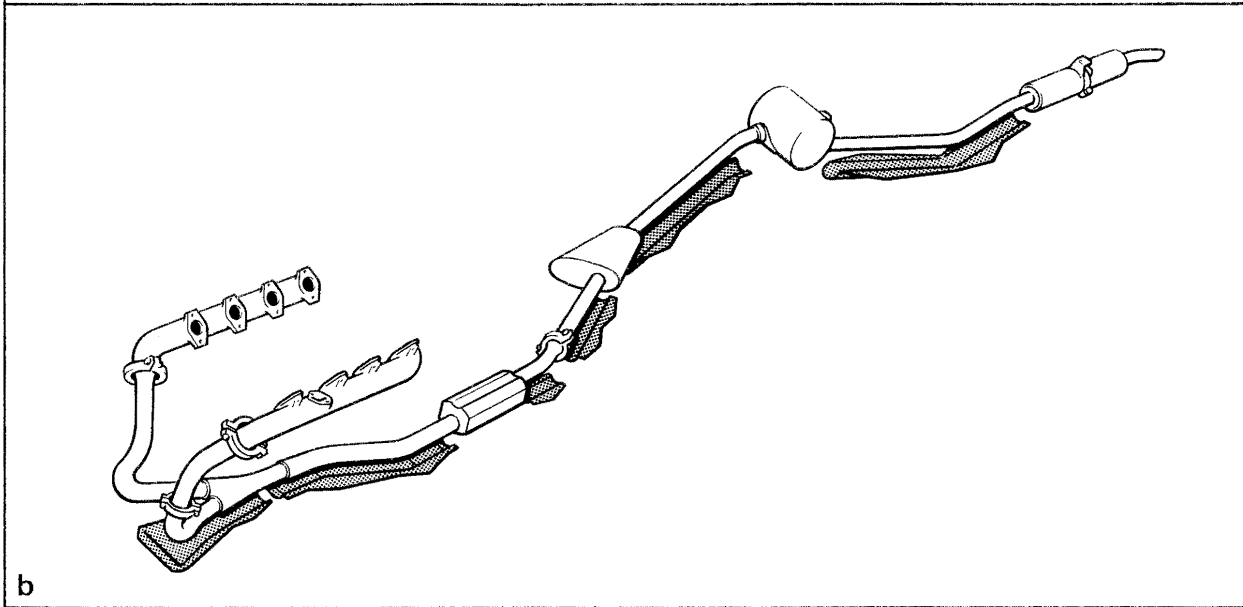
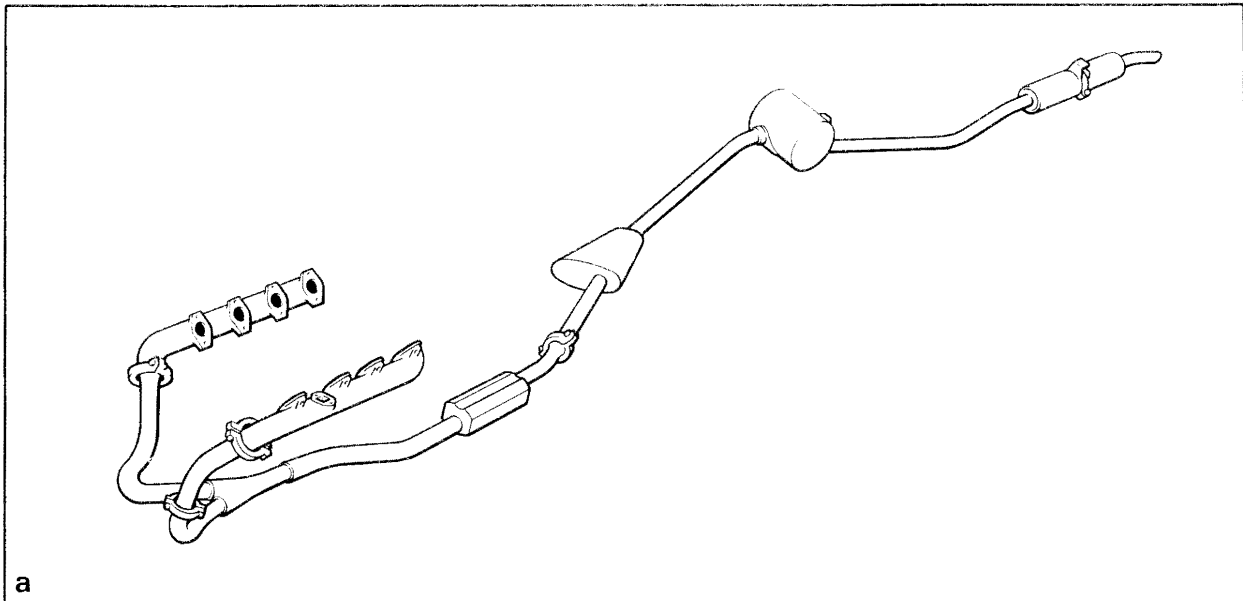
INTRODUCTION

The information contained in this chapter is applicable to the single pipe, four box and twin pipe, six box systems.

Heatshields are fitted to the underbody of all cars above certain parts of the exhaust system. Certain cars built to North American and Japanese emission control regulations are fitted with a catalytic converter in place of the front silencer; grass-fire shields are suspended under the pipe-work and later under the silencers and catalytic converter.

In 1975 a six box, twin pipe system with balance pipe and angled tail pipes was introduced on Corniche cars destined for countries other than Australia, Canada, Japan and the U.S.A. as shown in Figure Q1 - Exhaust configurations.

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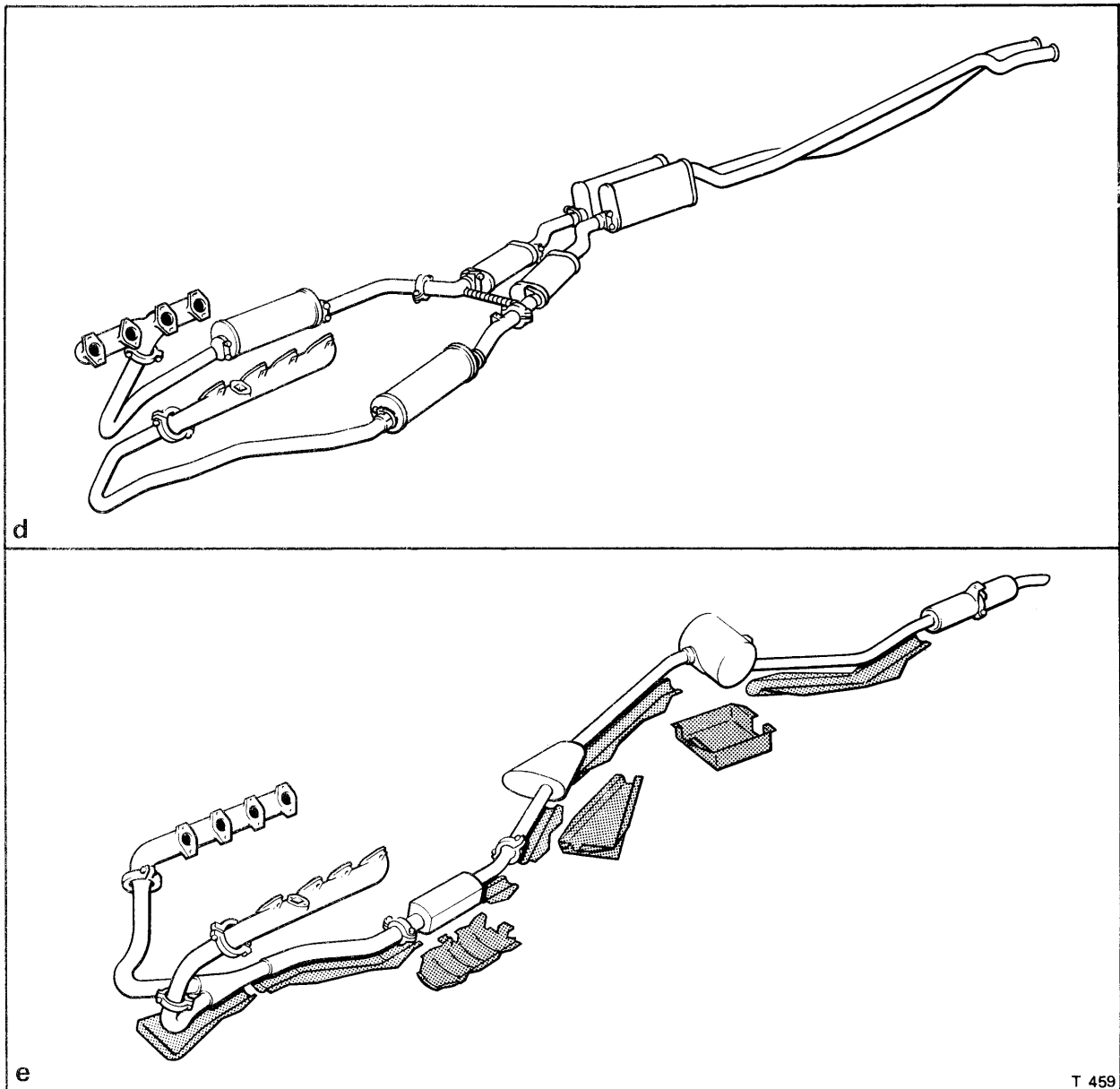


Fig. Q1 EXHAUST SYSTEM CONFIGURATIONS

- a** Early cars. Single four box system with front off-take.
- b** **March 1970** (Canada, Japan and U.S.A.). Single four box system with front off-take. Grass-fire shields fitted.
- c** **December 1974** (Canada and U.S.A.). Single four box system with centre off-takes and grass-fire shields. Catalytic converter replacing front silencer.
- d** **April 1975 Corniche** (Other than Australia, Canada, Japan and U.S.A.). Twin six box system with balance pipe. Centre off-take 'A' bank. Front off-take 'B' bank.
- e** **March 1976** (Japan). Single four box system with front off-takes. Grass-fire shields fitted. Catalytic converter replacing front silencer. Thermal probe connection to catalytic converter.

Note

Dates quoted are approximate. When renewing an exhaust system reference must be made to the Parts List for details.

Section Q2

EXHAUST PIPES, SILENCERS and GRASS-FIRE SHIELDS

(Single pipe, four box system)

Grass-fire shields - To remove and fit

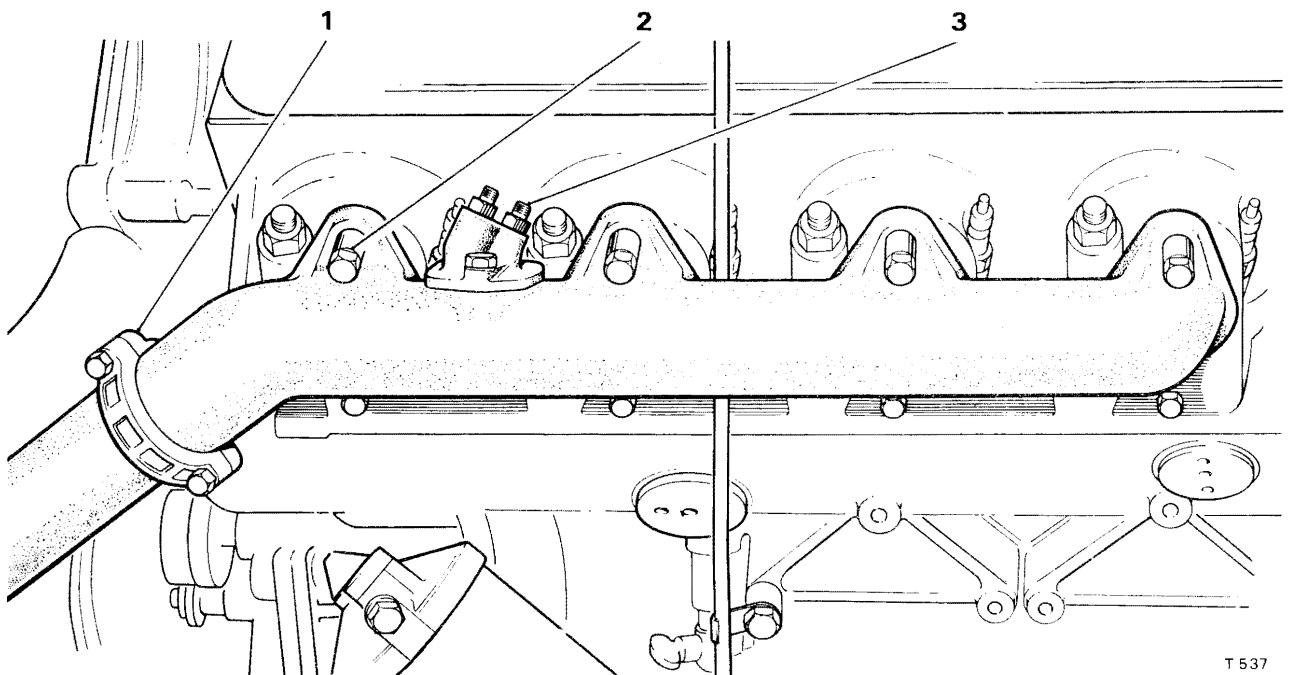
1. Detach the rear shield and the shield covering the intermediate silencers, if fitted.
2. Remove the remaining shields.
3. Check that the shields are in good condition and no breaks or cracks have occurred in the metal mesh.

If damage to a shield has occurred it must be discarded and a new shield fitted.

4. Replace the shields by reversing the procedure for removal noting the following.
5. On cars built to the Japanese specification, ensure a minimum gap of 5 mm. (0.20 in.) is maintained between the grass-fire shields and the exhaust system.

Exhaust pipes and silencers - To remove

1. Place the car on a ramp; remove the gear range selector thermal cut-out from the fuseboard and chock the rear wheels. Raise to a convenient working height.
2. Remove the rear section of the exhaust by detaching at the spherical joint between the front silencer and the expansion box (*see Fig. Q3*). Also disconnect the pipework at the resilient metal mounts attached to the body underframe.
3. To remove the front section of the exhaust, support the system at the 'Y' joint and release the spherical joints at the manifolds.
4. Detach the short downtake pipe at the lower spherical joint on the 'B' bank side of the engine.

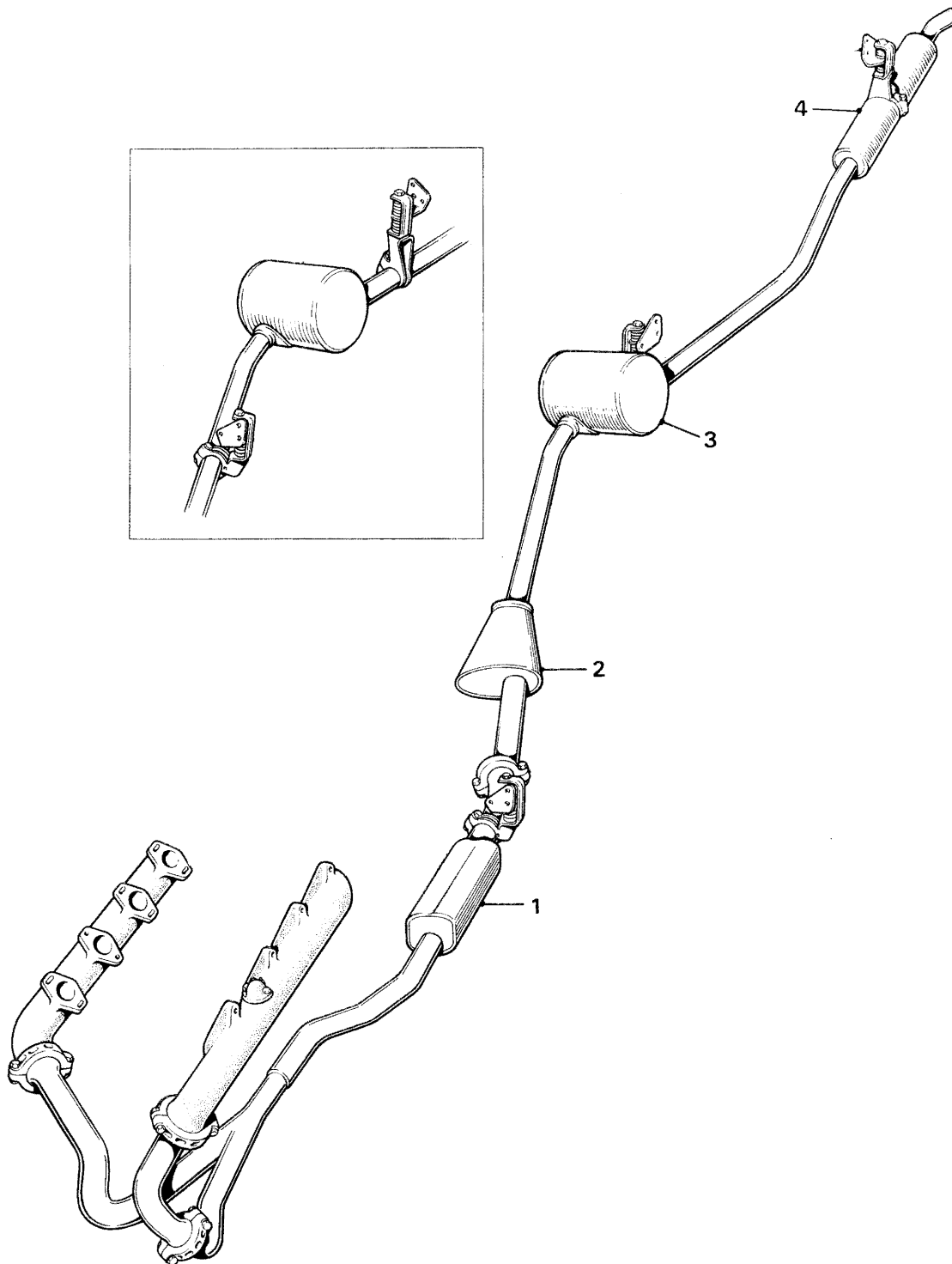


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FIG. Q2 EXHAUST MANIFOLD AND DOWNTAKE PIPE (FRONT OFF-TAKE)

- | | |
|--|----------------------------|
| 1 Downtake pipe joint and clamp | 3 Choke stove pipe adapter |
| 2 Securing setscrew and distance piece | |

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FIG. Q3 SINGLE EXHAUST SYSTEM

- 1 Front silencer
- 2 Expansion box
- 3 Rear silencer

- 4 High frequency damper
- Inset. Alternative mounting

5. With the front system disconnected, carefully remove the assembly from under the car.

Exhaust pipes and silencers - To fit

To assemble, reverse the procedure given for removal, noting the following points.

1. All sealing rings and flared pipes must be thoroughly clean and free from scale. If necessary, lightly dress with fine emery cloth.

2. To ensure free movement of the joints for correct alignment of the components when being assembled, the angular faces of the sealing rings and grooves in the spherical clamps should be smeared with a graphite lubricant.

3. Clamp bolt threads should be oiled to prevent binding.

4. Do not fully tighten the joints until the system has been fitted and manoeuvred to obtain the best run (free from possible fouls) with good joint alignment.

5. The resilient metal exhaust mounts must be set approximately 6,35 mm. (0.250 in.) forward before tightening the clamp on the high-frequency damper. This offset is to allow the thermal expansion of the system (see Fig. Q5).

Exhaust mount - To renew

The 'Vibrashock' exhaust mounts may be readily removed and renewed as a complete assembly if necessary.

If it is necessary to remove and dismantle an exhaust mount, care must be taken on assembly to ensure that the mount cushions are in the correct position.

The two cushions in the mount vary in rate and they are colour coded, red and blue, for identification. On all the mounts, the blue coloured cushion, which is the harder of the two, must always be fitted uppermost.

The mounts have location tabs incorporated on the stirrups to locate the 'handcuff' clamps. Care should be taken when changing mounts to ensure that the tab is located correctly.

It is important when fitting the mounts that the one with the white colour code is fitted to the high frequency damper; the other mounts are coloured coded yellow. The mount colour coded white has a load carrying capacity of 6,8 kg. (15 lb.); the yellow coded mount a capacity of 9,07 kg. (20 lb.).

Refer to Chapter P for torque tightening figures.

Note

When the exhaust system is fitted, a check should be made to see that the correct clearances have been obtained.

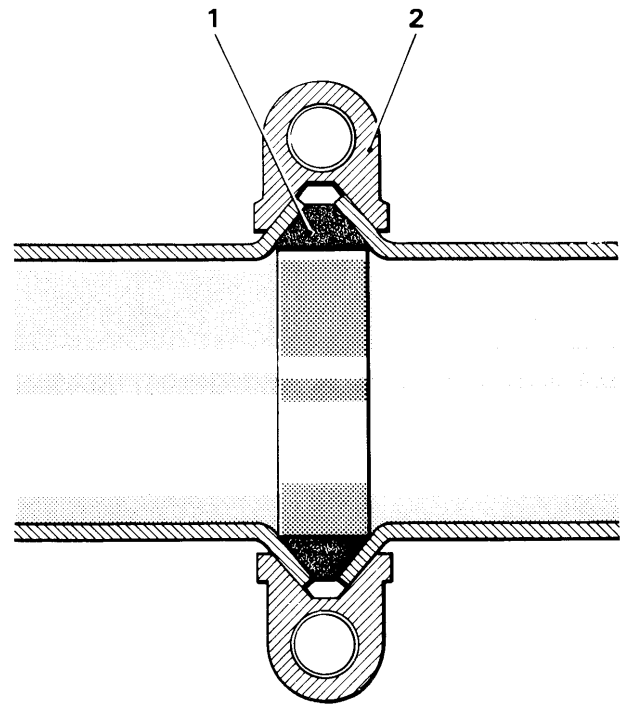
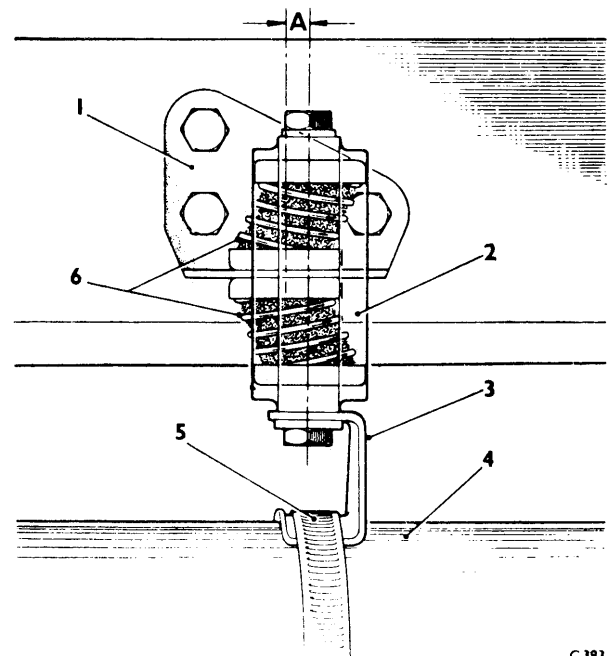


FIG. Q4 FLARED EXHAUST PIPE JOINT

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1 Sealing ring 2 Joint clamp

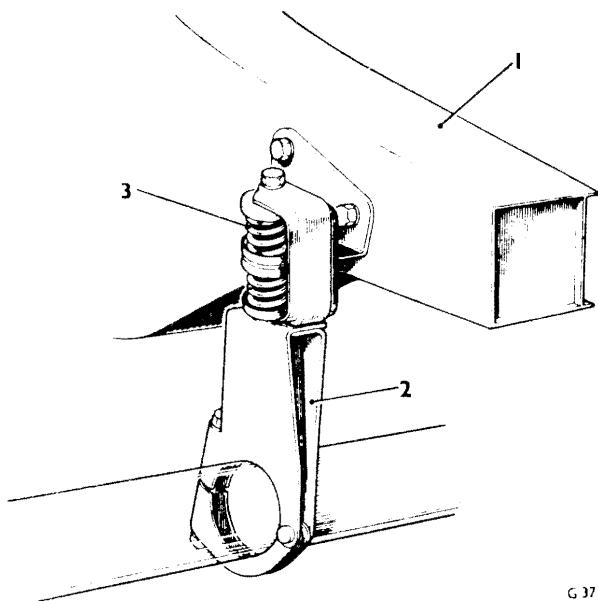


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FIG. Q5 EXHAUST MOUNT SETTING
(Rear illustrated)

A Expansion misalignment
1 Mounting bracket 4 Tail pipe
2 Mount stirrup 5 Clip
3 Pipe bracket 6 Absorber spring and cushion

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**FIG. Q6 EXHAUST MOUNT
WITH 'HANDCUFF' CLAMP**

- 1 Final drive crossmember
- 2 Handcuff clamp
- 3 Absorber spring and cushion

**Exhaust pipes and silencers
- To inspect**

Inspection should include an investigation to ensure that misalignment has not caused the exhaust system to bear on sub-frame, suspension, body, transmission or engine components, with resultant damage to any of these parts.

Individual exhaust components should be inspected at the flared ends of the pipes and for 'crimping' around the stub end pipes of some silencers.

Clamps should be checked to ascertain the freedom of all threads. Inspect each resilient metal mount assembly to ensure the spring mounts are working efficiently with the fixing brackets rigidly attached to the underbody.

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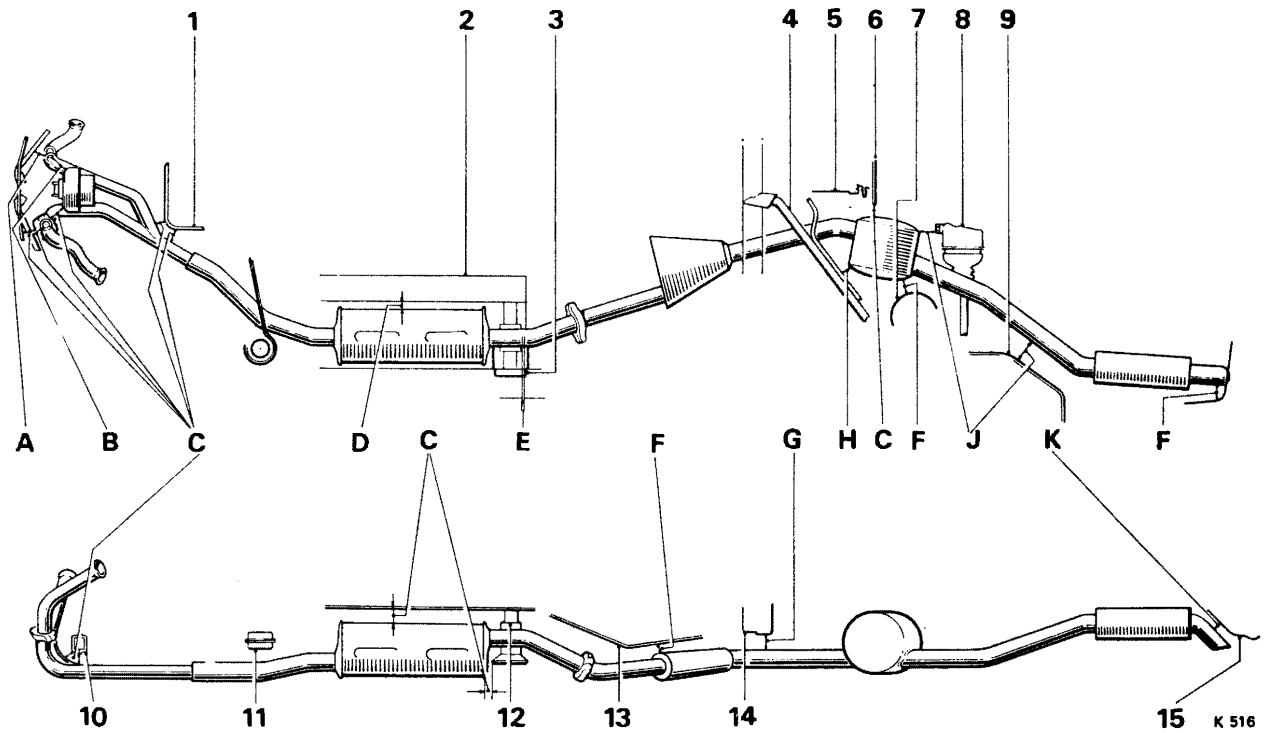


FIG. Q7 EXHAUST SYSTEM ALIGNMENT

- | | | |
|--|--------------------------------|--|
| 1 Engine sump | 4 Rear suspension trailing arm | 11 Front sub-frame rear member |
| 2 Body main member | 5 Propeller shaft | 12 Minimum annular clearance (Dimension C) |
| 3 Exhaust mount offset forward to allow for exhaust system movement when hot (Dimension E) | 6 Transmission damper | 13 Body floor depression |
| | 7 Spring support | 14 Rear suspension crossmember |
| | 8 Final drive half-shaft | 15 Rear of body |
| | 9 Wheel arch | |
| | 10 Engine front crossmember | |
| A 3,112 cm. (1.225 in.) | E 0,475 cm. (0.187 in.) | H 2,413 cm. (0.950 in.) |
| B 3,571 cm. (1.406 in.) | F 1,905 cm. (0.750 in.) | J 2,540 cm. (1.000 in.) |
| C 1,270 cm. (0.500 in.) | G 2,444 cm. (0.962 in.) | K 1,334 cm. (0.525 in.) |
| D 0,793 cm. (0.312 in.) | | |

April 1979

T.S.D. 2476

Section Q3

EXHAUST PIPES and SILENCERS

(Twin pipe, six box system)

Introduction

The pipes and silencers of this system are fitted to Corniche cars only, destined for countries other

than Australia, Canada, Japan and the U.S.A., from car serial numbers 22583 to 30000 (including 21729 and 21998).

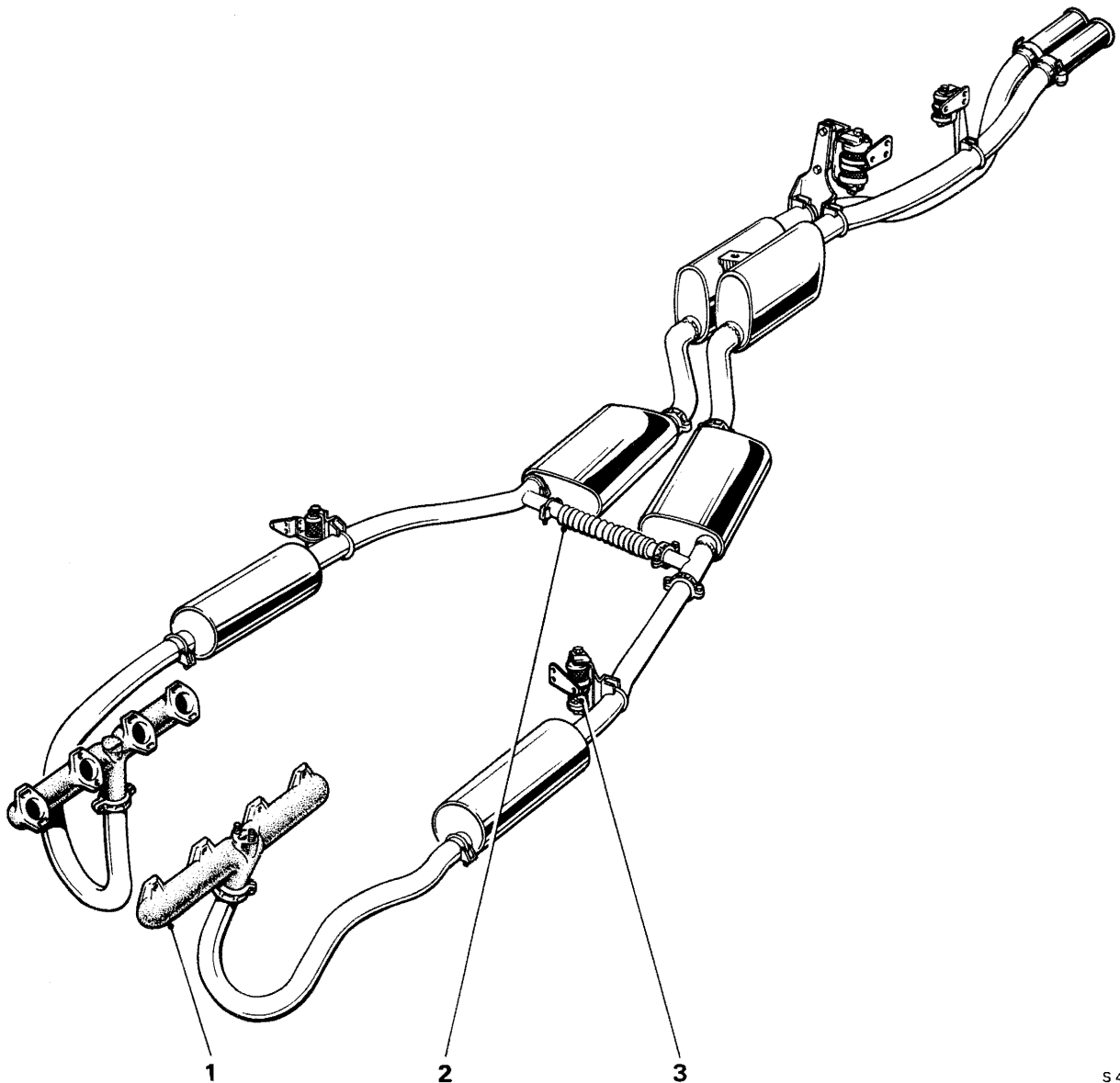


FIG. Q8 TWIN EXHAUST SYSTEM

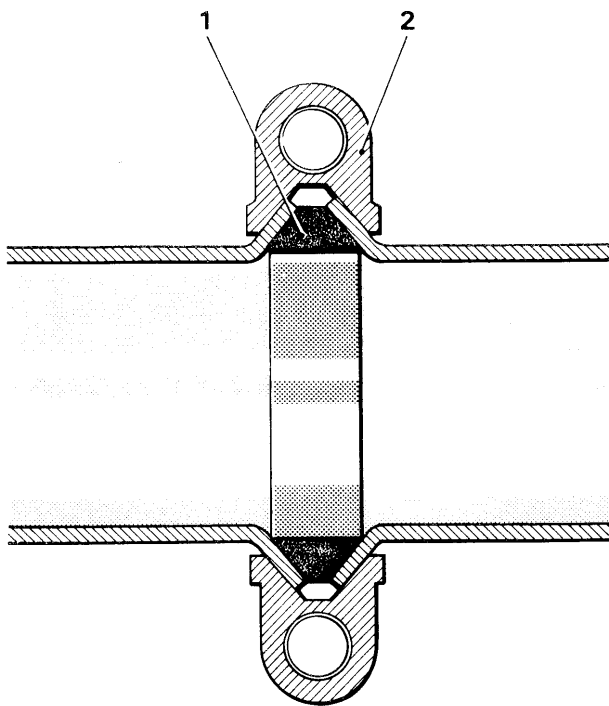
1 Exhaust manifold

2 Intermediate balance pipe

3 Vibrashock mount

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FIG. Q9 FLARED EXHAUST PIPE - SPHERICAL JOINT

- 1 Seal ring
- 2 Joint clamp

**Exhaust pipes and silencers -
To remove (see Fig. Q8)**

1. Drive the car onto a ramp; remove the gear range selector thermal cut-out from the fuseboard and chock the rear wheels. Raise to a convenient working height.
2. Detach the rear silencers and pipework at the spherical joints situated behind the intermediate silencers and also at the resilient metal mounts attached to the body underframe (see Fig. Q8). Remove the sealing rings.
3. Withdraw the rear section of the exhaust system.
4. Remove the 'U' clamp and spherical joint to detach the intermediate balance pipe (see Fig. Q9). Check all threads for damage and discard any 'U' clamps which are splayed.
5. Release the 'U' clamp to the 'A' bank intermediate silencer. Twist at the joint to break the seal and remove.
6. Detach the pipe attached to the rear of 'A' bank front silencer at the 'U' clamp and at the resilient metal mount situated behind the body cross-beam.

7. Unfasten the 'U' clamp attaching the 'A' bank front silencer to the downtake pipe. Twist at the joint to break the seal and withdraw.
8. Detach the 'B' bank intermediate silencer at the spherical joint just forward of the silencer body. Collect the sealing ring.
9. Unfasten the 'U' clamps at the pipe joint and at the resilient metal mount to release the length of pipe attached to the rear of 'B' bank front silencer.
10. Remove the 'B' bank front silencer by slackening the forward 'U' clamp (see Fig. Q8) at the sliding joint, twist the silencer to break the seal and withdraw.
11. To remove the downtake pipes, support at the lower end before attempting to release the spherical joint at the exhaust manifold.

Exhaust pipes and silencers - To fit

To assemble, reverse the procedure given for removal, noting the following points.

1. Ensure all pipes are a sliding fit into the silencer box stub pipe to allow for adjustment.
2. The arrow stamped on each silencer must point to the rear when the box is assembled into the system.
3. All sealing rings and pipes must be thoroughly clean and free from scale. If necessary, lightly dress with fine emery cloth.

To ensure free movement of the joints for correct alignment of the components when being assembled, the angular faces of the sealing rings and grooves in the spherical clamps should be smeared with a graphite lubricant.

The clamp bolt threads should be oiled to prevent binding.

4. Do not fully tighten the joints until the system has been fitted and manoeuvred to obtain the best run (free from possible fouls) with good joint alignment.
5. When the pipe runs are satisfactory, apply a sealant, such as Holts Firegum, into the ends of any straight tube joint especially covering the slits down the sides of the silencer stub pipes.

Important

Do not overtighten the 'U' clamps across the sliding joints as this could 'crimp' the inner and outer tubes together, causing difficult when dismantling.

6. The rear silencers and tailpipes are fitted under the car as one unit assembled to the rear of the intermediate silencers by spherical clamps and sealing rings.

If however, in the intermediate or front system, only one component is to be replaced, the transfer is made easier as a bench operation. Ensure the

new component is left loose to facilitate manoeuvring the pipe run when the system is assembled to the car.

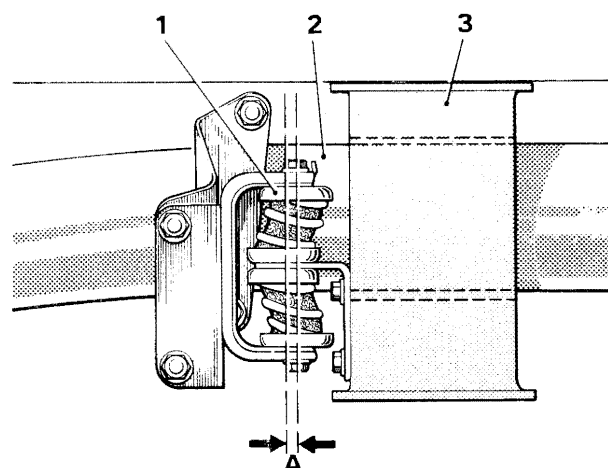
7. The resilient metal exhaust mounts must be set approximately 6,35 mm. (0.250 in.) forward before tightening the 'U' clamp around the exhaust pipe. This offset is to allow for thermal expansion of the system (see Fig. Q10).

Exhaust pipes and silencers - To inspect

Inspection should include an investigation to ensure that misalignment has not caused the exhaust system to bear on sub-frame, suspension, body, transmission or engine components, with resultant damage to any of these parts.

Individual exhaust components should be inspected at the flared ends of the pipes and for 'crimping' around the stub end pipes of some silencers.

Clamps should be checked to ascertain the freedom of all threads. Inspect each resilient metal mount assembly to ensure the spring mounts are working efficiently with the fixing brackets rigidly attached to the underbody.



S469

FIG. Q10 EXHAUST MOUNT - SHOWING OFFSET

- 1 Spring mount
- 2 Exhaust pipe
- 3 Body crossbeam
- A 6,35 mm. (0.250 in.)

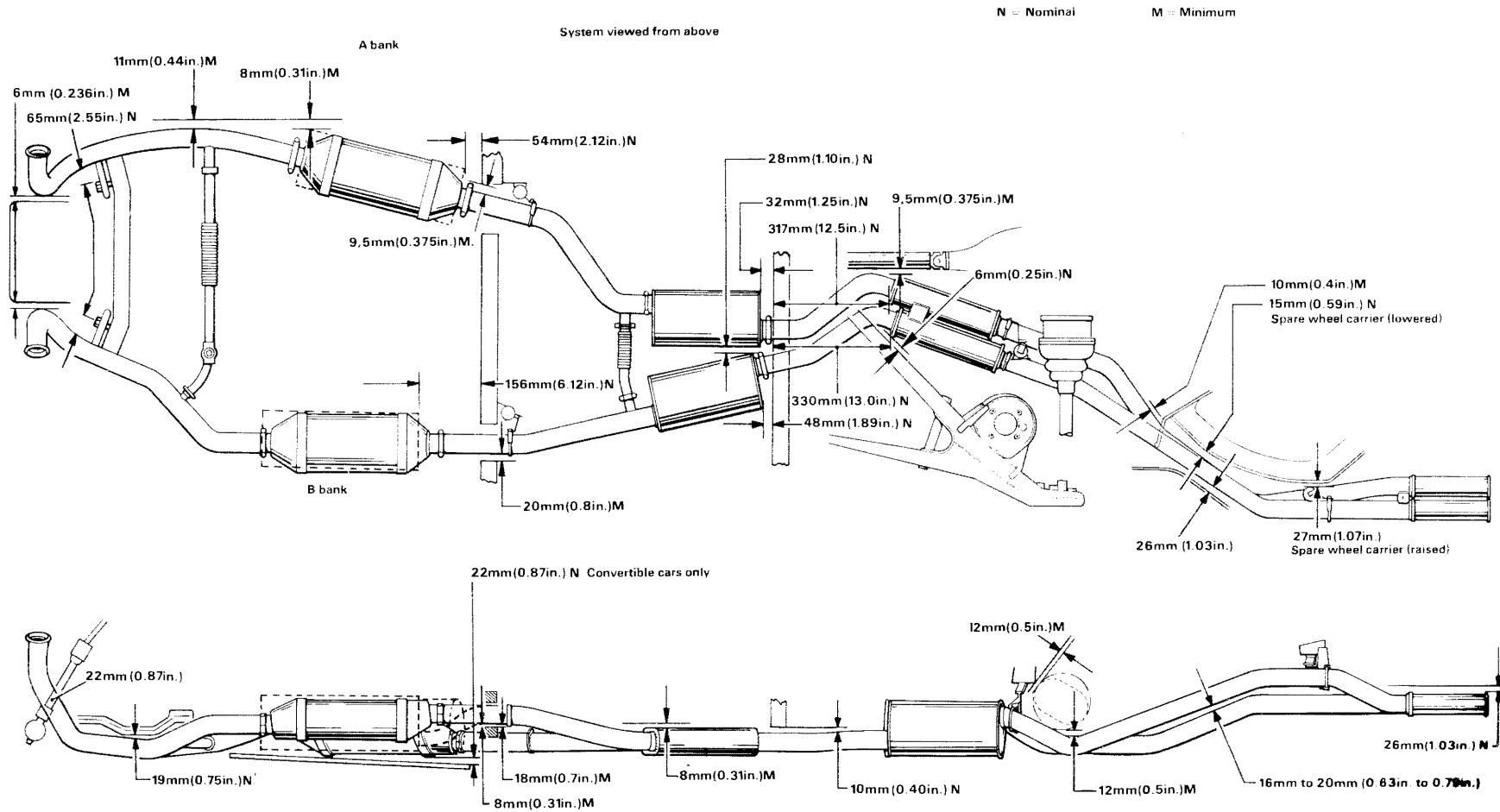


FIG. Q11 TWIN EXHAUST SYSTEM - CLEARANCE DIMENSIONS

Section Q4

EXHAUST MANIFOLDS

Exhaust manifolds - To remove

1. Support the downtake pipes just forward of the front silencer(s) with wood blocks and jacks.
2. Slacken and remove the bolts to the 'A' and 'B' bank downtake to manifold, spherical joints. Remove the clamps.
3. If fitted remove the two choke stove pipes from the unions located on 'B' bank manifold. Blank off the pipes to prevent ingress of dirt (see Fig. Q2 and Q11).
4. Remove the setscrews and distance pieces securing the manifolds to the cylinder heads, then detach the manifolds, taking care to retain the sealing rings from the downtake joints.
5. Discard the joints fitted between the manifolds and the cylinder heads.
6. Using a flat scraper remove all traces of carbon from the machined faces of the exhaust manifolds and the exhaust port faces on the cylinder heads. Extra care must be taken when scraping the cylinder heads not to damage the faces of the aluminium.
7. Blank off the ports in the cylinder heads to prevent the ingress of dirt and other foreign matter.

Note

The manifolds have 1,3 cm. (0.50 in.) long slotted holes on numbers 1, 2 and 4 flange faces on 'B' bank and numbers 1, 3 and 4 flange faces on 'A' bank. These holes allow for normal expansion and contraction without manifold distortion (see Fig. Q12 inset).

Exhaust manifolds - To inspect

1. The exhaust manifold should be checked for distortion by applying a straight edge across the joint face. Small irregularities should be corrected by dressing the face using abrasive cloth.

Note

Before re-facing, any scale on the joint faces should be carefully removed with a medium-cut file.

The importance of the manifold faces being flat and square cannot be over-emphasised.

Exhaust manifolds - To fit

To fit the manifolds, reverse the procedure given for their removal noting the following points.

1. Ensure all joint faces are free from scale

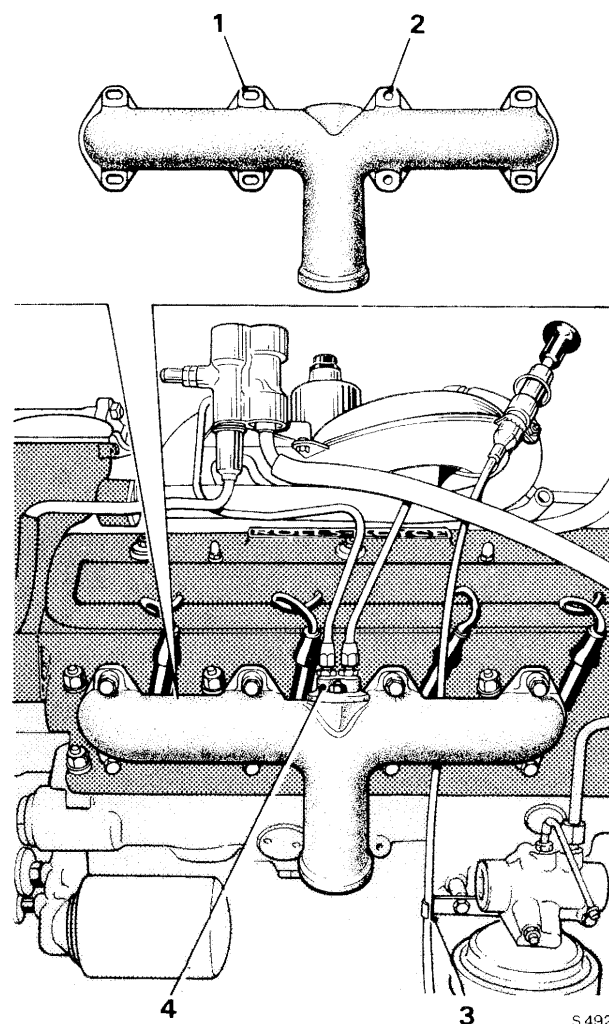


FIG. Q12 'B' BANK EXHAUST MANIFOLD WITH CENTRE OFF-TAKE

- 1 Elongated expansion hole
- 2 Location hole
- 3 Dipstick tube
- 4 Choke stove pipe (If fitted)

Chapter Q

and emery dust before being assembled.

2. The spherical seating faces of the manifold to downtake pipe joints may be lightly dressed with fine emery cloth before assembly.

3. Jointing compound must not be used on any of the manifold joints. The spherical joint clamp nuts of the manifold to downtake pipes should be lubricated with oil to ensure that the threads do not bind.

4. Smear the spherical seating faces of the sealing rings and the grooves in the spherical clamps with a graphite lubricant to assist in correct alignment when assembling.

5. All nuts and bolts should be tightened to the standard specified torque loadings (see Chapter P). Manifold setscrews must be tightened evenly, starting from the centre and working outwards.

6. After the engine has been run sufficiently to reach normal operating temperature, the manifold setscrews and spherical joint clamp bolts should be checked and if necessary, tightened again to the specified torque loadings (see Chapter P).

Chapter R
WHEELS AND TYRES

Chapter R

WHEELS AND TYRES

It must be noted that the car serial numbers shown in this Chapter are the earliest numbers which incorporate changes. Before requesting new components, always consult the appropriate section of the Parts List, Service Bulletins and Spares Information Sheets.

When radial-ply tyres are fitted the following information shows the Car Serial Numbers at which the various types and combinations of Road Wheels, Hubs, Tyre Valves and Wheel Discs are fitted.

Prior to Car Serial Numbers	
Silver Shadow and T Series	R.H.D. 5572 L.H.D. 6752
Long Wheelbase	6744 (including 6712, 6714 and 6720)
Coachbuilt	6760
(a) Road wheels fitted with radial-ply tyres and inner tubes (see Fig. R1).	
(b) Length of tyre valve 4.9 cm. (1.9 in.). This measurement does not include the dust cap.	

From Car Serial Numbers	
Silver Shadow and T Series	R.H.D. 5572 L.H.D. 6752
Long Wheelbase	6744 (including 6712, 6714 and 6720)
Coachbuilt	6760
(a) Road wheels with flat ledge rims enabling radial-ply tyres to be fitted without inner tubes (see Fig. R1).	
(b) Length of tyre valve 6.1 cm. (2.4 in.). This measurement does not include the dust cap.	
(c) Introduction of wheel discs with high profile claw rings.	

Note It is important to note that the two types of road wheel shown in Figure R1 are not interchangeable as individual items, and that fitting a different type of wheel to a car would also involve changing the wheel disc and tyre valve.

Regardless of the type of wheel fitted, the wheel retaining nuts should be torque tightened to between 6.22 kg.m. and 6.91 kg.m. (45 lb.ft. and 50 lb.ft.).

From Car Serial Numbers	
Silver Shadow and T Series	R.H.D. 8387 L.H.D. 9075 (including 9068 fitted to front hubs only)

Long Wheelbase	9113
Coachbuilt	8421 (9102 fitted to front hubs only)
(a) Introduction of spigotted hubs.	
(b) Wheel discs incorporating new claw rings and locating lugs are fitted.	
(c) Road wheels with wheel disc locating holes are fitted.	

From Car Serial Numbers	
Silver Shadow and T Series	10500 (including 10494)
Long Wheelbase	10563
Ventilated wheel discs are fitted to all cars except those destined for North America.	

From Car Serial Numbers	
Silver Shadow and T Series	18269 (including 18225 and 18259)
Corniche	18563
Ventilated wheel discs are fitted to all cars.	

From Car Serial Numbers	
Front wheel hubs	
Silver Shadow and T Series	11715
Long Wheelbase	11857
Corniche	11840

Rear wheel hubs	
Silver Shadow and T Series	11625
Long Wheelbase	11820
Corniche	11757
Introduction of spigotted hubs with interference wheel stud fittings.	

Note When renewing a damaged wheel stud, it may be necessary to use a press of approximately 2 032 kg. (2 tons) capacity to remove and fit the wheel stud.

When fitting the new wheel stud it should be rotated until the splines line up with those already cut in the hub and then pressed into position. Adequate interference is maintained to enable each wheel stud to be renewed approximately three times when in service.

It is important to note that new wheel hub and stud assemblies are in no way interchangeable with old assemblies.

Chapter R

**Road wheels—
To remove**

1. Apply the handbrake/parking brake.
2. Remove the wheel disc with the tommy bar provided in the tool kit.

On all cars other than the Corniche, place the tommy bar in one of the positions indicated by the arrows shown in Figure R2 noting the relationship between these arrows and the tyre valve and then press the tommy bar outwards towards the tyre. Do not twist the tommy bar.

On Corniche cars the wheel disc and wheel trim are separate items. To remove the wheel disc, place the tommy bar in position as shown in Figure R3 and press the tommy bar downwards.

To remove the wheel trim, place the tommy bar in position as shown in Figure R4, then press the tommy bar outwards towards the tyre; do not twist the tommy bar. Repeat this operation at several points around the circumference of the wheel.

3. Slacken the wheel retaining nuts approximately half-a-turn before raising the car. Nuts on the left-hand wheels have left-hand threads and nuts on the

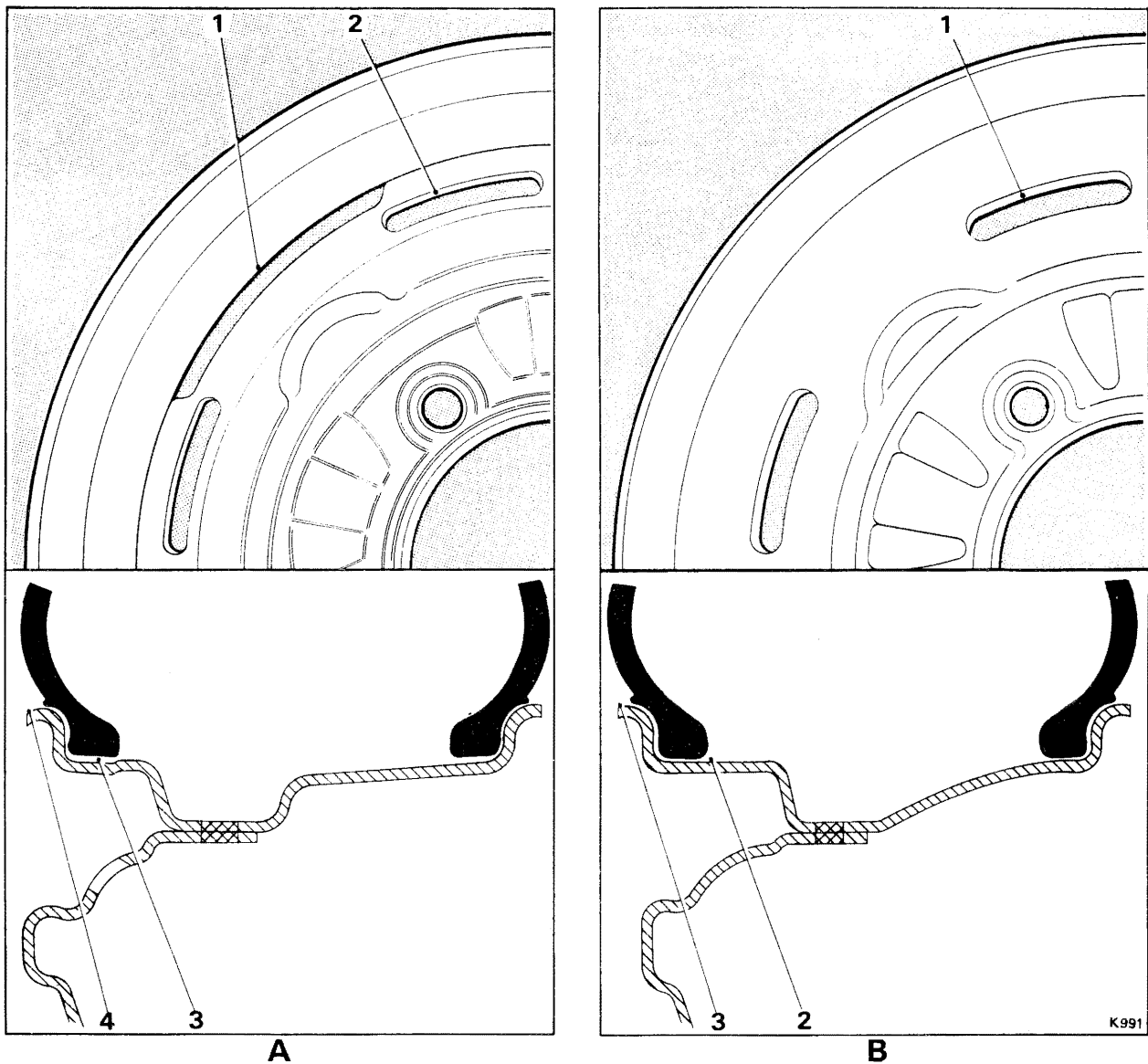


FIG. R1 IDENTIFICATION OF WHEELS

- A Original wheel**
- 1 Window in outer edge of knave (four in each wheel)
 - 2 Slot in knave pressing (six in each wheel)
 - 3 Angled seat
 - 4 Outer rim

- B Flat ledge rim wheel**
- 1 Slot in knave pressing (six in each wheel)
 - 2 Flat seat
 - 3 Outer rim

right-hand wheels have right-hand threads. An arrow and the word 'OFF' stamped on each wheel nut indicates the direction of removal.

4. Open the cover plate on the sill, fit the jack in position as shown in Figure R5 and then raise the car.

5. Remove the nuts and wheel.

Road wheels—To fit

Fit the wheel by reversing the procedure described for its removal, noting the following points.

1. Ensure that the spherical seatings of the nuts and wheels are not damaged.

2. Lightly coat the spherical seats of the nuts with grease before fitting.

3. Torque tighten the nuts to between 6,22 kg.m. and 6,91 kg.m. (45 lb.ft. and 50 lb.ft.).

Failure to observe the torque figures when tightening the nuts can cause damage to the spherical seating faces and cause difficulty in removing and fitting the nuts.

Wheel discs

The following information is not applicable to Corniche cars.

Two types of wheel discs may be fitted, either the ventilated type or the non-ventilated type. Both types of discs are secured to the wheel by a steel claw ring. The claw ring engages with three equally spaced protrusions on the wheel.

On non-ventilated type wheel discs that do not incorporate locating lugs it is possible that road vibrations may cause a rattle. This is due to the disc not being a secure fit over the wheel protrusions. If a rattle occurs the radius of the claw ring can be reduced to ensure a tight fit on the wheel by carrying out the following procedure.

1. Remove the wheel disc.

2. Locate the three marks on the claw ring which indicate the points at which the ring locates on the wheel protrusions.

3. Place a tommy bar on the outer edge of the claw ring, as shown in Figure R6.

4. Support the wheel disc on a piece of wood to prevent damage to the outer edge. Using a hammer, strike the tommy bar downwards until the claw ring radius is reduced at that point. Fit the disc to the wheel and if necessary repeat the operation until a secure fit is obtained.

5. Repeat the procedure on each of the three marks on the claw ring.

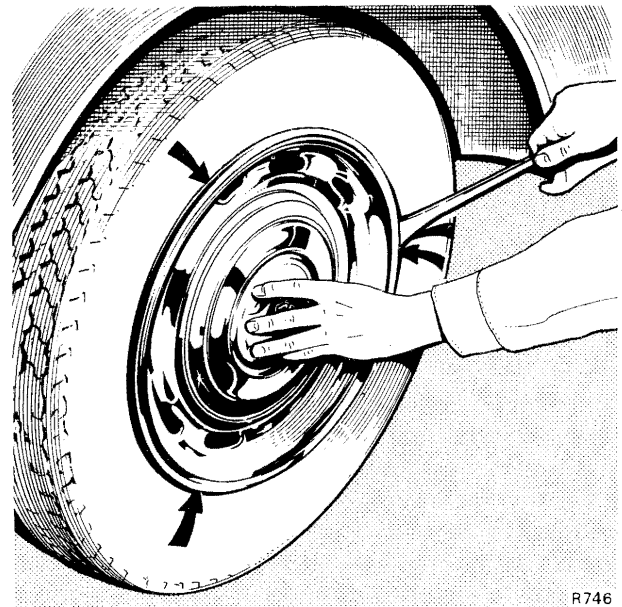


FIG. R2 REMOVING A WHEEL DISC

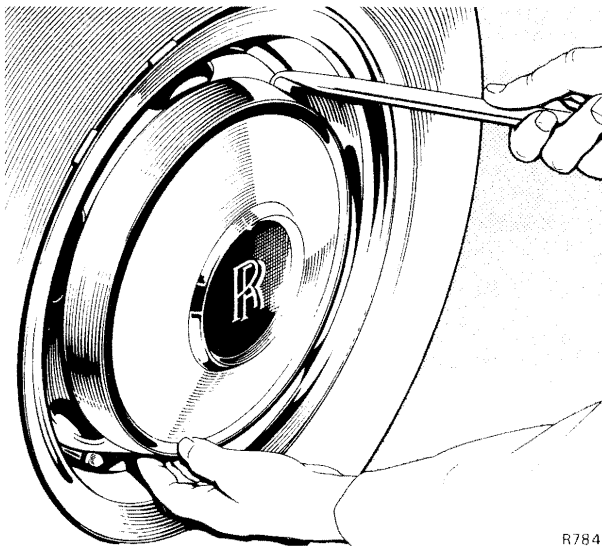


FIG. R3 REMOVING A WHEEL DISC (CORNICHE)

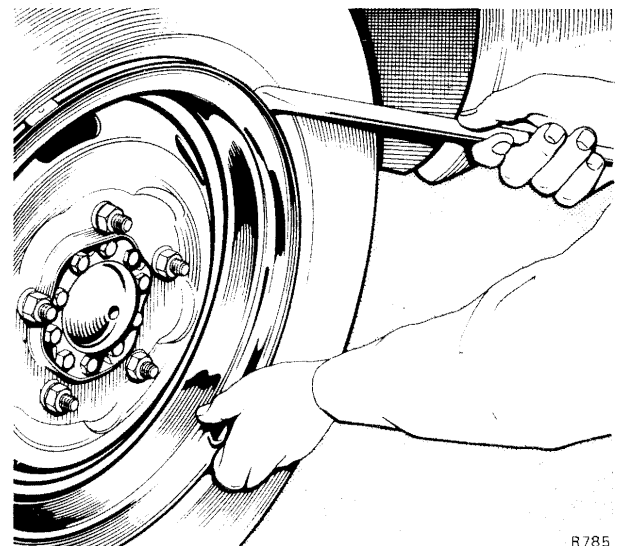


FIG. R4 REMOVING A WHEEL TRIM (CORNICHE)

Chapter R

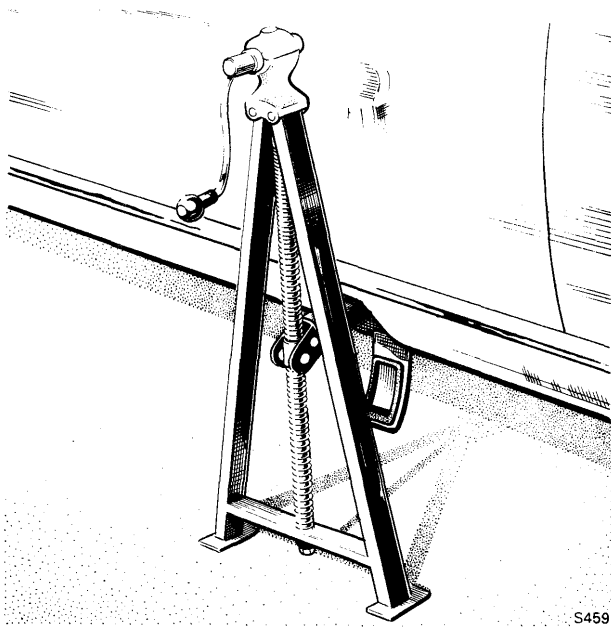


FIG. R5 JACK CORRECTLY POSITIONED

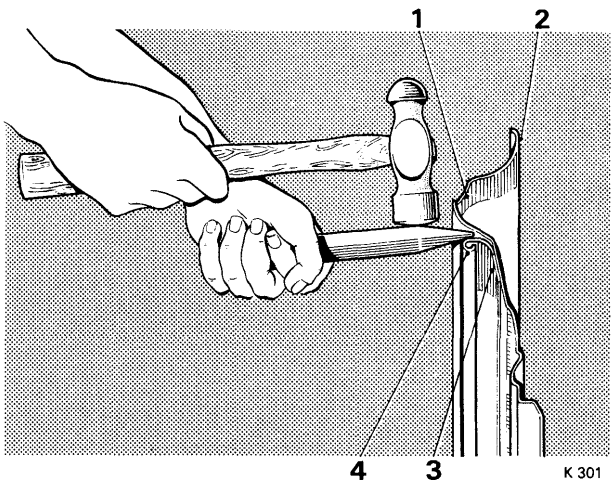


FIG. R6 CLAW RING ADJUSTMENT

- 1 Valve hole
- 2 Wheel disc
- 3 Claw ring
- 4 Point at which claw ring locates on wheel protrusion

Tyre pressures

When checking tyre pressures, ensure that the tyres are cold. A hot tyre must not be deflated in order to obtain the required pressure. As a tyre cools, the pressure decreases.

The recommended tyre inflation pressures (cold) are:

Prior to Car Serial Numbers

Silver Shadow saloon	18269
Bentley 'T' Series saloon	18225
Long Wheelbase saloon (without division)	19577
Long Wheelbase saloon (with division)	19640
Corniche Saloon	18564
Corniche Convertible	18563

All cars except those domiciled in the U.S.A., Canada and the Federal Republic of Germany fitted with 8.15 x 15 cross-ply tyres.

All cars other than the Silver Shadow Long Wheelbase

- Front - 1,8 kg/sq.cm. (26 lb/sq.in.)
- Rear - 1,8 kg/sq.cm. (26 lb/sq.in.)

For continuous high speed motorway driving the tyre pressures should be increased by 0,14 kg/sq.cm. (2 lb/sq.in.).

Long Wheelbase

- 1 - 3 occupants - Front - 2,0 kg/sq.cm. (28 lb/sq.in.)
- Rear - 2,1 kg/sq.cm. (30 lb/sq.in.)
- 4 - 5 occupants - Front - 2,0 kg/sq.cm. (28 lb/sq.in.)
- Rear - 2,25 kg/sq.cm. (32 lb/sq.in.)
- 5 occupants and luggage - Front - 2,0 kg/sq.cm. (28 lb/sq.in.)
- Rear - 2,4 kg/sq.cm. (34 lb/sq.in.)

All cars fitted with 205 x 15 radial-ply tyres and all cars domiciled in the U.S.A. and Canada fitted with 8.15 x 15 cross-ply tyres.

Silver Shadow and Bentley 'T' Series saloon

- 1 - 5 occupants - Front - 2,0 kg/sq.cm. (28 lb/sq.in.)
- Rear - 2,0 kg/sq.cm. (28 lb/sq.in.)
- 5 occupants and luggage - Front - 2,0 kg/sq.cm. (28 lb/sq.in.)
- Rear - 2,25 kg/sq.cm. (32 lb/sq.in.)

Long Wheelbase

- 1 - 3 occupants - Front - 2,0 kg/sq.cm. (28 lb/sq.in.)
- Rear - 2,1 kg/sq.cm. (30 lb/sq.in.)
- 4 - 5 occupants - Front - 2,0 kg/sq.cm. (28 lb/sq.in.)
- Rear - 2,25 kg/sq.cm. (32 lb/sq.in.)
- 5 occupants and luggage - Front - 2,0 kg/sq.cm. (28 lb/sq.in.)
- Rear - 2,4 kg/sq.cm. (34 lb/sq.in.)

Two-Door Saloon and Convertible

- 1 - 4 occupants - Front - 2,0 kg/sq.cm. (28 lb/sq.in.)
- Rear - 2,0 kg/sq.cm. (28 lb/sq.in.)

4 occupants - Front - 2,0 kg/sq.cm. (28 lb/sq.in.)
and luggage - Rear - 2,25 kg/sq.cm.
(32 lb/sq.in.)

All cars domiciled in the Federal Republic of Germany fitted with 8.15 x 15 cross-ply tyres or 205 x 15 radial-ply tyres.

All cars other than the Silver Shadow Long Wheelbase
Front and Rear 2,0 kg/sq.cm. (28 lb/sq.in.)

Long Wheelbase
Front - 2,0 kg/sq.cm. (28 lb/sq.in.)
Rear - 2,4 kg/sq.cm. (34 lb/sq.in.)

From Car Serial Numbers

Silver Shadow saloon	18269
Bentley 'T' Series saloon	18225
Long Wheelbase saloon (without division)	19577
Long Wheelbase saloon (with division)	19640
Corniche Saloon	18564
Corniche Convertible	18563

All cars except those domiciled in Australia, Canada, Japan and the U.S.A. fitted with HR 70 HR 15 (235/70 HR 15) radial-ply tyres.

For all loading conditions up to 5 occupants in Silver Shadow and Long Wheelbase cars or 4 occupants in Corniche cars and 113,5 kg. (250 lb.) of luggage.

Silver Shadow and Bentley T Series, Long Wheelbase saloon without division, Corniche Convertible and Corniche Saloon.

For speeds up to 180 k.p.h. (110 m.p.h.)
Front - 1,7 kg/sq.cm. (24 lb/sq.in.)
Rear - 2,0 kg/sq.cm. (28 lb/sq.in.)

For sustained speeds in excess of 180 k.p.h. (110 m.p.h.)

Front - 2,1 kg/sq.cm. (30 lb/sq.in.)
Rear - 2,4 kg/sq.cm. (34 lb/sq.in.)

Long Wheelbase saloon with division

For speeds up to 180 k.p.h. (110 m.p.h.)
Front - 1,7 kg/sq.cm. (24 lb/sq.in.)
Rear - 2,1 kg/sq.cm. (30 lb/sq.in.)

For sustained speeds in excess of 180 k.p.h. (110 m.p.h.)

Front - 2,1 kg/sq.cm. (30 lb/sq.in.)
Rear - 2,5 kg/sq.cm. (36 lb/sq.in.)

For cars domiciled in Australia, Canada and the U.S.A.

For all loading conditions up to 5 occupants in Silver Shadow and Long Wheelbase cars or 4 occupants in Corniche cars and 113,5 kg. (250 lb.) luggage.

Silver Shadow, Bentley T Series and Long Wheelbase saloon without division.

For speeds up to 180 k.p.h. (110 m.p.h.)
Front - 1,7 kg/sq.cm. (24 lb/sq.in.)
Rear - 2,0 kg/sq.cm. (28 lb/sq.in.)

For sustained speeds in excess of 180 k.p.h. (110 m.p.h.)

Front - 2,0 kg/sq.cm. (28 lb/sq.in.)
Rear - 2,25 kg/sq.cm. (32 lb/sq.in.)

Long Wheelbase saloon with division

For speeds up to 180 k.p.h. (110 m.p.h.)
Front - 1,8 kg/sq.cm. (26 lb/sq.in.)
Rear - 2,25 kg/sq.cm. (32 lb/sq.in.)

For sustained speeds in excess of 180 k.p.h. (110 m.p.h.)

Front - 2,1 kg/sq.cm. (30 lb/sq.in.)
Rear - 2,5 kg/sq.cm. (36 lb/sq.in.)

Corniche Saloon and Convertible

For speeds up to 180 k.p.h. (110 m.p.h.)
Front - 1,7 kg/sq.cm. (24 lb/sq.in.)
Rear - 2,0 kg/sq.cm. (28 lb/sq.in.)

For sustained speeds in excess of 180 k.p.h. (110 m.p.h.)

Front - 2,1 kg/sq.cm. (30 lb/sq.in.)
Rear - 2,4 kg/sq.cm. (34 lb/sq.in.)

For cars domiciled in Japan

Cars applicable to Car Serial Numbers

Silver Shadow saloon from 18269 to 22117 inclusive
Bentley 'T' Series

saloon from 18225 to 22141 inclusive

Long Wheelbase saloon (without division) from 19577 to 22072 inclusive

Long Wheelbase saloon (with division) from 19640 to 22171 inclusive

Corniche Saloon

R.H.D. from 18564 to 22647 inclusive

L.H.D. from 18680 to 22918 inclusive

Corniche Convertible

R.H.D. from 18563 to 22582 inclusive

L.H.D. from 18678 to 22780 inclusive

For all loading conditions up to 5 occupants in Silver Shadow and Long Wheelbase cars or 4 occupants in Corniche cars and 113,5 kg. (250 lb.) of luggage.

Silver Shadow and Bentley T Series, Long Wheelbase saloon without division, Corniche Convertible and Corniche Saloon.

For speeds up to 180 k.p.h. (110 m.p.h.)

Front - 1,7 kg/sq.cm. (24 lb/sq.in.)
Rear - 2,0 kg/sq.cm. (28 lb/sq.in.)

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For sustained speeds in excess of 180 k.p.h.
(110 m.p.h.)

Front - 2,1 kg/sq.cm. (30 lb/sq.in.)
Rear - 2,4 kg/sq.cm. (34 lb/sq.in.)

Long Wheelbase saloon with division

For speeds up to 180 k.p.h. (110 m.p.h.)
Front - 1,7 kg/sq.cm. (24 lb/sq.in.)
Rear - 2,1 kg/sq.cm. (30 lb/sq.in.)

For sustained speeds in excess of 180 k.p.h.
(110 m.p.h.)

Front - 2,1 kg/sq.cm. (30 lb/sq.in.)
Rear - 2,5 kg/sq.cm. (36 lb/sq.in.)

From Car Serial Numbers

Silver Shadow saloon	22118
Bentley T series saloon	22142
Long Wheelbase saloon (without division)	22073
Long Wheelbase saloon (with division)	22172
Corniche Saloon	R.H.D. 22648 L.H.D. 22919
Corniche Convertible	R.H.D. 22583 L.H.D. 22781

For all loading conditions up to 5 occupants in
Silver Shadow and Long Wheelbase cars or 4
occupants in Corniche cars and 113,5 kg. (250 lb.)
of luggage.

Silver Shadow, Bentley T Series and Long
Wheelbase saloon without division.

For speeds up to 180 k.p.h. (110 m.p.h.)
Front - 1,7 kg/sq.cm. (24 lb/sq.in.)
Rear - 2,0 kg/sq.cm. (28 lb/sq.in.)

For sustained speeds in excess of 180 k.p.h.
(110 m.p.h.)

Front - 2,0 kg/sq.cm. (28 lb/sq.in.)
Rear - 2,25 kg/sq.cm. (32 lb/sq.in.)

Long Wheelbase saloon with division

For speeds up to 180 k.p.h. (110 m.p.h.)
Front - 1,8 kg/sq.cm. (26 lb/sq.in.)
Rear - 2,25 kg/sq.cm. (32 lb/sq.in.)

For sustained speeds in excess of 180 k.p.h.
(110 m.p.h.)

Front - 2,1 kg/sq.cm. (30 lb/sq.in.)
Rear - 2,5 kg/sq.cm. (36 lb/sq.in.)

Corniche Saloon and Convertible

For speeds up to 180 k.p.h. (110 m.p.h.)
Front - 1,7 kg/sq.cm. (24 lb/sq.in.)
Rear - 2,0 kg/sq.cm. (28 lb/sq.in.)

For sustained speeds in excess of 180 k.p.h.
(110 m.p.h.)

Front - 2,1 kg/sq.cm. (30 lb/sq.in.)
Rear - 2,4 kg/sq.cm. (34 lb/sq.in.)

Tyres

Manufacturing tolerances on wheels and tyres, if
accumulated, will create sufficient radial 'run-out'
to cause undesirable vibrations and impair the ride
characteristics of the car. Therefore, it is important
to adhere to the following instructions regarding tyre
fitting and balancing. Distributors, Retailers and
Dealers should pass on these instructions to Tyre
Fitting Agents, who may be employed to fit tyres.

Manufacturers mark the lowest point of the tyre
with a red spot approximately 9 mm. ($\frac{3}{8}$ in.) diameter,
on the tyre side wall. The highest point of the wheel
is indicated with the letter 'H' stamped on the wheel
inner rim as shown in Figure R7.

Tyre—To remove

When removing a tyre from a flat ledge rim wheel it
is recommended that the tyre is removed from the
inboard edge of the wheel.

1. Remove the tyre ensuring that the narrow bead
seating is uppermost. A liberal amount of bead
lubricant should be applied to the tyre levers and
the tyre beads when removing the tyre.

2. Use one of the following methods to remove the
valve:

(a) Lubricate the valve and remove it by means of
the special tool manufactured by Dunlop Limited.

If this tool is not available, a thin pointed screw-
driver or similar object may be used by gently
forcing it between the shoulder of the valve and the
hole in the rim, simultaneously pushing the valve
inwards.

(b) Cut the valve with a sharp tool ensuring that
damage to the tyre does not occur.

3. Discard the valve.

Tyre—To fit

(with high and low spot marks)

1. Remove any burrs, high spots and scale from
the wheel, paying particular attention to the tyre
bead seating area.

2. On wheels to be fitted with tubeless tyres,
fit a new valve and smear it with tyre bead
lubricant, then press the valve into the hole in the
rim, using the special valve fitting tool.

If the tool is not available, the valve can be
installed as follows. Smear the valve with the tyre
bead lubricant and from inside the rim fit the valve
into the hole. Hold the outer end of the valve and
while working it from side to side, apply pressure to
the spherical end with a piece of wood or similar
blunt object, until the valve seats correctly in the
rim.

3. Lubricate the tyre beads, rim flanges, rim bead
seats and the area of the bead ledge.

Note Dunlop Tyre Bead Lubricant TBL1 or
TBL2 is recommended for use when
fitting tyre valves and tyres. It is most
important that soap or other similar
agents are not used.

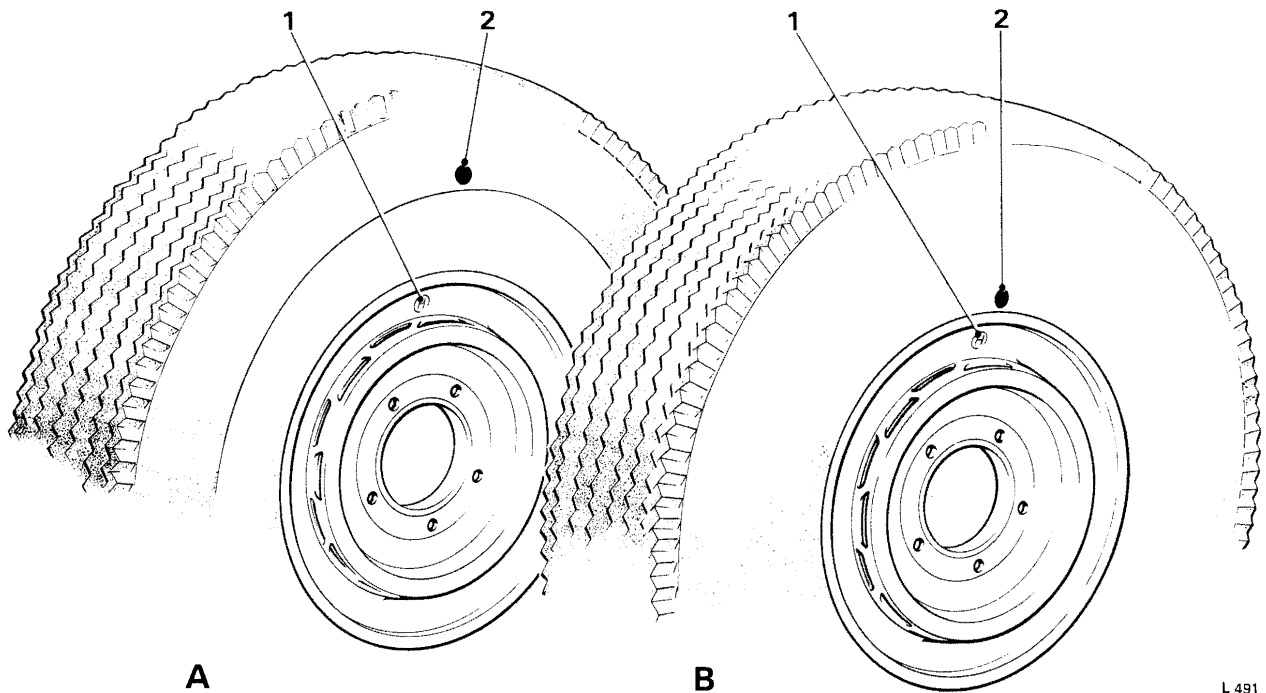


FIG. R7 WHEEL AND TYRE MARKINGS

A Whitewall tyre

B Blackwall tyre

- 1 'H' marking
2 Red spot marking

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4. Fit the tyre to the wheel ensuring that the red spot on the tyre is aligned with the letter 'H' marked on the wheel rim (see Fig. R7).

It should be noted that in addition to the red spot, some tyres may be marked with either a green, yellow or white spot. These markings can be ignored as they are merely used by the tyre manufacturer for inspection purposes.

Tyre—To fit (without high and low spots)

Some wheels and tyres of early origin will not be marked with the high and low spots and in these cases a trial and error method of fitting should be adopted as follows.

1. To determine the high spot on a wheel bead seat, rotate the wheel on a balancing machine and mark the high spot with a piece of chalk.
2. Each bead seat rim should be marked (see Fig. R8), as the high spot on one bead seat rim may vary slightly from the high spot on the other. In this case, the mean distance between the two spots should be taken as the actual high spot.

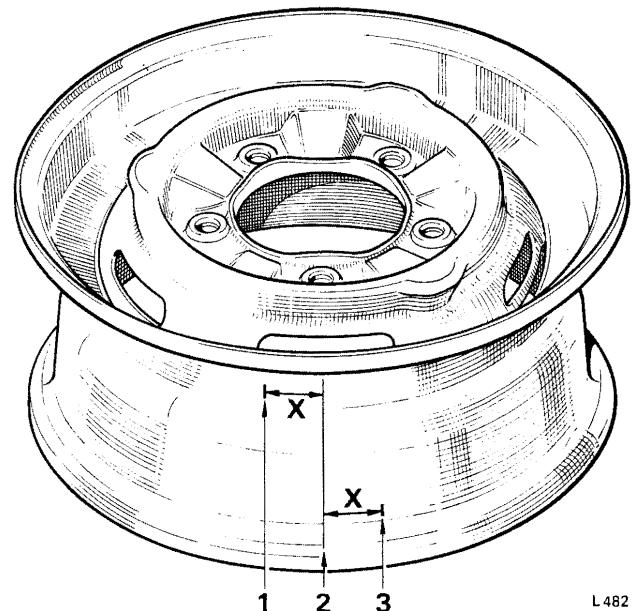


FIG. R8 METHOD OF DETERMINING THE HIGH SPOT OF A WHEEL

- 1 High spot
2 Actual high spot
3 High spot

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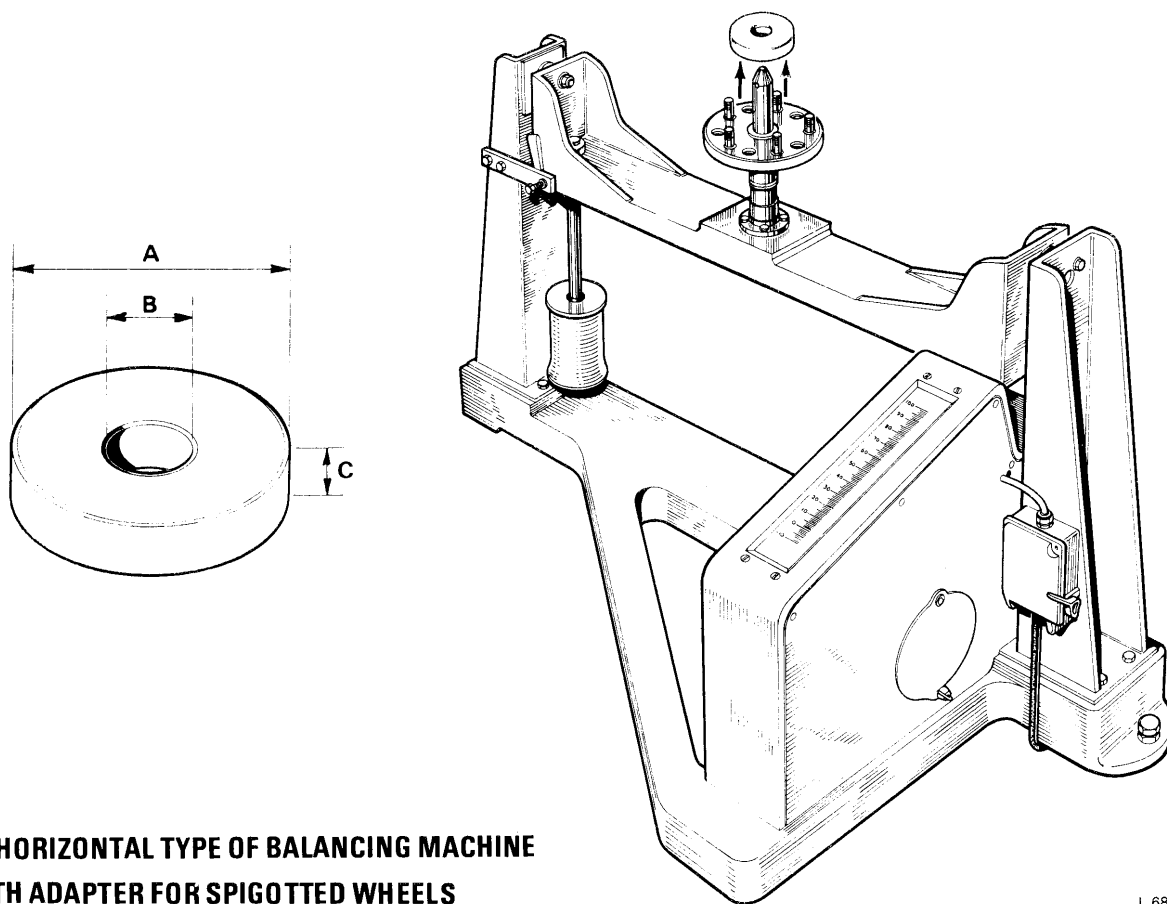
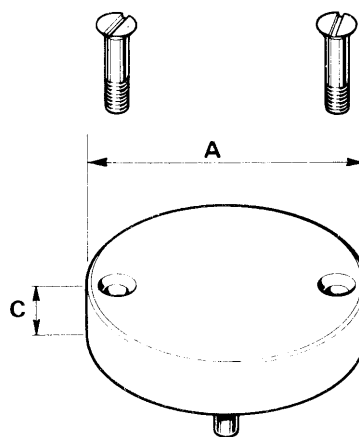
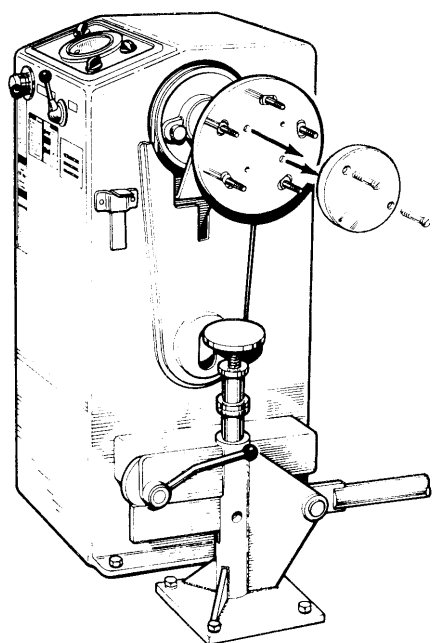


FIG. R9 HORIZONTAL TYPE OF BALANCING MACHINE WITH ADAPTER FOR SPIGOTTED WHEELS

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FIG. R10 VERTICAL TYPE OF BALANCING MACHINE WITH ADAPTER FOR SPIGOTTED WHEELS

Key to Fig. 9 and Fig. 10

A 11,75 cm. minus 0,005 cm.
(4.626 in. minus 0.002 in.)

B Bore to give 0,051 mm.
(0.002 in.) to 0,076 mm. (0.003 in.)
clearance on spindle

C 2,54 cm. (1.00 in.)

3. To determine the low spot on the tyre, mount the tyre on a rim which is known to be true and rotate it on a balancing machine. Mark the low spot on the tyre.

4. Fit the tyre and inner tube (if fitted) to the wheel so that the lowest spot of the tyre is aligned with the high spot of the wheel bead seat, then inflate the tyre to the recommended pressure.

After fitting the tyres to the wheels as described previously, balance each wheel.

Wheel and tyre balance

Wheels can be balanced using either a vertical or horizontal type of balancing machine.

For the earlier non-spigotted wheels the Dunlop adapter plate WH13 and balancing machine WBM3 are approved. For the later spigotted wheels the Dunlop adapter plate AP30 has been designed for use in conjunction with the balancing machine WBM20.

Alternatives to the Dunlop balancing machines can be obtained from the following; Hofmann Balancing Techniques Limited, Carl Schenck (U.K.) Limited and Leycock Engineering Limited.

If the specified balancing equipment is not available reference should be made to Figures R9 and R10. These illustrations show two types of small adapter collars which convert existing wheel balancing equipment for use on spigotted road wheels.

When fitting the adapter collar, it must be accurately centralised on the adapter plate.

The manufacturer's instructions must be observed when using the balancing equipment, and the following points noted.

1. When checking wheel balance on the car, it is essential that the weight of the car is removed from the tyres as soon as possible after stopping the car. This prevents temporary 'flats' from forming on the tyres. It is pointless attempting to balance wheels on which flats have formed, as the static balance may be affected by as much as 720 gm. cm. (10 oz. in.).

2. Before balancing ensure that the tyres are inflated to the correct cold inflation pressure.

3. The static and dynamic balance of the wheels should be within 216 gm.cm. and 360 gm.cm. (3 oz.in. and 5 oz.in.) respectively.

4. Balance weights can be removed and fitted with a special tool supplied by the manufacturer of the wheel balancing machine. When fitting the weights to the rim, only sufficient force should be used to secure them; excessive force will only tend to slacken them.

5. After fitting balance weights, paint the steel fittings to prevent them from rusting.

6. If an 'on the car' wheel balancing machine is available, it should be used to check the balance of the front wheels after they are fitted to the car.

This type of balancing machine enables any small amount of run-out which exists in the tyre, wheel, hub and brake disc, to be virtually balanced out.

New tyres

On no account should tyres other than those approved in this Workshop Manual or in subsequent Service Bulletins be fitted to the car, as this could have undesirable effects on the handling and stability of the car. Therefore, when fitting new tyres, reference should be made to the latest Service Bulletin.

When new tyres have been fitted, sustained speeds of 112 k.p.h. (70 m.p.h.) or over, during the first 800 km. (500 miles) must not be undertaken. Fast cornering, hard braking and harsh acceleration must also be avoided. This is important as heat generated by a new tyre, until it is sufficiently flexed, makes driving at speed inadvisable.

When fitting new tyres, fit new valves also and balance the wheels.

After fitting new radial-ply tyres, wheel vibrations may be felt during the initial running-in period. This is quite normal, but it is recommended that after the initial running-in period the tyres on all four wheels are again balanced, both statically and dynamically.

Legal requirements

All Distributors, Retailers and Dealers are advised to familiarise themselves with the legal requirements covering tyres and tyre wear, for the country in which they operate. The following are examples of requirements which apply in the United Kingdom.

1. Tyre tread.

The legal requirement for tyre tread is as follows.

Tread depth must not be less than 1 mm. (0.039 in.), in a continuous area extending to a minimum of 75 per cent of the tread width and this area must extend around the complete circumference of the tyre.

2. Tyre combination.

The legal requirements with regard to tyre combinations are as follows.

(a) Under no circumstances should radial-ply tyres be fitted to the front wheels with cross-ply tyres fitted to the rear wheels.

(b) Cross-ply and radial-ply tyres should not be used on the same axle.

(c) Best results are obtained by fitting either radial-ply tyres to all wheels including the spare, or, on early cars only, cross-ply tyres to all wheels including the spare.

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Tyre wear characteristics
Front tyres

The front tyres tend to wear on the shoulders leaving approximately three or four ribs of the tread pattern showing more prominently in the centre of

the tyre. This condition may be evident from a fairly early mileage, finally resulting in an amount of tread remaining on the centre ribs while the tyre rubber on the shoulders is worn smooth. The tyre tread assumes a rather rounded outline as shown in Figure R11.

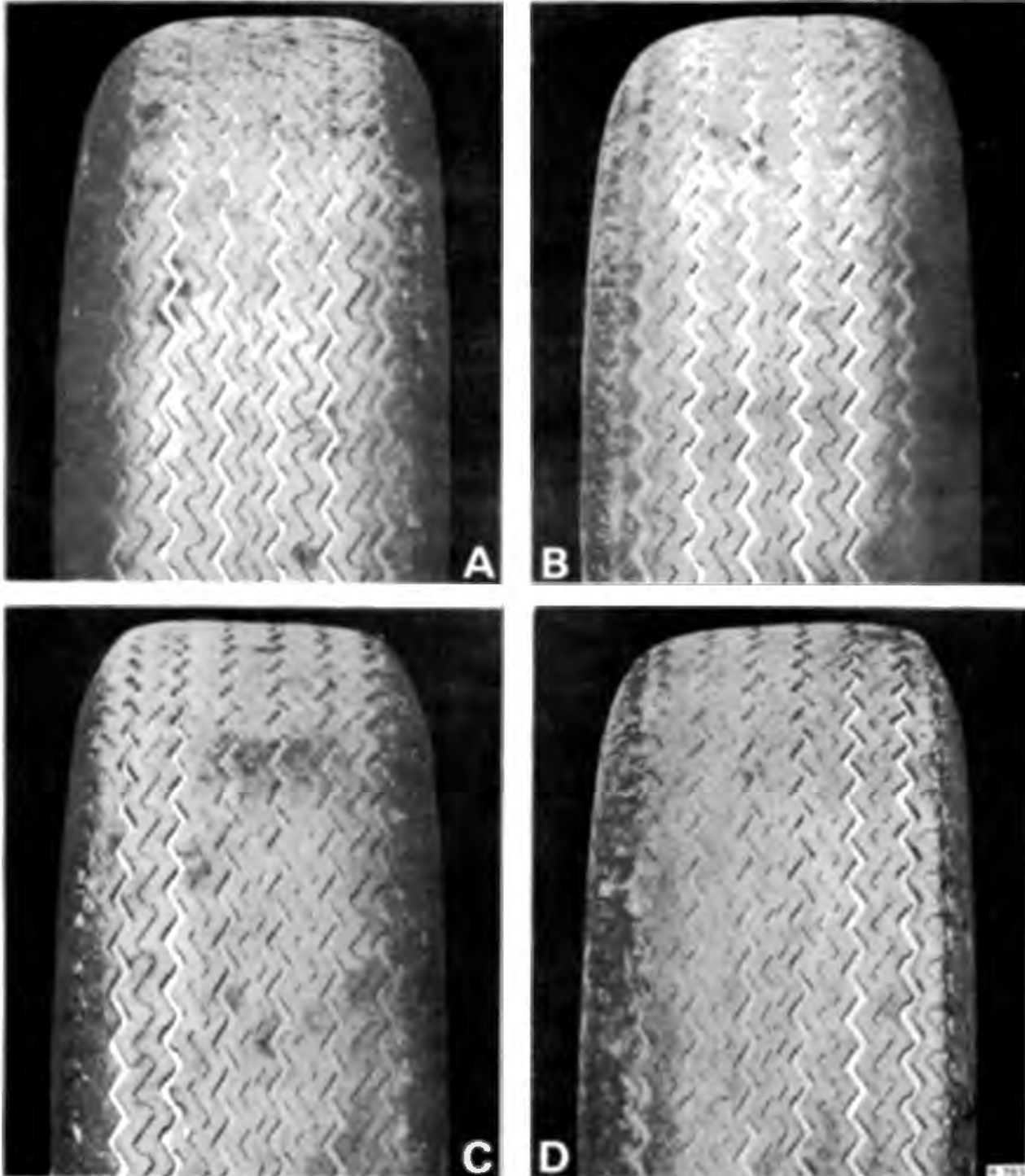


FIG. R11 TYRE WEAR

A Left-hand front-Inner edge
C Left-hand rear-Inner edge

B Right-hand front-Inner edge
D Right-hand rear-Inner edge

Note Letters shown adjacent to inner edges of tyres

Rear tyres

The rear tyres tend to wear in a tapered form from the outer shoulder across to the inner shoulder; the centre and inside shoulder showing most wear. An example of a normally worn rear tyre is shown in Figure R11.

When assessing tyre wear the following points should also be considered.

1. The wear rate on the outer shoulders of the front and rear tyres which run on the kerb side of the road will be slightly greater than the other outer shoulders, particularly if the car is driven on roads with a pronounced camber.

2. Tyre wear is critical to tyre inflation pressures, particularly with respect to under-inflation. Therefore, it is imperative that the recommended tyre pressures are maintained.

3. The higher the speed at which a car is driven through corners, the more the rear tyres will wear on the inner shoulders. The effects of hard cornering will be shown also by the 'feathering' which occurs on the rib edges as shown in Figure R11. Do not change the position of a partially worn set of tyres as the subsequent rate of wear will be increased.

Tread wear indicators

To provide a visual indication that the depth of tread remaining on a tyre is 1,6 mm. ($\frac{1}{16}$ in.) or less, tread wear indicators are incorporated into the construction of the tyres.

These indicators are integrally moulded ribs located in the tread grooves. The ribs are spaced at frequent intervals around the circumference of the tyre and at each point they extend across the full width of the tyre tread in all primary grooves.

When a tyre has worn so that one or more of the indicators are flush with the tread (1,6 mm. ($\frac{1}{16}$ in.) or less, tread depth) a new tyre is required.

Remould tyres

In cases where new tyres fail to meet the overall quality standards laid down by the manufacturers, but remain structurally sound and are suitable for sale as a remoulded tyre, the sidewalls will bear one of the following markings, 'Regraded Quality', 'Remould Quality' or 'Seconds'. In addition the speed rating of the tyre (e.g. the H in HR15) will be obliterated.

Under no circumstances should any tyres be fitted which have been branded 'Regraded Quality', 'Remould Quality' or 'Seconds', or those which have had the speed rating removed or altered.

Spare wheel—To remove

1. Turn the bolt in the luggage compartment anti-clockwise, using the box spanner and tommy bar provided in the tool kit. This operation lowers the carrier and facilitates removal of the spare wheel (see Fig. R12).

On cars fitted with a spare wheel retainer it is necessary to release the retainer before lowering the spare wheel platform. To release the retainer first remove the rubber plug situated in the luggage compartment floor (see Fig. R12). Lift the cable passing through the small bracket then visible.

Turn the toggle parallel to the cable and push the toggle down through the bracket. Lower the spare wheel platform by turning the lowering bolt anti-clockwise and remove the spare wheel, passing the cable out through the wheel stud hole.

Spare wheel—To fit onto spare wheel platform

Fit the spare wheel onto the platform by reversing the procedure described for its removal, noting the following points.

1. Rotate the spare wheel so that the tyre valve is in its most rearward position and is visible through the luggage compartment access hole.

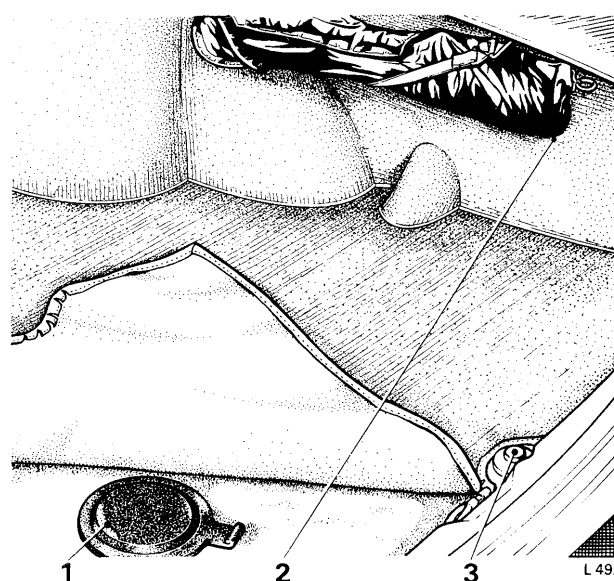


FIG. R12 LUGGAGE COMPARTMENT

- 1 Spare wheel inflation access plug
- 2 Tool kit
- 3 Lowering bolt for spare wheel platform

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2. Fit the spare wheel retainer (if fitted) as follows. Raise the wheel and platform, pass the cable with both toggles parallel, down through the bracket and the nearest stud hole in the spare wheel.

Spare tyre inflation (see Fig. R12)

1. Lift the carpet on the luggage compartment floor to expose the rubber plug.
2. Remove the plug to gain access to the tyre valve.
3. Adjust the tyre pressure as necessary.

Spare wheel stowage

If attention is drawn to a rattle from the rear of the car, it may be that the spare wheel carrier is incorrectly adjusted, thus allowing slight movement of the spare wheel under its clamping arrangement.

Adjustment can be effected by slackening the nut and bolt connecting the carrier to the operating tube which forms the rear suspension point of the carrier. As this bolt passes through a slotted hole in the operating tube, it will then be possible to move the carrier to a position which will allow the tyre to be correctly clamped. Tighten the nut and bolt after adjustment.

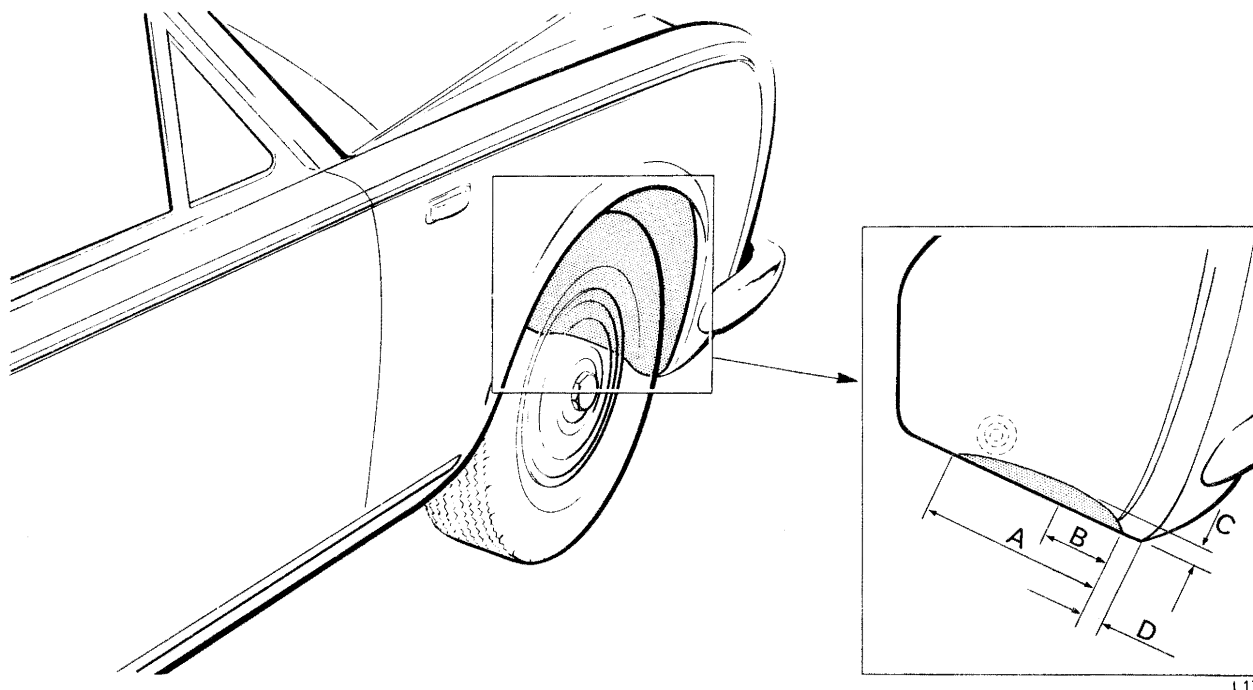


FIG. R13 UNDERWING SHEET CUT AWAY

A 24,13 cm. (9.50 in.)
 B 7,62 cm. (3.00 in.)

C 2,54 cm. (1.00 in.)
 D 2,54 cm. (1.00 in.)

Note Shading shows area under the wing

**Winter tyres
 Dunlop Weathermaster tyres**

The Dunlop Weathermaster SP 44 radial-ply 205 x 15 tyres are approved and should be fitted to either the rear wheels (with HR70 HR15 on the front) or to all four wheels.

Prior to Car Serial Numbers	
Silver Shadow saloon	18269
Bentley 'T' Series saloon	18225
Long Wheelbase saloon (without division)	19577
Long Wheelbase saloon (with division)	19640
Corniche Saloon	18564
Corniche Convertible	18563

When fitting a Dunlop Weathermaster tyre to a front wheel a small portion of the front wing undersheet must be removed (see Fig. R13). When carrying out work on the right-hand side undersheet care should be taken not to damage the air silencer mounted beneath the wing.

Maximum speed limitations

The maximum permissible speed limitations for the Dunlop Weathermaster SP44 tyre is 137 k.p.h. (85 m.p.h.) with an inflation pressure of 1,97 kg/sq.cm. (28 lb/sq.in.).

By increasing the inflation pressure to 2,25 kg/sq.cm. (32 lb/sq.in.) the safe maximum permissible speed may be increased to 153 k.p.h. (95 m.p.h.).

Studs

The approved tyres are supplied with 116 moulded holes for the acceptance of studs. If studs are to be fitted all holes should be utilised.

It is recommended that, Secomet P2-140 studs are used and when fitting studs to a tyre ensure that they protrude between 1,5 mm. and 2,0 mm. (0.06 in. and 0.79 in.).

Whenever possible a tyre should be studded from new, however, it is acceptable to stud a partially worn tyre provided the studs do not protrude beyond 4,0 mm. (0.157 in.) when fitted. If this limit is exceeded the tyre must be considered too worn to be successfully studded.

Snow chains

On all types of snow chains it is important to note that if the chains are fitted too tightly and the car is driven at fast speeds, or for long distances, on roads which are free of snow, irreparable damage to the tyres and the chains will occur.

Three types of snow chains are recommended, they are as follows.

- (a) Kantenspur 07-745
- (b) Union S2-3082
- (c) Union S2-3081

The Kantenspur 07-745 snow chains are recommended for use on front wheels when HR 70 HR 15 (235/70 HR 15) tyres are fitted.

Union S2-3082 snow chains are recommended as an alternative to the Kantenspur.

Union S2-3081 snow chains are recommended for use on Dunlop Weathermaster 205-15 SP 44 radial-ply tyres.

These snow chains can be used on all four wheels or to the rear wheels only when HR 70 HR 15 (235/70 HR 15) tyres are fitted to the front wheels.

Union S2-3081 snow chains can also be fitted to other 205-15 radial-ply and 8.15 H 15 cross-ply tyres.

When snow chains are fitted, a speed limit of 50 k.p.h. (31 m.p.h.) must not be exceeded on snow free roads.

Note It is advisable when fitting snow chains to wear the plastic gloves provided.

The spare links supplied with the kit are only intended to permit emergency road side repairs to be carried out if a chain is damaged.

Tyre pressures—

With or without snow chains

The recommended tyre inflation pressures (cold) are.

- All cars other than Long Wheelbase division
- (a) 205-15 Weathermaster to front and rear wheels, 1,97 kg/sq.cm. (28 lb/sq.in.)
- (b) HR70 HR15 (235/70 HR15) to front wheels 1,69 kg/sq.cm. (24 lb/sq.in.) and 205-15 Weathermaster to rear wheels 2,25 kg/sq.cm. (32 lb/sq.in.)
- (c) when HR70 HR15 (235/70 HR15) tyres are fitted to both front and rear wheels refer to the figures quoted on Page R5.

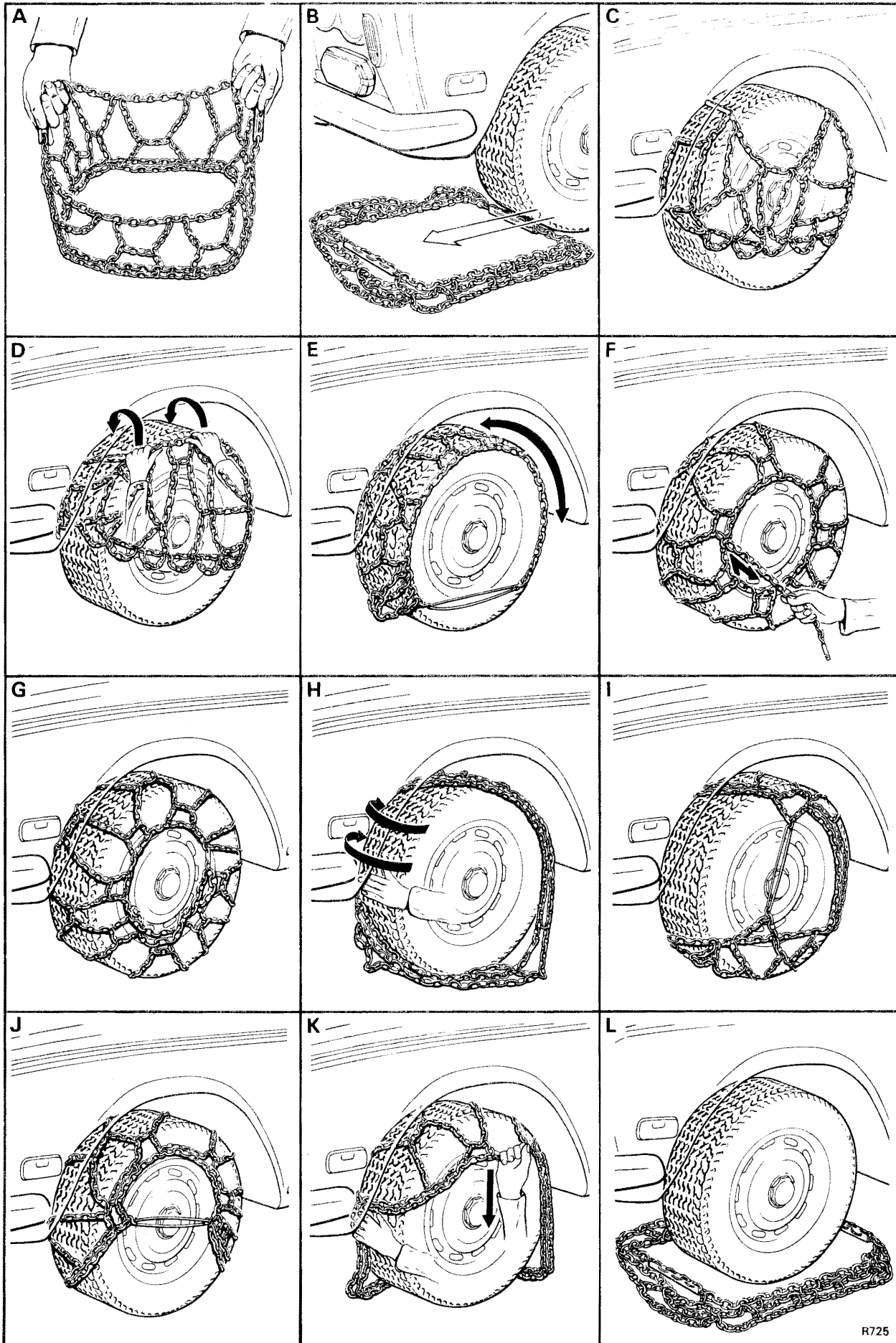
Long Wheelbase division cars

- (a) 205-15 Weathermaster to front and rear wheels 1,97 kg/sq.cm. (28 lb/sq.in.)
- (b) HR70 HR15 (235/70 HR15) to front wheels 1,8 kg/sq.cm. (26 lb/sq.in.) and 205-15 Weathermaster to rear wheels 2,5 kg/sq.cm. (36 lb/sq.in.)
- (c) When HR70 HR15 (235/70 HR15) tyres are fitted to both front and rear wheels refer to the figures quoted on Page R5.

Kantenspur snow chains—To fit

1. Ensure that the car is standing on a level surface.
2. Apply the handbrake/parking brake.
3. Holding the chain apart by the red plastic handles, ensure that it hangs as shown in Figure R14 inset A.
4. Position the chain in an oval shape immediately before or behind the front wheel and move the car until the tyre is situated centrally inside the chain (*see Fig. R14 inset B*).
5. Holding the red handles lift the chain over the tread of the tyre (*see Fig. R14 inset C*).
6. Lift the upper chain and place it completely over the full width of the tyre (*see Fig. R14 inset D*).
7. Fit the rubber tensioner supplied with the kit horizontally near the bottom of the tyre and move the wheel one quarter of a revolution in either a forward or rearward direction (*see Fig. R14 inset E*).
8. Remove the rubber tensioner, disengage the fastener and pull the chain as indicated by the arrow to produce tension (*see Fig. R14 inset F*).
9. To take up the remaining chain, thread it through the outer circumference as shown in Figure R14 inset G and hook in the fastener.
10. Check to ensure that the fastener is hooked securely in the side of the chain and that a clearance of approximately 12,7 mm. (0.5 in.) exists between the chain and the tyre. This clearance is necessary as snow chains should not be fitted too tightly.
11. Repeat Operations 1 to 10 on the other front wheel.

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Kantenspur snow chains—To remove

1. Unhook the fastener, unthread it and allow it to hang at the bottom of the wheel (see Fig. R14 inset H).
2. Move the chain towards the inner side of the wheel until part of the tread is visible (see Fig. R14 inset H).
3. Attach the rubber tensioner vertically over the wheel centre (see Fig. R14 inset I).
4. Repeat Operations 1, 2 and 3 on the other wheel.
5. Move the wheels one quarter of a revolution until the free part of the tread is on the ground (see Fig. R14 inset J) then remove the tensioners.
6. Hold the chain on the upper part of the wheel, then pull it outwards and downwards until the chain is situated around the base of the wheel (see Fig. R14 insets K and L). Repeat this operation on the other front wheel.
7. Drive the car out of the chains.

3. Position the chain adjacent to the rear wheel ensuring that the tension chain and tensioning key are positioned away from the car (see Fig. R16 inset A).
4. Hook the end or hook links onto the fitting clip and fasten the clip to the tyre (see Fig. R16 inset B).
5. Move the car forward one revolution of the wheels so that the clip can be removed.
6. Remove the clip and evenly distribute the free anti-skid sections around the tyre.
7. Check that the hooks and links are not twisted.
8. Connect the inner and outer chains by means of the hook link and the end or extension links. The inside chain should be connected first.
9. Tighten the tension chain and lock the tensioning key.
10. Check to ensure that the tensioning key is correctly tightened; snow chains must not be fitted too tightly to the tyres. When correctly fitted it should be possible to slide a hand between the chain and tyre (see Fig. R16 inset C).

Union S2 snow chains (see Fig. R15)

Union S2 chains can be fitted using either of two methods:

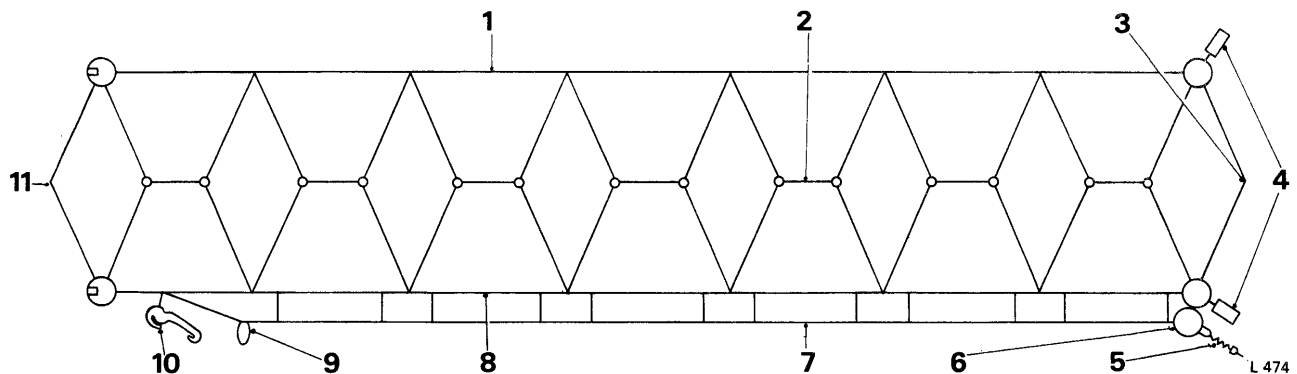
- (a) Not raising the wheels, and using a fitting clip.
- (b) Raising the wheels clear of the ground.

Wheels not raised

1. Ensure that the car is standing on a level surface.
2. Apply the handbrake/parking brake.

Wheels raised**Rear wheels**

1. Ensure that the car is standing on a level surface.
2. Apply the handbrake/parking brake.
3. Chock the front wheels to prevent the car from rolling.
4. Position a jack in the centre of the final drive casing on the rear suspension crossmember. Place a piece of soft wood between the jack head and the casing. Raise the car until the rear road wheels are clear of the ground.

**FIG. R15 SNOW CHAIN (UNION S2)**

- | | |
|---------------------|-------------------|
| 1 Inner chain | 7 Tension chain |
| 2 Anti-skid section | 8 Outer chain |
| 3 End link | 9 Safety link |
| 4 Extension links | 10 Tensioning key |
| 5 Spring hook | 11 Hook link |
| 6 End fitting | |

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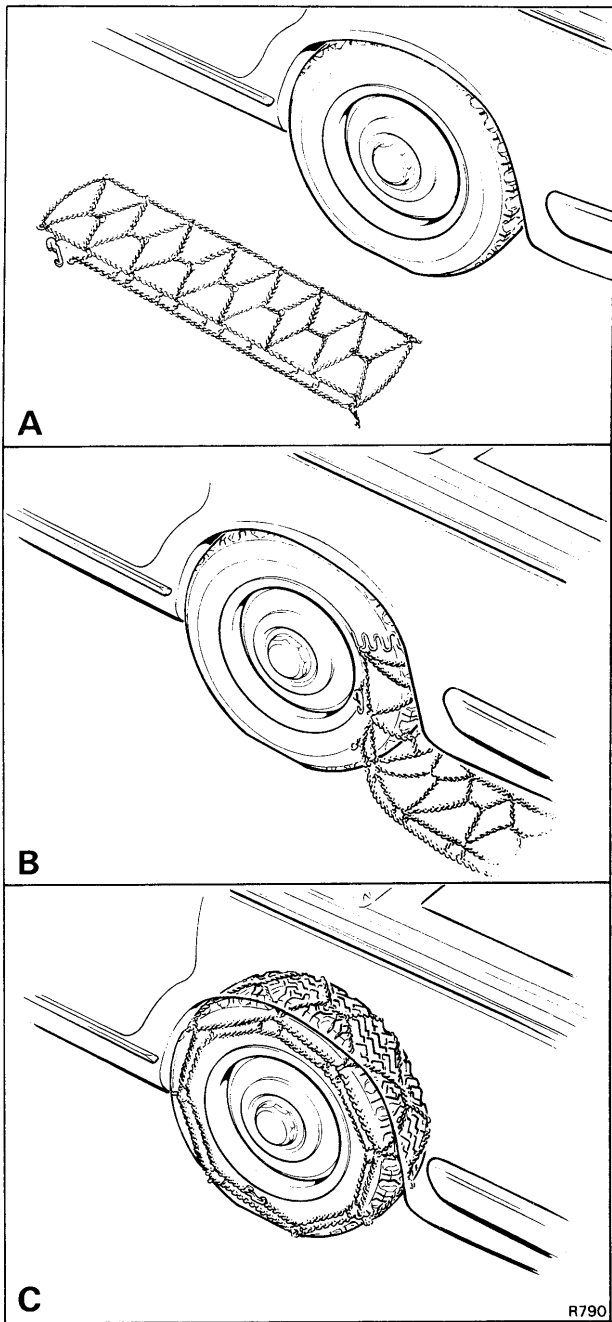


FIG. R16 FITTING UNION S2 3081 SNOW CHAIN

- A Snow chain in position prior to fitting;
- B Fitting snow chain with the aid of the fitting clip-Wheels not raised
- C Snow chain correctly fitted

The car jack can be used for this operation by opening the cover plate on the body sill, positioning the jack correctly and raising the side of the car. This method will allow only one rear wheel to be raised at a time.

5. Position the chain adjacent to the rear road wheel ensuring that the tension chain and tensioning key are positioned away from the car (see Fig. R16 inset A). The chain should lie flat and not twisted.

6. Lift the chain by the inner side (i.e. the one nearest the wheel) and place it onto the tyre. Spread the anti-skid sections evenly over the tyre.

7. Ensure that the hooks and links are not twisted.

8. Connect the inner and outer chains by means of the hook link and the end or extension links. The inside chain should be connected first.

9. Tighten the tension chain and lock the tensioning key.

10. Repeat Operations 5 to 9 inclusive on the other rear wheel.

11. Lower and remove the jack.

12. Remove the chocks from the front wheels.

Front wheels

1. Repeat Operations 1 and 2 as described for the rear wheels.

2. Chock the rear wheels.

3. Position a jack under the front pivot mounting for the lower triangle levers on the sub-frame and follow the same procedure as in Operation 4 of the rear wheels.

4. Repeat Operations 5 to 9 inclusive as described for the rear wheels.

5. Repeat these operations on the other wheel.

6. Lower and remove the jack.

7. Remove the chocks from the rear wheels.

Cleaning snow chains

To protect the chains against rust, wash in hot water and dry them as soon as possible after use.



Workshop Manual

**Rolls-Royce Silver Shadow
(including Long Wheelbase Saloon)
Rolls-Royce Corniche
Bentley T Series
and Bentley Corniche**

Up to and including car serial number 30000

Volume 3

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Chapter S

BODY

Section S1

DOORS

FRONT DOORS

Door—To remove

1. Disconnect the battery leads.
- 2.(a) **4-Door Saloon and Long Wheelbase cars.**
Using a suitable wedge-shaped tool (see *Door trim – To remove, Operation 10(a)*), lift and remove the side scuttle trim pad to gain access to the wiring loom plug and socket; disconnect the plug from the socket.
For guidance refer to Figure S1, which shows the position of the wiring loom plug and socket for a right-hand door; the position of the plug and socket for a left-hand door is symmetrically opposite.
- (b) **Coachbuilt cars.** Remove the screw securing the side scuttle trim pad to the side scuttle wall; this screw is situated towards the rear and bottom of the trim pad. Carefully ease the pad away from the ram air outlet duct (if fitted) and remove the trim pad. The trim pad is located in a channel at its upper edge.

Disconnect the door plugs and sockets. For guidance refer to Figure S2, which shows the position of the plugs and socket for a left-hand door; the position of the plugs and socket for a right-hand door are symmetrically opposite.

Although the arrangement of the door wiring loom plugs and sockets vary slightly on

later cars when compared with early cars, and on right-hand drive cars when compared with left-hand drive cars, they are all located behind the side scuttle panels and should be easily identified.

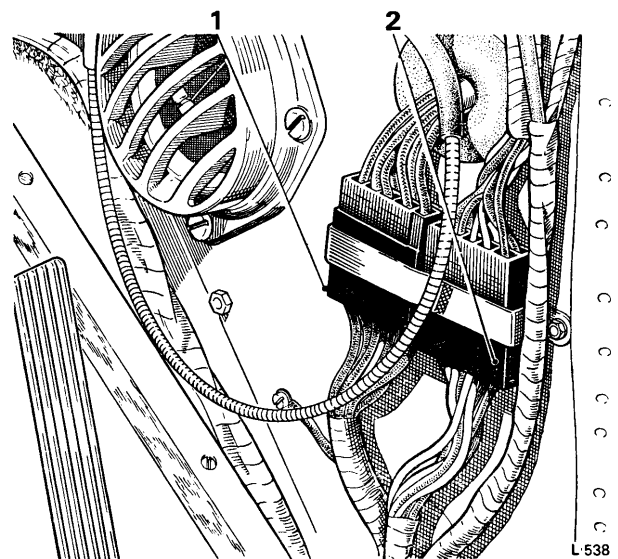
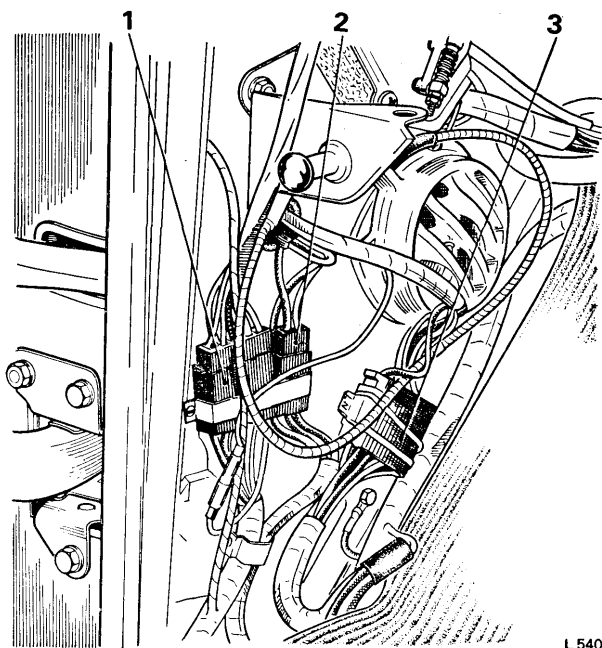


FIG. S1 POSITION OF WIRING PLUG LOOM AND SOCKET FOR R.H. FRONT DOOR (Early 4-Door Saloon Illustrated)

- 1 Door loom plug and socket
- 2 Body loom plug and socket

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FIG. S2 POSITION OF WIRING LOOM PLUG AND SOCKET FOR L.H. DOOR (Early 2-Door Saloon Illustrated)

- 1 Body loom plug and socket
- 2 Window lift loom plug and socket
- 3 Seat loom plug and socket

3. Support the door and remove the setscrews securing the upper and lower hinges to the front pillar.

4. Remove the door together with its hinges, carefully manoeuvring the wiring loom through the aperture in the door pillar.

Door—To fit

To fit the door reverse the procedure given for a removal, noting the following points.

1. The position of the door in relation to its aperture should be as illustrated in either Figure S3, which is for 4-Door Saloon and Long Wheelbase cars, or Figure S4, which is for Coachbuilt cars.

To obtain this position, the door should be moved on its hinges whilst the hinge securing screws are just a little more than finger tight.

If the door is only partly assembled when carrying out this operation, the remaining parts comprising the door should be weighed and the corresponding weight added to the bottom of the door. This is necessary to allow for the possibility of the door dropping slightly when parts are added after the door position has been set.

The body waist lines should also be taken into account when positioning the door to ensure that they align satisfactorily with each other.

2. Adjust the door striker plate so that the following conditions are complied with.

- (i) The door is not raised by the striker plate when closed.
- (ii) The rear edge of the door is level with the rear door on four-door cars or level with the car body on two-door (coachbuilt) cars.

If difficulty is encountered in obtaining the precise setting due to the pitch of the door striker plate serrations, adjust the striker plate so that the door does not drop by more than $\frac{1}{16}$ in. (1.59 mm.) when closed and the rear edge of the door protrudes the minimum amount.

Use the minimum thickness of shim under the striker plate consistent with not pulling the door.

Important When positioning the striker plate it is necessary to feel that the serrations on the striker plate, shim (if fitted) and door post are properly engaged with each other.

On Car Serial Number 5001 and onwards the screws securing the striker plate must be torque tightened to 18 lb. ft. (2.49 kg.m.).

3. Check and if necessary, adjust the door exterior handle push button (see *Front door lock mechanism—To fit*, on Page S18).

4. Check the position of the window frame and adjust if necessary (see *Window Frame—To fit*).

Door trim—To remove

4-Door Saloon and Long Wheelbase cars

- 1. Disconnect the battery.
- 2. Remove the arm rest by lifting the release lever and sliding the rest upward.
- 3. Remove the screws securing the arm rest slide and remove the slide from the door; retain the screws with the slide.
- 4. To facilitate removal of the chromed cover from a window lift switch escutcheon, a tool similar in design to the one shown in Figure S5 should be produced from a strip of spring steel.
- 5. Remove the window lift escutcheon cover as follows bearing in mind that the driver's door on some cars is fitted with a master switch in addition to the multi-switch.

Using the tool referred to in Operation 4, insert the feet behind the chromed cover then with a sharp pull at the looped end of the tool remove the cover.

When removing the chromed cover from the escutcheon on a driver's multi-switch, remove the cover by inserting the feet of the tool under each end of the cover alternately at the outer switch levers and remove the cover progressively.

6. Remove the screws securing the escutcheon to the switch; remove the escutcheon.

- 7.(a) **Cars prior to Car Serial Number 5001.** Remove the special screws securing the grab handle and interior door handle in position; remove the handle noting the angular position of the door handle to ensure correct assembly.
- (b) **Cars after Car Serial Number 5000.** Remove the chromed cover from the interior door handle escutcheon then remove the two screws securing the escutcheon to the handle base; remove the escutcheon.

A tool similar to the one shown in Figure S5, but having only one leg, will be required to remove the escutcheon cover. Use the tool in a similar manner to that described in Operation 5 for removing the chromed cover from a window lift switch escutcheon.

8. Carefully remove the trim pad from the door (see Fig. S6); take care to avoid damage to the paintwork.

The trim pad is secured to the door by upholstery clips and a wedge-shaped tool will be required

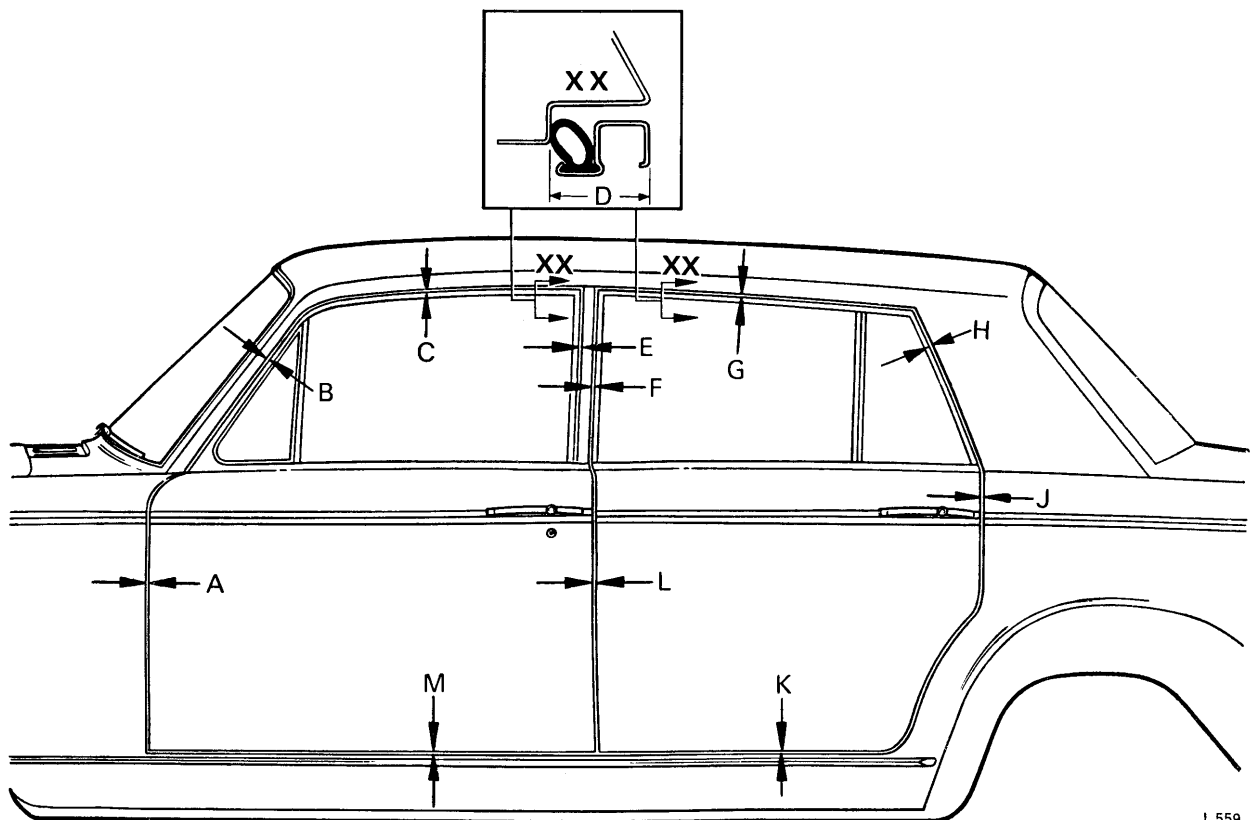


FIG. S3 POSITION OF DOORS IN THE BODY APERTURE (4-Door Saloon and Long Wheelbase Cars)

- A** $\frac{3}{16}$ in. to $\frac{3}{32}$ in. (4,762 mm. to 2,381 mm.)
B $\frac{3}{16}$ in. to $\frac{1}{16}$ in. (4,862 mm. to 1,587 mm.)
C $\frac{1}{4}$ in. to $\frac{5}{16}$ in. (6,350 mm. to 4,762 mm.)
D $1\frac{3}{16}$ in. to $1\frac{3}{32}$ in. (30,162 mm. to 26,987 mm.)
 —measured 3 in. (7,620 cm.) from each end of the frame
***E** $\frac{1}{4}$ in. to $\frac{7}{32}$ in. (6,350 mm. to 5,556 mm.)
F $\frac{1}{4}$ in. to $\frac{7}{32}$ in. (6,350 mm. to 5,556 mm.)
G $\frac{1}{4}$ in. to $\frac{5}{16}$ in. (6,350 mm. to 4,762 mm.)

- *H** $\frac{1}{4}$ in. to $\frac{3}{16}$ in. (6,350 mm. to 4,762 mm.)—
 measured $1\frac{1}{2}$ in. (3,810 cm.) from top of frame
 with top of frame flush with body
J $\frac{1}{8}$ in. to $\frac{1}{16}$ in. (3,175 mm. to 1,587 mm.)
K $\frac{1}{4}$ in. to $\frac{1}{8}$ in. (6,350 mm. to 3,175 mm.)
L $\frac{7}{32}$ in. to $\frac{5}{32}$ in. (5,556 mm. to 3,968 mm.)—
 between front and rear door
M $\frac{1}{4}$ in. to $\frac{1}{8}$ in. (6,350 mm. to 3,175 mm.)

Note All gaps to be parallel to within $\frac{1}{32}$ in. (0,793 mm.).

Doors to be flush with body to within $\frac{1}{32}$ in. (0,793 mm.) in or out.

*The clearances given at these points are critical in order to avoid seal fouls; when setting these clearances prior to fitting the door seal, set to the first dimension given as these clearances tend to reduce slightly after the seal, door trim, etc., is fitted.

Inset shows dimension from the seal face on the body to outer face of window frame

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for inserting behind the clips to prise the trim from the door (see Fig. S6). The tool should have a $\frac{3}{8}$ in. (9,52 mm.) wide slot cut into the wedge to accommodate the neck of the clips.

9. Remove the screws securing the pocket to the door; remove the pocket.

10. On cars after Car Serial Number 5000, remove the two 2 B.A. setscrews securing the trim covered grab handle to the door; remove the grab handle.

11. Remove the black waterproof dust cover from the door.

12. Slacken the lock-nut on the sill button adjuster and unscrew the button and rod; remove the button from the door.

13. Remove the setscrews securing the wood finisher to the door; remove the wood finisher.

Door trim—To remove

Coachbuilt cars

1. Carry out the door trim removal procedure described in Operations 1, 2 and 3 for 4-Door Saloon and Long Wheelbase cars then proceed as follows.

2.(a) **Cars prior to Car Serial Number 5001.** Remove the interior door handle by depressing the spring-loaded pin collar into the escutcheon and pressing out the pin; note the position of the handle to ensure correct assembly.

Remove the window lift switch escutcheon(s) by following the removal procedure previously described for 4-Door Saloon and Long Wheelbase cars (see *Door trim – To remove, Operations 4, 5 and 6*).

(b) **Cars after Car Serial Number 5000.** The interior door handle and window lift switch escutcheons are fitted to a small trim pad separate from the door trim panel.

On these cars therefore the door trim panel can be removed without disturbing the handle and switch(es).

3. **On cars fitted with opening quarter windows only** (see Fig. S7), slacken the grub screw securing the quarter window knob; unscrew the knob from the shaft and remove the washer fitted between the knob and trim pad.

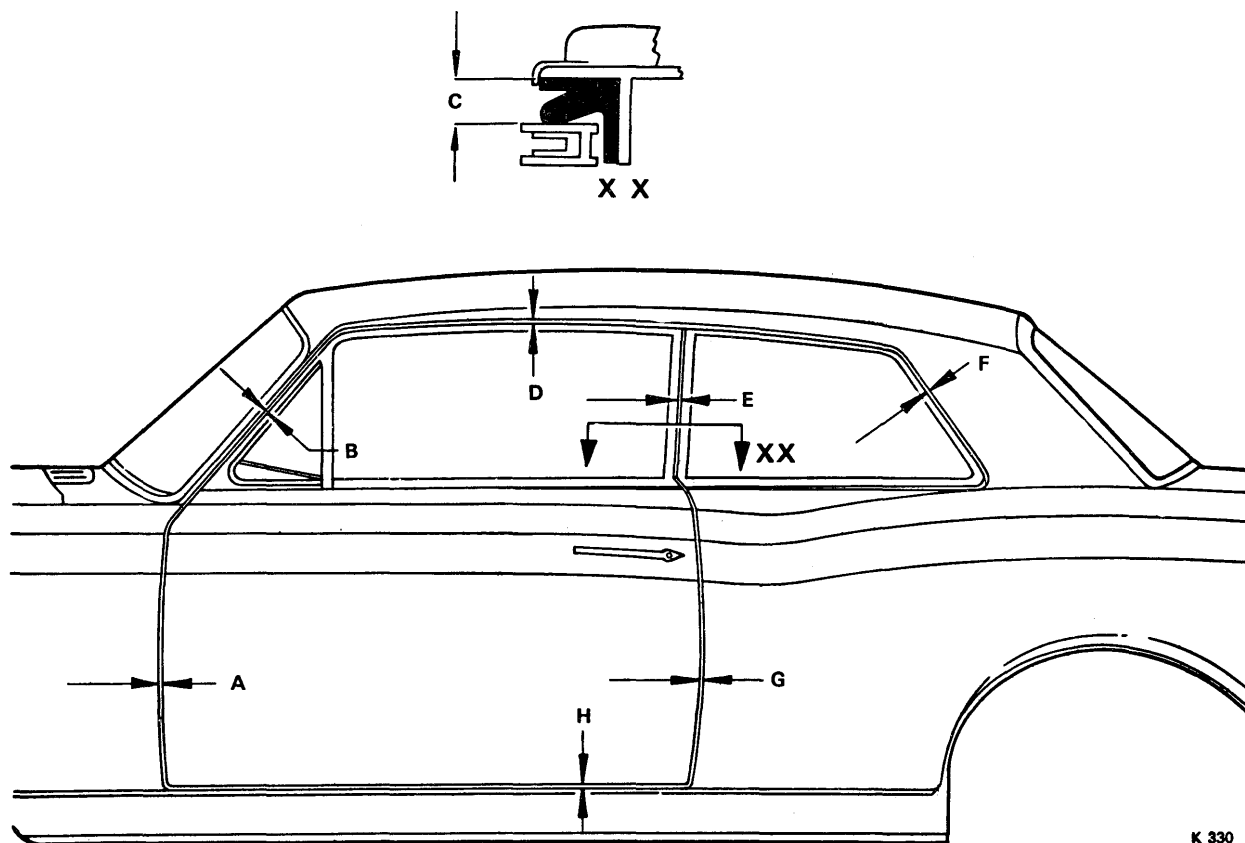


FIG. S4 POSITION OF DOOR IN THE BODY APERTURE (2-Door Saloon and Convertible Cars)

- | | |
|---|---|
| A $\frac{3}{32}$ in. (2,381 mm.) | E $\frac{3}{32}$ in. (2,381 mm.) |
| B $\frac{3}{16}$ in. (4,762 mm.) | F $\frac{1}{16}$ in. (1,587 mm.) |
| C $\frac{7}{16}$ in. (11,112 mm.)—seal gap | G $\frac{3}{32}$ in. (2,381 mm.) |
| D $\frac{3}{32}$ in. (2,381 mm.) | H $\frac{3}{32}$ in. (2,381 mm.) |

4. Remove the two screws securing the emergency window winder cover to the lower trim pad.

5. Remove the screws securing the wood finisher to the door; remove the finisher.

6. Remove the screws securing the trim pad at the bottom edge of the door; remove the door trim pad.

As the front and rear edge of the trim pad are each located in a channel, it will be necessary to bow the pad outwards slightly during removal.

7. **Cars after Car Serial Number 5001.** To remove the interior door handle and window lift switch escutcheons from these cars follow the same procedure described in Operations 4, 5 and 7(b), Door trim – to remove, on 4-Door Saloon and Long Wheelbase cars.

Door trim—To fit

All cars

To fit the door trim reverse the procedure given for removal noting the following points.

1. Ensure that any particles of metal, fragments of glass, etc., are removed from the bottom of the door before the trim pad is fitted, otherwise they are likely to rattle when the car is mobile and cause annoyance to the occupants.

2. Check that the interior door handle operates the door lock satisfactorily and adjust if necessary (*refer to Door lock – To fit, Operations 2 and 3*).

If the mechanism has to be altered, ensure as a final check that when the interior door handle is moved to its fully open position, the lock bolt will move up and down quite easily by hand.

3. **4-Door Saloon and Long Wheelbase cars.** When fitting the sill lock button, screw the button in the sill rod adjuster then set the button as follows.

(a) **Cars prior to Car Serial Number 9001** (*see Fig. S8*). With the button in its unlocked position (i.e. fully raised), screw the adjuster up or down as required until the head of the button measures $1\frac{1}{8}$ in. (2,85 cm.) from the top of the polished wood sill finisher (*see Fig. S8*); then tighten the lock-nut.

(b) **Cars after Car Serial Number 9000** (i.e. cars fitted with the centralised door locking system). With the button in its locked position (i.e. fully lowered), screw the adjuster up or down as required until the head of the button measures $\frac{1}{2}$ in. (12,7 mm.) from the top of the polished wood sill finisher; then tighten the lock-nut.

4. **Coachbuilt cars with opening front quarter windows.** When fitting the front quarter window knob, note that the grub screw locates in a small drilling in the threaded portion of the control shaft. If a new quarter light mechanism has been fitted, drill a location in the control shaft as follows.

Fit the door trim pad, then fit the washer and handle onto the control shaft. Remove the grub screw then screw the handle along the shaft until it just makes contact with the washer.

Unscrew the handle a quarter of a turn, then drill a location in the shaft; fit the grub screw and tighten into its location in the shaft.

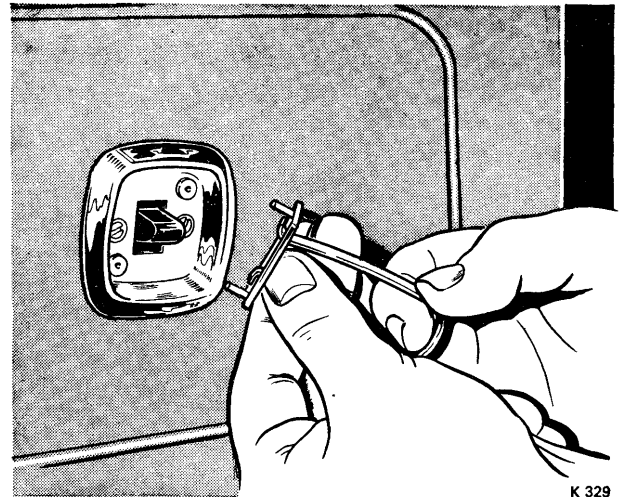


FIG. S5 REMOVING THE ESCUTCHEON COVER FROM AN ELECTRIC WINDOW LIFT SWITCH

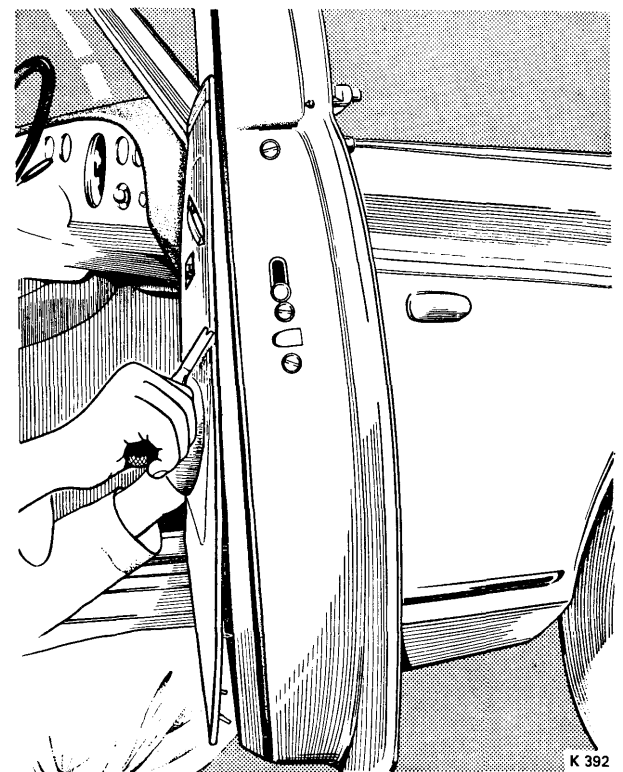
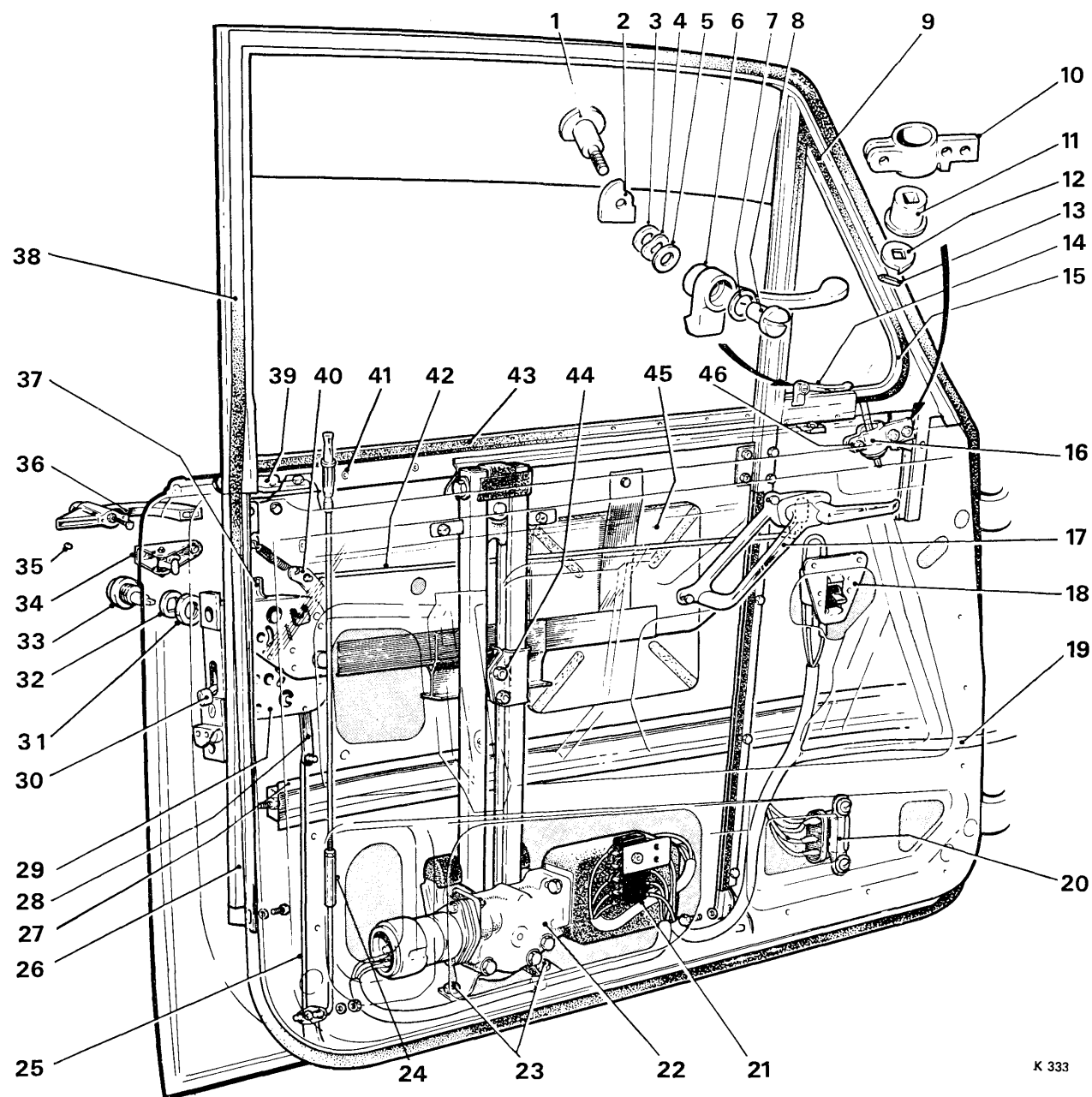


FIG. S6 REMOVING A DOOR TRIM PAD (4-Door Saloon and Long Wheelbase Cars)

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FIG. S7 TYPICAL CONSTRUCTION OF A FRONT DOOR (4-Door Saloon and Long Wheelbase Cars prior to Car Serial Number 5001)

- | | | |
|--|--|---|
| 1 Spindle | 17 Combined grab handle/interior door handle | 33 Private lock |
| 2 Stop plate | 18 Electric window lift switch | 34 Lever assembly—push button to lock contactor lever |
| 3 Shim washer | 19 Wiring loom | 35 Dome nut—exterior door handle |
| 4 Waved washer | 20 Relay | 36 Exterior door handle |
| 5 Shim washer | 21 Electrical junction block | 37 Contactor lever—door lock |
| 6 Quarter window catch | 22 Electric window lift assembly | 38 Door seal |
| 7 Shim | 23 Window lift securing screws | 39 Bracket |
| 8 Sleeve screw | 24 Sill lock button adjuster | 40 Remote control lever—door lock |
| 9 Quarter window seal | 25 Control rod | 41 Pop rivet |
| 10 Clamp bracket | 26 Window frame | 42 Control rod—lock to interior handle |
| 11 Friction bush | 27 Anti-drum plate | 43 Window channel felt |
| 12 Limit stop plate | 28 Sill lock lever | 44 Bolt |
| 13 Roll pin | 29 Door lock | 45 Anti-drum pad |
| 14 Quarter window handle | 30 Bolt—door lock | 46 Clamp bolt |
| 15 Quarter window frame | 31 Nut—private lock | |
| 16 Quarter window friction swivel assembly | 32 Collar—private lock | |

Door hinges—To remove

1. Remove the door (see *Door—To remove, on Page S1*).
2. Remove the door trim pad (see *Door trim—To remove, on Page S2*).
3. Detach the hinge seals from the door.

On early 4-Door Saloon cars and all Coachbuilt cars, the seal is secured with adhesive; on later 4-Door Saloon and Long Wheelbase cars the seal is retained by press fasteners.

4. Detach the black water-proof covering from the door sufficiently to gain access to the hinge securing screws.

5. Remove the three $\frac{1}{2}$ in. A/F setscrews securing each hinge to the door; note the number of shims (if fitted) between the hinge faces and the door, to facilitate correct assembly.

Remove the hinges from the door.

Door hinges—To fit

To fit the hinges reverse the procedure given for removal noting the following points.

1. On early 4-Door Saloon cars and Coachbuilt cars secure the hinge seals to the door following the procedure described in Operation 2, Door seals—To fit, on Page S22.

2. When fitting the door, note the points mentioned in the door fitting procedure (see *Door—To fit, on Page S2*).

Electric window lift mechanism—To remove
(see Figs. S7 and S9)

1. Remove the door trim pad (see *Door trim—To remove, on Page S2*).

2.(a) **4-Door Saloon and Long Wheelbase cars.** Remove one of the two screws securing the chain channel steady strap to the upper part of the window lift channel.

(b) **Coachbuilt cars.** Remove the two bolts securing the chain channel to the top of the door (see Fig. S9).

3. Disconnect the electrical leads at the connector block noting their colour code to ensure correct assembly.

4.(a) **4-Door Saloon and Long Wheelbase cars.** Remove the setscrew securing the window support bracket to the chain channel noting the number and position of any spacing washers to ensure correct assembly.

(b) **Coachbuilt cars.** Remove the two bolts securing the window support bracket to the window lift pick-up plate.

Note If the original window and window lift motor are to be refitted, scribe correlation marks around the pick-up plate to ensure correct assembly.

Whilst carrying out Operations (a) or (b) the window glass should be supported and then upon detachment from the support bracket, moved to the closed position. It should then be held in this position by sticking a piece of masking tape to the glass and window frame; on Convertible cars however, it will be necessary to prop up the window.

5. Scribe correlation marks around the washers which are fitted underneath the heads of the two setscrews securing the window lift to the bottom of the door; these marks are to assist alignment of the window lift, should the same lift and glass be refitted to the door. Remove the two setscrews and washers.

6. Remove the window lift motor by manoeuvring it through the bottom door aperture.

7. The procedure for dismantling the electrical window lift is explained in Chapter M, Electrical System.

Electric window lift mechanism—To fit

To fit the window lift reverse the procedure given for removal noting the following points.

Note To avoid confusion the points applicable to 4-Door Saloon and Long Wheelbase cars and to Coachbuilt cars are separated.

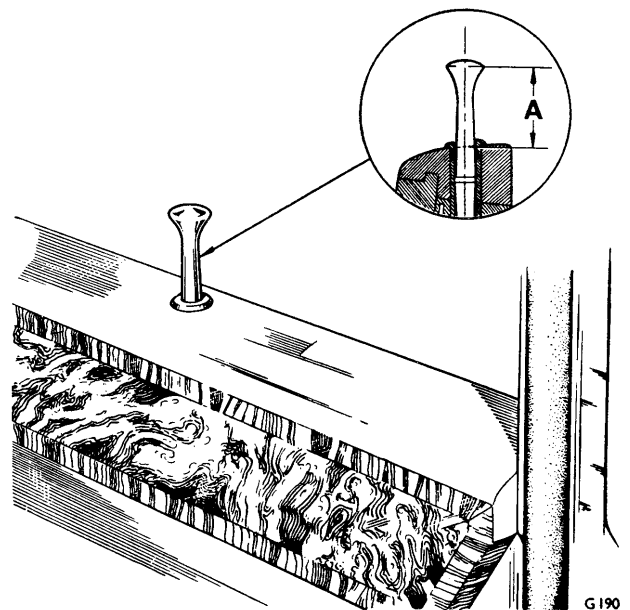


FIG. S8 SILL LOCK BUTTON SETTING (4-Door Saloon Cars prior to Car Serial Number 9000)

A $1\frac{1}{8}$ in. (2.86 cm.) with button in fully raised (unlocked) position

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4-Door Saloon and Long Wheelbase cars

1. Before tightening the setscrews which secure the window lift to the base of the door, the lift should be moved bodily outboard on its elongated holes as far as it will go; the setscrews should then be tightened.
2. Ensure that the space between the window support plate and the lift pick-up plate is taken up by the

correct amount of washers; the space may vary slightly from car to car, three washers are usually required but occasionally two washers are sufficient.

3. The window lift should be energised before the trim pad is fitted to ensure that the window glass moves smoothly up and down its channel and the window lift is operating satisfactorily.

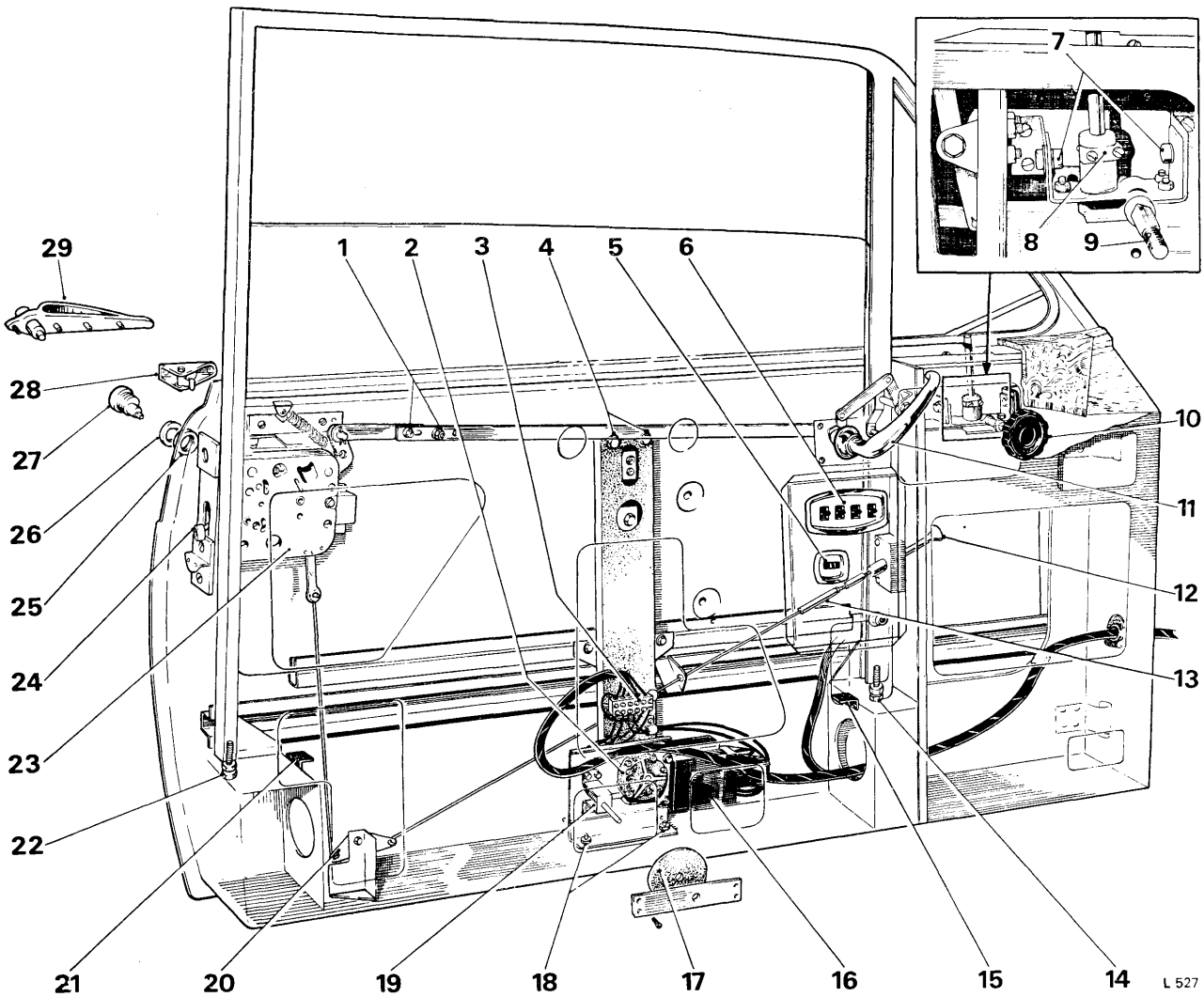


FIG. S9 TYPICAL CONSTRUCTION OF A DOOR (2-Door Saloon Cars prior to Car Serial Number 5001)

- | | | |
|--|--|--|
| 1 Tie-rod adjusting nuts | 9 Location for grub screw | 20 Fulcrum lever |
| 2 Electric window lift gearbox | 10 Quarter window handle | 21 Window stop |
| 3 Electrical junction box | 11 Interior door handle | 22 Window frame securing nuts |
| 4 Window channel securing screws | 12 Cubby box lock button | 23 Door lock |
| 5 Master switch—electric windows (Driver's door) | 13 Lock control rod adjuster | 24 Bolt—door lock |
| 6 Electric window lift switches (Driver's door) | 14 Window frame | 25 Nut—private lock |
| 7 Quarter window mechanism securing screws | 15 Window stop | 26 Collar—private lock |
| 8 Cross-plate | 16 Electric window lift assembly | 27 Private lock |
| | 17 Anti-drum pad | 28 Lever assembly—push button to lock contactor assembly |
| | 18 Electric window lift mounting bolts | 29 Exterior door handle |
| | 19 Manual control—electric window lift | |

Coachbuilt cars

4. If the original window lift and window are to be refitted, align the correlation marks scribed during removal; if a new window or window lift has been fitted, it will be necessary to reset the window on its pick-up plate. In both cases check in accordance with the following instructions.

5. Adjust the window by means of the elongated holes of the pick-up plate so that when it reaches its maximum upward travel it pinches the seal in the door frame tightly but does not strike it too hard.

6. When the window closing action has been set satisfactorily, set the window opening action as follows.

7. When the window is fully open, adjust the stops so that they bear the load of the window but do not cause a bump when the window is opened fully.

8. Repeat Operation 3.

Electrically operated window glass —To remove

4-Door Saloon and Long Wheelbase cars

1. Disconnect the battery leads.

2. Remove the door trim pad (*see Door trim – To remove, on Page S2*).

3. Remove the electric window lift assembly as described earlier in this Section (*see Page S7*).

4. Remove the screws securing the black painted waist channel which fits underneath the wood finisher (*see Fig. S7*); remove the waist channel.

On cars fitted with an adjustable rear view mirror to the driver's door, it will also be necessary to remove the screws securing the control unit mounting bracket to the door before the channel can be removed.

5. Remove the black enamelled plate fitted to the window frame.

6. Slide the window glass down through the frame channel until it is free of the channel then up through the space between the window frame and the inboard side of the door.

2-Door Saloon cars

1. Disconnect the battery leads.

2. Remove the door trim panel (*see Door trim – To remove, on Page S4*).

3. Remove the electric window lift assembly as described earlier in this Section (*see Page S7*).

4. Remove the self-tapping screws located under the quarter window.

5. Remove the two chrome screws on the leading face of the frame.

6. Remove the two nuts located at the window feet (*see Fig. S9, item 22*).

7. Remove the window and window frame.

8. Slide the glass out of the frame.

Convertible cars

1. Disconnect the battery leads.

2. Remove the door trim pad (*see Door trim – To remove, on Page S4*).

3. Detach the upper end of the sealing felt from the front window channel and remove the screw from inside the top of the channel securing the stop plate; remove the stop plate from the channel.

4. Disconnect the tension strap of the spring balance unit from the runner plate in the rear window channel.

5. Scribe correlation marks around the washers which fit under the heads of the setscrews securing the window frame slide bracket to the runner plate in the rear window channel; these marks are to assist alignment of the window frame should the same frame be refitted. Remove the two setscrews.

6. Support the window frame, then remove the two setscrews securing the cam plate on the window electrical lift mechanism to the window frame pick-up bracket.

7. Slide the window and frame upwards out of the channels.

Electrically operated window glass—To fit

To fit the window glass reverse the procedure given for removal noting the following points.

1. Before fitting a new window, ensure that any fragments of glass, dirt, etc., are removed from the door as debris which is allowed to remain in the bottom of the door will rattle. Also, fragments of glass and dirt could become embedded in the felt adjacent to the window glass causing damage to the glass.

2. Ensure that the seals and window frame felt are in good condition and renew if necessary (*see Door seals – To remove, on Page S21*).

3. **Coachbuilt 2-Door Saloon cars.** As the frame and glass are removed together on these cars, it will be necessary to reset the frame position (*see Window frame – To fit, on Page S11*).

4. Cars are fitted with either tinted or plain glass, therefore before fitting a new glass it should be compared with the original glass, or with the corresponding window on the other side of the car, to ensure that it is of the correct type.

5. Fit the window lift motor and adjust the window as described earlier in this Section (*see Page S7*).

6. Fit the door trim (*see Page S5*).

Opening quarter window—To remove

4-Door Saloon and Long Wheelbase cars (*see Fig. S7*).

1. Remove the front door trim including the wood finisher from the top of the door (*see Front door trim – To remove, on Page S2*).

2. Remove the roll pin together with the limit stop

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plate from the window friction swivel then release the 2 B.A. clamp bolt.

3. Remove the 2 B.A. bolts securing the clamp bracket to the window frame; remove the bracket together with the friction bush.

4. Lift the quarter window from its upper swivel and remove it from its aperture.

5. Remove the sleeve screw securing the catch to the quarter window then remove the shim, handle, shim, wave washer and shim.

Coachbuilt cars (see Fig. S9)

1. Remove the door trim as described on Page S4.

2. Remove the two setscrews securing the cross-plate to the quarter window drive-shaft (see Fig. S9 item 8).

3. Remove the recessed screw located in the underside of the exterior swivel hinge; remove the quarter window by easing the top outward (to clear the hinge) and lifting upward.

4. Remove the two bolts securing the quarter window mechanism to its mounting brackets (see Fig. S9, item 7); remove the mechanism.

Opening quarter window—To fit

To fit the opening quarter window reverse the procedure given for removal noting the following points.

4-Door Saloon and Long Wheelbase cars (see Fig. S7)

1. Smear the quarter window spindle with Palmolive grease or its equivalent before fitting to the clamp assembly.

2. Ensure that the split in the friction bush and the split in the clamp are opposite to each other.

3. Fit the limit stop plate so that when the quarter window is opened to 90°, the straight edge of the stop plate is towards the inside of the door.

4. Before tightening the clamp bolt, position the window correctly in its frame and ensure that the limit stop plate and the clamp/friction bush assembly are down to the roll pin.

Tighten the clamp bolt so that 12 lb. (5,44 kg.) actual pull on a spring balance is required to move the quarter window on its spindle (see Fig. S10).

5. Smear the locking catch swivel bolt with Palmolive grease or its equivalent before fitting the handle.

6. Ensure that the locking catch shims are central on the sleeve nut and are not trapped between the sleeve and the stop plate.

Coachbuilt cars

1. Refer to the points mentioned regarding the fitting of the quarter window in Front door trim—To fit, on Page S5.

Fixed quarter window—To remove

4-Door Saloon and Long Wheelbase cars

1. Remove the window frame (see *Window frame—To remove, Operations 1 to 6 inclusive*).

2. Remove the three countersunk headed screws securing the support plate under the quarter window; remove the support plate and the lower seal.

3. Withdraw the quarter window from the frame.

Coachbuilt cars

1. Lower the electrically operated door window (if raised).

2. Remove the seal from the front window channel sufficiently to gain access to the two screws located in the channel; remove the two screws.

3. Remove the chromed countersunk headed screw from the leading face of the quarter window frame.

4. Remove the quarter window together with its glazing surround by applying pressure on the exterior edges of the window; at the same time support the window on the inboard side as it may leave the frame suddenly at the final moment of separation.

Take great care to avoid damage to the window frame and also the polished wood sill finisher during this operation.

Fixed quarter window—To fit

To fit a quarter window reverse the procedure given for removal noting the following points.

4-Door Saloon and Long Wheelbase cars

1. If a new quarter window seal is to be fitted, the side of the seal having the four continuous 'pips' moulded into it should face inboard.

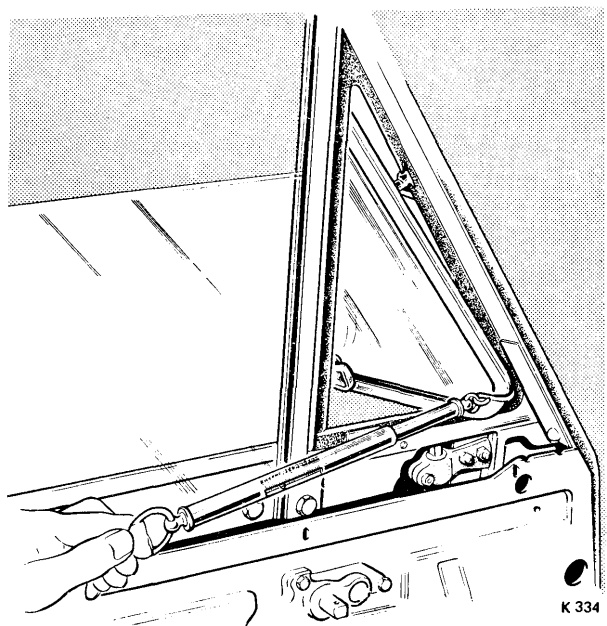


FIG. S10 CHECKING THE QUARTER WINDOW POUNDAGE (4-Door Saloon and Long Wheelbase Cars with opening quarter windows)

Coachbuilt cars

1. Before fitting the quarter window ensure that its recess in the frame is clean, then apply a continuous strip of Seelastik around the sides of the recess.
2. After fitting the quarter window, remove any surplus sealant from the frame using Bostik cleaner 6001; take great care to avoid damage to the frame.

Window frame—To remove**4-Door Saloon and Long Wheelbase cars**

1. Disconnect the battery leads.
2. Remove the door trim, as described on Page S2.
3. Remove the window glass (*see Electrically operated window glass – To remove, on Page S9*).
4. Remove the seal from the perimeter of the door.
5. Using a $\frac{3}{16}$ in. (4.76 mm.) diameter drill, remove the pop rivets securing the window frame cross-plate to the door; remove the cross-plate.
6. Remove the seven setscrews securing the window frame to the door; remove the frame.

Coachbuilt cars

1. Refer to Electrically operated window glass – To remove, on Page S9, as the glass and frame are removed together on these cars.
2. **On Convertible cars**, to remove the separate window frame channels from the doors proceed as follows.
3. Disconnect the battery leads.
4. Remove the door trim panel (*see Door trim – To remove, on Page S4*).
5. To remove the combined front channel/quarter window frame remove the following.

The two screws in the leading edge of the frame, the four screws under the quarter window and the nut securing the foot of the channel to the door; remove the channel from the door.

6. To remove the rear window frame channel, remove the two screws from the bracket on the upper end of the channel and the nut securing the lower end; remove the channel from the door.

Window frame—To fit
(*see Figs. S7 and S9*)

To fit the window frame reverse the procedure given for removal noting the following points.

1. Before securing the frame to the door it will be necessary to set the window frame to body clearances. Refer to Figure S3 which shows the frame setting clearances for 4-Door Saloons or to Figure S4 which shows the clearances for 2-Door Saloons and Convertibles.

To enable these distances to be set correctly, the door seal should first be removed and the frame set as follows.

2. Check the position of the door in the body aper-

ture (*see Figs. S3 and S4*); adjust if necessary as described earlier (*see Door – To fit*).

3. **Coachbuilt cars.** Acquire three wooden blocks measuring $\frac{7}{16}$ in. (11,11 mm.) square and 2 in. (5,08 cm.) long. Temporarily attach the blocks to the seal face of the frame; the blocks should be equally spaced, one on each side member and one on the upper cross-member.

4. Fit the window frame to the door and finger tighten the securing screws and nuts; **on 4-Door Saloon cars**, do not fit the pop rivets at this stage.

5. Close the door, then adjust the position of the frame until the clearances of the frame in the body aperture correspond with the clearances given in Figures S3 and S4; on Coachbuilt cars the wooden blocks should be in contact with the seal face on the body.

6. Tighten the frame securing screws and nuts; on Coachbuilt cars remove the wooden blocks from the frame.

7. **4-Door Saloon and Long Wheelbase cars.** Secure the window frame cross-piece with pop rivets.

If a new window glass channel seal is fitted the four continuous 'pips' on the outside of the seal should face inboard.

8. Fit the door seal (*see Door seals – To fit, later in this Section*).

9. Fit the remainder of the door components and trim.

Door lock mechanism—To remove**4-Door Saloon and Long Wheelbase cars** (*see Figs. S7 and S11*)

1. Remove the window glass (*see Electrically operated window glass – To remove, on Page S9*).
2. Detach the return spring from the lock remote control lever.
3. Disconnect the lock control rods by pulling the ends of the rods out of their nylon bushes.
4. Remove the $\frac{1}{2}$ in. A/F setscrew situated at the forward end of the lock.
5. Remove the three external countersunk headed screws securing the lock to the door; remove the lock.

On later cars, where the lock bolt roller is retained either by a circlip or a split pin, it is necessary to remove the roller before the lock can be removed from the door. To remove the roller proceed as follows.

- (a) **Roller retained by circlip.** Using circlip pliers, (RH 7674), remove the circlip securing the washer and roller to the lock bolt; remove the washer and roller.
- (b) **Roller retained by split pin.** Straighten out the legs of the split pin, rotate the roller until the slot in the outer lip of the roller is aligned with the head of the split pin then remove the split pin; remove the washer and roller.

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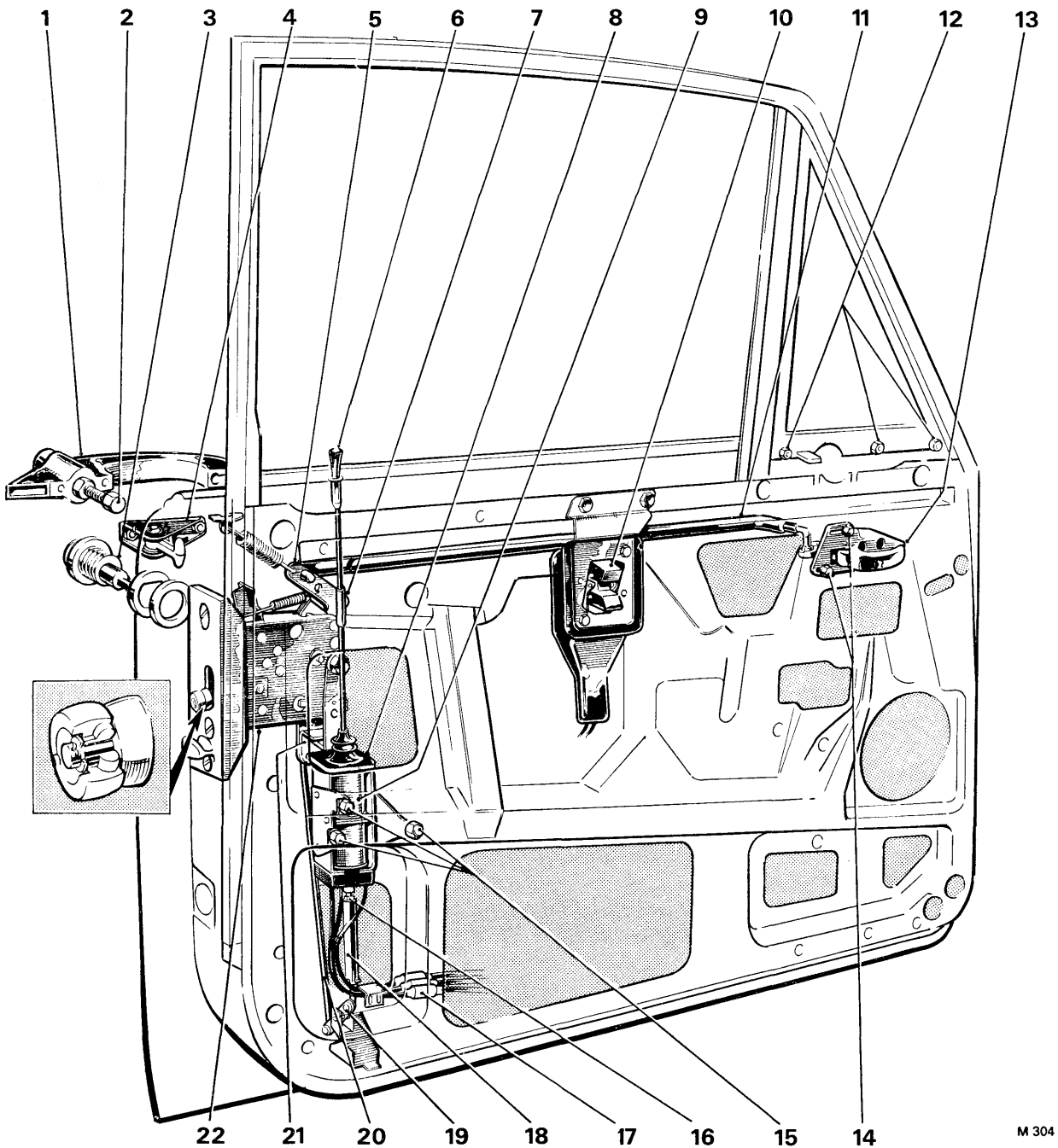


FIG. S11 FRONT DOOR LOCKING MECHANISM (4-Door Saloon and Long Wheelbase Cars after Car Serial Number 9000)

- | | | |
|--|--|---------------------------------------|
| 1 Exterior door handle | 8 Dust seal—solenoid | 16 Lock-nut—spring link adjustment |
| 2 Screw and lock-nut—push button adjustment | 9 Solenoid | 17 Lucar connectors to solenoid leads |
| 3 Private lock | 10 Centralised door locking switch | 18 Spring link assembly |
| 4 Lever assembly—push button to lock contactor lever | 11 Remote control rod | 19 Pivot lever assembly |
| 5 Remote control lever—door lock | 12 Fixed type quarter window securing screws | 20 Lock-to-lever control rod |
| 6 Sill lock button | 13 Interior door handle | 21 Sill lock lever—door lock |
| 7 Lock-nut—sill lock button adjuster | 14 Handle securing screws (3 off) | 22 Door lock |
| | 15 Solenoid securing screws (3 off) | |

Refer to Front door lock mechanism - To check, on Page S15, for further information regarding the lock bolt roller.

6. Remove the two socket headed cap screws and the dome nut securing the exterior handle to the door; remove the handle.

7. Remove the nut securing the private lock to the door; remove the lock together with the collar which fits between the nut and the door (and also the weather shield on later cars).

8. Remove the two special 2 B.A. bolts securing the push button to lock actuator lever assembly to the door; remove the lever.

9. Remove the control rods from the pivot bracket in the bottom of the door by pulling the ends of the rods out of their nylon bushes.

10. Disconnect the remote control rod from the interior door handle by pulling the rod out of its nylon bush.

On later cars, the interior door handle mechanism is sealed by a polythene bag to repel moisture. To disconnect the remote control rod on these cars it will first be necessary to remove the three screws securing the handle to the door. Then detach the open end of the polythene bag from the door and disconnect the rod from the lever on the handle.

11. Remove the two screws securing the lock striker plate to the door pillar; **on cars prior to Car Serial Number 5001**, socket headed screws are fitted; **on**

cars after Car Serial Number 5000, special counter-sunk headed screws are fitted. Retain the shim (if fitted) and the hardened washers (socket headed screws only).

Cars after Car Serial Number 9000 (i.e. cars fitted with the centralised door locking system).

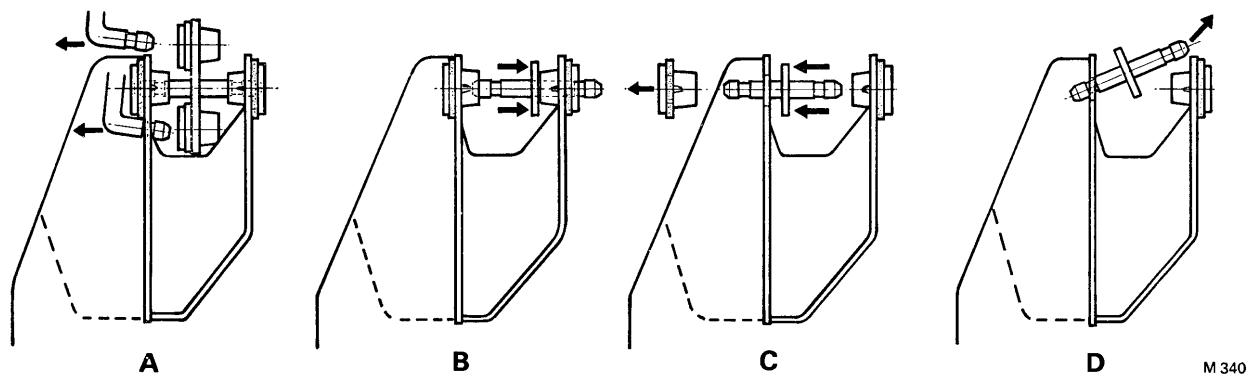
12. To remove the solenoid and mounting bracket proceed as follows (see Fig. S11).

Disconnect the electrical leads to the solenoid at the Lucar connectors. Remove the three 2 B.A. screws securing the solenoid to the door panel; the two front screws are retained by nuts and washers while the rear screw locates in a threaded bush attached to the solenoid bracket. Disconnect the spring link from the nylon bush in the pivot lever then remove the solenoid and spring link assembly.

Note that on earlier cars, the solenoid is protected by a polythene tube with the ends taped together; on later cars a rubber dust cover is fitted to the solenoid (see Fig. S11, item 8).

13. To remove the pivot lever assembly from the door proceed as follows (see Fig. S12).

Press the pivot lever assembly towards the rear edge of the door until the lever boss abuts the rear nylon bush. Remove the nylon bush at the forward end of the lever spindle then push the freed end of the lever spindle into the hole vacated by the bush until the other end of the spindle is also free from its bush; remove the pivot lever assembly from the door.



**FIG. S12 REMOVING A PIVOT LEVER ASSEMBLY FROM THE FRONT DOOR BRACKET
(4-Door Saloon and Long Wheelbase Cars after Car Serial Number 9000)**

- A** Control rods disconnected from pivot lever
- B** Pivot lever spindle pressed into rear bush until lever abuts rear bush
- C** Front bush removed from door bracket and pivot lever spindle pressed out of rear bush into hole vacated by front bush
- D** Pivot lever assembly tilted for removal from door bracket

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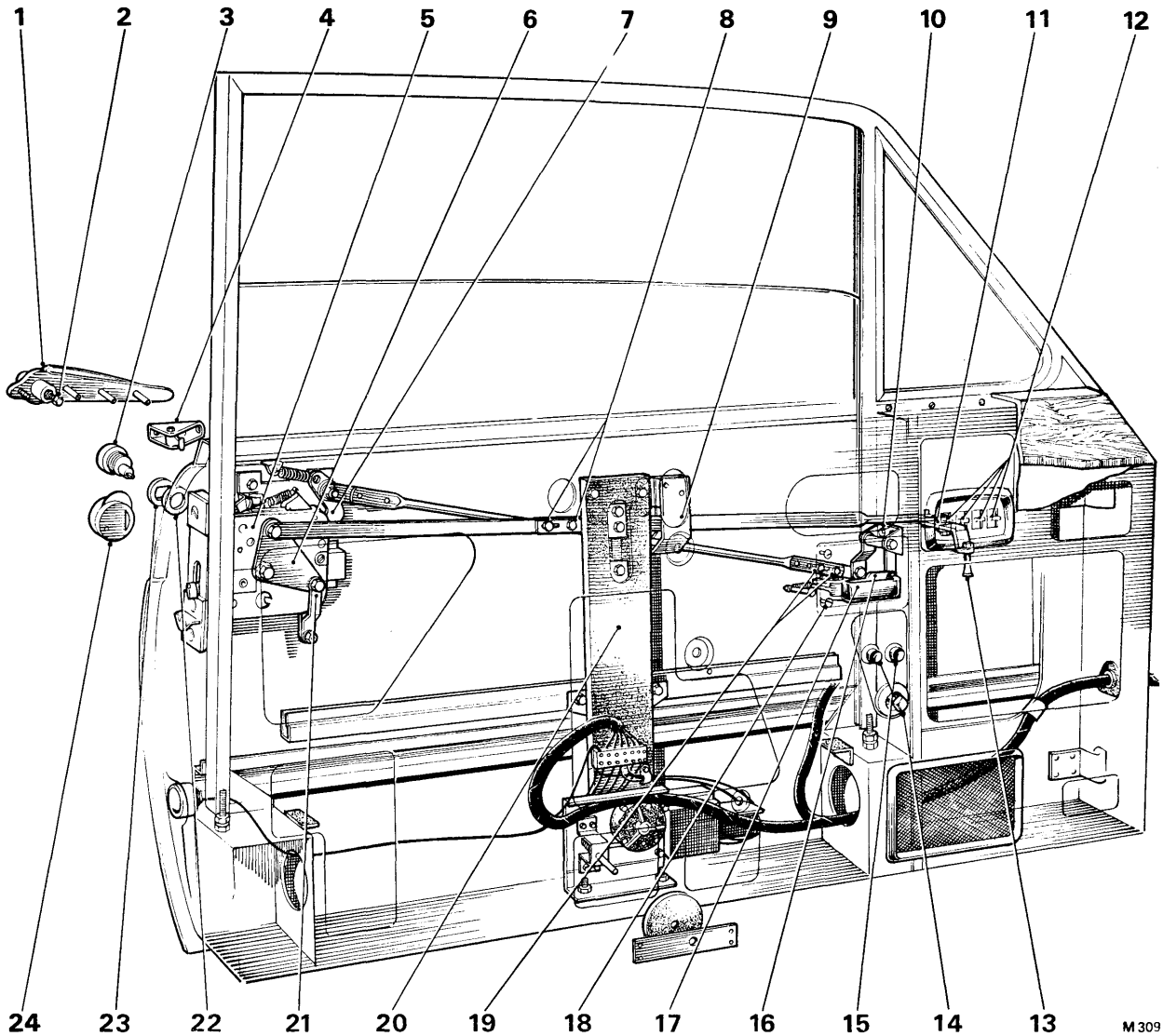


FIG. S13 DOOR LOCKING MECHANISM (2-Door Saloon and Convertible Cars from Car Serial Number 5001 to Car Serial Number 9000)

- | | | |
|--|---|---|
| 1 Exterior door handle | 10 Pivot lever assembly—remote control links | 17 Interior door handle |
| 2 Adjuster—door handle push button | 11 Pivot bracket—cubby box locking lever | 18 Screws securing the interior handle recess panel (4 off) |
| 3 Private lock | 12 Electric window lift switches (Driver's door) | 19 Lock-nuts—remote control link adjustment |
| 4 Lever assembly—push button to lock contactor lever | 13 Knob—cubby box locking lever | 20 Electric window lift assembly |
| 5 Door lock | 14 Front seat adjustment switch | 21 Link—locking lever to lock pivot plate |
| 6 Door lock pivot plate | 15 Final travel switches—electric windows | 22 Nut—private lock |
| 7 Remote control lever | 16 Link—remote control pivot lever to interior handle | 23 Collar—private lock |
| 8 Lock-nuts—lock lever linkage adjustment | | 24 Weather shield—private lock |
| 9 Support bracket | | |

Door lock mechanism—To remove

Coachbuilt cars (see Figs. S9, S13 and S14).

1. Detach the return spring from the door lock remote control lever.

2. Detach the remote control linkage from the lock lever; on early cars the link is secured to the lock lever by a clevis pin, washer and split pin while on late cars it is secured by a shouldered bolt, washer and nut.

3.(a) **Cars prior to Car Serial Number 5001** (see Fig. S9). Detach the control rod which fits between the lock and the fulcrum lever by pushing the ends out of the nylon bushes.

(b) **Cars from Car Serial Number 5000 to Car Serial Number 9000** (see Fig. S13). Remove the shouldered setscrew securing the cubby lever lock linkage to the triangular shaped plate on the door lock.

(c) **Cars after Car Serial Number 9000** (see Fig. S14). Remove the 3 B.A. nut and bolt securing the cable conduit to the lock. Slacken the $\frac{7}{16}$ in. A/F nut locking the cable to the pivot bolt in the lock lever; withdraw the cable from the lock lever bolt.

4. Remove the screw situated at the forward end of the door lock and the three external countersunk headed screws securing the lock to the rear face of the door; remove the door lock.

On later cars, where the lock bolt roller is retained either by a circlip or a split pin, it will be necessary to remove the roller before the lock can be removed from the door (see *Door lock mechanism—To remove, 4-Door Saloon and Long Wheelbase cars, Operation 5*).

5. Remove the two self-tapping screws and the two bolts securing the lock actuator lever assembly to the door; remove the actuator lever assembly.

6. Remove the four screws securing the exterior handle to the door, noting the position of the respective distance pieces.

7. Remove the nut securing the private lock to the door; remove the lock together with the weather shield (if fitted) and the collar which fits between the nut and the door.

8. Detach the remote control rod from the pivot lever by removing the split pin, washer(s) and clevis pin; remove the remote control rod.

9. Detach the interior door handle from the remote control link; on cars prior to Car Serial Number 5001 the link is secured by a split pin, washer and clevis pin while on late cars it is secured by a shouldered bolt.

10. Remove the screws securing the interior door handle to the door; remove the handle.

11. Remove the four bolts securing the remote control linkage pivot bracket to the door; remove the bracket together with its pivot lever assembly.

12. Remove the door locking button linkage as follows.

(a) **Cars prior to Car Serial Number 5001** (see Fig. S9). Release the lock-nut on the cubby box knob adjuster (see Fig. S9, item 13); unscrew the control knob and withdraw it from the cubby box. Push the other end of the adjuster rod out of the nylon bush in the fulcrum lever (see Fig. S9, item 20) and remove the control rod. The fulcrum lever assembly is secured to the door with a nut and washer.

(b) **Cars from Car Serial Number 5000 to Car Serial Number 9000** (see Fig. S13). Remove the split pin, washer and clevis pin securing the locking lever linkage to the pivot lever; remove the linkage. Remove the four bolts securing the pivot lever bracket to the door; remove the bracket together with the pivot lever and the locking lever knob.

13. Remove the door striker plate by following the procedure described previously for 4-Door Saloon and Long Wheelbase cars (see *Door lock mechanism—To remove, Operation 11*).

Cars after Car Serial Number 9000 (i.e. cars fitted with the centralised door locking system).

14. To remove the solenoid proceed as follows (see Fig. S14).

Detach the electrical leads of the solenoid at their Lucar connections. Remove the four screws securing the solenoid to the door; detach the spring link rod from the nylon bush in the cable connector then remove the solenoid together with its mounting bracket and spring link.

15. To remove the cable and conduit, first remove the two screws securing the nylon block on the forward end of the cable to the door; remove the block together with the cable and conduit.

16. Remove the door striker plate by following the procedure described in *Door lock mechanism—To remove, Operation 10*, for 4-Door Saloon and Long Wheelbase cars.

Door lock mechanism—To check

When carrying out Operations 22 to 27 inclusive note that Coachbuilt (2-door) cars after Car Serial Number 9000 are not fitted with a door locking lever in the cubby box as were earlier Coachbuilt cars; door locking on these later cars is accomplished by the key operated private lock or by the centralised door locking switch.

1. Check the condition of the lock bolt roller (see Fig. S7, item 30). If necessary renew the roller as described in the following Operations 2 to 19 inclusive; note that on **early cars** the roller is retained by swaging the end of the bolt, while on **later cars** the roller is retained either by a circlip or a split pin.

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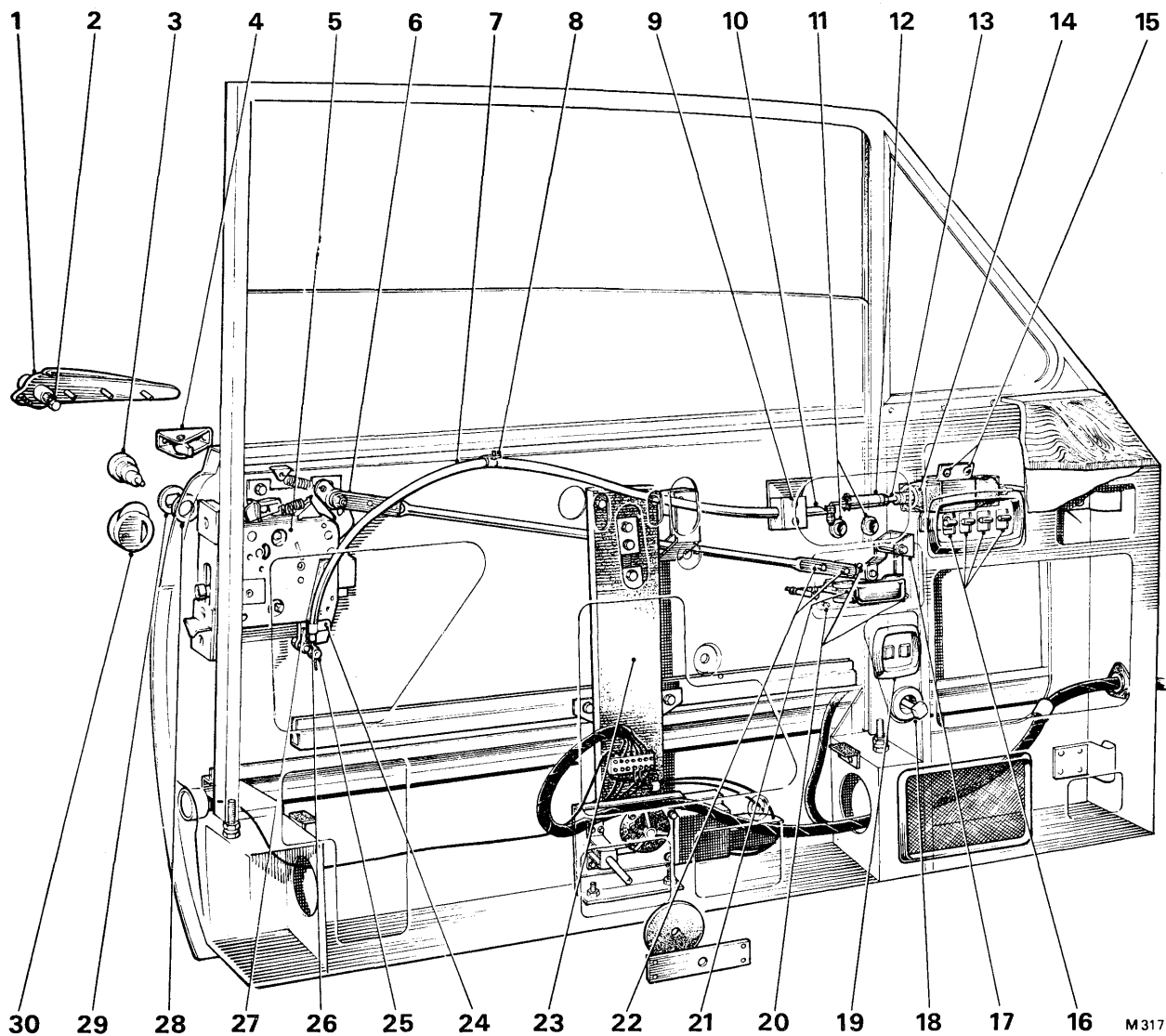


FIG. S14 DOOR LOCKING MECHANISM (2-Door Saloon and Convertible Cars after Car Serial Number 9000)

- | | | |
|--|---|---|
| 1 Exterior door handle | 11 Final travel buttons—electrically operated windows | 21 Interior door handle |
| 2 Adjusting screw—handle push button | 12 Spring link assembly | 22 Lock-nuts—remote control link adjustment |
| 3 Private lock | 13 Lock-nut | 23 Electric window lift assembly |
| 4 Actuator lever assembly | 14 Solenoid assembly | 24 Screw securing conduit clip to lock |
| 5 Door lock | 15 Solenoid securing screws (4 off) | 25 Cable lock-nut |
| 6 Remote control linkage to interior handle | 16 Electric window lift switches | 26 Cable—lock to solenoid spring link |
| 7 Cable conduit | 17 Pivot lever assembly | 27 Door lock lever |
| 8 Conduit support clip | 18 Front seat adjustment control switch | 28 Nut—private lock |
| 9 Screws securing nylon block on conduit to the door | 19 Centralised door locking switch | 29 Collar—private lock |
| 10 Cable connector | 20 Handle securing screws (3 off) | 30 Weathershield—private lock |

Early cars – roller swaged onto the lock bolt (*Operations 2 to 7 inclusive*)

2. Using a file, remove the rising bolt swaging, retaining the roller and washer to the end of the bolt; remove the roller (*see Fig. S7, item 30*).

3. Fit a new roller, chamfered end leading, onto the rising bolt.

4. Fit the washer.

5. Using a centre punch, punch three equally spaced 'pops' onto the end of the rising bolt to retain the washer and roller on the rising bolt.

6. Spin the roller about the bolt to ensure that it rotates satisfactorily.

7. Carefully paint the filed end of the rising bolt with silver coloured paint to prevent rust and to provide a satisfactory finish.

Late cars – roller retained by a circlip (*Operations 8 to 14 inclusive*)

8. Using circlip pliers (RH 7674), remove the circlip securing the roller to the lock bolt; remove the washer and roller.

9. Discard the circlip if there is any possibility that it has been inadvertently expanded beyond its yield point thereby rendering it useless as a retainer.

10. Fit a roller, chamfered end leading, to the lock bolt.

11. Fit the washer.

12. Using circlip pliers (RH 7674), fit the circlip into its groove so that the sharp edge of the circlip is facing outwards; take care not to overstress the circlip. Ensure that the circlip is located in the groove by checking that the circlip will rotate freely after assembly. Check that the circlip has not been overstressed by observing the gap between the legs of the circlip; the legs should be reasonably parallel.

13. Check the security of the roller by applying a load of 25 lb. (11,34 kg.) to the roller. If the circlip fails to hold, repeat the test after fitting a new circlip. If the circlip fails this second test, drill the lock bolt and fit the later type roller and washer as follows.

14. Carefully drill a 0.0625 in. (1,587 mm.) diameter hole in the end of the lock bolt. The centre of this hole must be 0.0625 in. (1,587 mm.) from the end of the lock bolt.

Fit the new roller which has a section of the outer spigot removed (*see Fig. S11 inset*) and the new washer (*part number UB19027*) as described in the following Operations 16 to 19 inclusive.

Later cars – roller retained by a split pin (*Operations 15 to 19 inclusive*)

15. Straighten the legs of the split pin, rotate the roller until the slot in the outer lip of the roller is aligned with the head of the split pin then remove and discard the split pin; remove the washer and roller.

16. Fit a new roller to the lock bolt so that the slot in the outer lip of the roller is facing outwards.

17. Fit the washer.

18. Rotate the roller until the slot in the outer lip is aligned with the hole in the lock bolt, then fit a new split pin as shown in Figure S11 inset.

Note Always use a new split pin when fitting the lock bolt roller.

19. Check that the roller will rotate freely on the lock bolt and does not bind on the 'T' shaped head of the split pin.

20. Check the door lock operating mechanism as follows.

21. Check that the contact lever spring fully returns the lever from the full on position to the full off position; this check can only be carried out with the lock removed from the door.

22. Check that the rivets are secure; this check can only be carried out with the lock removed from the door.

23. Check the exterior door handle operation as follows.

(a) Fully raise the lock bolt, move the lock control button up (i.e. the control button on the sill on cars other than coachbuilt; the control lever in the door cubby box on coachbuilt cars) then press the door handle push button; the bolt should move down.

If the door lock is removed from the door, the lock control lever should be moved down and the lock contactor lever pressed, to carry out this check.

(b) Fully raise the lock bolt; move the sill lock button (or cubby box lever) to the locked position then press the door handle push button; the bolt should not move down.

If the door lock is removed from the door, the lock control lever should be moved up and the lock contactor lever pressed, to carry out this check.

24. Check the interior door handle operation as follows.

(a) Fully raise the lock bolt; move the lock control button (i.e. the lock control button on the sill on cars other than coachbuilt; the control lever in the door cubby box on coachbuilt cars) to the unlocked position, then operate the interior door handle; the bolt should move down.

If the door lock is removed from the door, the lock control lever should be moved down and the lock remote control lever pressed to carry out this check.

(b) Fully raise the lock bolt; move the sill lock button (or cubby box lever) to the locked position then operate the interior door handle. On cars prior to Car Serial Number 5000 (except those cars fitted with child-proof locks), the bolt should move down; on later cars fitted with child-proof locks,

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the bolt should not move down.

If the door lock is removed from the door, the lock control lever should be moved up and the lock remote control lever pressed.

25. Check the operation of the self-cancelling mechanism as follows.

Move the sill lock button (or cubby box lever) to the locked position then fully raise the lock bolt; the lock control button (lever) should move to the fully unlocked position.

If the lock is removed from the door, the lock control lever should be fully raised to carry out this check.

26. Check the keyless locking mechanism as follows.

Move the lock control button (lever) to the locked position, press the door handle push button and hold then raise the lock bolt; the lock control lever should stay down.

If the lock is removed from the door, the lock control lever should be raised and the contactor lever pressed to carry out this check.

27. Check the operation of the key mechanism as follows.

Fit the door key into the lock, then turn the key alternately in opposite directions and check that the lock control button moves to the locked and unlocked positions in sequence with the key movement.

If the door lock is removed, the operating cam should be turned instead of the key and the lock operating lever checked to ensure that it moves up and down in sequence with the cam movement.

28. Raise the lock bolt to the half-way position, then repeat Operations 23 to 27 inclusive.

Door lock mechanism—To fit

To fit the door lock mechanism reverse the procedure given for removal noting the following points.

1. During assembly lubricate the following points with Molytone 265 grease or its equivalent.

- (i) The spade end of the private door locks.
- (ii) Pivot points and contact faces of the exterior door handle and the contactor lever assembly.
- (iii) Pivot points on all lock linkages.

2. When fitting the door lock striker plate, refer to Door – To fit, Operation 2 on Page S2.

3. Before fitting the exterior door handle, apply sealant as follows.

(a) **4-Door Saloon and Long Wheelbase cars.** Apply Bostik cement 1311 or its equivalent to the mating face of the handle to seal it to the moulding and to the moulding to seal it to the door (see Fig. S15); take care to keep the sealant away from the push button stem.

(b) **Coachbuilt cars.** Apply Glasticon sealer or its equivalent to the mating face of the handle to seal it to the door.

4. Set the exterior door handle push button as follows.

(a) **All cars except Coachbuilt cars prior to Car Serial Number 5001.** The exterior door handle adjusting screw should be set so that a clearance of $\frac{1}{32}$ in. (0,791 mm.) exists between the head of the screw and the contractor lever before the push button is pressed. Check that when the button is pressed, the lock bolt is triggered off from its fully raised position whilst the outer face of the button is still $\frac{1}{16}$ in. (1,587 mm.) or more from the handle surround (see Fig. S16). At this point it should be possible to move the lock bolt up and down by hand without feeling any interference from the lock mechanism. If the lock bolt will not operate without interference, difficulty will be experienced opening and closing the car door.

(b) **Coachbuilt cars prior to Car Serial Number 5001.** The external door push button should be adjusted so that there is approximately $\frac{1}{32}$ in. (0,79 mm.) free movement before the head of the actuator is felt to make any perceptible contact with the push button.

If there is no free movement, the handle should be removed from the door and the required amount ground off the plunger.

5. When fitting the private door locks, ensure that the key slot is vertical before finally tightening the lock to the door; rotating the lock unit after it has been tightened will result in binding when the key is operated.

6. Adjust the position of the interior door handle remote control linkage as follows.

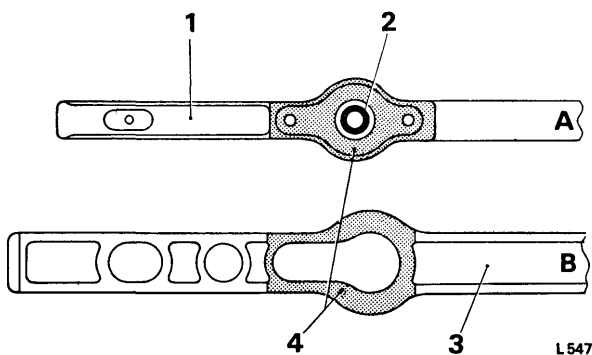


FIG. S15 LOCATION OF SEALANT ON EXTERIOR DOOR HANDLE AND MOULDING (4-Door Saloon and Long Wheelbase Cars)

- A Door handle
- B Moulding
- 1 Inboard face of handle
- 2 Push button stem
- 3 Inboard face of slipper moulding
- 4 Sealant—shaded areas

4-Door Saloon and Long Wheelbase cars.

- (a) **Cars prior to Car Serial Number 5001.** With the lock and remote control rods fitted, adjust the position of the interior door handle on its elongated holes so that the lock bolt is triggered off from its fully raised position at approximately $\frac{1}{8}$ in. (3,17 mm.) before the contactor lever reaches the end of its travel.

This travel can be checked by looking through the door pressing aperture and checking the travel of the lock remote control lever which is controlled by, and travels exactly the same distance as, the contactor lever (see Fig. S17, Inset).

This travel represents approximately 2° of handle travel.

At the point when the lock bolt is triggered off, it should be possible to move the lock bolt up and down by hand without any sign of interference. If interference is felt, opening and closing the door will not be satisfactory.

- (b) **Cars after Car Serial Number 5000.** Fit the door lock and control rods noting that there are two bushes fitted into the interior door handle mounting bracket (see Fig. S17); fit the remote control rod to the rearmost bush. Take up all free play in the handle-to-lock linkage by adjusting the position of the interior door handle on its elongated holes.

If all free play in the linkage cannot be taken up in these slots, fit the remote control rod to the forward bush in the interior handle bracket.

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- (c) **Cars prior to Car Serial Number 5001.** Fit the lock, interior door handle and linkage then adjust the link connecting the interior door handle to the lock as follows.

Slacken the two bolts on the link so that it is possible to adjust it by means of the elongated holes (see Fig. S9, item 1).

Take up any free play from the lock actuating lever by pulling it gently forward against spring tension until a slight resistance is felt; at the same time, the interior door handle should be held in its fully closed position. Retain the mechanism in this position, then tighten the two bolts on the remote control link.

- (d) **Cars after Car Serial Number 5000** (see Figs. S13 and S14). Adjust the links connecting the interior door handle to the lock by following a similar procedure to that given for cars prior to Car Serial Number 5001.

7. **On cars after Car Serial Number 9000** (i.e. cars fitted with the centralised door locking system), fit and adjust the solenoid and linkage as follows.

- (a) **4-Door Saloon and Long Wheelbase cars** (see Fig. S11). Fit the private lock (see Operation 5).

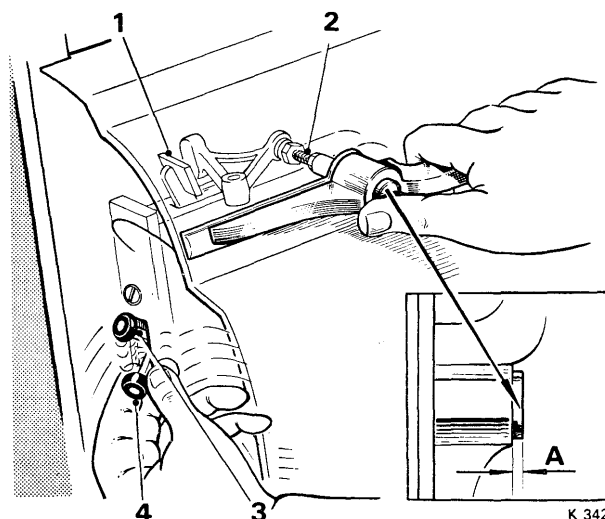


FIG. S16 EXTERIOR DOOR HANDLE ADJUSTMENT (4-Door Saloon and Long Wheelbase Cars)

A = $\frac{1}{8}$ in. (1,587 mm.) — Between end of push button and handle surround

- 1 Contactor lever—door lock
- 2 Adjusting screw
- 3 Lock bolt (position after being 'triggered off' i.e. fully down)
- 4 Lock bolt (position before being 'triggered off' i.e. fully raised)

Lubricate the external rubber stop on the door lock unit with Molytone 265 grease, then fit the lock. Fit the pivot lever assembly to the nylon bushes in the door bracket by reversing the removal procedure (see *Door lock mechanism - To remove, Operation 13*). Fit the control rod from the lock to the pivot lever, into the nylon bushes. Secure the solenoid unit complete with upper rod, spring link and water proofed bag to the door panel. Move the door lock lever to the locked position and the solenoid link to the down position. Slacken the lock-nut on the spring link then adjust the spring link length until the lower rod is aligned with the nylon bush in the pivot lever (see Fig. S11); tighten the lock-nut on the spring link then connect the link to the lever.

Check that the forces required to lock and unlock the door are the same. If they are not, the spring link is not correctly adjusted. Re-adjust the link and check again.

- (b) **Coachbuilt cars** (see Fig. S14). Fit the private lock (see Operation 5), Lubricate the external rubber stop on the door lock unit with Molytone 265 grease, then fit the lock. Smear the solenoid-to-lock operating cable with Molytone 265 grease, then fit the conduit, cable and nylon block to the

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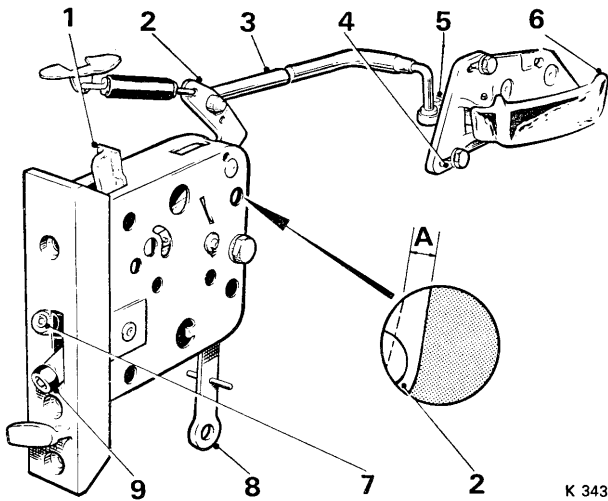


FIG. S17 INTERIOR DOOR HANDLE ADJUSTMENT (4-Door Saloon and Long Wheelbase Cars after Car Serial Number 5000)

Note Dotted line in inset indicates position of lock remote control lever when door handle has reached full extent of travel

A = $\frac{1}{8}$ in. (3,175 mm.)

- 1 Lock contactor lever
- 2 Lock remote control lever
- 3 Control rod
- 4 Elongated hole
- 5 Bush
- 6 Interior door handle
- 7 Lock bolt (raised position)
- 8 Sill lock lever—door lock
- 9 Lock bolt (position after being 'triggered off')

door panel. Secure the conduit bracket to the lock with the 3 B.A. screw and nut. Fit the solenoid unit complete with its waterproofed polythene bag and spring link assembly to the door, then connect the cable to the spring link rod. Slacken the lock nut on the spring link to move the lower link of the door lock down to the open (unlock) position and move the solenoid link to the open position, i.e. towards the rear of the car. Secure the cable to the lower link of the door lock with the lock-nut and also tighten the spring link lock-nut.

Check that the forces required to lock and unlock the door are the same. If they are not, the spring link is not correctly adjusted. Re-adjust the spring link and check again.

Connect the solenoid electrical leads at their Lucar connections, then close the ends of the polythene tube with adhesive tape sealing the solenoid inside; ensure that movement of the solenoid spring link is not restricted by the polythene tube.

8. On later cars on which the interior door handle

mechanism is protected by a polythene bag, fit a new bag as follows.

- (a) **4-Door Saloon and Long Wheelbase cars.** Cut off a corner of the polythene bag as small as possible. Push the remote control rod through the hole so that the interior handle end of the rod is inside the bag. Using the rubber sleeve, secure the polythene bag to the rod; position the sleeve up to the 90° bend in the rod, leaving approximately 1.00 in. (25,4 mm.) of the rod inside the bag. Fit the remote control rod to the lock. Pull the open end of the polythene bag through the door handle aperture in the inner panel. Using Dunlop adhesive S81, secure the open end of the polythene bag around the lip of the aperture with approximately 0.375 in. (9,525 mm.) overlap. Fit the interior door handle to the remote control rod. Secure the handle to the door with the three setscrews, trapping the open end of the polythene bag between the handle and the door. Adjust the handle and remote control linkage as described in Operation 6(b). Check that the handle operates without straining the polythene bag unduly.

- (b) **Coachbuilt cars.** Fit the polythene bag to the door handle mechanism following a similar procedure as that given for 4-Door Saloon and Long Wheelbase cars.

9. After fitting the door lock and before fitting the trim pad, etc., check that the door can be locked as follows.

- (a) **Cars prior to Car Serial Number 5001** (except those cars fitted with child-proof locks). Check that the door can be locked from outside the car and that when locked the exterior door handle is inoperative.
- (b) **Cars after Car Serial Number 5000** (also earlier cars fitted with child-proof locks). Check that the door can be locked from inside and outside the car and that when locked both the interior and exterior door handles are inoperative.
- (c) **4-Door Saloon and Long Wheelbase cars after Car Serial Number 9000.** Carry out the same checks listed in (b) but note that these cars are also fitted with the centralised door locking system.

This system comprises an electrically operated solenoid connected to each door lock mechanism and is controlled by two switches mounted one on each front door trim panel. Operation of either of these two switches will energise the solenoids causing the lock mechanism on each door to move either to the locked or unlocked position as required.

Check that the doors can be locked and unlocked by operation of either switch and that when locked both the interior and exterior door handles are inoperative.

(d) Coachbuilt cars after Car Serial Number 9000.

Check that the door can be locked from inside and outside the car and that when locked the exterior door handle is inoperative; note that the interior door handle should be operative at all times (i.e. the interior door handle should open the door irrespective of whether it is locked or unlocked).

Check also that the doors can be locked and unlocked by operating the centralised door locking switch on each door panel; refer to item (c).

Door seals—To remove**4-Door Saloon and Long Wheelbase cars**

1. To remove the door to body seal proceed as follows.

(i) Carefully insert a screwdriver under the lip of the door seal at a point adjacent to the door frame vertical strip; take care not to damage the window frame.

(ii) Lift the door seal using the screwdriver, until finger grip can be established under the seal. Run the finger underneath and along the seal until the seal is removed from the door.

2. To remove the door frame to window glass seal proceed as follows.

(i) Remove the electrically operated window glass frame (see *Window frame – To remove, on Page S11*).

(ii) Using a sharp scraper or knife, remove the seal from the door frame; take care to avoid damage to the surrounding paintwork.

3. To remove the seal from the window glass channels proceed as follows.

(i) Remove the window glass (see *Electrically operated window glass – To remove, on Page S9*).

(ii) Insert a screwdriver under one end of the seal then remove the seal from the channel.

4. To remove the opening quarter window seal proceed as follows.

(i) Remove the quarter window (see *Opening quarter window – To remove, on Page S9*).

(ii) Remove the seal from the window frame.

5. To remove the fixed quarter window seal proceed as follows.

(i) Remove the quarter window (see *Fixed quarter window – To remove, on Page S10*).

(ii) Remove the two remaining sections of the seal from the frame.

6. To remove the seal from the lower cross-rail of the window frame proceed as follows.

(i) Remove the window glass (see *Electrically operated window glass – To remove, on Page S9*).

(ii) Using a sharp scraper or knife, remove the seal from the frame; take care to avoid damage to the window frame.

Door seals—To remove**Coachbuilt cars**

1. To remove the door to body seal proceed as follows.

(i) Using a scraper or similar tool, carefully remove the seal from the channel around the door aperture.

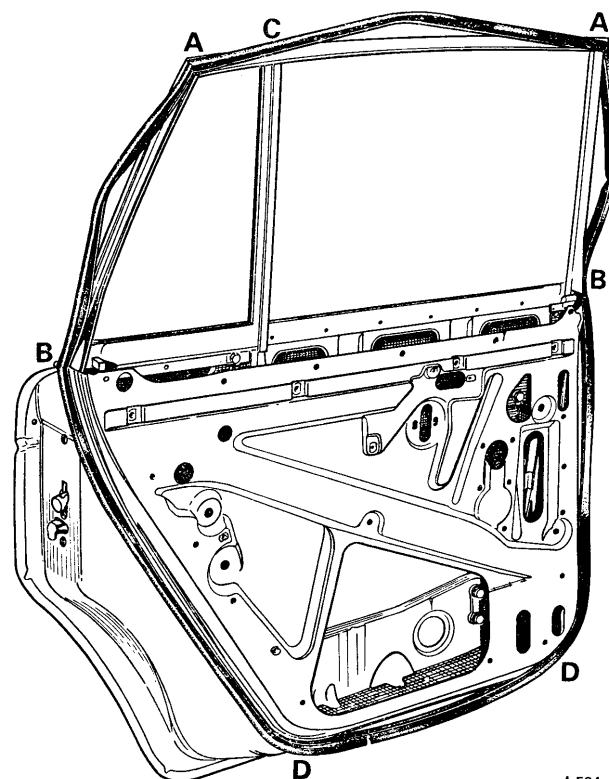
On Convertible cars, it will be necessary to remove the polished wood finisher under the rear quarter window to enable the rear section of the seal to be removed.

(ii) Remove the seal from the front door pillar by first removing the screw securing the upper end of the seal then detaching the seal from the pillar.

2. To remove the seals from the window channels proceed as follows.

(a) 2-Door Saloon cars

(i) Remove the window glass and frame (see *Electrically operated window glass – To remove, on Page S9*).



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**FIG. S18 REGISTERING THE DOOR SEAL
(4-Door Saloon and Long Wheelbase Cars)**

- A** At the upper mitred corners
- B** Steps on the seal at door waist line
- C** Notch on seal with the window frame centre vertical leg
- D** At the lower corners

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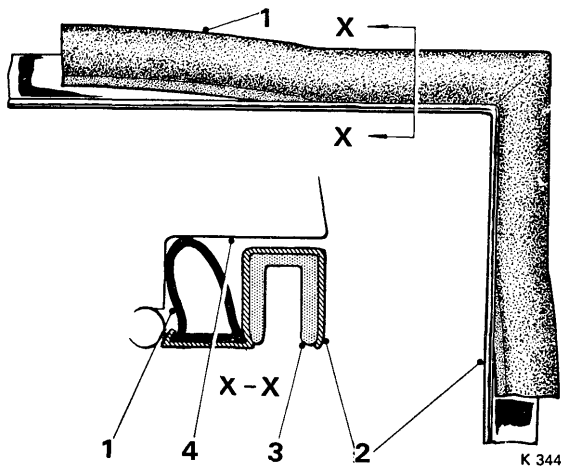


FIG. S19 FITTING THE DOOR SEAL INTO THE CHANNEL (4-Door Saloon and Long Wheelbase Cars)

- 1 Rubber seal
- 2 Door frame
- 3 Window frame felt
- 4 Car body

- (ii) Remove the glass from the frame.
- (iii) Remove the seal from the frame channel.
- (b) **Convertible cars**
- (i) Remove the window glass (see *Electrically operated window glass – To remove, on Page S9*).
- (ii) Remove the seal from each window channel.
- 3. To remove the seal from the metal finisher on the door outer sill proceed as follows.
 - (i) Remove the window glass (see *Electrically operated window glass – To remove, on Page S9*).
 - (ii) Using a sharp knife or scraper, carefully remove the seal from the finisher.
- 4. To remove the opening quarter window seal proceed as follows.
 - (i) Remove the quarter window (see *Opening quarter window – To remove, on Page S9*).
 - (ii) Remove the seal from the window frame.

Door seals—To fit

4-Door Saloon and Long Wheelbase cars

- 1. To fit the door to body seal proceed as follows.
 - (i) Ensure that the seal channel is clean and free from obstructions.
 - (ii) Register the door seal at the points indicated in Figure S18 and manipulate the seal into the channel.

Once the seal has entered satisfactorily at these points the seal between these points should be manoeuvred evenly into the channel. The seal should be located on the inner part of the metal

frame channel and in the outer part of the door channel then tamped in, a short length at a time. A wooden, wedge-shaped tool with no sharp edges will assist the seal entry into the channel (see Fig. S19).

Note Do not lubricate the seal to assist the entry of the seal into the seal channel.

- (iii) Lubricate the seal with a minimum amount of seal lubricant (Marston's EXPO. 59 or a similar lubricant) at the short length where the seal rubs against the car body, rather than presses onto it.
- 2. To fit the seal between the window glass frame and the door frame proceed as follows.
 - (i) Clean the bonding surfaces of the seal and the door using Bostik cleaner 6001; allow the cleaner to dry for at least one hour.
 - (ii) Apply Boscolite primer 9252 or its equivalent to the door surface to which the seal is to be fitted; allow at least one hour to dry.
 - (iii) Apply Boscoprene cement 2402 parts 1 and 2, or its equivalent to the bonding surfaces of the door and the seal; allow 10 to 15 minutes for the cement to partially dry.
 - (iv) Fit the seal to the door, using the edge of a steel rule, or a similar tool, to raise the seal lip over the door edge.
 - (v) Fit the remaining parts comprising the door by reversing the procedure given for removal (see *Window frame – To fit, on Page S11*).
- 3. To fit the window channel seal reverse the procedure given for removal noting the following points.
 - (i) Ensure that the edge of the seal having the four continuous 'pips' moulded into it is positioned inboard.
- 4. To fit the opening quarter window seal reverse the procedure given for removal.
- 5. To fit the fixed quarter window seal reverse the procedure given for removal.
- 6. To fit the sealing strip to the lower cross rail on the window frame proceed as follows.
 - (i) Fix the seal to the frame following the same basic procedure described in Operation 2 for fitting the window frame to door seal.
 - (ii) Fit the window (see *Electrically operated window glass – To fit, on Page S9*).

Door seals—To fit

Coachbuilt cars

- 1. To fit the door to body seal proceed as follows.
 - (i) Check the seal channel retaining screws for tightness; tighten or replace screws as necessary.
 - (ii) Cut the sealing strip to the required length noting the following.

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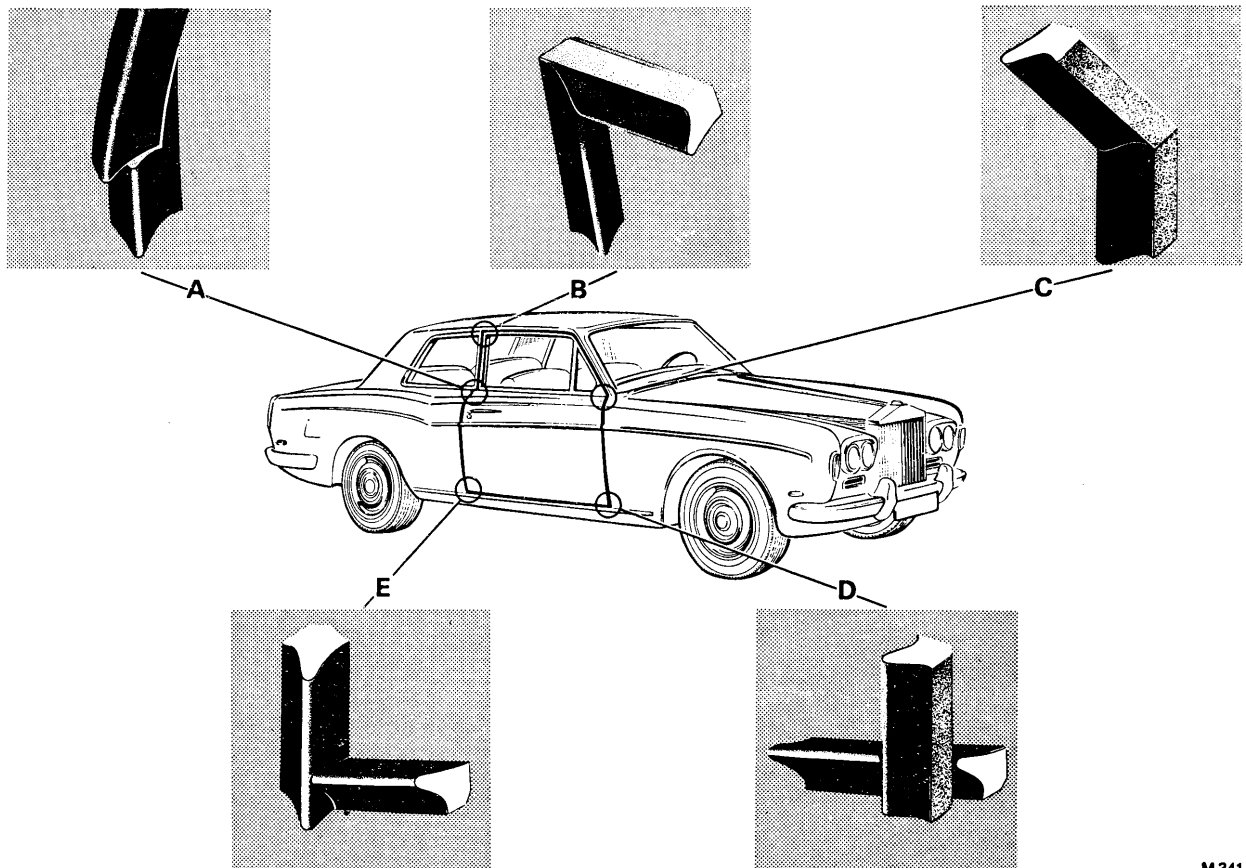
On 2-Door Saloon cars, five pieces of seal required; refer to Figure S20 which shows the position and type of seal abutment joints required.

On Convertible cars, four pieces of seal required; the seal abutment joints to be as shown in Figure S20, except for the centre and upper joint on the rear post which are applicable only to 2-Door Saloon cars.

- (iii) Apply Bostik adhesive 1261 to the seal channels in the door aperture.
- (iv) Fit the sections of the seal into the channel noting the points in Operation (ii); apply Bostik adhesive 1261 where one section of the seal abuts another.
- (v) Remove surplus adhesive using Bostik cleaner 6001. The seal on the leading face of the rear

quarter window (2-Door Saloon and Convertible cars) and the cantrail to window frame seal (Convertible cars only) can be replaced by following a similar procedure.

2. To fit the window channel seal reverse the procedure given for removal noting the following point.
 - (i) Ensure that the widest section of the seal is positioned inboard.
3. To fit the seal to the metal finisher on the door outer sill reverse the procedure given for removal noting the following point.
 - (i) Fix the seal to the chromed finisher using Bostik adhesive 1261 or its equivalent.
4. To fit the seal to quarter window, opening and fixed type, reverse the procedure given for removal.

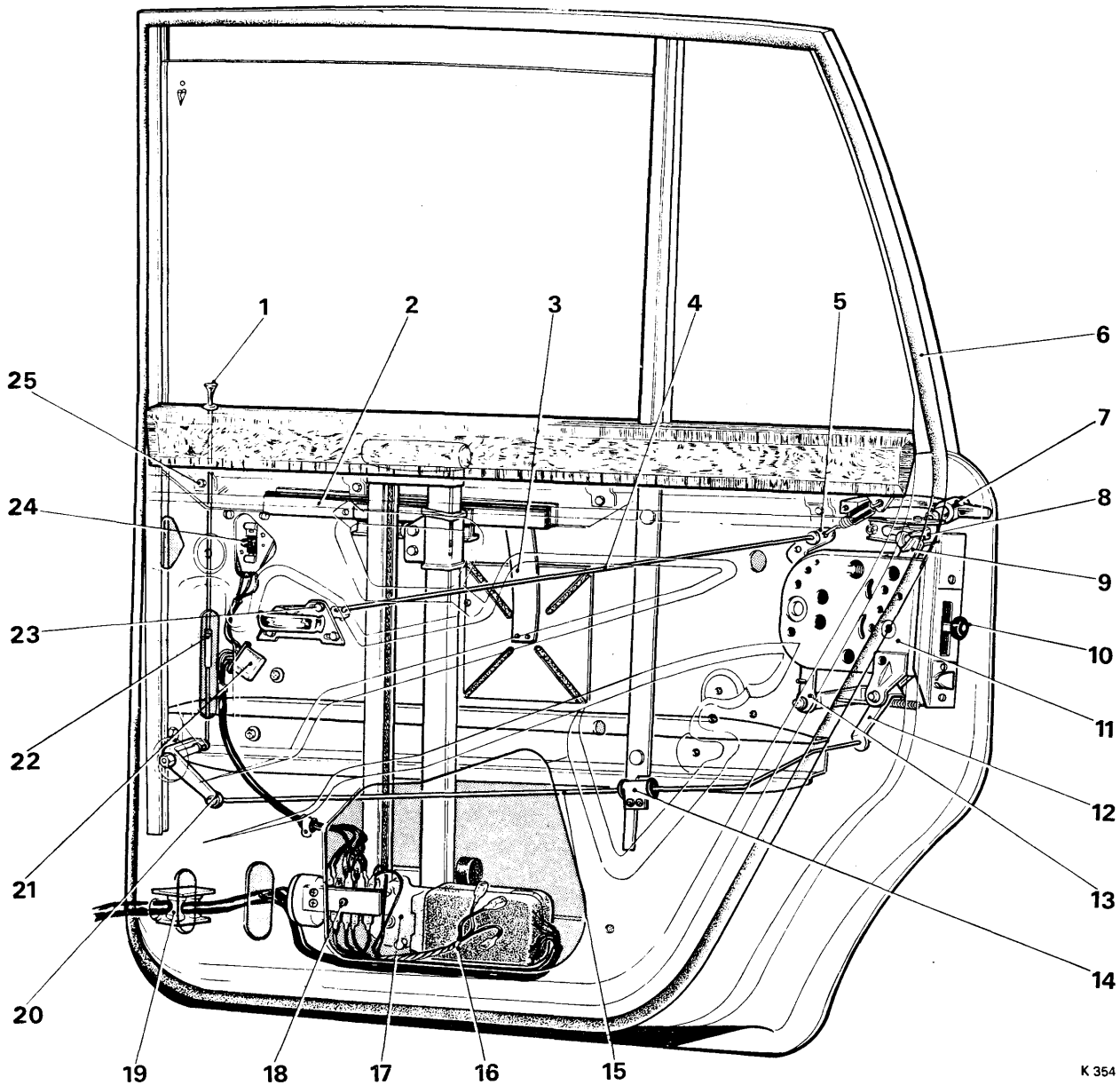


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FIG. S20 DOOR TO BODY SEAL (2-Door Saloon Cars)

- A** Stepped joint—door waist line
- B** Mitred joint
- C** Mitred joint
- D** The horizontal and vertical sections of the seal are in separate channels at this point
- E** Rear vertical section of the seal extends to bottom of channel, lower horizontal section abuts to rear vertical section

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FIG. S21 TYPICAL CONSTRUCTION OF A REAR DOOR (4-Door Saloon and Long Wheelbase Cars prior to Car Serial Number 9000 with rod operated sill lock button)

- | | | |
|---|---|--|
| 1 Sill lock button | 8 Actuator lever assembly—
push button to lever lock | 18 Electrical junction block
securing nut |
| 2 Window glass channel | 9 Contactor lever—door lock | 19 Door loom guide assembly |
| 3 Anti-drum pad steady strap | 10 Bolt—door lock | 20 Pivot lever |
| 4 Remote control rod—lock to
interior handle | 11 Door lock | 21 Window lift relay |
| 5 Door lock remote control
lever | 12 Pivot lever | 22 Sill lock button adjuster |
| 6 Door seal | 13 Sill control lever—door lock | 23 Screws securing the interior
door handle (3 off) |
| 7 Exterior door handle and
push button | 14 Control rod support bracket | 24 Electric window lift switch |
| | 15 Sill lock control rod | 25 Screw—waist rail |
| | 16 Electrical leads to the arm rest | |
| | 17 Electric window lift assembly | |

REAR DOORS

Door overhaul procedure

To remove and fit the rear door components, carefully follow a procedure similar to the one already described for the front door, noting any variations of procedure which are described under the following headings.

Door—To remove

1. Disconnect the battery.
2. Remove the door trim pad (see *Rear door trim – To remove*).
3. Disconnect sufficient electrical connections to enable the rear door to be removed; note their colour codes to ensure correct assembly.
4. Using circlip pliers (RH 7674), remove the circlip securing the check strap pin to the door linkage (see *Fig. S22*).
5. Using a hammer and drift, tap the pin downward until it clears the hinge.
6. Support the door then remove the four setscrews securing each hinge to the door; note the position of the check springs on the lower hinge setscrews to ensure correct assembly. Retain any packing pieces which may be fitted between the door and hinge to ensure correct assembly.
7. Remove the door simultaneously manoeuvring the wiring loom through the loom aperture.

Door—To fit

To fit the rear door reverse the procedure given for removal noting the following points.

1. The door should be fitted in a manner similar to that described for the fitting of a front door (see *Front door – To fit, on Page S2*); when setting the striker plate ensure that the rear edge of the door is level with the car body.
2. Apply Shell Retinax A grease or its equivalent to the check spring on the lower door hinge.
3. Ensure that the rubber seals are fitted to the hinges before securing the hinges to the door; renew the seals if damaged (see *Door hinges – To remove*).

Door hinges—To remove from the body

1. Remove the rear door (see *Rear door – To remove*).
2. Lift back the carpet to expose the self-tapping screws securing the metal finisher to the lower edge of the door aperture; remove the screws and the finisher.

3. Remove the front seat belt anchorage bolt (if fitted) from the body centre pillar (refer to *Section S9, Front seat belts – To remove*).

4.(a) **4-Door Saloon cars and Long Wheelbase non-division cars.** Using a wedge shaped tool as previously described for removing the front door trim pad (see *Page S2*), carefully remove the trim pad from the centre pillar.

(b) **Long Wheelbase cars with centre division.** Remove the centre division assembly (see *Section S6, Centre division – To remove*).

Remove the three $\frac{7}{16}$ in. A/F setscrews securing the centre division wooden mounting assembly to the body centre pillar; remove the mounting assembly.

5. Remove the socket headed screw securing the lower hinge to the body bracket (see *Fig. S22, item 3*).

6. Using an extension bar on the socket spanner, remove the two socket headed screws securing each hinge to the body; remove the hinges.

An extension bar is required as the screws are situated at the end of two recesses in the pillar pressing. *Figure S22, item 4*, shows the location of the access hole to the lower hinge screws.

Door hinges—To fit

To fit the rear door hinges reverse the procedure given for removal noting the following point.

1. Fix the upper hinge seal to the door by following the procedure described in *Operation 2 under Door seals – To fit, on Page S22*.

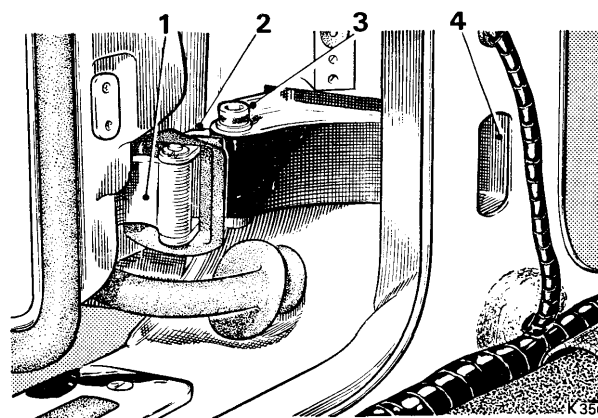


FIG. S22 REAR DOOR BOTTOM HINGE
(4-Door Saloon car illustrated)

- 1 Check strap
- 2 Hinge
- 3 Socket headed cap screw
- 4 Access hole to setscrews securing the hinge to the body

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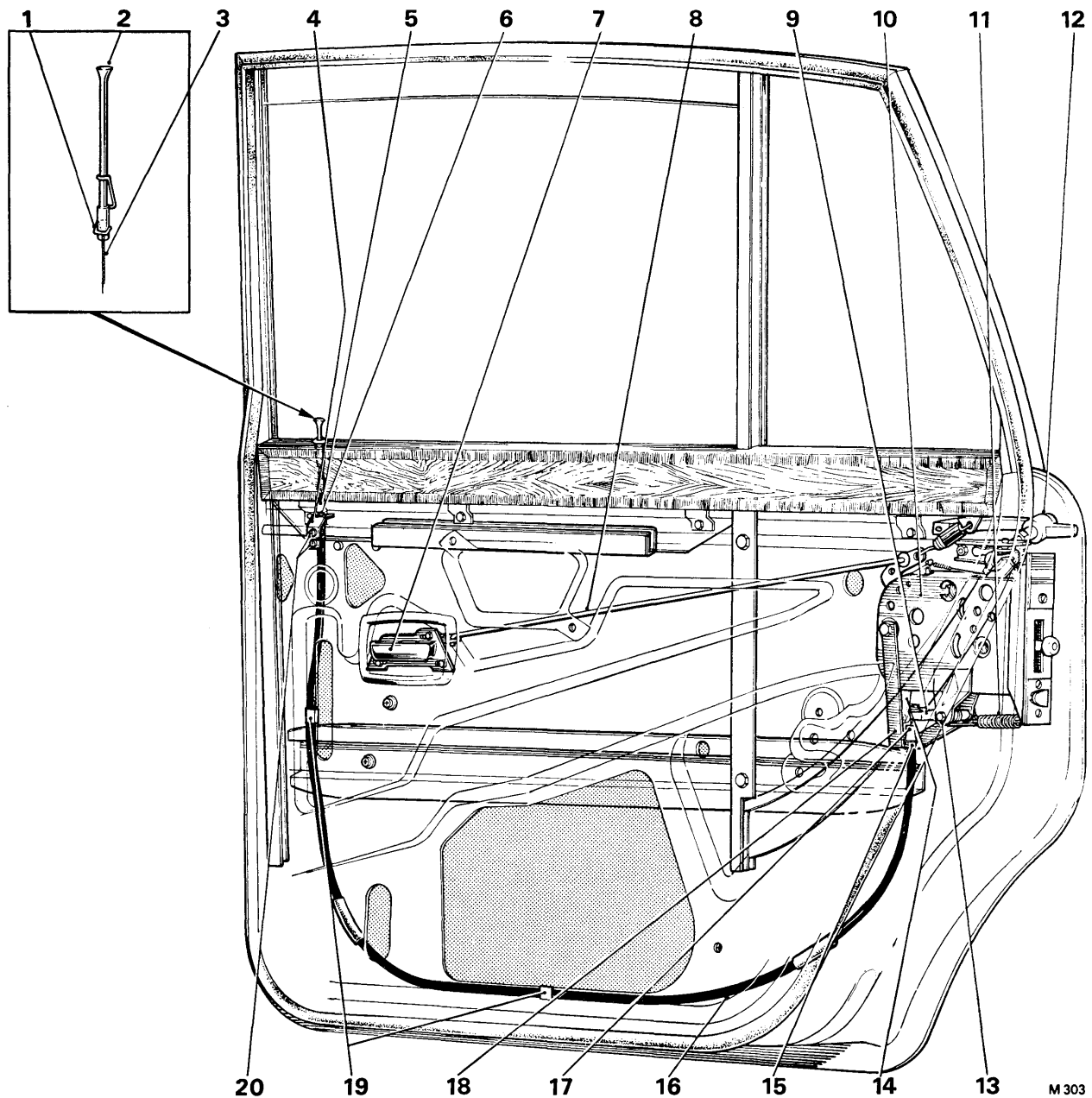


FIG. S23 REAR DOOR LOCKING MECHANISM (4-Door Saloon and Long Wheelbase Cars with cable operated sill lock button)

- | | | |
|---------------------------------|--|---|
| 1 Spring clip | 9 Pivot lever | 16 Cable and sheath |
| 2 Button—detachable type | 10 Door lock | 17 Guide |
| 3 Cable | 11 Spring—pivot lever return | 18 Nipple and locking screw |
| 4 Cable bracket | 12 Exterior handle and push button | 18 Cable bracket |
| 5 Sleeve | 13 Pivot bolt | 19 Cable securing clips |
| 6 Lock-nuts (2 off) | 14 Sill control lever—door lock | 20 Screws (2 off) securing cable bracket to door |
| 7 Interior door handle | 15 Lock-nuts (2 off)—cable to bracket | |
| 8 Remote control rod | | |

Door trim—To remove (see Fig. S21)

1. **Cars prior to Car Serial Number 6001.** Detach the cover of the step lamp in the arm rest out of its spring clip.

2. Slacken the two setscrews securing the arm rest to the door; access to the screws is gained through the opening in the bottom of the arm rest and a fairly long 2 B.A. flat spanner will be required to reach them.

Slide the arm rest upward until it is felt to be free of the setscrews; remove the setscrews.

3. Lift back the trim pad until the electrical leads to the step lamp and cigar lighter can be disconnected; note the colour codes of the leads to ensure correct assembly.

4. The sill mounted door locking buttons on some later cars are operated by a cable (see Fig. S23) and not by rods and links used on earlier cars.

Two types of these cables can be encountered.

- (a) The earlier type of cable on which the button is fixed to the cable.
- (b) The later type of cable on which the button is secured to the cable by a spring clip, enabling the button and cable to be separated.

The later type cable can be identified by the spring clip visible on the lower end of the button shank when the door panel and dust cover are removed.

5. To remove a cable operated button proceed as follows.

- (a) **Earlier type cable.** Remove the $\frac{7}{16}$ in. A/F bolt and nut securing the link on the lock end of the cable to the lock; slacken the nipple locking screw and remove the nipple and link.

Lift the button out of the polished wood finisher, withdrawing the cable from its sheath; remove the finisher.

- (b) **Later type cable** (see Fig. S23). Remove the two 2 B.A. screws and nuts securing the mounting bracket on the button end of the cable sheath, to the door. Remove the screws securing the polished wood finisher and lift the finisher to gain access to the lower end of the button.

Hold the button to prevent it turning then rotate the spring clip on the button shank through 90° until the lower leg of the spring clip disengages from the slot in the button shank; remove the button from the cable.

Remove the polished wood finisher.

Door trim—To fit

To fit the door trim reverse the procedure given for removal noting the following points.

Cars fitted with cable operated sill lock buttons (see Fig. S23).

1. On cars fitted with the later type cable, ensure that when fitting the button to the cable the leg of the spring clip engages the slot in the button shank (see Fig. S23, inset).

2. Before fitting the dust cover and trim pad, set the sill lock button (see REAR DOORS, Door lock mechanism – To fit, Operation 1).

Cars fitted with rod operated sill lock buttons (see Figs. S21 and S24).

3. Before fitting the dust cover and trim pad, set the sill lock button (see FRONT DOORS, Door trim – To fit, Operation 3).

Electric window lift mechanism—To remove

Cars after Car Serial Number 9000 (i.e. cars fitted with the centralised door locking system).

1. Remove the door trim pad following a procedure similar to that described for removing the front door trim and also noting any variation of procedure described under REAR DOORS, Door trim – To remove.

2. Remove the centralised door locking solenoid and mounting bracket (see REAR DOORS, Door lock mechanism – To remove, Operation 4).

3. Remove the window lift mechanism by following the same procedure described for removing the window lift mechanism from a front door and by reference to Figure S21.

Electric window lift mechanism—To fit

Cars after Car Serial Number 9000 (i.e. cars fitted with the centralised door locking system).

To fit the window lift mechanism reverse the procedure given for removal noting the following points.

1. Refer to FRONT DOORS, Electric window lift mechanism – To fit, Operations 1, 2 and 3.

2. Fit and set the solenoid as described later in this Section (see REAR DOORS, Door lock mechanism – To fit, Operation 3).

Electrically operated window glass —To remove

Cars after Car Serial Number 9000 (i.e. cars fitted with the centralised door locking system).

1. Remove the door trim and pad following a procedure similar to that described for removing the front door trim and also noting any variation of procedure described under REAR DOORS, Door trim – To remove.

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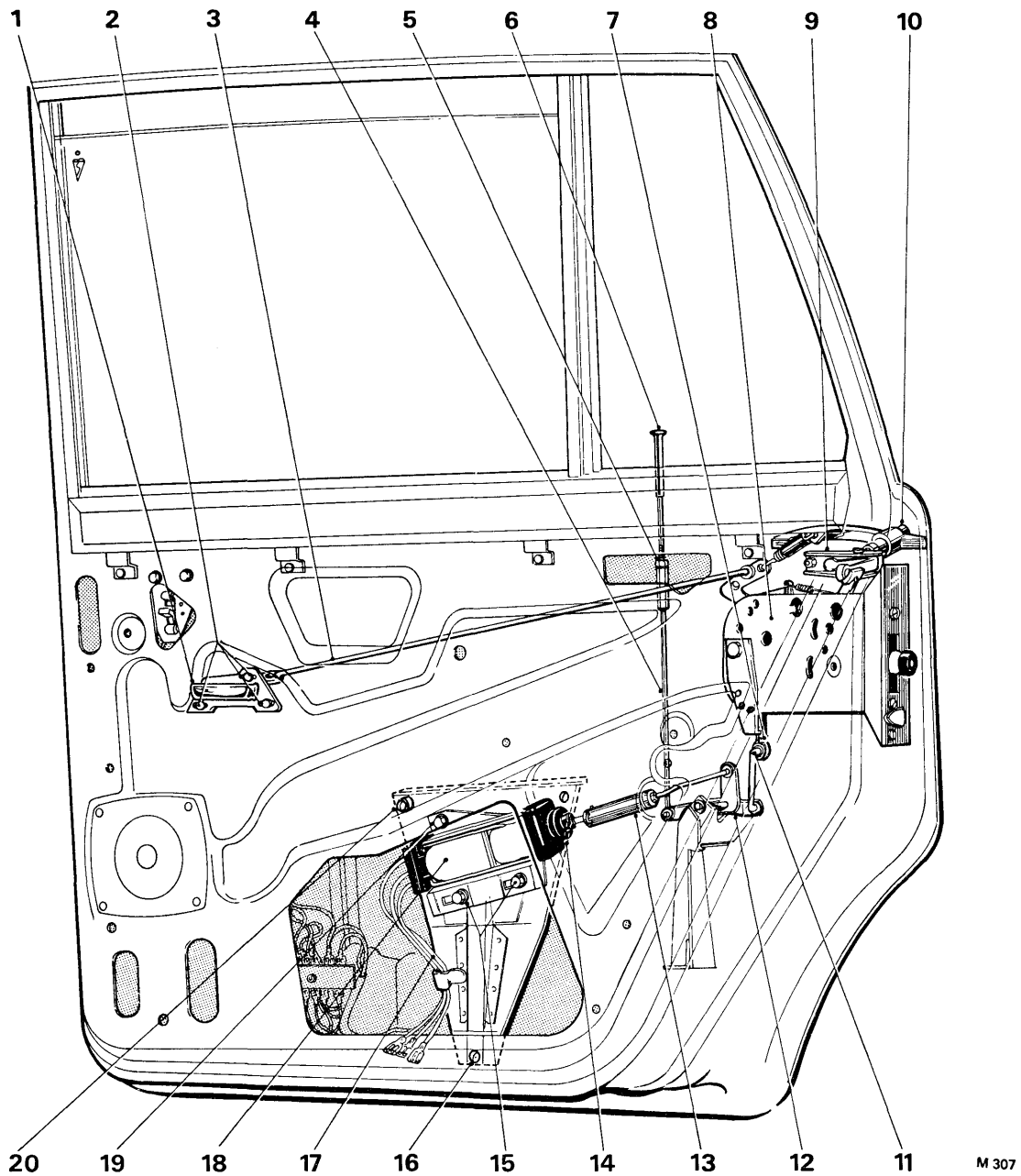


FIG. S24 REAR DOOR LOCKING MECHANISM (4-Door Saloon and Long Wheelbase Cars after Car Serial Number 9000)

- | | | |
|--|--|--|
| 1 Interior door handle | 8 Door lock | 16 Screws securing solenoid mounting bracket to door |
| 2 Handle securing screws (3 off) | 9 Contactor lever assembly | 17 Solenoid electrical leads (3 off) |
| 3 Remote control rod | 10 Exterior door handle | 18 Solenoid assembly |
| 4 Control rod—pivot lever to lock button | 11 Control rod—lock to pivot lever | 19 2 B.A. bolt—solenoid to bracket |
| 5 Lock-nut—sill button adjuster | 12 Pivot lever assembly | 20 Distance piece |
| 6 Sill lock button | 13 Spring link | |
| 7 Sill locking lever—door lock | 14 Dust cover—solenoid | |
| | 15 Setscrews (2 off)—solenoid to bracket | |

2. Remove the centralised door locking solenoid and mounting bracket from the door (*see REAR DOORS, Door lock mechanism - To remove, Operation 4*).

3. Remove the electric window lift assembly, frame and glass by following a procedure similar to that described for removing these components from the front door.

Electrically operated window glass—To fit

To fit the electrically operated window glass reverse the procedure given for removal noting the following point.

Cars after Car Serial Number 9000

1. When fitting the centralised door locking solenoid and its mounting bracket it will be necessary to adjust the solenoid as described under REAR DOORS, Door lock mechanism - To fit, Operation 3.

Fixed quarter window—To remove

Cars after Car Serial Number 9000

1. Before the window frame can be removed it will first be necessary to remove the solenoid and mounting bracket of the centralised door locking system (*see REAR DOORS, Door lock mechanism - To remove, Operation 3*).

All cars

2. Remove the 2 B.A. nut and screws securing the support plate situated beneath the quarter window (the support plate is retained by three screws on the front door fixed quarter window).

Fixed quarter window—To fit

Cars after Car Serial Number 9000

1. When fitting the centralised door locking solenoid it will be necessary to adjust the solenoid (*see REAR DOORS, Door lock mechanism - To fit, Operation 3*).

All cars

2. Fit the 2 B.A. nut and screw securing the support plate situated beneath the quarter window.

Window frame—To remove

Cars after Car Serial Number 9000

1. Before the window frame can be removed it will first be necessary to remove the solenoid and mounting bracket of the centralised door locking system (*see REAR DOORS, Electrically operated window glass - To remove, Operations 1, 2 and 3*).

All cars

2. Remove the six setscrews securing the window frame to the door (the frame is secured by seven setscrews on the front door).

Window frame—To fit

Cars after Car Serial Number 9000

1. Fit the centralised door locking solenoid and mounting bracket by reversing the procedure given for removal then adjust the solenoid (*see REAR DOORS, Door lock mechanism - To fit, Operation 3*).

All cars

2. Fit the six setscrews securing the window frame to the door.

Door lock mechanism—To remove

1. In addition to the black water proof cover attached to the outer face of the inner door panel, a similar cover attached to the inner face protects the interior door handle and door switch mechanisms; this inner cover is secured by four spring clips and adhesive. Note the position of these spring clips during removal to ensure correct assembly.

2. **On cars fitted with cable operated sill locking buttons** (*see Fig. S23*), remove the cable as follows.

Remove the two screws and nuts securing the button end of the cable sheath to the door. Slacken the nipple locking screw at the lock end of the cable; disconnect the cable from the lock and retain the nipple. Slacken the two lock-nuts on the lock end of the cable sheath then detach the sheath from its mounting bracket. Detach the spring clip securing the sheath to the base of the door then remove the cable and sheath.

3. **Long Wheelbase division cars prior to Car Serial Number 9000.** Private door locks are fitted to these cars.

Cars after Car Serial Number 9000 (*see Fig. S24*).

4. To remove the solenoid and mounting bracket of the centralised door locking system proceed as follows.

With the trim panel and dust cover removed, disconnect the three electrical leads to the solenoid at their Lucar connections.

Using a screwdriver, remove the three screws and nuts securing the solenoid mounting bracket to the doors; note the position of the spacing washer. Disconnect the solenoid remote control rod from its bush in the pivot lever assembly then remove the solenoid and mounting bracket assembly from the door.

5. To remove the pivot lever assembly from the door proceed as follows, noting that the removal procedure is basically the same as that shown in Figure S12.

Disconnect the control rods from their nylon bushes then remove the rods.

Press the pivot lever assembly towards the inner door panel until the outboard end of the lever spindle is free from its nylon bush; remove this nylon

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bush from the door. Push the freed end of the pivot lever spindle into the hole vacated by the nylon bush until the other end of the spindle is also freed from its bush; remove the pivot lever assembly from the door.

Door lock mechanism—To fit

1. **On cars fitted with cable operated locking buttons**, fit the cable by reversing the procedure given for removal then adjust as follows.

Take up any slackness in the cable by adjusting the position of the two lock-nuts at the lock end of the cable sheath (see Fig. S23).

Set the height of the button above the top of the sill by adjusting the position of the bracket, attached to the button end of the cable sheath, in its slot in the door panel; set the button so that when it is in its unlocked position (i.e. fully raised), the head of the button measures $1\frac{1}{8}$ in. (2,85 cm.) from the top of the polished wood sill finisher.

2. Set the exterior and interior door handles and remote control linkage as described for the front door (see *FRONT DOORS, Door lock mechanism – To fit*).

If private locks are fitted, refer to the points noted when fitting a private lock to the front door (see *FRONT DOORS, Door lock mechanism – To fit, Operation 5*).

3. **On cars after Car Serial Number 9000** (i.e. cars fitted with the centralised door locking system), fit and adjust the solenoid and linkage as follows.

Fit the door lock, if removed. Fit the pivot lever assembly by reversing the procedure given for removal (see *Door lock mechanism – To remove, Operation 4*). Fit the lock-to-lever control rod and the sill control rod into their nylon bushes; ensure that the angled end of the sill control rod is pointing inboard and that the other end is pointing upward.

If the solenoid has been removed from its mounting bracket (when renewing the solenoid for example), secure the solenoid and spring link assembly to the bracket with the 2 B.A. nut and bolt and the two $\frac{1}{2}$ in. A/F setscrews. Position the bracket and solenoid assembly inside the door, connect the link of the solenoid to the pivot lever then secure the assembly to the door with the three screws, washers and nuts; ensure that the spacing washer is fitted to the upper forward screw, between the bracket and the door inner panel.

Adjust the solenoid by slackening the 2 B.A. nut and bolt and the two $\frac{1}{2}$ in. A/F setscrews securing the solenoid to the bracket (see Fig. S24), then sliding the solenoid along the slots until the spring link is balanced (i.e. until any free play is removed, but tension is not applied to the spring link); adjustment should **not** be made at the spring link.

Fit the polished wood finisher to the door sill then fit the sill lock button and lock-nut to the sill control rod. Move the sill lock button to the locked position (i.e. fully lowered) then screw the knob up or down as required until the head of the knob is $\frac{1}{2}$ in. (12,7 mm.) above the wood finisher; tighten the lock-nut.

Check that the force required to raise or lower the sill lock button is the same in both directions; if not, slacken the 2 B.A. bolt and the two $\frac{1}{2}$ in. A/F setscrews and adjust the solenoid in the slots until this condition is obtained.

Connect the three electrical leads of the solenoid to their Lucar connectors.

4. After fitting the door locking mechanism, and before fitting the trim pad, etc., check that the door can be locked as follows.

(a) **Cars prior to Car Serial Number 9001**. Check that the door can be locked from the inside (and from the outside also if private door locks are fitted as they are on some earlier Long Wheelbase division cars) and that when locked, both the interior and exterior door handles are inoperative.

(b) **Cars after Car Serial Number 9000**. Carry out the same checks listed in (a) but note that these cars are also fitted with the centralised door locking system (see *FRONT DOORS, Door lock mechanism – To fit, Operation 9(c)*).

Check that the doors can be locked and unlocked by operating either of the switch controls on the front doors.

Door seals—To remove and fit

To remove and fit the rear door seals, follow the same procedure described for the front door seals (see *FRONT DOORS, Door seals – To remove and fit*) noting the following point.

1. The fixed quarter window glass seal is in four sections (the front door fixed quarter window seal is in three sections).

Section S2

SEATS

FRONT SEATS

Seat—To remove

1. **4-Door Saloon and Long Wheelbase cars.** Remove the seat cushion by gripping and lifting the front of the cushion until it is clear of the seat well.

2. Operate the seat mechanism as necessary to expose the two rear socket-headed screws securing the fore and aft slide mechanism to the floor; remove these screws.

3. Operate the seat mechanism to expose the two front socket-headed screws securing the fore and aft slide mechanism to the floor.

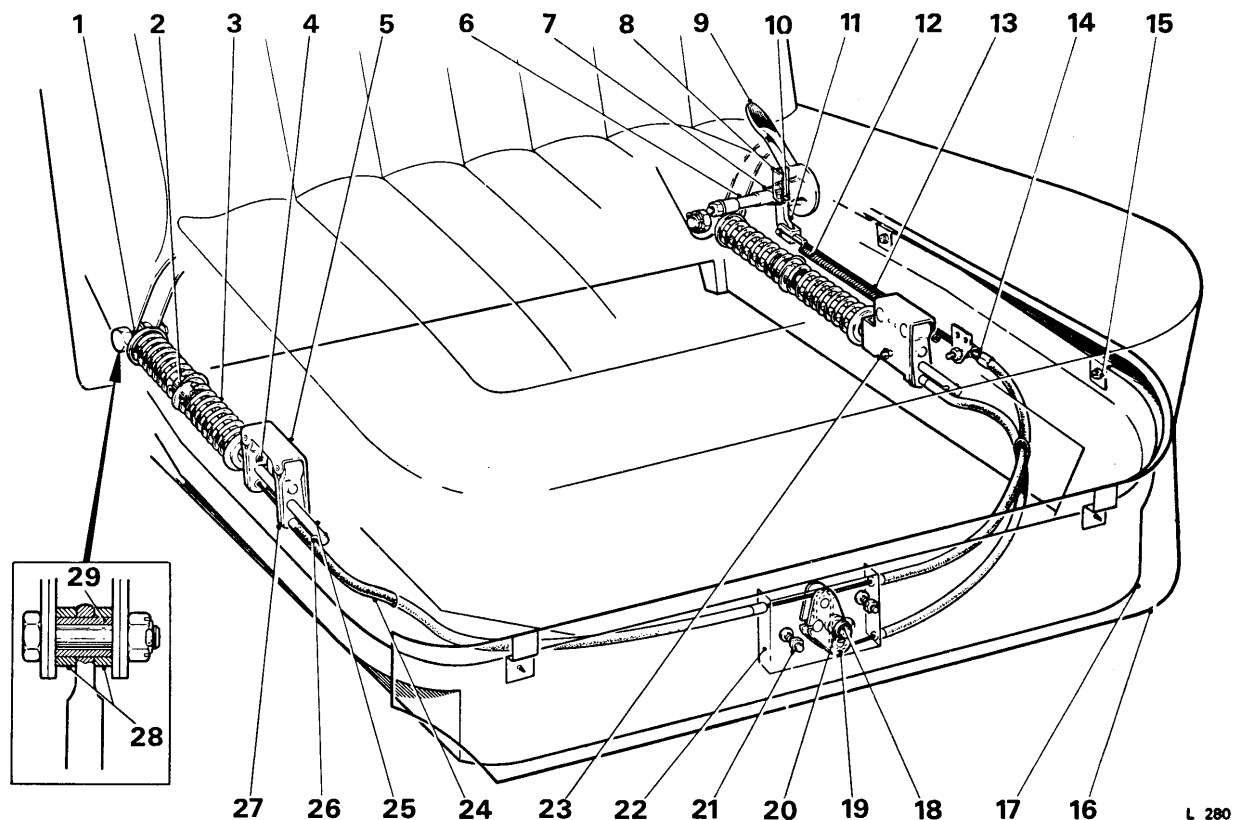


FIG. S25 FRONT SEAT RAKE MECHANISM (Early 4-Door Saloon Cars)

- | | | | |
|------------------|-------------------------|--------------------------|-----------------------|
| 1 Cup washer | 9 Handle | 16 Valance | 23 Pivot pin and clip |
| 2 Stabiliser | 10 Stop pin | 17 Seat frame | 24 Secondary cable |
| 3 Helical spring | 11 Remote control lever | 18 Plasti-ring | 25 Bar |
| 4 Leaf spring | 12 Return spring | 19 Rocking lever | 26 Roll pin |
| 5 Back plate | 13 Primary cable | 20 Washer | 27 Flap |
| 6 Spindle | 14 Threaded adjuster | 21 Special screw (2 off) | 28 Distance piece |
| 7 Brass washer | 15 Self-tapping screw | 22 Bracket | 29 Distance tube |
| 8 Stop bracket | | | |

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4. Disconnect the battery.
5. Disconnect the electrical connections to the seat mechanism.
6. Remove the two front socket-headed screws.
7. **Cars after Car Serial Number 9617** (see Fig. S33). Remove the four $\frac{7}{16}$ in. A/F setscrews securing the fulcrum bracket of the seat mechanism rear clutch to the car floor.
8. **Long Wheelbase cars with centre division.** Disconnect the trim flap on the rear of the backrest from the channel in the division. Detach the inner seat belt strap (if fitted) from the retaining bracket fitted to the seat base adjacent to the stowage bin as follows.

Lift the leather trim from the inboard edge of the seat valance to expose the two split rivets securing the seat belt retaining bracket to the valance (see Fig. S29); remove one of these split rivets then detach the belt from the seat base.

9. Remove the seat assembly.

For information regarding the electrical seat mechanism, refer to Chapter M – Electrical System.

Seat—To fit

To fit the seat reverse the procedure given for removal.

Rake mechanism—To adjust

4-Door Saloon and Long Wheelbase non-division cars

1. Remove the seat (see *Front seat – To remove*).
2. Remove the self-tapping screws securing the seat valance to the seat frame; remove the valance.
- 3.(a) **Early cars** (see Fig. S25). Using the primary cable adjuster (item 14) adjust the length of the cable so that any slackness is just removed.

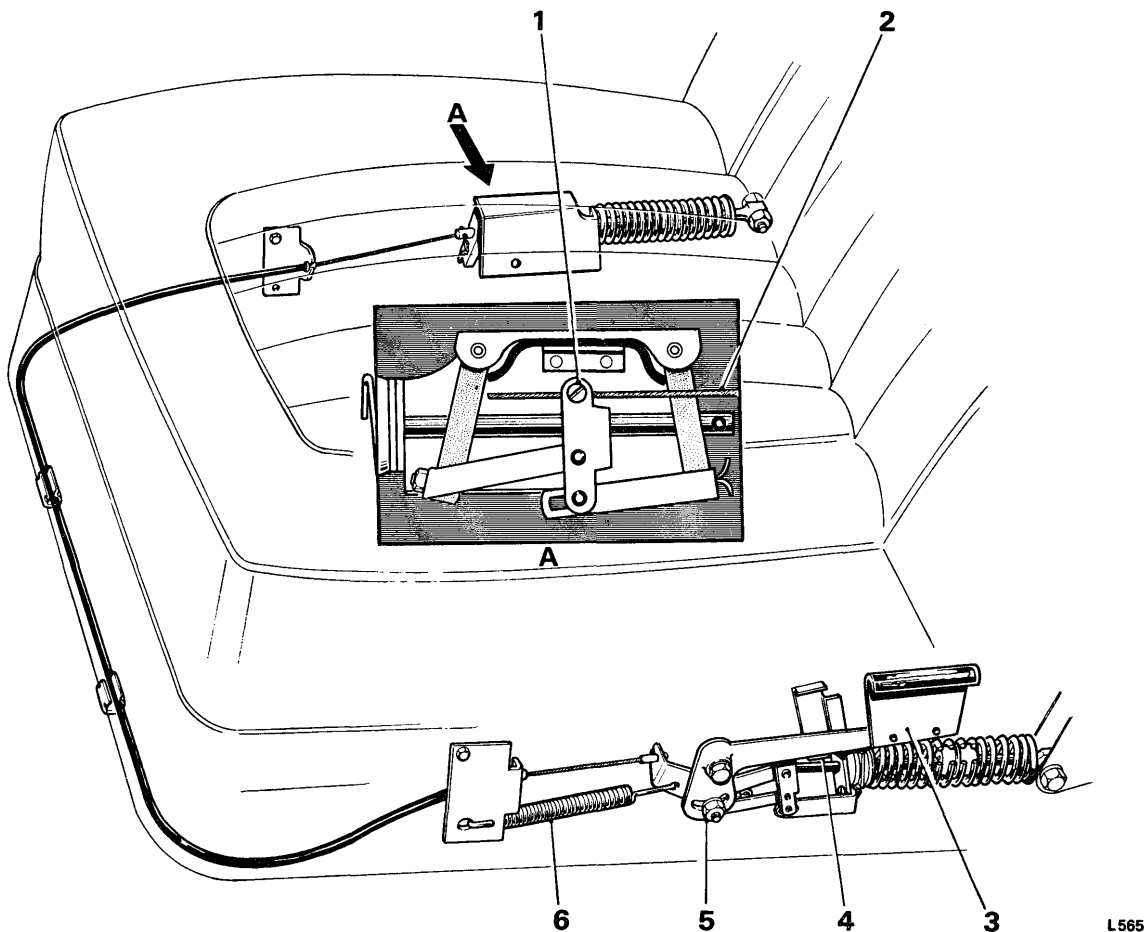


FIG. S26 FRONT SEAT RAKE MECHANISM (Later 4-Door Saloon and Long Wheelbase Non-division Cars)

Note Annotations depict adjustment points only. Refer to similar illustration Figure S25 for description of other components comprising the seat rake mechanism.

- | | | | |
|---|----------------------------|--------------------------|-------------------------------|
| A Inset shows view in direction of arrow | 1 Solderless nipple | 3 Handle | 5 Handle adjuster |
| | 2 Cable | 4 Handle off-stop | 6 Handle return spring |

(b) **Late cars** (see Fig. S26). Ensure that the retaining pin in the forward end of the 0.375 in. (9.525 mm.) diameter rod is clear of the forward flap.

Slacken the handle adjuster.

Remove the handle return spring (item 6).

On the handle side of the adjuster, take up all free play in the linkage by pushing the handle adjuster rearward; ensure that the handle is on its down stop then tighten the handle adjuster.

Fit the handle return spring.

On the side opposite to the handle, remove the free play in the linkage by slackening the solderless nipple and moving the nipple along the cable; ensure that the cable abutments are located correctly then tighten the solderless nipple.

4. After adjusting the seat rake mechanism and fitting the seat into the car, check that the rake mechanism is able to hold the weight of a seat occupant when the backrest is at varying degrees of recline; also ensure that the rake mechanism operates smoothly.

Coachbuilt cars

1. No adjustment is provided on the Reutter hinged rake adjusters fitted to Coachbuilt cars.

Slackness in the rake mechanism is an indication of wear and will necessitate one or both hinge units being renewed (see *Hinged rake adjuster—To remove, in this Section*).

Rake mechanism cable(s)—To remove

4-Door Saloon and Long Wheelbase non-division cars

1. Remove the seat as previously described.

2. Remove the screws securing the valance to the seat frame; remove the valance.

Early cars (see Fig. S25)

3. Slacken the primary cable at its threaded adjuster.

4. Remove the return spring from the pin securing the fork end of the primary cable to the remote control handle, also detach the spring from its primary cable adjuster anchorage.

5. Remove the clevis pin securing the fork end of the primary cable to the operating lever.

6. Unscrew the nut and detach the threaded adjuster from the seat frame.

7. Detach and remove the cable from the rocking lever.

8. Slacken the grub screws and remove the solderless nipples from the flap connections; withdraw the secondary cable.

Late cars (see Fig. S26)

9. Slacken the solderless nipple locking screw; withdraw the cable from the nipple and retain the nipple.

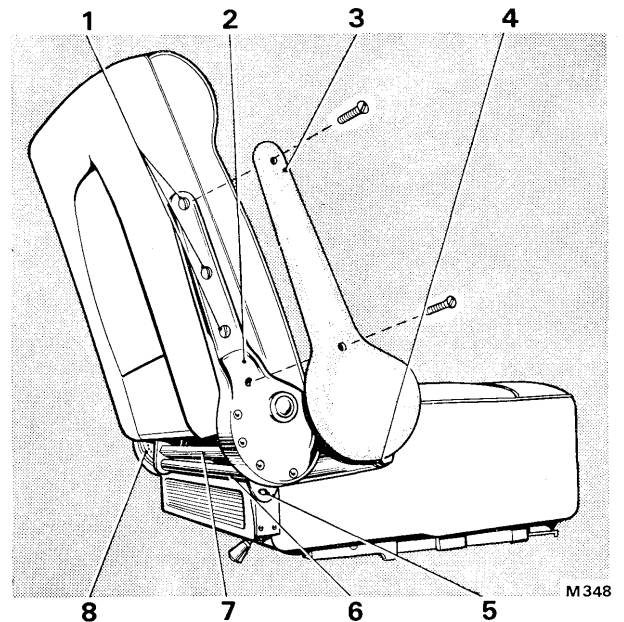


FIG. S27 FRONT SEAT RAKE ADJUSTER (2-Door Saloon and Convertible Cars)

- 1 Screw securing adjuster to backrest
- 2 Hinged rake adjuster—outer
- 3 Trim cover (if fitted)
- 4 Pivot bolt—adjuster to seat base
- 5 Backrest locking catch
- 6 Locking bar
- 7 Square sectioned tie-bar
- 8 Hinged rake adjuster—inner

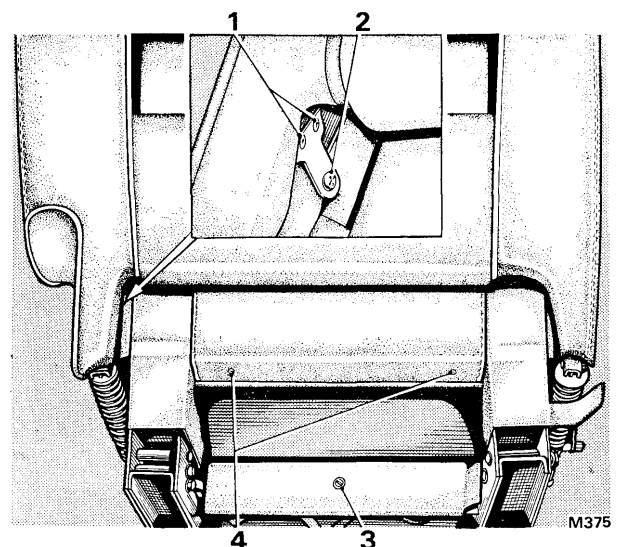


FIG. S28 FRONT SEAT BACKREST (4-Door Saloon and Long Wheelbase Non-division Cars after Car Serial Number 6000)

- 1 Pop rivets securing bracket to rear frame
- 2 Screw securing bracket to squab
- 3 Screw securing the lower trim pad
- 4 Screws securing the upper trim pad (2 off)

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10. Detach the other end of the cable from the bracket.

11. Detach the cable from the clips at the front of the seat frame; remove the cable.

Rake mechanism cable(s)—To fit

4-Door Saloon and Long Wheelbase non-division cars
To fit the cable(s) reverse the procedure given for removal noting the following points.

1. The cables are lubricated with graphite wax on initial assembly and no further attention should be required.

Early cars (see Fig. S25)

2. Of the two cables, the secondary one should be fitted first. The solderless nipple at each end of the cable should be fitted approximately 0.125 in. (3.17 mm.) from the end of the cable.

3. After fitting the primary cable, it should be adjusted by its threaded adjuster so that any slackness is just removed (see *Rake mechanism – To adjust*).

Late cars (see Fig. S26)

4. Set the cable as described earlier (see *Rake mechanism – To adjust, Operation 3(b)*).

5. Ensure that after the cable has been adjusted, the lever is just clear of its stop bracket.

Rake mechanism—To remove and fit

4-Door Saloon and Long Wheelbase non-division cars

Removing and fitting the mechanism is straightforward once the seat has been removed (see *Front seat – To remove*) if reference is made to Figure S25 for early cars or to Figure S26 for late cars; however, the following points should be observed.

1. Ensure that the stabiliser is in good condition and that it is fitted midway between the ends of the spring.

2. The backplate should be free to move on its mounting pin or pivot bolt whichever is applicable.

3. When fitting the rake mechanism, adjust as described previously (see *Rake mechanism – To adjust, on Page S32*).

4. With the exception of the cables and the tie bar which passes through the control flaps, all working parts should be lubricated sparingly with Rocol MTS 1000 grease. As mentioned previously, the cable(s) is lubricated with graphite wax on initial assembly and no further attention should be required.

Hinged rake adjusters—To remove

Coachbuilt cars (see Fig. S27)

1. Operate the rake lever and let the backrest move to its most forward position.

2. Remove the backrest (see *Seat backrest – To remove, on Page S36*).

3. Remove the screws securing the trim covers (if fitted) over the hinged rake adjusters.

4. Remove the screw securing the backrest locking bar (if fitted) to one of the hinged adjusters; it is not necessary to detach the locking bar from both adjusters unless they are to be renewed.

5. Remove the screws securing the hinged rake adjusters to the backrest; remove the rake adjusters together with the locking bar (if fitted) and the square sectioned tie-bar.

Note that the square sectioned tie-bar only locates onto the squared boss on each adjuster and is not fixed to the adjusters.

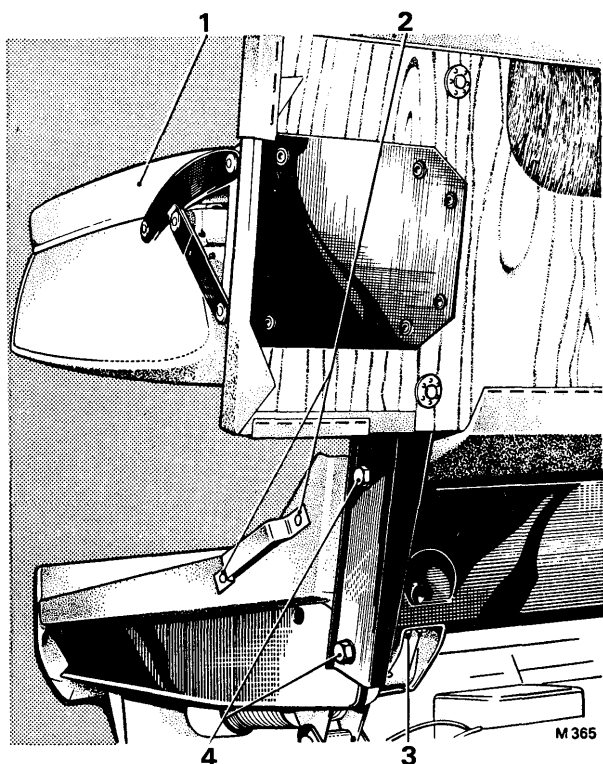


FIG. S29 POSITION OF THE INBOARD SCREWS SECURING THE FRONT SEAT BACKREST TO THE BASE (Long Wheelbase Cars with Centre Division)

- 1 Armrest
- 2 Rivets securing the seat belt retaining bracket
- 3 2 B.A. screws securing rear of seat mechanism to base
- 4 Inboard bolts securing the backrest to the seat base

Hinged rake adjuster—To fit

Coachbuilt cars

To fit the hinged rake adjuster reverse the procedure given for removal noting the following points.

1. Before fitting the hinge rake adjusters ensure they are both in their most forward position.
2. After fitting, check that the rake mechanism is able to hold the seat and occupant at varying degrees of adjustment.
3. On cars fitted with the backrest locking device, check that the locking pins on the seat base securely engage the slots in the hinged rake adjusters (see Fig. S27, item 6).

Seat backrest—To remove

4-Door Saloon and Long Wheelbase non-division cars prior to Car Serial Number 6001

1. Remove the front seat (see *Seat - To remove*, on Page S31).
2. Remove the self-tapping screws securing the valance to the seat base; remove the valance.
3. Operate the rake mechanism and move the backrest to its foremost position.
4. Remove the two $\frac{7}{16}$ in. A/F nuts and bolts securing the rake mechanism tie-bars to the backrest (see Fig. S25, inset); lever the tie-bars away from the backrest frame channels.

Remove the distance pieces and bushes from the tie-bars.

5. Ease the lower edge of the squab side trim upward sufficiently to expose the pivot bolt in each side of the backrest; remove the two pivot bolts.

6. Remove the backrest from the seat frame.

4-Door Saloon and Long Wheelbase non-division cars after Car Serial Number 6000

1. Remove the front seat (see *Seat - To remove*, on Page S31).

2. Lift the head restraint (if fitted) out of the backrest.

3. Remove the Phillips self-tapping screw securing the inboard side of the backrest to the squab frame; this screw is situated just below the armrest well.

4. Remove the Phillips self-tapping screw securing each of the two brackets on the frame to the rear of the backrest; these two brackets are situated inside the foot well at the rear of the seat and can be identified by the two pop rivets securing each bracket to the squab frame (see Fig. S28).

5. Firmly grip the top and bottom of the rear section of the backrest; ease the lower end away from the squab frame slightly then lift upward to disengage the two lugs securing the rear section of the backrest to the squab frame.

Remove the rear section of the backrest.

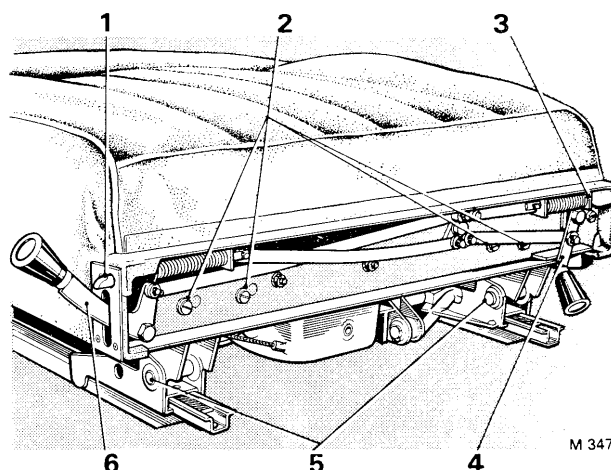


FIG. S30 TYPICAL FRONT SEAT BACKREST LOCKING MECHANISM (2-Door Saloon and Convertible Cars after Car Serial Number 5000)

- 1 Locking pin
- 2 Screws securing seat mechanism rear bracket to seat base
- 3 Locking pin
- 4 Release lever
- 5 Pins—seat mechanism to rear bracket
- 6 Release lever

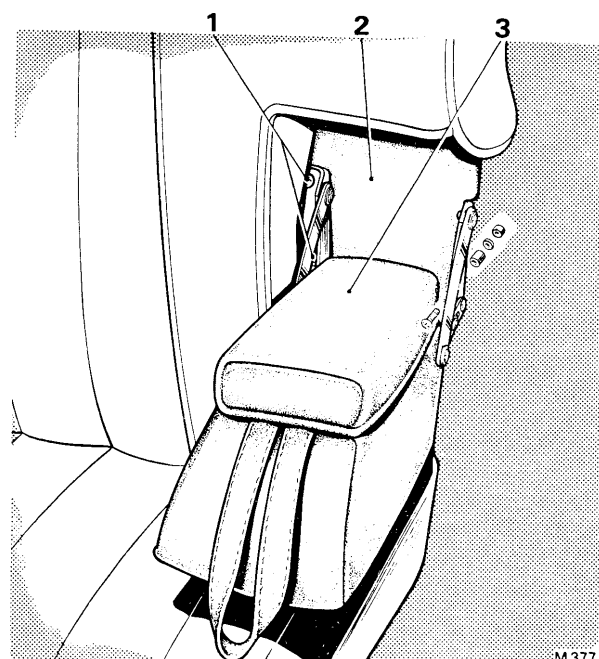


FIG. S31 FRONT SEAT ARMREST (4-Door Saloon and Long Wheelbase Cars after Car Serial Number 6000)

- 1 Inner screws (2 off) securing the armrest (the 2 outer screws are located under the trim pad)
- 2 Trim pad
- 3 Armrest

Chapter 5

6. Remove the squab frame from the seat base by following the instructions on Page S35 for cars prior to Car Serial Number 6001, Operations 3 to 6 inclusive.

Seat backrest—To fit

4-Door Saloon and Long Wheelbase non-division cars
To fit the front seat backrest reverse the procedure given for removal noting the following points.

1. Ensure that the distance pieces and bushes are fitted correctly to the rake mechanism tie-bars (see Fig. S25, inset), and that the retaining bolts are fully tightened.
2. After fitting the backrest, check the operation of the rake mechanism (see *Rake mechanism - To adjust, Operation 4*).

Seat backrest—To remove

Long Wheelbase cars with centre division

1. Remove the seat (see *Front seat - To remove, on Page S31*).
2. Remove the two self-tapping screws securing the outer side trim of the backrest to the seat base; carefully detach the backrest side trim from the seat base.

3. Remove the four $\frac{1}{2}$ in. A/F bolts and nuts securing the backrest to the seat base; refer to Figure S29 which shows the position of the two inboard bolts. Remove the backrest.

Seat backrest—To fit

Long Wheelbase cars with a centre division

To fit the front seat backrest reverse the procedure given for removal noting the following point.

1. Use Dunlop adhesive S1127 or its equivalent to fix the backrest trim to the seat base.

Seat backrest—To remove

Coachbuilt cars (see Fig. S27)

1. Operate the backrest locking lever (if fitted) and disengage the locking mechanism.
2. Remove the two large chrome-headed pivot bolts securing the hinged rake adjusters to the seat base then carefully remove the backrest to avoid damage to the seat trim; retain the chromed washer and distance piece with its pivot bolt.

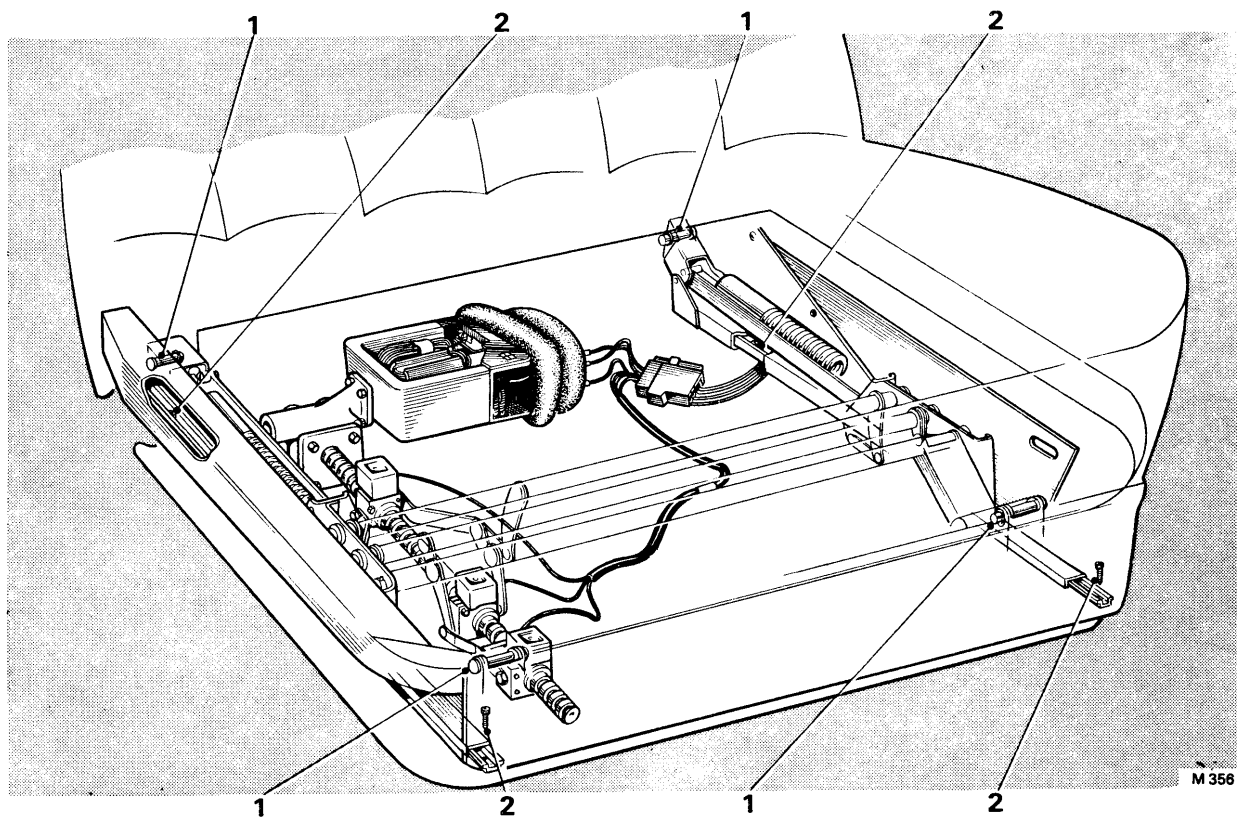


FIG. S32 FRONT SEAT MECHANISM (4-Door Saloon and Long Wheelbase Cars prior to Car Serial Number 6001)

- 1 Socket-headed screws securing seat runners to car floor (4 off)
- 2 Pins and clips securing the mechanism to the seat base (4 off)

Seat backrest—To fit**Coachbuilt cars**

To fit the backrest reverse the procedure given for removal noting the following point.

1. Ensure that the distance piece is fitted between the seat base and each rake adjuster.

Armrest—To remove**4-Door Saloon and Long Wheelbase cars prior to Car Serial Number 6001**

1. Lower the armrest.
2. Insert a $\frac{1}{2}$ in. A/F flat spanner between the armrest and the backrest and engage the hexagon boss on the armrest pivot stud.
3. Unscrew the stud and remove the armrest together with the pivot stud.

4-Door Saloon and Long Wheelbase cars after Car Serial Number 6000

1. Remove the front seat (see *Front seat—To remove*).

2. On 4-Door Saloon and Long Wheelbase non-division cars, remove the backrest from the squab frame (see *Backrest—To remove, Operations 2 to 6 inclusive*).

3. Lower the armrest to gain access to the small trim pad covering the armrest securing screws; remove this trim pad noting the following.

- (a) On 4-Door Saloon and Long Wheelbase non-division cars, the trim pad is secured by two spring type upholstery clips and wire rings; remove the rings then free the clips using a suitable wedge-shaped tool.

- (b) On Long Wheelbase cars fitted with a centre division, the trim pad is secured by clips, staples and adhesive; detach the trim, remove the staples then free the clips using a suitable wedge-shaped tool.

4. Remove the screws securing the armrest and mechanism to the squab frame; note the position of the distance pieces between the links and the frame to ensure correct assembly.

5. Remove the armrest and mechanism.

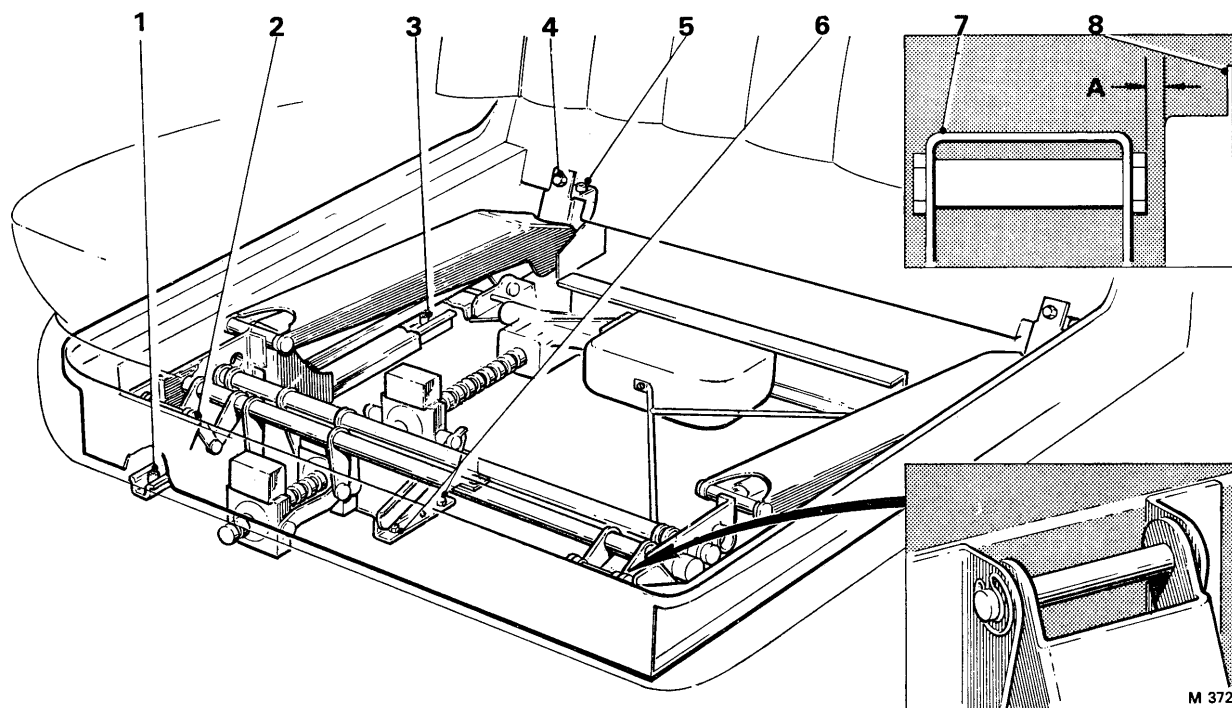


FIG. S33 FRONT SEAT MECHANISM (4-Door Saloon and Long Wheelbase Cars after Car Serial Number 9617)

- A** 0.015 in. (0.371 mm.) minimum clearance
1 Socket-headed screw
2 Pin and retaining clip (2 off)—
front of seat mechanism to seat base
3 Socket-headed screw

- 4** $\frac{1}{2}$ in. A/F setscrew—rear bracket
5 2 B.A. screws—rear bracket
6 $\frac{7}{16}$ in. A/F setscrew (4 off)
7 Seat mechanism
8 Seat base

Chapter 5

Coachbuilt cars

1. Lower the armrest.
2. Using a thin $\frac{3}{4}$ in. A/F flat spanner, unscrew the hexagon boss on the armrest pivot stud; the stud is situated between the armrest and the inboard side of the backrest.
3. Remove the armrest together with its pivot stud.

Armrest—To fit

To fit the armrest reverse the procedure given for removal noting the following points.

Long Wheelbase cars fitted with a centre division after Car Serial Number 6000

1. Use Dunlop adhesive S1127 or its equivalent to secure the loose trim when fitting the small trim pad over the armrest securing screws.

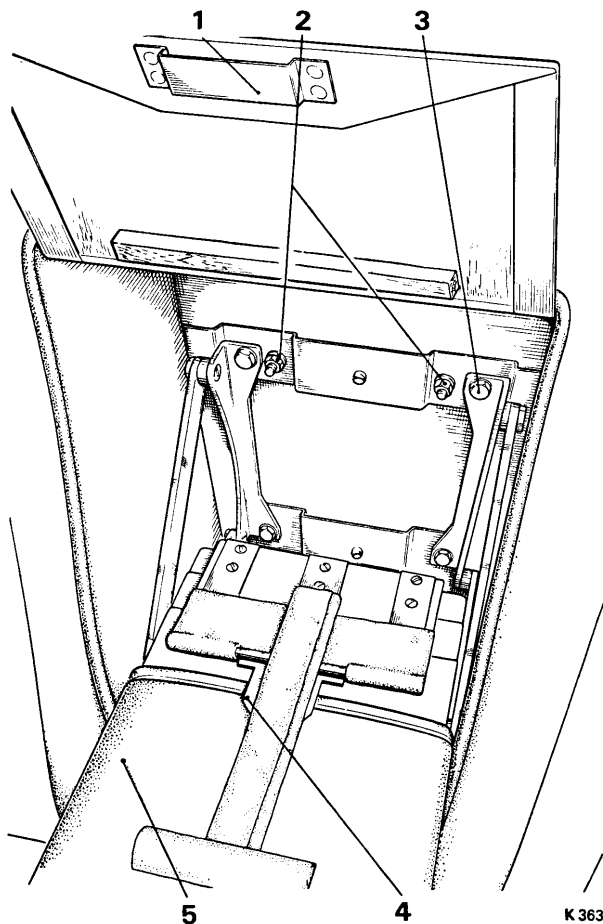


FIG. S34 CENTRE REAR ARMREST (4-Door Saloon and Long Wheelbase Non-division Cars)

- 1 Bracket attached to trim pad
- 2 Backrest securing bolts (2 off)
- 3 Armrest mechanism securing screws (4 off)
- 4 Armrest
- 5 Spring flap

Coachbuilt cars

2. When fitting the armrest, ensure that the stop pin on the armrest is below the stop plate attached to the backrest.

Electrically operated seat mechanism—To remove

1. Remove the front seat as described earlier in this Section.
2. Remove the screws securing the trim panel(s) at the rear of the seat base; two panels are fitted to 4-Door Saloon and Long Wheelbase cars, one panel to Coachbuilt cars.
- 3.(a) **Cars prior to Car Serial Number 6001** (see Fig. S32). Remove the retaining clips from the four pins securing the seat mechanism to the seat base; remove the four pins.
- (b) **Cars after Car Serial Number 6000** (see Fig. S33). Remove the screws securing the brackets on the rear of the mechanism to the seat base. Remove the clips from the two pins securing the front of the mechanism to the seat base; remove the pins.
4. Lift the seat away from the electrically operated seat mechanism.

Electrically operated seat mechanism—To fit

To fit the mechanism reverse the procedure given for removal noting the following point.

1. **Cars after Car Serial Number 6000.** When fitting the seat mechanism to the base, ensure that there is a minimum clearance of 0.015 in. (0.381 mm.) between the mechanism and the side of the seat base (see Fig. S33, inset).

For further information regarding the electrically operated seat mechanism refer to Chapter M—Electrical System.

REAR SEATS

Seat—To remove

4-Door Saloon and Long Wheelbase cars

1. Remove the rear seat cushion by gripping and lifting the front of the cushion until it is felt to clear the seat well. Finally, remove the cushion from the car.

2. Remove the screws securing the two brackets on the lower corners of the backrest to the car body.

Bend these two brackets slightly inboard to avoid damage to the cheek pads when the backrest is removed.

3. Lower the rear centre armrest then push the top of the trim pad inward as far as possible; manipulate the lower part of the trim pad until the armrest mechanism flap is felt to clear the bracket attached to the back of the trim pad.

Lift the trim pad upward to expose the armrest mechanism.

4.(a) **4-Door Saloon and Long Wheelbase non-division cars.** Remove the carpet from the front wall of the luggage compartment to expose the heads of the two bolts shown in Figure S34, item 2; remove the two bolts, nuts and washers.

Push the backrest upward until it is felt to clear the two lugs secured to the car body.

(b) **Long Wheelbase cars with centre division.** Remove the self-tapping screws securing the trim panel in the forward section of the luggage compartment; remove the panel.

Remove the two self-tapping screws, situated one each side of the rear refrigeration unit, securing the upper corners of the backrest (see Chapter C, Figure C37, item 1).

Remove the two $\frac{7}{16}$ in. A/F setscrews securing the backrest to the car body (see Fig. S35).

5. Remove the backrest from the car.

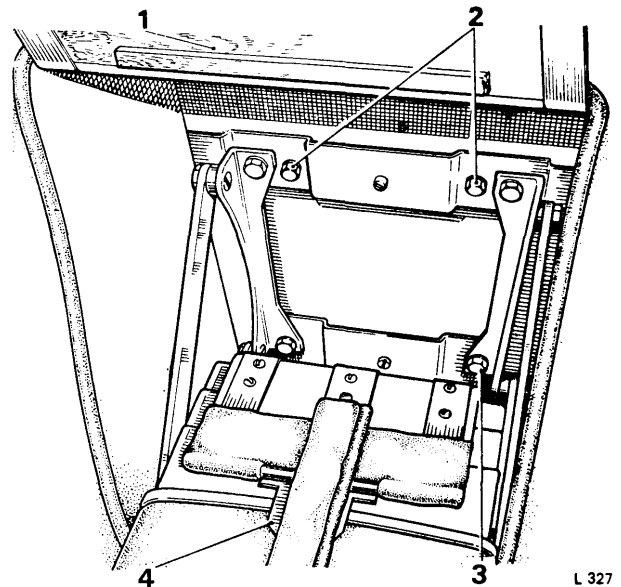


FIG. S35 CENTRE REAR ARMREST (Long Wheelbase Cars with Centre Division)

- 1 Trim pad
- 2 Backrest securing setscrews (2 off)
- 3 Armrest mechanism securing setscrews (4 off)
- 4 Spring flap

Seat—To remove

Coachbuilt cars

1. Remove the rear seat cushion.
2. Remove the screws securing the two brackets on the lower edge of the backrest to the seat pan.
- 3.(a) **2-Door Saloon.** Push the backrest upward until it is felt to be free of the lugs securing it to the car body.
- (b) **Convertible.** Remove the screws securing the backrest to the two brackets situated one at each end of the backrest (see Fig. S36).
4. Remove the backrest from the car noting that if a radio speaker is fitted to the rear of the backrest, it will first be necessary to disconnect the electrical leads from the speaker at the Lucar connections.

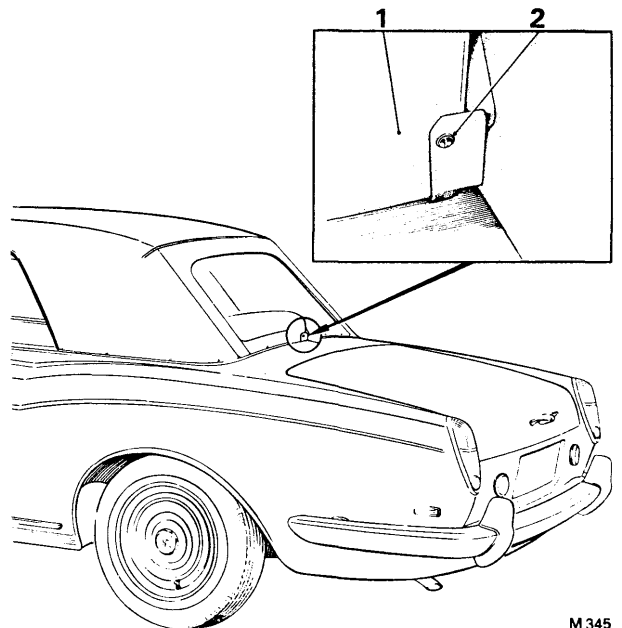


FIG. S36 POSITION OF THE REAR SEAT BACKREST BRACKETS (Convertible Cars)

- 1 Backrest
- 2 Screw securing backrest to bracket

Seat—To Fit

All cars

To fit the rear seat reverse the procedure given for removal.

Section S3

WINDSCREEN AND REAR WINDOW

Windscreen—To remove

4-Door Saloon and Long Wheelbase cars prior to Car Serial Number 6001

1. Before attempting to remove the windscreen, cover the paintwork in the vicinity of the windscreen with thick, clean felt; this is to prevent possible damage to the paintwork when removing the windscreen.
2. Remove the windscreen wiper blades and arms.
3. Remove the screws securing the interior driving mirror; remove the mirror.
4. Remove the screws securing the wood finishers surrounding the windscreen; remove the finishers.
5. Working inside the car, lift the lip of the rubber seal over the windscreen aperture using a steel rule

or similar tool; start at the top corners and work towards the centre, simultaneously applying pressure to the windscreen. An assistant will be required to support the windscreen as it is pushed out of its aperture. Do not force the windscreen out of the aperture by applying sharp blows as this may cause damage to the body and paintwork and may possibly break the glass.

Windscreen—To remove

4-Door Saloon and Long Wheelbase cars after Car Serial Number 6000 (see Fig. S37)

1. Carry out Operations 1 and 2 as described under Windscreen—To remove, for 4-Door Saloon and Long Wheelbase cars prior to Car Serial Number 6001, then proceed as follows.

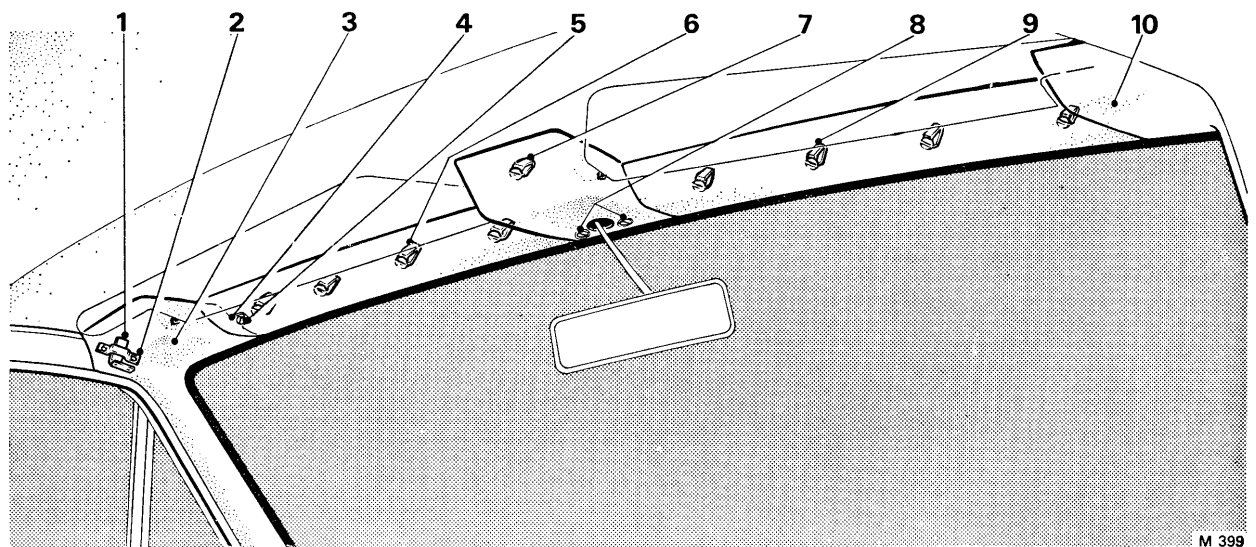


FIG. S37 TRIM PANELS SURROUNDING THE WINDSCREEN (4-Door Saloon and Long Wheelbase Cars after Car Serial Number 6000)

- | | | |
|---|---|--|
| 1 Clip (locating into cantrail bracket) | 5 Screw—side trim panel to body | 9 Right-hand upper trim panel securing clips (4 off) |
| 2 Bracket on cantrail | 6 Left-hand upper trim panel securing clips (4 off) | 10 Right-hand side trim panel (for attachment points see left-hand side panel) |
| 3 Left-hand side trim panel | 7 Upholstery clip—centre cover | |
| 4 Bracket—side trim panel | 8 Screws—centre cover to body | |

Chapter 5

2. Remove the two self-tapping screws from the cover surrounding the interior driving mirror mounting bracket.

Grip the cover between the top of the cover and the head lining then, using light hand pressure, pull the cover downward until the upholstery clip which retains it into position is felt to free itself of its location; remove the cover.

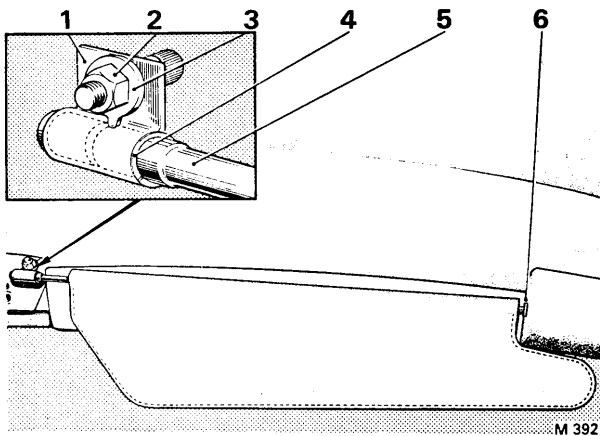


FIG. S38 SUN VISOR FRICTION BRACKET FITTED WITH TAB WASHER (Late Cars)

- 1 Friction bracket
- 2 Nut
- 3 Tab washer
- 4 Nylon bush
- 5 Sun visor spindle
- 6 Nylon bush

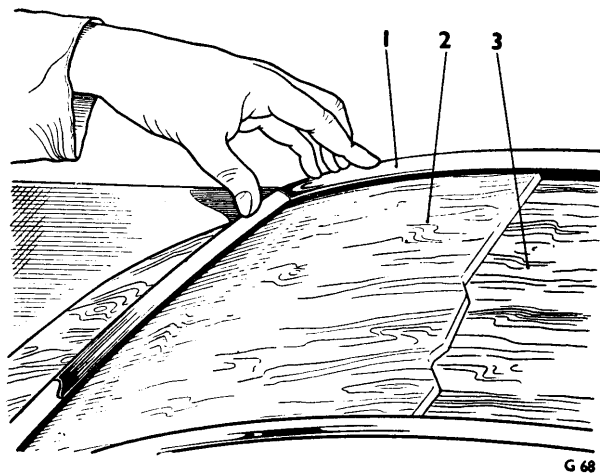


FIG. S39 CHECKING THAT THE EMBELLISHER CONFORMS TO THE SHAPE OF THE WINDSCREEN

- 1 Embellisher
- 2 Windscreen
- 3 Wooden block

3. Remove the three self-tapping screws securing the interior driving mirror to the car roof; remove the mirror.

4. Remove the nut and special socket-headed bolt securing each sun visor into position; the head of this screw is fitted toward the windscreen side of the visor. On later cars (see Fig. S38), a special tab washer is fitted to this screw; take care not to lose this washer.

Manoeuvre the stem of each sun visor out of its mounting bush then remove the visor; the assembly sun visors are handed therefore, to ensure that they are refitted correctly, they should be kept separate.

5. Insert a hand between the roof of the car and the left-hand upper trim panel. Grip the panel then carefully pull it downward until the upholstery clips holding it in position are felt to free themselves of their location holes; remove the panel.

Repeat this procedure for the right-hand panel.

Keep the two panels separate to ensure that they are refitted in their original positions.

6. Remove the self-tapping screw securing the top part of the left-hand side trim panel to the body.

Grip the trim panel then pull the panel downwards, and slightly rearward, to free the clip securing the panel to the cantrail; remove the panel by lifting upward.

Repeat this procedure for the right-hand panel.

Keep the two panels separate to ensure that they are refitted in their original positions.

7. Finally remove the windscreen by following the procedure described in Operation 5 under Windscreen - To remove, for 4-Door Saloon and Long Wheelbase cars prior to Car Serial Number 6001.

Windscreen—To remove

Coachbuilt cars prior to Car Serial Number 6001

1. Carry out Operations 1, 2 and 3 as described under Windscreen - To remove, for 4-Door Saloon and Long Wheelbase cars prior to Car Serial Number 6001, then proceed as follows.

2. Remove the front and rear sections of the top roll (see Section S10, Top roll - To remove, in this Chapter).

3. Remove the screw securing the wooden finishers to the screen posts; remove the finishers.

4. Remove the screws securing the windscreen upper trim panel; remove the trim panel.

5. Remove the screws securing the windscreen side trim panels; remove the panels.

6. Finally, remove the windscreen by following the procedure described in Operation 5 under Windscreen - To remove, for 4-Door Saloon and Long Wheelbase cars prior to Car Serial Number 6001.

Windscreen—To remove**Coachbuilt cars after Car Serial Number 6000**

To remove the windscreen follow the same basic procedure described in Operations 1 to 7 inclusive under Windscreen – To remove, for 4-Door Saloon and Long Wheelbase cars after Car Serial Number 6001, noting the following points of difference.

1. The cover surrounding the interior driving mirror is retained by screws only (see Operation 2).
2. Remove the screws securing the windscreen upper trim panel and the side trim panels before removing the panels (see Operations 5 and 6).

Windscreen—To fit
(see Figs. S39 and S40)**All cars**

1. Remove all traces of dirt, glass fragments and sealing compound from around the windscreen aperture; dirt and sealing compound should be removed with Bostik cleaner 6001.
2. Examine the existing rubber seal; if it shows signs of losing its resilience, perishing or damage such as cuts, it should be replaced by a new seal.
3. If the original seal is to be used, ensure that the channel in the seal which receives the windscreen is perfectly clean and free from particles of glass, sealing compound and dirt; use Bostik cleaner 6001 for removing the dirt and sealing compound.
4. Obtain a large block of wood suitably formed to provide a sound working base for the windscreen.
5. Lay the windscreen on the block so that its external surface is uppermost.

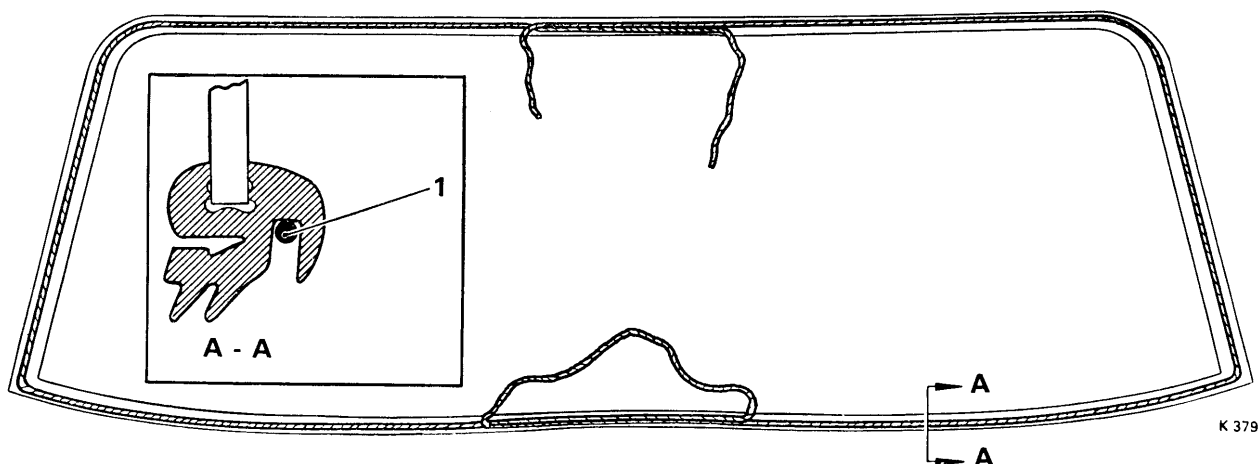
6. Examine the existing embellisher to ensure that it is still serviceable; if it is badly bent or split it should be renewed.

7. To ensure that the embellisher is a perfect fit when it is finally fitted, it should first be fitted to the windscreen without the rubber seal.

8. Fit the embellisher to the windscreen and check that the corners of the embellisher marry up to the windscreen for approximately 3 in. (7,62 cm.) of their length (see Fig. S39).

If the embellisher is not a good fit in the corners, it should be re-shaped by an experienced sheet metal worker until it conforms with these measurements.

9. Remove the embellisher.
10. Apply a small quantity of Seelastik into the channel of the seal at the lower two corners. From the corner, spread the Seelastik approximately 3 in. (7,32 cm.) along the channel length and approximately 1 in. (2,54 cm.) along the height of the channel.
11. Under no circumstances should Bostik sealing compound be used as an alternative to Seelastik; from experience it has been found that when Bostik is used, air bubbles appear between the laminations of the glass.
12. Fit the rubber seal around the windscreen.
13. Fit the embellisher into the rubber seal; start in the centre and work outward. Use a steel rule to work the lip of the seal around the embellisher. Remove surplus Seelastik, using Bostik cleaner 6001.
14. Invert the windscreen so that the inner face is uppermost, then using a suitable tool (e.g. a screwdriver with a hole drilled into the blade and the blade corners ground off) fit a length of thin cord around

**FIG. S40 CORD FITTED TO THE RUBBER SEAL PRIOR TO FITTING THE WINDSCREEN**

Inset shows position of cord in rubber seal

1 Cord

Chapter S

the inside edge of the rubber seal; leave a loop in the cord at the bottom of the windscreen and overlap the two free ends of the cord at the top of the windscreen as shown in Figure S40.

15. Offer the windscreen to the aperture in the car body. Position the windscreen into the aperture so that the bottom of the windscreen is entered and seated on the bottom ledge of the aperture.

16. Centralise the windscreen in the aperture.

17. To assist the entry of the upper part of the windscreen into the aperture, wipe a cloth soaked in Bostik cleaner 6001 along the top length of the seal then before the cleaner is allowed to dry, apply several sharp blows with a heavy rubber mallet (or with the palm of the hand) about the seal; with this the windscreen should enter the aperture.

18. When the windscreen is in position, carefully pull the loop so that the lip of the rubber seal is drawn into position halfway up the windscreen. Then in a similar manner, pull each end of the string (see Fig. S41) along the top of the windscreen and down its sides until the cord is free and the rubber seal is fully in position. Finally, ensure that the windscreen is firmly in position by applying a few sharp blows with a rubber mallet around the embellisher.

19. After fitting the windscreen, examine the finished job; if the lip of the seal is curled under, it should be corrected with the skilful use of a steel rule (or a similar tool) paying particular attention to the corners. If the seal is not flush with the body, further pressure should be applied to the windscreen. Obviously commonsense should be used when applying

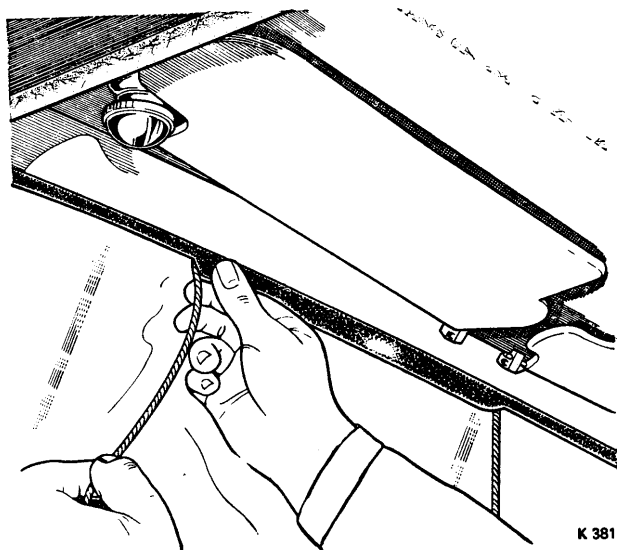


FIG. S41 VIEW OF THE WINDSCREEN WITH THE CORD IN POSITION FOR FITTING THE RUBBER SEAL

extra pressure, as too much pressure would only result in damage to the windscreen. If, after the second attempt the seal will not remain flush, the windscreen should be removed and the fault determined, e.g. the car may have a distorted aperture, in which case experienced panel beaters will be required to rectify the fault.

Note Ensure that the lower lip of the seal does not obscure the screen demister outlets at the base of the windscreen.

20. After the windscreen has been fitted to the satisfaction of the operator, it should be tested for leaks; carry this out by applying water under pressure to the outside of the windscreen. The most likely parts of the seal to leak are the bottom corners.

21. If the windscreen is free from water leaks, the trim, etc., previously removed should be fitted by reversing the removal procedure.

22. When fitting the sun visors to cars after Car Serial Number 6000, ensure that the leg of the tab washer is located in its slot.

Solbit sealing strip—To fit

4-Door Saloon and Long Wheelbase cars

Since January 1970, windscreens fitted to 4-Door Saloon and Long Wheelbase cars destined for North America have been sealed with a special Solbit sealing strip along their lower edge. To fit the Solbit sealing strip when replacing the windscreen on one of these cars, proceed as follows.

1. Prepare the windscreen for fitting as described under Windscreen—To fit, Operations 1 to 14 inclusive.

2. Clean the rear channel in the seal (i.e. the part of the seal which will contact the body) and also the angled lower edge of the windscreen aperture using Genklene cleaner.

3. Apply Solbit primer 1058 to the lower edge of the rear channel in the rubber seal and also along the angle of the lower edge of the windscreen aperture on the body, approximately $\frac{1}{4}$ in. (6,35 mm.) outward from the base of the angle.

Important Care should be taken to keep the Solbit primer 1058 away from the finished paintwork.

4. Protect the scuttle at each end of the windscreen aperture with masking tape.

5. Connect the positive terminal of a 12 volt battery to one end of the wire core in the Solbit sealing strip and the negative terminal of the battery to the other end of the wire core; allow between 10 and 15 seconds only for the Solbit seal to soften slightly then disconnect the battery from the wire core.

6. Fit the Solbit sealing strip along the lower length of the windscreen aperture in the car body so that an equal length of the strip, approximately 2 in. (6 cm.), extends outboard of the lower corners of the aperture; press the Solbit sealing strip firmly into the angle of the lower aperture.

7. Fit the windscreen into the aperture in the car body, following the procedure described under Windscreen – To fit, Operations 15 to 18 inclusive.

8. Attach the terminals of the 12 volt battery once again (see Operation 5) to the wire core of the sealing strip, the ends of which now protrude from each side of the windscreen rubber seal. Ensure that the protruding ends of the sealing strip and the battery connections to the wire core are resting on the masked-off area of the scuttle and **not** on the paintwork.

9. When the battery has been connected to the sealing strip for approximately one minute, then apply pressure to the sealing strip, especially along the lower edge, until the windscreen rubber seal is flush with the body (see Windscreen – To fit, Operation 19). Allow the battery to remain connected for a further ten minutes then disconnect the battery from the sealing strip.

10. Trim the ends of the Solbit sealing strip so that only $\frac{1}{8}$ in. (3,175 mm.) of the strip is left protruding from each side of the rubber seal then press the ends of the strip under the outer lip of the rubber seal; using finger pressure, smooth the lip of the seal to remove any lumps or irregularities.

11. Remove the masking tape from the sides of the scuttle.

12. Complete the windscreen fitting procedure as described under Windscreen – To fit, Operations 20 and 21.

Rear window—To remove

All 4-Door Saloon cars prior to Car Serial Number 6911 (excluding 6860 and 6901) and Long Wheelbase cars prior to Car Serial Number 6599

1. Disconnect the battery.
2. Cover the paintwork in the vicinity of the rear window to prevent possible damage.
3. Remove the rear seat cushion and backrest (see Section S2, Rear seat – To remove, in this Chapter).
4. Remove the two cheek pads (see Section S10, MISCELLANEOUS TRIM, Cheek pad – To remove).
5. Using a similar tool to the one shown for removing a door panel (see Fig. S6), lift the parcel shelf trim pad clear of its upholstery clips.
6. Remove the two vanity mirrors as follows.

Insert the removal tool (see Fig. S42) adjacent to the upholstery clip securing the vanity mirror in position then move the vanity mirror away from the

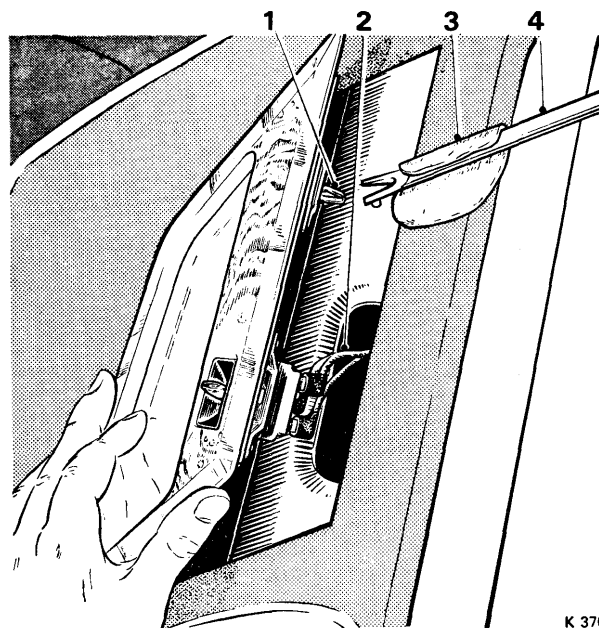


FIG. S42 REMOVING THE VANITY MIRROR (4-Door Saloon and Long Wheelbase Non-division Cars)

- 1 Upholstery spring clip
- 2 Electrical leads
- 3 Protective pad
- 4 Removal tool

quarter trim panel until the electrical leads can be disconnected; disconnect the leads then remove the vanity mirror (see Fig. S42).

7. Remove the two quarter/cantrail trim panels as follows (see Fig. S43).

Remove the tacks securing the draught welt to the body.

Remove the Phillips screw from the lower quarter panel, also remove the small tack adjacent to the Phillips screw.

Using a small screwdriver, carefully remove the clips securing the quarter panel/cantrail to the rear top corner of the car body.

Using the removal tool noted in Operation 5, detach the upholstery clips securing the quarter panel/cantrail to the car body noting that it is only necessary to detach the clips as far as the centre door pillar to facilitate removing the rear window.

8. Remove the small tacks and clips securing the head lining adjacent to the sides of the window.

9. Lift the trim covering the wooden fillet which is fitted immediately below the rear window then remove the seven self-tapping screws securing the fillet to the body; remove the fillet together with the trim and the lower polished wood finisher.

10. Peel the head lining inboard to reveal three screws in the wooden frame at each side of the window; remove these screws.

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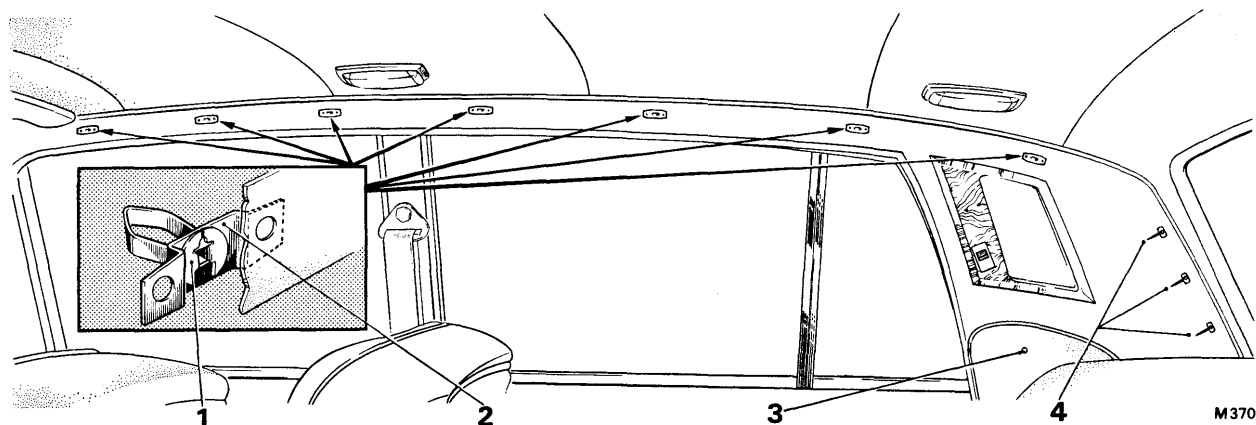


FIG. S43 POSITION OF THE QUARTER PANEL/CANTRAIL UPHOLSTERY CLIPS AND PINS (4-Door Saloon and Long Wheelbase Non-division Cars)

- | | |
|-----------------------------------|---|
| 1 Upholstery spring clip (7 off) | 3 Tack in quarter panel |
| 2 Bracket (clip to cantrail trim) | 4 Pins securing quarter panel to body (3 off) |

11. Using the removal tool (see Operation 5) detach the upholstery clips securing the head lining trim into position above the window (see Fig. S44); note the strip of leather shown in the illustration to protect the wooden finisher. Lift the head lining forward as far as the rearmost listing bar.

12. Remove the self-tapping screws securing the wooden frame surrounding the window; remove the frame together with the polished wood finisher.

13. Disconnect the two demister leads at their Lucar connections and draw them through the holes in the body into the rear compartment; both connections are accessible from within the luggage compartment, each lead being approximately 12 in. (30,48 cm.) from its respective bottom corner of the rear window (see Fig. S45).

14. From inside the car and using a steel rule, lift the lip of the rubber seal over the rear window aperture, simultaneously applying light pressure to the rear window; an assistant will be required outside the car to support the rear window as it is pushed out of its aperture. Under no circumstances should the rear window be forced out of its aperture by applying sharp blows as this method is likely to cause damage to the body and paintwork.

Rear window—To remove

4-Door Saloon cars after Car Serial Number 6910 (also including 6860 and 6901)

1. Carry out Operations 1 and 2 as described under Rear window – To remove, for 4-Door Saloon cars prior to Car Serial Number 6911 (excluding 6860 and 6901), then proceed as follows.
2. Remove the rear seat cushion.

3. Cover the rear parcel shelf trim pad to protect it against damage or staining.

4. Insert a bent piece of stiff wire (or similar tool) down one side of the trim directly under the lower wood finisher of the rear window. Carefully lift the corner of the trim until finger grip can be obtained, then lift the lower flap of the trim clear of the parcel shelf trim pad. Lift up the trim and remove the screws thus exposed securing the lower wood finisher and trim assembly in the window aperture; remove the finisher and trim assembly.

5. Remove the self-tapping screws from the two sections of the wood finisher around the window; remove the finisher.

6. Finally, disconnect the demister leads and remove the rear window following the procedure described in Operations 13 and 14 under Rear window – To remove, for 4-Door Saloon cars prior to Car Serial Number 6911 (excluding 6860 and 6901).

Rear window—To remove

Long Wheelbase cars after Car Serial Number 6599 (i.e. cars with smaller rear window)

1. Carry out Operations 1, 2 and 3 as described under Rear window – To remove, for Long Wheelbase cars prior to Car Serial Number 6599, then proceed as follows.
2. Cover the rear parcel shelf to protect the trim pad from damage or staining.
3. Remove the sixteen self-tapping screws securing the wood finisher round the rear window; remove the finisher. On later cars the finisher is in two sections.
4. **On cars fitted with a centre division**, remove the self-tapping screws securing the trim panel in the

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forward section of the luggage compartment; remove the panel.

5. Disconnect the demister leads (*see Operation 13 on early cars*).

6. Remove the self-tapping screws securing the fourteen angled brackets around the rear window aperture; remove the brackets.

7. From outside the car, insert the tip of a steel rule (or similar tool) between the seal and the glass then work the rule round the perimeter of the window to disturb the seal, simultaneously applying light pressure on the glass; an assistant will be required inside the car to support the glass as it is freed from the seal.

If the original glass is to be used again take great care not to break the glass when applying pressure to remove it.

Rear window—To remove

2-Door Saloon cars

1. Carry out Operations 1, 2 and 3 as described under Rear window – To remove, for 4-Door Saloon cars prior to Car Serial Number 6911, then proceed as follows.

2. Remove the screws, including those in the side member, securing the hinge cover to the top of the luggage compartment; lower the cover sufficiently for the electrical leads to the luggage compartment lamp to be disconnected then remove the cover.

3. Remove the screws securing the wood finisher around the rear window; remove the finisher.

4. Finally, disconnect the demister leads and remove the rear window by carrying out the procedure described in Operations 13 and 14 under Rear window – To remove, for 4-Door Saloon cars prior to Car Serial Number 6911.

Rear window—To fit

All Saloon cars except Long Wheelbase cars after Car Serial Number 6599

To fit the rear window follow the same basic procedure already described for fitting the windscreen (*see Windscreen – To fit, in this Section*) and by reversing the procedure described for removing the rear window, noting the following point.

1. When fitting the rubber seal to the window glass, thread the demister leads through the seal.

Rear window—To fit

Long Wheelbase cars after Car Serial Number 6599 (i.e. cars with smaller rear window)

1. Remove all traces of dirt and old sealing compound from the seal using Bostik cleaner 6001.

If the original glass is to be fitted also remove the old sealant from the glass.

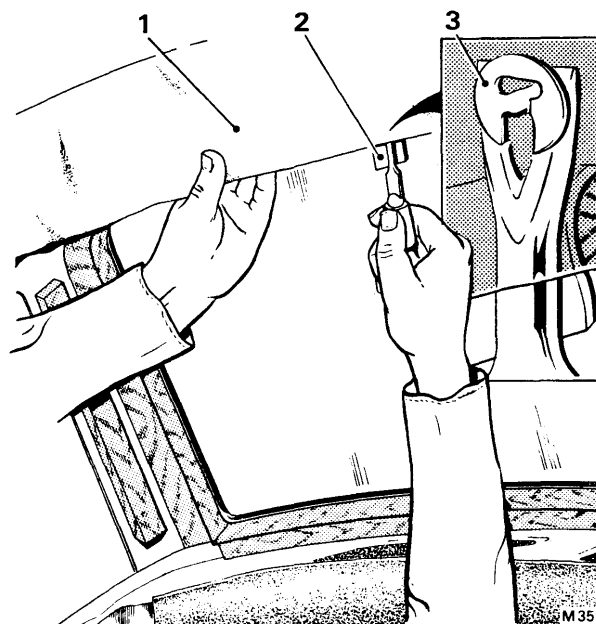


FIG. S44 DETACHING THE HEAD LINING ABOVE THE REAR WINDOW (Early 4-Door Saloon Cars)

- 1 Head lining
- 2 Protective strip
- 3 Upholstery spring clip

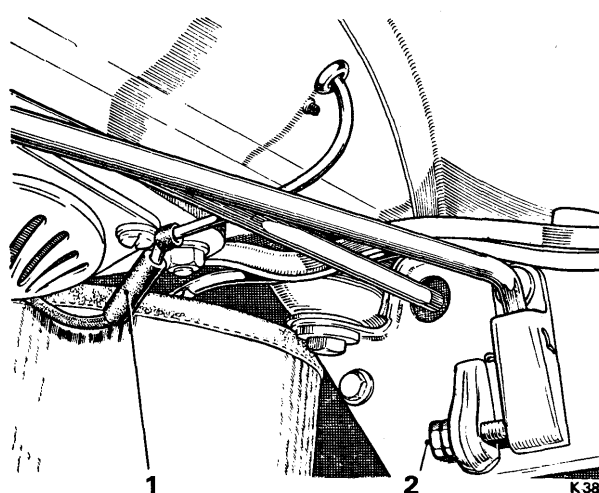


FIG. S45 POSITION OF THE REAR WINDOW DEMISTER LEAD CONNECTIONS (4-Door Saloon Cars)

- 1 Demister lead snap connectors
- 2 Adjuster—hinge torque rods

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2. Examine the condition of the seal after cleaning and if it is damaged or perished, renew the seal as follows.

Remove the old seal. Using Bostik cleaner 6001, remove the old sealant from the window aperture; take great care to avoid damage to the Everflex roof covering. Allow one hour for the cleaner to dry, then apply Bostik adhesive 8383 or its equivalent to the mating faces of the seal and the window aperture.

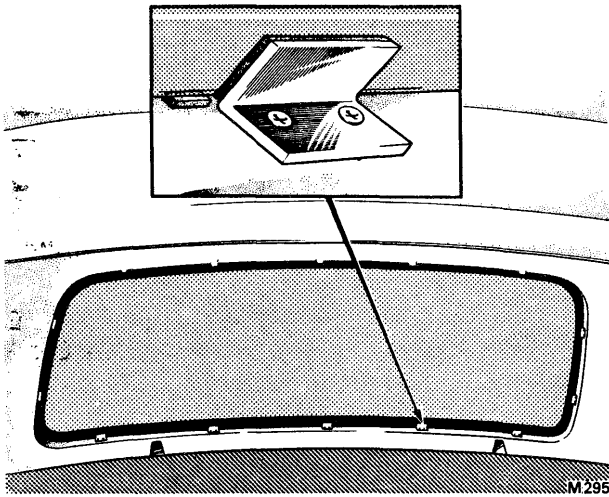


FIG. S46 REAR WINDOW RETAINING BRACKETS (Long Wheelbase Saloon Cars)

Inset shows the rubber pad fitted to each bracket

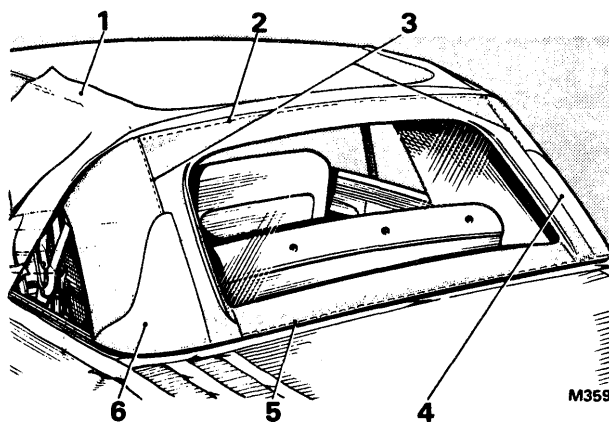


FIG. S47 BACKLIGHT AND TRIM (Convertible Cars)

- 1 Hood outer covering
- 2 Staples securing backlight trim to rear cross - stick assembly
- 3 Hand stitches securing backlight trim to 'wiggling'
- 4 Waterproof patch
- 5 Staples securing backlight trim to body
- 6 Waterproof patch

Allow 10 to 15 minutes for the adhesive to partly dry, then position the seal around the aperture so that the two ends of the seal meet in the centre of the upper edge of the aperture. Ensure that the outer lip of the seal seats evenly all round the aperture, then allow two to three hours for the adhesive to dry (longer if possible).

3. Apply a strip of $\frac{1}{4}$ in. (6,35 mm.) wide Prestik sealing strip around the outer edge of the glass mating face of the rubber seal.

4. Apply an even and continuous ribbon of Seelastik to the rubber seal in the window aperture; it will help in obtaining an even flow of sealant if the tube of Seelastik is warmed in hot water prior to application.

5. Ensure that the two rubber packing strips are in position on the bottom ledge of the window aperture; if not fit two new packing strips.

The purpose of the packing strips is to prevent the lower edge of the glass making contact with the car body.

6. From inside the car, fit the window into the aperture by locating the lower edge of the glass on top of the two packing pieces then pressing the window firmly into position in the centre of the aperture.

7. With the glass held firmly onto its seat (do not apply excessive pressure or the glass will break), fit the fourteen angled brackets to secure the glass in the aperture; ensure that each bracket is complete with its rubber buffer pad and that this pad is adjacent to the glass when fitted (*see Fig. S46*).

8. Examine the lip of the seal adjacent to the glass; if the lip is turned under at any point, correct this by the careful use of a steel rule or similar tool, paying particular attention to the corners, until the seal is flush with the glass.

9. Carefully ease the outer lip of the seal away from the Everflex covering and apply a thin strip of Seelastik between the seal and the Everflex (use white Seelastik on light coloured Everflex coverings); continue this all round the outer lip of the seal. Apply the Seelastik also to the stitched seams on the Everflex covering, adjacent to the window seal.

10. Allow at least 24 hours to dry then remove any surplus Seelastik using Bostik cleaner 6001.

11. Test for leaks by applying water under pressure to the outside of the rear window, paying particular attention to the lower corners.

12. If the window sealing is satisfactory, fit the wood finisher, demister leads, rear seat, etc., by reversing the procedure given for removal.

Backlight and trim—To remove (see Fig. S47)

Convertible cars

1. Remove the press-stud fastener screws from the rear edge of the hood outer covering; remove the finisher welt then detach the hood outer covering from the body rearward of the hood pillars (see *Hood outer covering – To remove, Operations 7, 8 and 9*).

2. Fold the hood outer covering forward to expose the backlight trim (see Fig. S47).

3. Carefully remove the two weather sealing strips situated one on each side of the backlight trim (see Fig. S47); these sealing strips are secured with adhesive.

4. Using a soft wax pencil, mark each side of the backlight trim midway down the length of vertical stitching securing each side of the backlight trim to the 'wiggings'; ensure that each mark extends across the stitching onto the canvas 'wiggings'.

Also mark midway along the lower edge of the backlight trim and extend the mark rearward onto the masking tape attached to the rear decking panel.

5. Remove the stitches (see Fig. S47, item 3), securing each side of the backlight outer trim to the 'wiggings'; detach the outer trim from the 'wiggings' noting that it is also secured with adhesive.

6. Remove the staples (or tacks) securing the lower edge of the backlight trim to the body; note the location and spacing of the staples to facilitate assembly.

7. Remove the tacks securing the upper corners of the backlight outer trim to the hood rear cross-stick.

8. Fold one side of the outer trim over the backlight to reveal the vertical line of hand stitches securing the backlight inner trim to the head lining (see Fig. S122); remove these stitches.

Repeat this operation on the other side of the hood trim.

9. Remove the staples securing the backlight inner trim to the body; note the position of the staples and the rexine sealing strip to facilitate assembly.

10. Remove the staples securing the backlight trim to the hood rear cross-stick noting their position and spacing to facilitate assembly; remove the backlight complete with its trim surround.

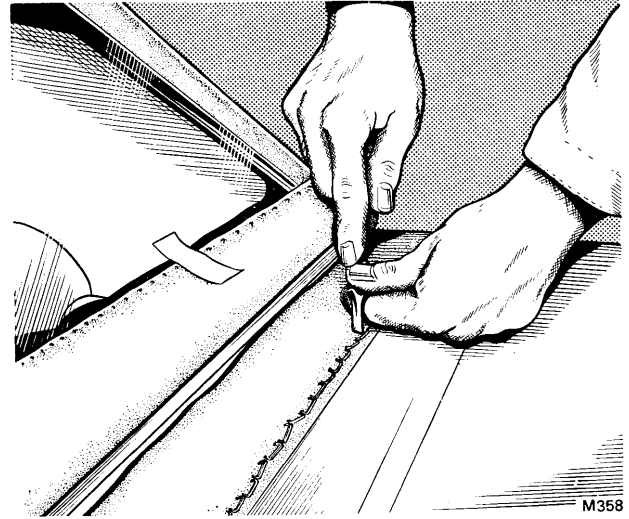


FIG. S48 REMOVING THE STAPLES FROM THE LOWER EDGE OF THE BACKLIGHT TRIM (Convertible Cars)

Backlight and trim—To fit

Convertible cars

To fit the backlight and trim reverse the procedure given for removal noting the following points.

1. If fitting a new backlight and trim surround, first transfer the reference marks, made during removal, onto the sides and lower edge of the new trim.

2. Before commencing to fit the backlight, ensure that the hood is raised and the catches secured.

3. When securing the upper and lower edges of the backlight trim ensure that the reference marks, made during removal, are aligned.

4. Use a water-proof thread, such as Terylene Thread 30/3, to secure the backlight trim to the headlining and 'wiggings'.

5. Use Dunlop L107 adhesive or its equivalent, to secure each side of the backlight outer trim to the 'wiggings' and to secure the weather sealing strips on each side of the trim; ensure that each strip over-laps the line of hand stitches (see Fig. S47).

Section S4

BONNET AND LUGGAGE COMPARTMENT LID

Bonnet—To remove

1. Release the bonnet catch by pulling the operating lever under the fascia; raise the bonnet to its fullest extent.
2. Disconnect the battery leads.
3. Disconnect the bonnet lamp leads at the snap connectors adjacent to the switch on the right-hand hinge bracket; on early cars it will also be necessary to disconnect the two leads from the termination block at the front of the engine compartment.

Note the position of the leads to ensure correct assembly.

4. Detach the clips securing the leads to the right-hand hinge bracket; on early cars it will also be necessary to remove the screws and detach the two clips securing the lead to the front of the engine compartment.

5. Detach the bonding strip situated at the front of the bonnet.

6. Using a soft pencil, scribe correlation marks round the washers of the setscrews securing the bonnet to the hinges.

7. With two assistants supporting the bonnet, remove the eight $\frac{1}{2}$ in. A/F setscrews securing the bonnet to the hinges; remove the bonnet.

Bonnet—To fit

To fit the bonnet reverse the procedure given for removal noting the following points.

1. The setscrews securing the bonnet to the hinges should not be fully tightened until the bonnet clearances have been set in relation to the body as shown in Figure S49.

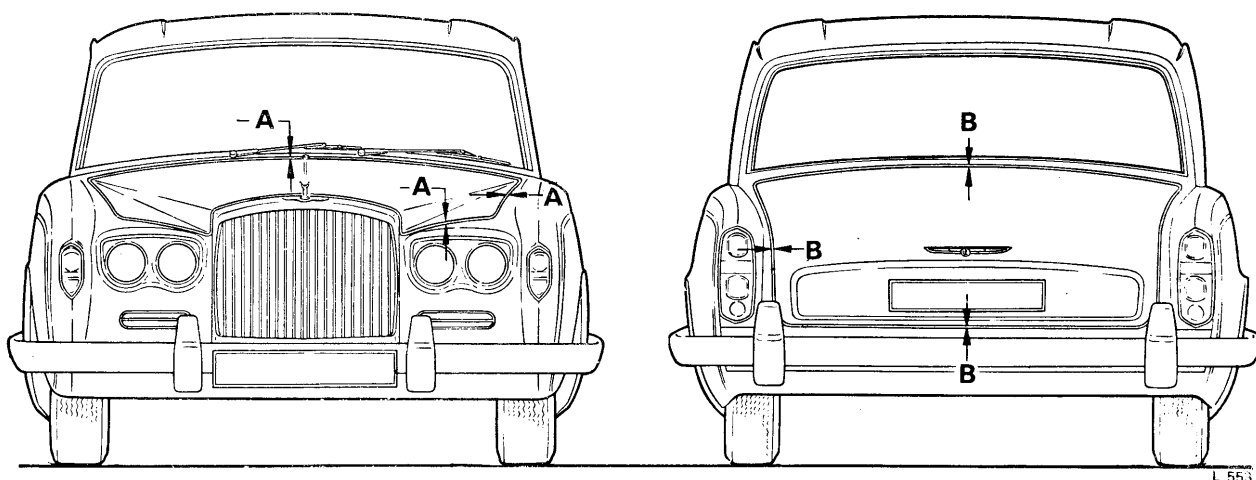


FIG. S49 BONNET AND LUGGAGE COMPARTMENT LID CLEARANCES

4-Door Saloon and Long Wheelbase Cars

- A** $\frac{9}{32}$ in. (3,571 mm.)
B $\frac{1}{4}$ in. (6,350 mm.)

2-Door Saloon and Convertible Cars

- A** $\frac{3}{32}$ in. (2,381 mm.)
B $\frac{3}{32}$ in. (2,381 mm.)

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2. Before fully tightening the setscrews securing the catch plates to the bonnet, the best position for the catch plates in relation to the catch should be found. This should be carried out by leaving the setscrews finger tight and adjusting the position of each catch plate so that the bonnet can be opened and closed without difficulty. When the catch plates have been set satisfactorily, fully tighten the setscrews.

Bonnet hinges—To remove

1. Remove the bonnet as described previously.
2. Remove the radiator matrix (see Chapter L, Section L2).
3. Using a hooked piece of strong wire, remove the large coil springs from the hinges.
4. Disconnect the remaining lead to the bonnet lamp switch secured to the right-hand hinge at the snap connection.
5. Remove the four $\frac{1}{2}$ in. A/F setscrews securing the hinges to the front wall of the engine compartment; remove the hinges.

Bonnet hinges—To fit

To fit the hinges reverse the procedure given for removal noting the following point.

1. Fit the bonnet as described earlier (see Bonnet—To fit, on Page S51) before fully tightening the setscrews securing the bonnet to the hinges.

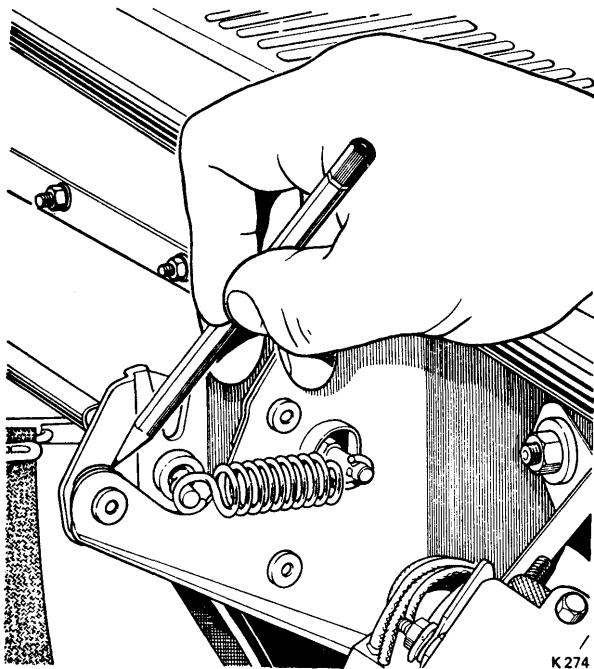


FIG. S50 MARKING THE BONNET CATCH MECHANISM TO FACILITATE ASSEMBLY

Bonnet seals—To remove

1. Remove the thin sectioned seal which surrounds the front and sides of the bonnet by simply pulling the seal off its seating flange.
2. Remove the other seal which provides the seal for the rear of the bonnet by carefully detaching it from the body.

If a knife or a similar tool is used for this operation take great care to avoid damaging the paintwork.

Bonnet seals—To fit

1. To fit the thin sectioned seal simply press into position over the body flange. Do not use an adhesive or a lubricant.
2. To fit the seal for the rear of the bonnet, first clean the seal seating surface on the body using Bostik cleaner 6001. Fix the new seal to the body with Dunlop adhesive S1127 or its equivalent.

Bonnet catch mechanism—To remove

1. Scribe the profile of the bonnet catch mounting brackets onto their adjacent guide plates (see Fig. S50).
2. Remove the toggle springs from each end of the countershaft.
3. Remove the six $\frac{7}{16}$ in. A/F setscrews securing the guide plates to the mounting brackets.
4. Remove the guide plates from the countershaft.

Unless it is necessary to remove the countershaft completely from the car, it is best left attached to the cable and moved onto one side. This is because disconnecting the cable will result in a new cable being required; also, if the bonnet is closed when fitting the catch mechanism prior to the cable being connected, it may be extremely difficult to open the bonnet again. However, if it is required to disconnect the cable proceed as follows.

Bonnet catch operating cable—To remove (see Fig. S51)

1. With the aid of a pair of pliers straighten out the protruding end of the cable (this is likely to result in the bent portion breaking off).
2. Remove the small socket-headed grub screw from the cable nipple (see Fig. S51) on the countershaft.
3. Draw the cable out of the nipple and remove the nipple and its washer from the countershaft.
4. Disconnect the battery leads.
5. From inside the car, unscrew the main fusebox retaining screw and fully open the fusebox.

6. Slacken the two 2 B.A. screws securing the small trim panel surrounding the bonnet catch operating lever; remove the panel.

The two screws are situated behind the trim panel and to gain access to the inner screw it will be necessary to remove either the radio trim cover or the centre console side panel as follows.

Cars prior to Car Serial Number 6001. Remove the control knobs from the radio situated under the fascia. Remove the two screws securing the bottom of the radio trim cover; remove the cover.

Cars after Car Serial Number 6001. Remove the centre console side panel adjacent to the bonnet catch operating lever using a wedge-shaped tool to free the spring type upholstery clips securing the panel.

7. Remove the cable from the operating lever by 'springing' the looped end of the cable over the collar of the retaining lug.

8. Withdraw the cable from its outer sheath.

If the straightened (or broken) end of the cable will not pass through the sheath, remove the screw securing the sheath clip and remove the cable, sheath and clip together.

Bonnet catch mechanism—To fit

To fit the bonnet catch mechanism reverse the procedure given for removal noting the following points.

1. If the operating cable is disconnected from the countershaft, **do not** attempt to close the bonnet until the cable has been fitted (see *Bonnet catch operating cable—To fit and set*).

Failure to observe this point may result in a locked bonnet and no obvious means of opening it. In this event, complicated manoeuvres underneath the car will be necessary in an effort to unlock the bonnet mechanism with the aid of a rod or length of stiff wire.

2. Ensure that the pegs on the bonnet catch plates are locating correctly in the rubber stops on the countershaft guide plates when the bonnet is closed; on later cars these pegs have been extended to provide a more positive location of the bonnet.

3. If necessary reset the bonnet catch plates so that the bonnet will open and close without difficulty (see *Bonnet—To fit, Operation 2*).

Bonnet catch operating cable—To fit and set (see Fig. S51)

1. Ensure that the bonnet catch operating lever under the fascia pivots freely and is returned onto its stop by the return spring.

2. Fit the cable outer sheath (if removed); lightly smear the cable with Molytone 265 grease or its equivalent then thread the new cable through the sheath.

3. Fit the looped end of the cable to the retaining lug on the operating lever under the fascia.

4. Move the countershaft to the bonnet locked position.

5. Position a $\frac{1}{4}$ in. (6,35 mm.) diameter bar in the guide plate and the countershaft locking cam adjacent to the cable.

Refer to Figure S51, which illustrates a right-hand drive car; on left-hand drive cars position the setting bar in the guide plate and cam at the opposite end of the countershaft.

6. Fit the cable nipple and washer to the countershaft then thread the free end of the cable through the nipple. Tighten the nipple so that, with the cam fully closed onto the setting bar, there is approximately $\frac{1}{8}$ in. (3,175 mm.) of free movement between the lever resting on its stop and starting to open the cam (see Fig. S51); bend down the free end of the cable protruding through the nipple.

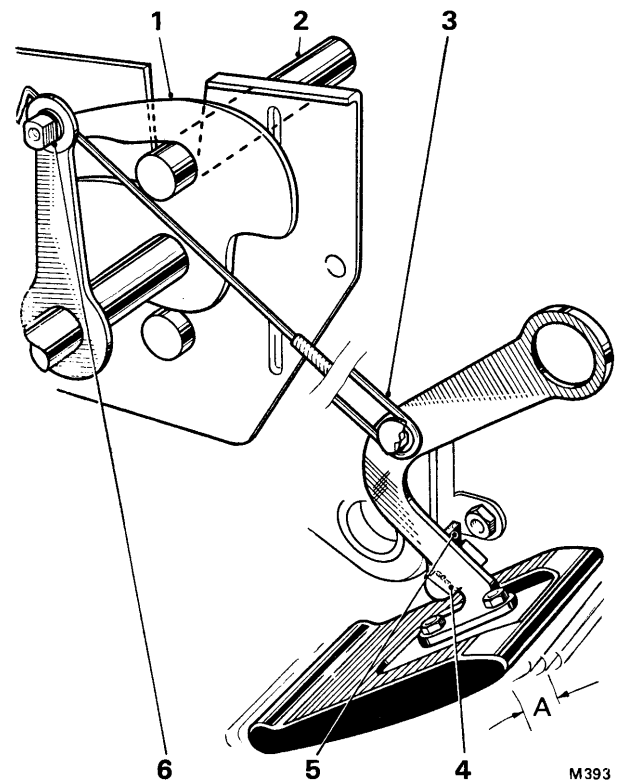


FIG. S51 SETTING THE BONNET CATCH OPERATING MECHANISM

A $\frac{1}{8}$ in. \pm $\frac{1}{16}$ in. (3,175 mm. \pm 1,587 mm.) — free movement

- 1 Cam
- 2 $\frac{1}{4}$ in. (6,350 mm.) diameter slave setting bar
- 3 Operating cable
- 4 Stop on lever
- 5 Stop on bracket
- 6 Cable nipple

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7. Remove the setting bar and pull the operating lever; check that the countershaft locking cams move to the unlocked position assisted by the toggle springs and that the operating lever returns onto its stop when released.

8. Close the bonnet and ensure that the bonnet catch plates are being engaged correctly by the countershaft locking cams.

If necessary reset the bonnet catch plates (see *Bonnet catch mechanism – To fit, Operations 2 and 3*).

Luggage compartment lid—To remove

4-Door Saloon and Long Wheelbase cars

1. Disconnect the battery leads.
2. Remove the two screws securing the luggage compartment lamp surround; remove the surround together with the lamp lens.
3. Remove the two screws from the luggage compartment lamp cap; remove the cap.
4. Remove the two screws securing the bulb holder and withdraw the holder sufficiently for the electrical leads to be disconnected; disconnect the leads and remove the holder.
5. Tie a piece of string (at least 4 feet (1,22 m.) long) to the leads; withdraw the leads from the lid frame until only the string remains in the frame then

disconnect the string from the leads. The string is left in the lid frame to provide an easy means of reconnecting the leads.

6. **Cars after Car Serial Number 5000.** Using a sharp wedge-shaped tool, carefully separate the carpet trim from the luggage compartment lid until access to the snap connectors of the reversing lamp leads is possible (see *Fig. S52*); disconnect the connectors.

Remove the self-tapping screw securing the bonding cable of the right-hand loom.

Tie a piece of string to each of the reversing lamp leads (see *Operation 5*), then withdraw the leads from the lid frame.

7. Remove the six $\frac{1}{2}$ in. A/F setscrews securing the hinges to the luggage compartment lid; two assistants will be required to support the lid as the setscrews are removed. To facilitate assembly note the number of shims (if fitted) between the hinge faces and the lid.

Remove the luggage compartment lid.

Luggage compartment lid—To remove

Coachbuilt cars

1. Remove the eight self-tapping screws securing the two small covers to the inside front face of the luggage compartment lid; remove the covers to expose the lid securing setscrews.
2. Remove the luggage compartment lid following the removal procedure described in *Operation 7, Luggage compartment lid – To remove, 4-Door Saloon and Long Wheelbase cars*.

Luggage compartment lid—To fit

All cars

To fit the luggage compartment lid reverse the procedure given for removal noting the following points.

1. Do not fully tighten the setscrews securing the luggage compartment lid to the hinges until after the lid clearances have been set in relation to the body (see *Fig. S49*).
2. After fitting, the contour of the lid should match perfectly with the contour of the body.
3. Check that the lid can be opened and closed without difficulty (see *Luggage compartment lock mechanism – To fit, Operation 7*).
4. Use Evo-stik adhesive 613 or its equivalent to stick the carpet trim to the lid.

Luggage compartment lid hinges—To remove

4-Door Saloon and Long Wheelbase cars

1. Remove the luggage compartment lid (see *Luggage compartment lid – To remove, on Page S54*).

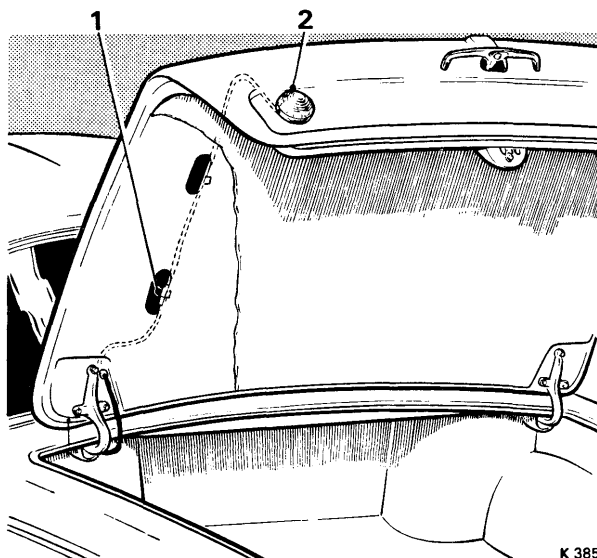


FIG. S52 REVERSING LAMP SNAP CONNECTORS (4-Door Saloon and Long Wheelbase Cars with reversing lamps attached to luggage compartment lid)

- 1 Snap connector
- 2 Reversing lamp

2.(a) **4-Door Saloon and Long Wheelbase non-division cars.** Unfasten the press studs securing the carpet trim (if fitted) around the lid hinges and torque rods; remove the trim.

(b) **Long Wheelbase cars with centre division.** Remove the six self-tapping screws securing the trim panel in the forward section of the luggage compartment; remove the panel.

3. **On late cars,** remove the screws securing the clips for the lid electrical looms.

4. Disconnect the leads to the luggage compartment lamp switch at the snap connectors; the switch is secured to the right-hand hinge.

5. Remove the eight $\frac{1}{2}$ in. A/F setscrews securing the hinges to the car body; remove the hinges complete with the torque rods.

Luggage compartment lid hinges—To remove

Coachbuilt cars

1. Remove the luggage compartment lid (see *Luggage compartment lid—To remove, on Page S54*).

2. Remove the screws securing the cover of the luggage compartment lamp; remove the cover. Remove the screws securing the lamp unit, disconnect the leads and remove the lamp.

3.(a) **2-Door Saloon cars.** Remove the screws securing the hinge cover; remove the cover.

(b) **Convertible cars.** Remove the screws securing the three hinge cover panels; remove the panels.

4. **Convertible cars.** Remove the six 2 B.A. bolts securing the two inner triangular shaped hinge brackets to the body.

Disconnect the loom running through the two brackets at the terminal block and draw the loom clear of the brackets.

5. Complete the removal procedure by carrying out Operations 3, 4 and 5 as described for 4-Door Saloon and Long Wheelbase cars.

Luggage compartment lid hinges—To fit

All cars

To fit the hinges reverse the procedure given for removal noting the following points.

1. Before tightening the screws securing the lid to the hinges the lid must be set in relation to the body (see *Luggage compartment lid—To fit*).

2. Before fitting any trim or cover panels which cover the hinges, check that the torsion bar hinge adjusting screws (see *Fig. S45, item 2*) are set correctly.

They should be set so that an initial vertical downward effort of approximately 20 lb. (9,07 kg.) is required, at the luggage compartment lid handle, to move the lid from the fully open to the fully closed position.

Luggage compartment lock mechanism—To remove

4-Door Saloon and Long Wheelbase cars (see Fig. S53)

1. Remove the two screws securing the black painted cover plate fitted to the inside face of the luggage compartment lid.

2. Ease the carpet trim away from the lock catch mechanism and remove the four 2 B.A. setscrews securing the catch mechanism to the lid; remove the catch mechanism and withdraw the remote control rod.

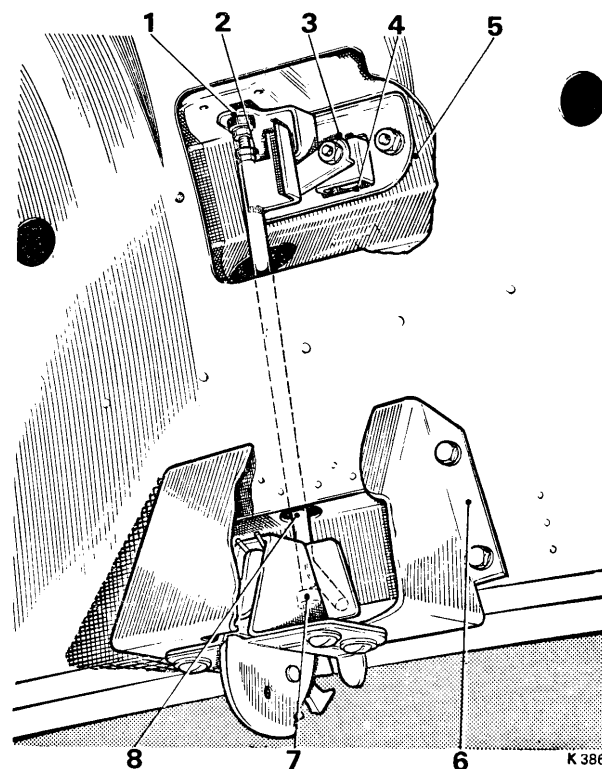


FIG. S53 LUGGAGE COMPARTMENT LID LOCK MECHANISM (4-Door Saloon and Long Wheelbase Cars)

- 1 Bearing—remote control rod
- 2 Adjuster lock-nut
- 3 Contactor
- 4 Push button—handle
- 5 Upper bracket
- 6 Cover—lower mechanism
- 7 Bearing—remote control rod
- 8 Remote control rod assembly

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3. Remove the two $\frac{7}{16}$ in. A/F nuts securing the upper bracket (see Fig. S53, item 5); remove the bracket.

4. Using a sharp wedge-shaped tool, carefully peel back the carpet trim sufficiently to enable the lid handle securing nuts to be removed.

Remove the two nuts and washers securing the handle to the lid taking care not to drop them in the lid pressing; remove the handle complete with the lock assembly.

5. To remove the push button lock from the handle proceed as follows.

Remove the nut securing the contactor and remove the contactor noting its position to ensure correct assembly. Remove the two circlips securing the bridge plate and remove the plate and the spring from the lock button. Remove the two brass countersunk headed screws securing the two halves of the lock button together; remove each half of the lock button from the handle.

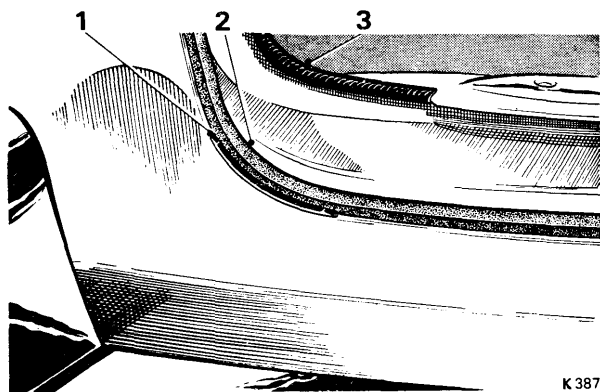
Luggage compartment lock mechanism— To remove

Coachbuilt cars

1. Remove the four $\frac{1}{4}$ in. UNF screws securing the lock catch mechanism to the luggage compartment lid; remove the catch mechanism.

2. Remove the four 2 B.A. screws securing the chromed plate surrounding the catch mechanism aperture; remove the plate.

3. Remove the two nuts and washer securing the handle to the lid; remove the handle.



**FIG. S54 LUGGAGE COMPARTMENT LID SEALS
(4-Door Saloon and Long Wheelbase Cars)**

- 1 Rubber strip
- 2 Luggage compartment lid seal
- 3 Sealing strip—inner flange

Luggage compartment lock mechanism— To fit

All cars

1. Fit and secure the handle to the luggage compartment lid ensuring that the rubber seal is in position between the handle and the lid.

2.(a) **4-Door Saloon and Long Wheelbase cars** (see Fig. S53). Fit the upper bracket, remote control rod and lower lock catch mechanism as follows.

Fit the upper bracket; slacken the remote control rod adjuster lock-nut then screw down the adjuster thereby reducing the length of the rod. Fit the remote control rod and the lower lock catch mechanism to the lid ensuring that each end of the rod locates correctly in the special bearings. Unscrew the remote control rod adjuster until any end float is just removed; tighten the adjuster lock-nut.

(b) **Coachbuilt cars.** Fit the chromed plate and the lock catch mechanism to the luggage compartment lid.

3. Press the handle push button and check that there is approximately $\frac{1}{4}$ in. (3,17 mm.) free movement before the contactor is felt to make contact with the bracket fixed to the remote control rod (on Coachbuilt cars before the contactor makes contact with the catch mechanism).

If there is insufficient free travel, the arm of the upper bracket (4-Door Saloon and Long Wheelbase cars) should be bent inboard or the contactor legs (Coachbuilt cars) should be reset, until the travel is correct; only a small amount of bending should be necessary.

4. Check that the cam wheel on the lock catch mechanism can be rotated freely when the handle push button is fully depressed.

5. Insert the key in the push button lock and turn to the locked position; press the handle push button and check that the contractor on the push button does not operate the catch mechanism.

Turn the key to the unlocked position and check that the catch mechanism is operated when the push button is pressed.

6. Fit the remaining parts by reversing the procedure given for removal.

7. Finally, check that the luggage compartment lid can be opened and closed without difficulty, and that all free movement is removed from the lid when closed.

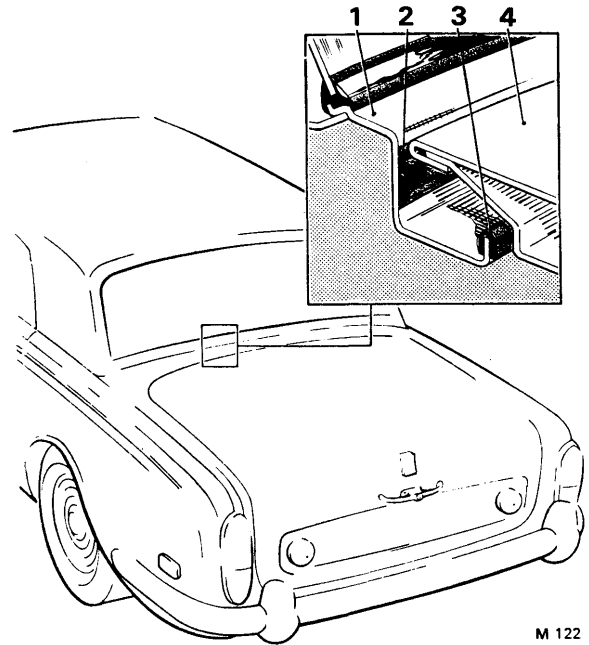
If necessary, slacken the two $\frac{7}{16}$ in. A/F setscrews securing the lock catch plate to the floor of the luggage compartment and adjust the position of the catch plate until both these conditions are complied with; then tighten the setscrews.

Luggage compartment lid seal—To remove**4-Door Saloon and Long Wheelbase cars**

1. Remove the seal from the body (or from the lid on early cars) using a sharp knife or similar tool; take great care to avoid damage to the paintwork.

2. Remove the thin sectioned sealing strip attached to the inner rim of the lid aperture.

This sealing strip is not secured with adhesive except on very early cars where the lid seal itself was attached to the lid and not to the car body (see *Luggage compartment lid seal—To fit, on Page S57*).



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FIG. S56 POSITION OF THE LUGGAGE COMPARTMENT LID SEAL ON THE BODY (4-Door Saloon and Long Wheelbase Cars)

- 1 Rear decking panel
- 2 Luggage compartment lid seal
- 3 Thin sectioned sealing strip
- 4 Luggage compartment lid

Luggage compartment lid seal—To remove**Coachbuilt cars**

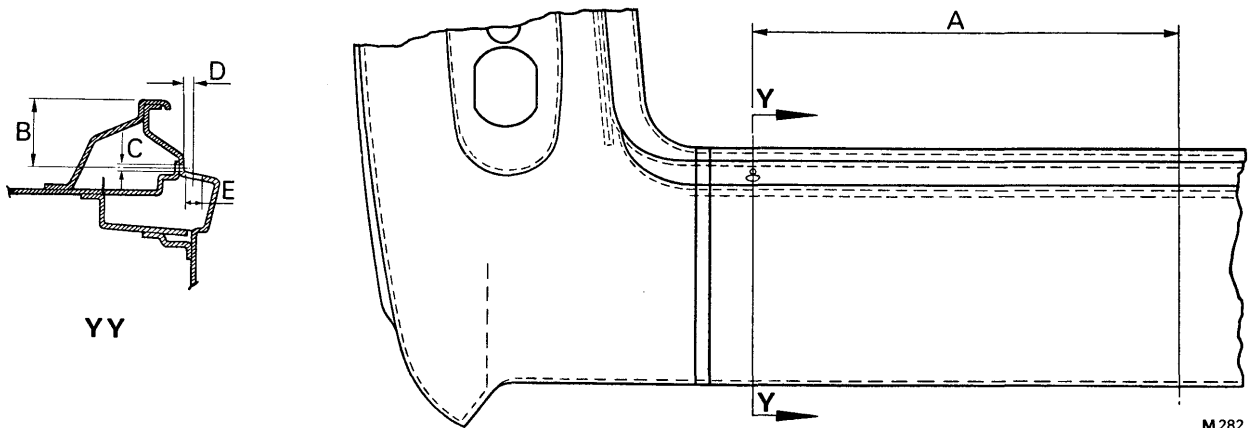
1. Remove the nine screws securing the chromed strip on the rear face of the luggage compartment; remove the chromed strip.

2. Using an old scraper or a similar tool remove the luggage compartment lid seal.

Luggage compartment lid seal—To fit

4-Door Saloon and Long Wheelbase cars (see *Figs. S54 and S56*)

On early cars the luggage compartment lid seal was secured to the lid. When renewing the lid seal on these early cars, the later type seal should be used and fitted to the body as it is on all later cars (see *Fig. S54*).

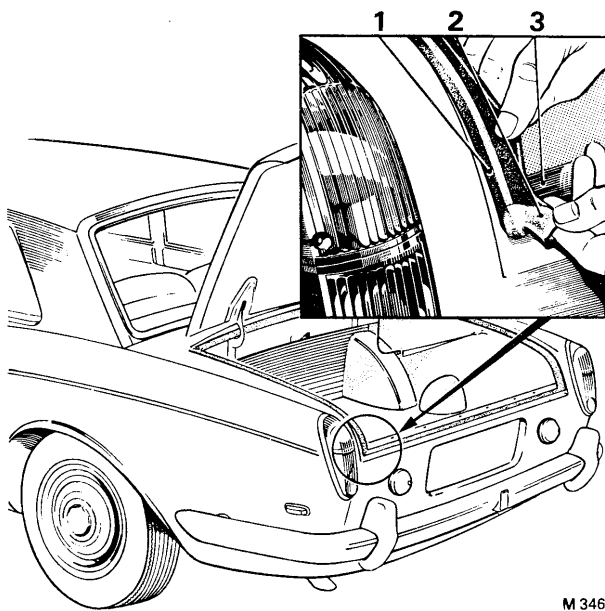


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FIG. S55 LUGGAGE COMPARTMENT LID SEAL DRAIN HOLES (Early 4-Door Saloon and Long Wheelbase Cars)

- A** 18.125 in. to 18.370 in. (46,037 cm. to 46,659 cm.)
B 1.297 in. to 1.327 in. (3,294 cm. to 3,370 cm.)
C 0.101 in. to 0.104 in. (2,565 mm. to 2,641 mm.) diameter
D 0.203 in. to 0.218 in. (5,156 mm. to 5,537 mm.)
E 0.375 in. to 0.390 in. (9,525 mm. to 9,906 mm.) diameter

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FIG. S57 LUGGAGE COMPARTMENT LID SEAL (2-Door Saloon and Convertible Cars)

- 1 Luggage compartment lid seal
- 2 Rubber gusset fitted to rear mitred joint of seal
- 3 Chromed plate

Before fitting the later type seal to these early cars, drill two drain holes in the rear of the car as follows.

Drill two holes 0.375 in. (9.525 mm.) diameter in the rear of the cars, each hole to be approximately 18.125 in. (46 cm.) on either side of the body centre line (see Fig. S55). Fit a cover plate (part number UB.15696) over each hole and secure with a sheet metal screw (part number UA.7352/z). The two buffers on the luggage compartment lid will no longer be required.

Fit the luggage compartment lid seal as follows.

1. Using Bostik cleaner 6001, clean the bonding areas of the seal and the body lip; allow to dry for one hour.
2. Apply Boscolite primer 9252 to the bonding area on the body only and allow to stand for one hour.
3. Apply Boscoprene cement parts 1 and 2 to the bonding areas of the seal and the body; apply the cement also to the two small rubber strips which fit

into the radiused bottom corners of the seal channel (see Fig. S54, item 1). Care should be taken to keep the primer and cement away from the finished paintwork. Allow the cement to dry for between 5 and 15 minutes.

Note Although early cars were not fitted with these small rubber strips, they should be fitted to all cars whenever the luggage compartment lid seal is renewed.

4. Fit the two rubber strips to the lower corners of the seal channel.
5. Fit the luggage compartment lid rubber seal to the body; ensure that the edge of the seal is level with the start of the radius on the body (see Fig. S56) then press firmly into position.

The luggage compartment lid should remain open for a minimum period of 12 hours after fitting a new seal.

6. Fit the thin sectioned sealing strip to the lip of the body; do not use an adhesive.
7. When the seal adhesive is dry, close the lid and water test for leaks.
8. If necessary, reset the position of the luggage compartment lock catch plate (see *Luggage compartment lock mechanism – To fit, Operation 7*).

Luggage compartment lid seal—To fit

Coachbuilt cars (see Fig. S57)

1. Clean the seal channel using Bostik cleaner 6001; allow to dry for one hour.
2. Apply Bostik adhesive 1261 to the seal channel on the body.
3. Fit the four sections of the seal into position ensuring that the mitred corners of the seal match perfectly.
4. Apply Romac rubber solution 61-805 or its equivalent to the mating faces of the mitred joints. Allow the solution to become 'tacky' then press the faces firmly together.
5. Fix the small rubber strip to the underside of each mitred joint as shown in Figure S57 using Romac rubber solution 61-805 and following the same procedure described in Operation 4.
6. Fit the chromed plate to the rear edge of the seal.

Section S5

ELECTRICALLY OPERATED REAR QUARTER WINDOWS

(Coachbuilt Cars)

Quarter window—To remove

2-Door Saloon cars (see Fig. S58)

1. Remove the screw securing the quarter window swivel link to the drive-shaft (see Fig. S58, item 5); disconnect the link from the drive-shaft and carefully retain the distance piece and nylon washer.
2. Fully open the quarter window by hand.
3. Remove the four screws securing the hinge on the front edge of the window to the body; remove the quarter window.
4. To remove the glass from the frame, first remove the countersunk-headed screw from the upper and lower frame channels then detach the front channel from the frame; remove the glass from the frame.

Quarter window—To fit

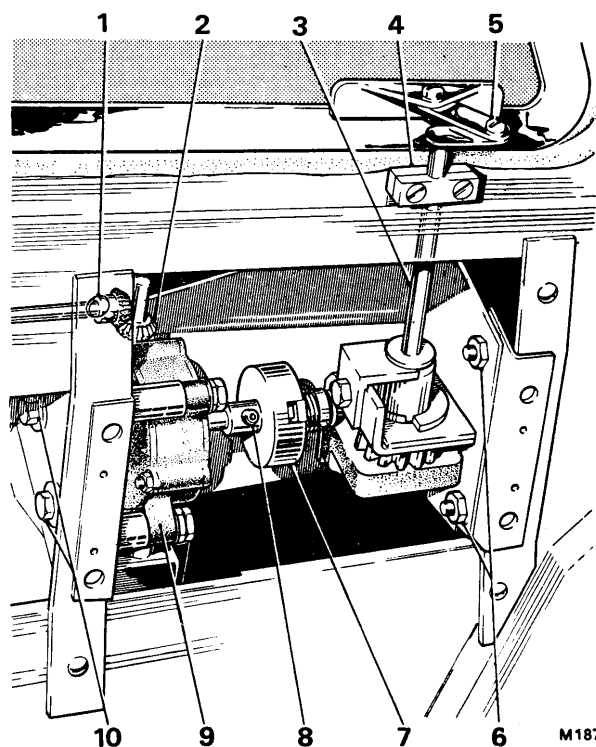
2-Door Saloon cars

To fit the quarter window reverse the procedure given for removal.

Quarter window—To remove

Convertible cars (see Fig. S60)

1. Fully lower the hood and ensure that the quarter window is fully raised.
2. Disconnect the battery leads.
3. Remove the rear battery cushion and backrest (see Section S2, Rear seat - To remove).
- 4.(a) **Early cars.** Remove the screws securing the polished wood finisher on the rear armrest; remove the finisher.
- (b) **Late cars.** Remove the ashtray from the rear armrest then remove the three screws securing the wood finisher; remove the wood finisher.



**FIG. S58 REAR QUARTER WINDOW MECHANISM
(2-Door Saloon Cars)**

- 1 Screw—mounting bracket to body panel (4 off)
- 2 Bevel gears—manual drive
- 3 Drive-shaft
- 4 Clamping block
- 5 Screw—swivel link to shaft
- 6 Setscrew—mounting bracket
- 7 Spring clutch
- 8 Clutch locking screw
- 9 Electrical motor assembly
- 10 Setscrews—mounting bracket

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5. Remove the screws securing the polished wood finisher under the quarter window; remove the finisher.

6. On cars fitted with seat belts remove the belt anchorage bolt from the quarter panel; on cars fitted with the hooked bolt, detach the belt lug and slacken the lock-nut before attempting to remove the hooked bolt.

7. Remove the screws securing the quarter trim panel to the body (see Fig. S59).

8. Lift the panel away sufficiently to enable the electrical leads to the panel to be disconnected; note the position of the leads to ensure correct assembly.

Remove the panel.

9. Scribe the profile of the window mounting brackets onto the lift mechanism bracket (see Fig. S60); ensure this is carried out accurately to facilitate assembly.

10. Remove the four 2 B.A. screws securing the quarter window to the lift mechanism (see Fig. S60); remove the window glass and frame.

11. To remove the glass from the quarter window frame, refer to Operation 4, Quarter window - To remove, 2-Door Saloon cars, in this Section.

Quarter window—To fit

Convertible cars

To fit the rear quarter window reverse the procedure given for removal noting the following point.

1. After fitting the quarter window, fully raise the hood and close the door adjacent to the quarter window; check that the window can be raised and lowered satisfactorily and that the window frame contacts the sealing rubber when closed.

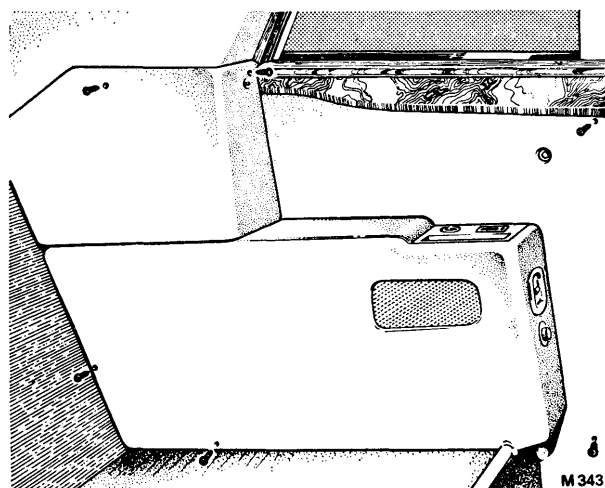


FIG. S59 REAR QUARTER PANEL/ARMREST SECURING SCREWS

To adjust the position of the quarter window, slacken the four 2 B.A. screws securing the window to the lift mechanism then move the quarter window to the required position.

Quarter window mechanism—To remove

2-Door Saloon cars (see Fig. S58)

1. Disconnect the battery leads.

2. Disconnect the quarter window swivel link from the drive-shaft (see Quarter window - To remove, 2-Door Saloon cars, Operation 1).

3. Remove the rear seat cushion and backrest (see Section S2, Rear seat - To remove).

4.(a) **Early cars.** Remove the four screws securing the polished wood finisher on the rear armrest; remove the finisher.

(b) **Late cars.** Remove the ashtray from the rear armrest then remove the three screws securing the finisher; remove the finisher.

5. Remove the screws securing the polished wood finisher around the quarter window; remove the finisher.

6. **On cars after Car Serial Number 5000,** remove the chromed cover from the quarter window switch situated on the quarter panel. Remove the two screws securing the switch to the panel and disconnect the electrical leads to the switch; remove the switch.

7. On cars fitted with front seat belts, remove the belt anchorage bolt from the quarter panel mounting point; if the anchorage bolt is the hooked type, first detach the belt lug and slacken the anchorage bolt lock-nut.

8. Remove the screws securing the quarter trim panel to the body (see Fig. S59); lift the panel away sufficiently to enable the electrical leads to the panel switches and cigar lighter to be disconnected.

9. Disconnect the panel leads noting their positions to ensure correct assembly; remove the quarter panel.

10. Remove the two screws securing the drive-shaft clamping block (see Fig. S58); separate the blocks and lift out the drive-shaft.

If the drive-shaft cannot easily be removed, rotate the bevelled gear on the motor assembly (see Fig. S58, item 2) by hand whilst lifting the drive-shaft.

11. Remove the two screws securing the flexible drive of the manual lift mechanism to the body quarter panel.

12. Disconnect the electrical leads to the motor assembly; note their positions to ensure correct assembly.

13. Remove the four screws securing the window mechanism and mounting brackets to the body panel (see Fig. S58); remove the window mechanism and mounting bracket assembly.

For information concerning the electrically operated window mechanism refer to Chapter M – Electrical System.

Quarter window mechanism—To fit

2-Door Saloon cars

To fit the rear quarter window mechanism reverse the procedure given for removal noting the following point.

1. After fitting the flexible drive of the manual lift mechanism, ensure that the two bevelled gears (see Fig. S58, item 2) are held out of mesh by the spring in the flexible drive cable, otherwise the electrical operation of the window will be noisy.

Quarter window mechanism—To remove

Convertible cars (see Fig. S60)

1. Remove the rear seat, backrest and quarter panel following the same procedure described earlier (see *Quarter window – To remove, Operations 1 to 8 inclusive*) then proceed as follows.

2. Slacken the Allen type grub screw locking the junction block onto the flexible mechanical drive (see Fig. S60, item 7); disconnect the flexible drive at the junction block.

3. Disconnect the electrical leads to the quarter window motor assembly at the terminal block; note their position to ensure correct assembly.

4. Remove the two 2 B.A. bolts and nuts securing the angled ends of the lower attachment brackets to the car body (see Fig. S60, item 8).

5. Remove the two 2 B.A. screws securing the waist attachment plate to the car body (see Fig. S60, items 1 and 4).

6. Remove the quarter window lift mechanism, together with the two attachment brackets and the quarter window, from the body.

For information regarding the electrical window lift assembly refer to Chapter M – Electrical System.

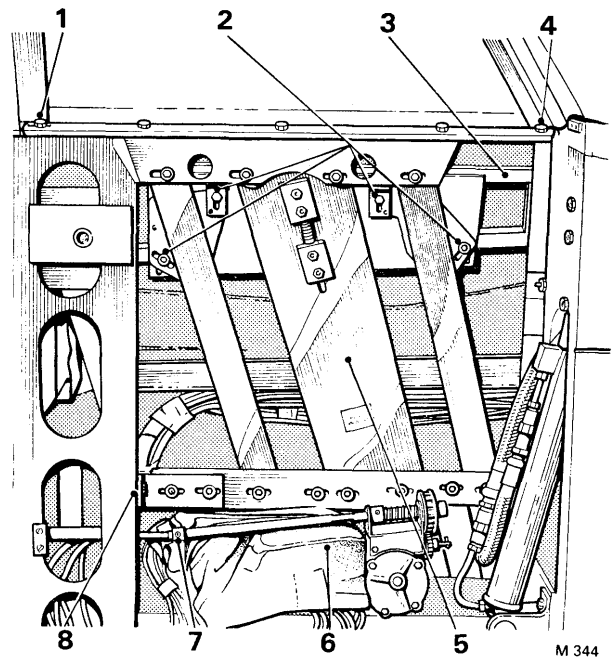


FIG. S60 REAR QUARTER WINDOW MECHANISM (Convertible Cars)

- 1 Screw—waist plate to body
- 2 Screw—quarter window to lift mechanism (4 off)
- 3 Quarter window frame
- 4 Screw—waist plate to body
- 5 Window lift channel
- 6 Electrical motor assembly
- 7 Locking screw—junction block on flexible manual drive-shaft
- 8 Bolt—lower attachment plate to body

Quarter window mechanism—To fit

Convertible cars

To fit the quarter window mechanism reverse the procedure given for removal noting the following point.

1. After fitting the mechanism and before fitting the quarter panel/armrest, check that the window opens and closes satisfactorily as described earlier (see *Quarter window – To fit, Operation 1*).

Section S6

CENTRE DIVISION

(Long Wheelbase Cars)

Electrically operated division glass —To remove (see Figs. S61 and S62)

1. Remove the front seats and rear seat cushion (see Section S2, Front seat — To remove).
2. Remove the eight screws securing the two side cover panels to the front of the division; remove the panels.
3. Remove the division glass electric motor assembly (see Chapter M — Electrical System).
4. Prop up the division glass in the fully raised position.
5. Attach a strong piece of string, approximately 5 ft. (1.52 m.) long, centrally on the loop of the tensioning cord, then unwind the glass tensioning cord from the two hooks on the support channel, keeping a firm grip on the loop of the cord. Firmly holding the free end of the string against the pull of the tension roller, release the tensioning cord then allow the cord and string to coil round the roller as it unwinds.

When the tension has been released, indicated by the roller ceasing to rotate, lift the socket end (left-hand side) of the roller out of the slotted bracket, then detach the ratchet end (right-hand side) from the pawl bracket (see Fig. S62); remove the tension roller.

6. Remove the six $\frac{7}{16}$ in. A/F bolts and nuts securing the lower edge of the top roll panel to the division.
7. It is necessary to remove one of the two perspex end windows from the division to enable the division glass to be removed.

Remove either the left-hand or right-hand end window as follows, the removal procedure being the same for both windows.

8. Remove the $\frac{7}{16}$ in. A/F bolt, nut and thick washers securing the side trim panel and one end of the top roll panel to the bracket on the division.
9. Open the rear door and remove the screw in the side of the division end trim panel (see Fig. S66);

withdraw the panel sufficiently to disconnect the electrical leads to the interior lamp switch then remove the panel.

Note the colour codes of the leads to ensure correct assembly.

10. Remove the prop and lower the division glass onto its stops.
11. Detach the felt strip from the upper channel then remove the Phillips headed screw securing the upper end of the channel to the end window mounting block on the cantrail (see Fig. S61).
12. Remove the Phillips headed screw from the cantrail trim above the end window; carefully ease the cantrail trim away from mounting block on the cantrail.

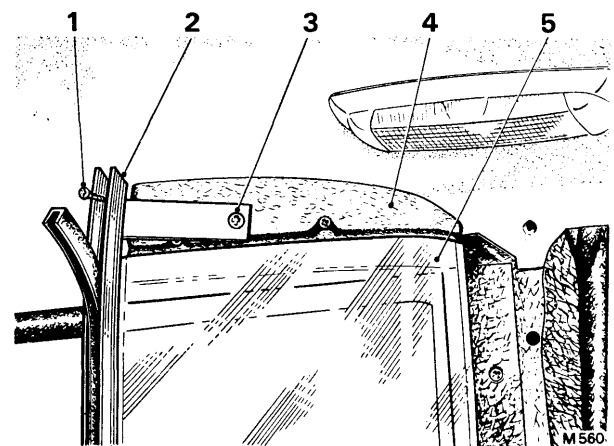


FIG. S61 POSITION OF THE DIVISION END WINDOW SECURING SCREWS

- 1 Screw—upper channel to mounting block
- 2 Upper channel
- 3 Screw - steady strip
- 4 Mounting block
- 5 End window

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13. Remove the two screws securing the upper channel steady strip to the mounting block on the cantrail, between the front and rear sections of the cantrail trim; remove the steady strip.

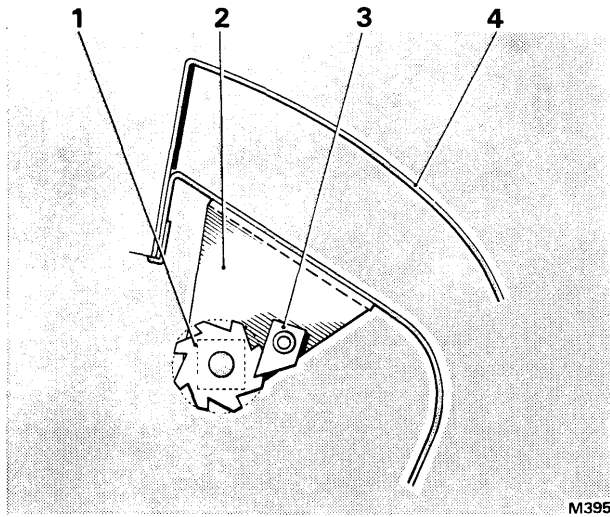


FIG. S62 TENSION ROLLER SHOWING THE PAWL ATTACHED TO THE ROLLER BRACKET

- 1 Ratchet wheel
- 2 Roller bracket
- 3 Locking pawl engaged in ratchet wheel
- 4 Division top roll panel

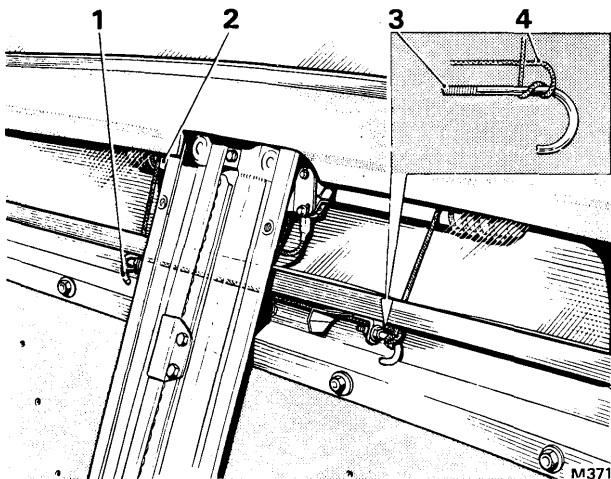


FIG. S63 METHOD OF ATTACHING THE ROLLER CORD TO THE DIVISION GLASS PICK-UP PLATE

- 1 Cord attached to hooked bolt
- 2 Tension roller
- 3 Hooked bolt
- 4 Tension cord

14. Remove the seat belt anchorage bolt and the Phillips screw from the centre pillar trim pad; remove the trim pad.

15. Remove the $\frac{7}{16}$ in. A/F bolt and nut securing the division glass upper channel to the division; remove the division end window together with its seal channel and the division glass upper channel.

16. Remove the $\frac{7}{16}$ in. A/F bolt and nut securing the end of the roll panel (same end noted in Operation 8) to the division; gently lift the freed end of the roll panel just clear of the division to enable the glass to be removed more easily.

17. Slide the division glass upward until it is clear of the lower channels, then move it sideways out of the undisturbed upper channel; remove the glass from the division.

Two people will be required for this operation, one to support each side of the glass; care must be taken to avoid damage to the glass and to the polished wood finisher on the division.

18. Until ready to refit the glass, secure the freed end of the roll panel to the division with a nut and bolt to prevent the panel becoming distorted.

Electrically operated division glass—To fit (see Figs. S62, S63, S64 and S65)

1. Fit the division glass and perspex end window by reversing the procedure given for removal (see *Electrically operated division glass – To remove, Operations 8 to 18 inclusive*), then proceed as follows.

2. Check that the glass will move smoothly in the channels.

If necessary, slacken the channel securing nuts, re-align the channels until the glass moves smoothly then tighten the nuts.

3. Prop up the division glass in the fully raised position.

4. Fit and set the tension roller as follows (Operations 5 to 10 inclusive).

5. Ensure that the cord is attached securely to the roller with the two screws; renew the cord if it is damaged or frayed.

6. Attach a 5 ft. (1.52 m.) length of strong string midway along the loop of the tensioning cord. Holding the string at 90° to the roller to take up the slack in the cord, rotate the roller away from the string (anti-clockwise when viewed on the ratchet end of the roller) until the cord is wound onto the roller (see Fig. S64); the point where the string is attached to the cord should now be approximately half-way along the roller. Continue to rotate the roller until there are ten complete coils of the string around the roller.

7. Fit the roller to the brackets on the division; ensure that the pawl attached to the right-hand bracket is securely engaged in the ratchet wheel on the roller. (see Fig. S62).

8. Pull the free end of the string attached to the roller cord, thereby causing the roller to rotate; keep a firm grip on the string as increasing resistance will be felt as the string unwinds off the roller and the tension is applied. Continue to pull on the string until the looped centre of the roller cord can be grasped, then attach the cord to each of the two hooks on the division glass pick-up plate as shown in Figure S63; ensure that the centre of the cord (point where the string is attached) is mid-way between the hooks. Remove the string from the cord.

9. Remove the prop from under the division glass and check that the tension roller is working correctly by lowering and raising the glass by hand.

Increasing resistance should be felt as the glass is lowered; light hand pressure should be sufficient to raise the glass.

10. If the glass requires other than light pressure to raise it, the assistance of the tension roller can be increased by turning the squared adjuster on the end of the shaft (opposite end to the ratchet wheel) using a spanner. Turn the adjuster clockwise, when viewed on the adjuster end of the roller, $\frac{1}{8}$ th. of a turn only at a time; ensure that the pawl on the right-hand bracket remains in contact with the ratchet wheel while turning the adjuster. This last point is important as damage could occur due to the sudden release of tension if the pawl becomes dis-engaged from the ratchet wheel; it would also entail removing the roller and starting the fitting and setting procedure again.

11. Lightly smear the rollers on the division glass pick-up bracket with Molytone 265 grease or its equivalent then fit the division glass motor assembly (see Chapter M – Electrical System).

12. Before the side cover panels are fitted to the division, set the glass travel stop switches (see Fig. S65) by slackening the switch securing screws and adjusting the position of the switch on its elongated holes as follows.

- (a) Set the 'up' travel stop switch so that it operates when the top edge of the glass is just making contact with the head lining.
- (b) Set the 'down' travel stop switch so that it operates when the pick-up plate on the lower edge of the glass is just making contact with the felt covered stops on the division.

13. Tighten the travel stop switch securing screws when the switch is adjusted correctly.

14. Fit the division side panels and front seats by reversing the procedure given for removal.

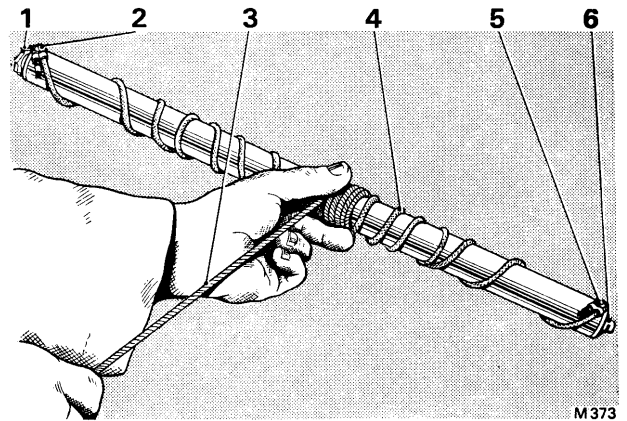


FIG. S64 TENSION ROLLER READY TO FIT

- 1 Ratchet wheel
- 2 Screw securing cord to roller
- 3 String attached to tension roller cord
- 4 Roller cord
- 5 Screw securing cord to roller
- 6 Squared adjuster

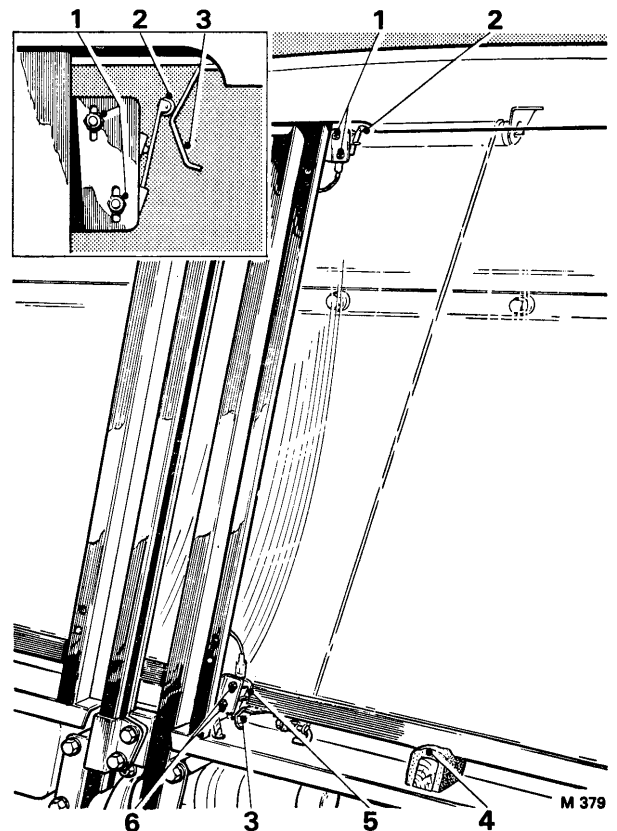


FIG. S65 DIVISION GLASS STOP SWITCHES

- 1 Securing screws—upper stop switch
- 2 Upper switch contact roller
- 3 Switch actuating bracket attached to window pick-up plate
- 4 Felt covered window stop (2 off)
- 5 Lower stop switch contact
- 6 Securing screws—lower stop switch

Chapter 5

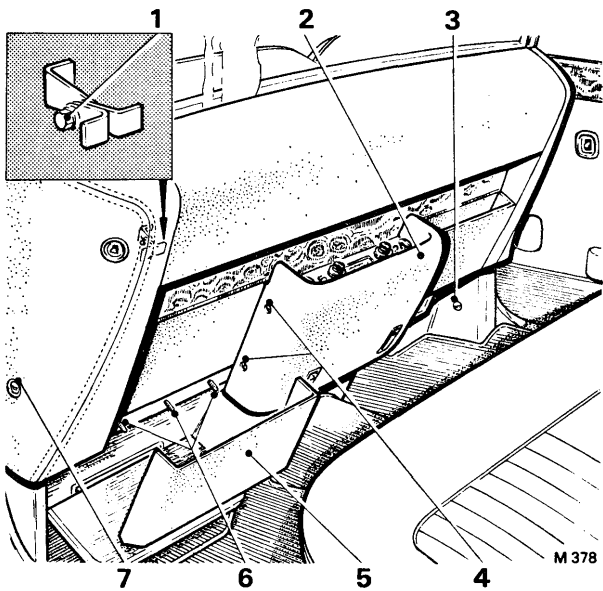


FIG. S66 POSITION OF THE DIVISION CONSOLE MOUNTING SCREWS

- 1 Bolt securing top roll and side trim panel to division
- 2 Division console
- 3 Screw-division to centre pillar
- 4 Console mounting screws
- 5 Magazine pocket (shown removed)
- 6 Magazine pocket securing studs
- 7 Screw securing side trim panel

Division console—To remove
(see Fig. S66)

Remove the three 2 B.A. nuts securing each magazine pocket to the division; the nuts are situated beneath the lower edge of the pockets.

Remove the pockets.

2. Support the console and remove the four screws securing the console to the division; the screws are situated in recessed holes in each side of the console.

3. Remove the console sufficiently to gain access to the electrical connections; disconnect the leads noting their colour code to ensure correct assembly.

4. Remove the console.

Division console—To fit

To fit the console reverse the procedure given for removal.

Centre division—To remove
(see Fig. S67)

1. Remove the division glass screen (see *Electrically operated division glass - To remove, on Page S63*).

2. Remove the remaining perspex end window from the division following the same procedure given for removing the other end window (see *Electrically operated division glass - To remove, Operations 8 to 15 inclusive*).

3. Remove the remaining $\frac{7}{16}$ in. A/F bolts and nuts securing the top roll panel to the division; remove the panel.

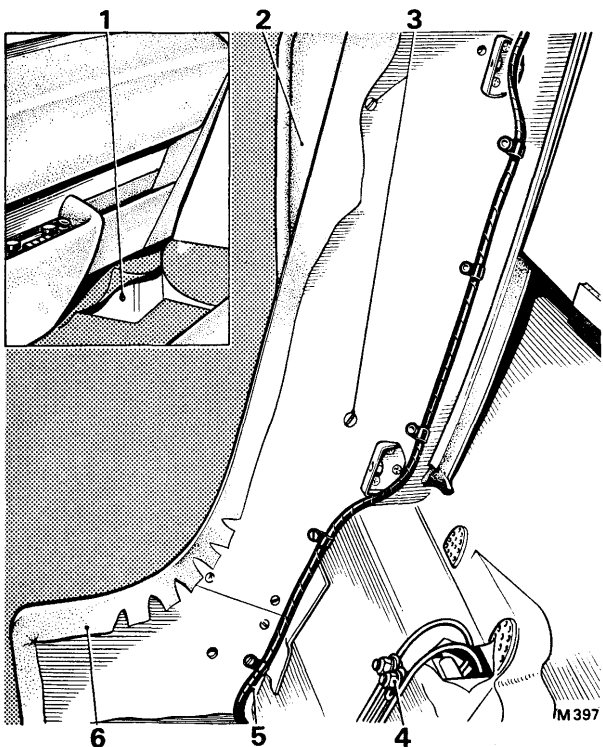


FIG. S67 SCREWS SECURING THE DIVISION TO THE BODY CENTRE PILLAR

Inset shows the location of the lower screw in the rear compartment

- 1 Lower screw—division to centre pillar
- 2 Body centre pillar
- 3 Upper screws (2 off)—division to centre pillar
- 4 2 B.A. nuts securing the rear foot rest spring clip
- 5 Electrical loom to the rear roof lamp switch
- 6 Centre division frame

4. Remove the rear console from the division (*see Division console – To remove, on Page S66*).

5. Detach the roof lamp switch looms from each side of the division by removing the screws securing the loom clips to the division (*see Fig. S67*).

6. Detach the looms at the centre of the division at the terminal connections and remove the screws securing the rear console loom clips and division glass motor loom clips to the division; carefully draw the rear console loom forward clear of the division.

7. Remove the six countersunk-headed screws securing the two angled brackets, situated one at each end of the division upper frame; remove these two brackets.

8. Detach the felt trim from the lower front edge of the division to expose the ten self-tapping screws securing the division to the car floor; remove the screws.

9. Remove the rear seat cushion.

10. Remove the front seat belt anchorage bolts if front seat belts are fitted; the bolts are situated in the rear compartment, one on each side of the floor

tunnel and one adjacent to the base of each centre pillar.

Remove the seat belts.

11. Remove the six countersunk-headed screws securing the division to the centre pillars; the two upper screws on each side are situated at the front of the division (*see Fig. S67*), the lower screw on each side is at the rear of the division (*see Fig. S66*).

12. Ease the division rearward until it is clear of the centre pillars; remove the division through the rear door aperture.

Centre division—To fit

To fit the centre division reverse the procedure given for removal noting the following points.

1. Secure the felt trim, sealing the front of the division to the car floor, with Bostik adhesive 1261 or its equivalent.

2. Before fitting the front cover plates to the division, check that the division glass can be operated satisfactorily and the stop switches are set correctly (*see Electrically operated division glass – To fit*).

Section S7

POWER OPERATED HOOD SYSTEM (Convertible Cars)

Introduction

The hood on the Rolls-Royce Silver Shadow and Bentley T series Convertible with coachwork by H. J. Mulliner, Pard Ward Limited, is power operated; electro-hydraulic equipment is provided to enable the hood to be raised and lowered.

The source of the power is an electric motor connected to the car battery and driving a hydraulic pump operating through solenoid valves. This equipment together with the hydraulic fluid reservoir, is situated behind a trim panel between the rear spring housings in the forward section of the luggage compartment (see Fig. S70).

The hood folding mechanism itself is operated by hydraulic rams in each rear quarter; the rams are connected to the folding framework of the hood behind the rear quarter windows (see Fig. S76).

Information concerning the Everflex hood and head lining is given in Section S10 – Miscellaneous Trim.

Information concerning the electrical part of the system is given in Chapter M – Electrical System.

GENERAL

Controls

A switch to operate the hood is situated on the fascia panel of cars prior to Car Serial Number 6001, and on the centre console panel of cars after Car Serial Number 6000. The power operated hood system is wired through the handbrake warning lamp and will only operate when the handbrake is applied; therefore it is necessary to switch on the ignition and apply the handbrake before the switch will raise or lower the hood. The hood can be operated whether the engine is running or stationary.

For additional information on the electrical part of the system refer to Chapter M – Electrical System.

To lower the hood

1. Ensure that the handbrake is applied and 'Neutral' is selected then switch on the ignition.
2. Release the two safety catches securing the hood to the top rail of the windscreen (see Fig. S68).
3. Press the rear part of the hood operating switch (lower part on fascia mounted switches) until the hood is fully lowered; release the switch.

A cover is provided to fit over the hood well to protect the retracted hood. The cover is secured over the well by press studs and when not required it is stored in a bag in the luggage compartment.

To raise the hood

1. Remove the hood cover (if fitted).
2. Ensure that the handbrake is applied and 'Neutral' is selected then switch on the ignition.
3. Press the front part of the hood operating switch (upper part on fascia mounted switches) until the hood is fully raised; release the switch.
4. Fasten the two safety catches to secure the hood to the top rail of the windscreen.

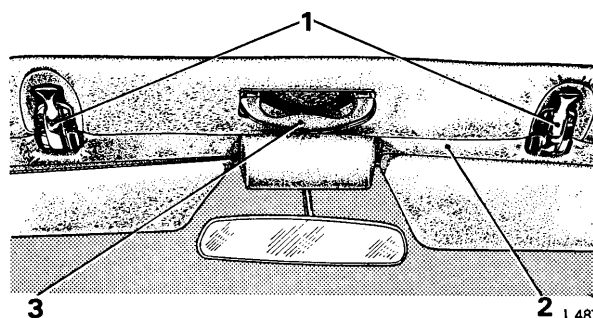
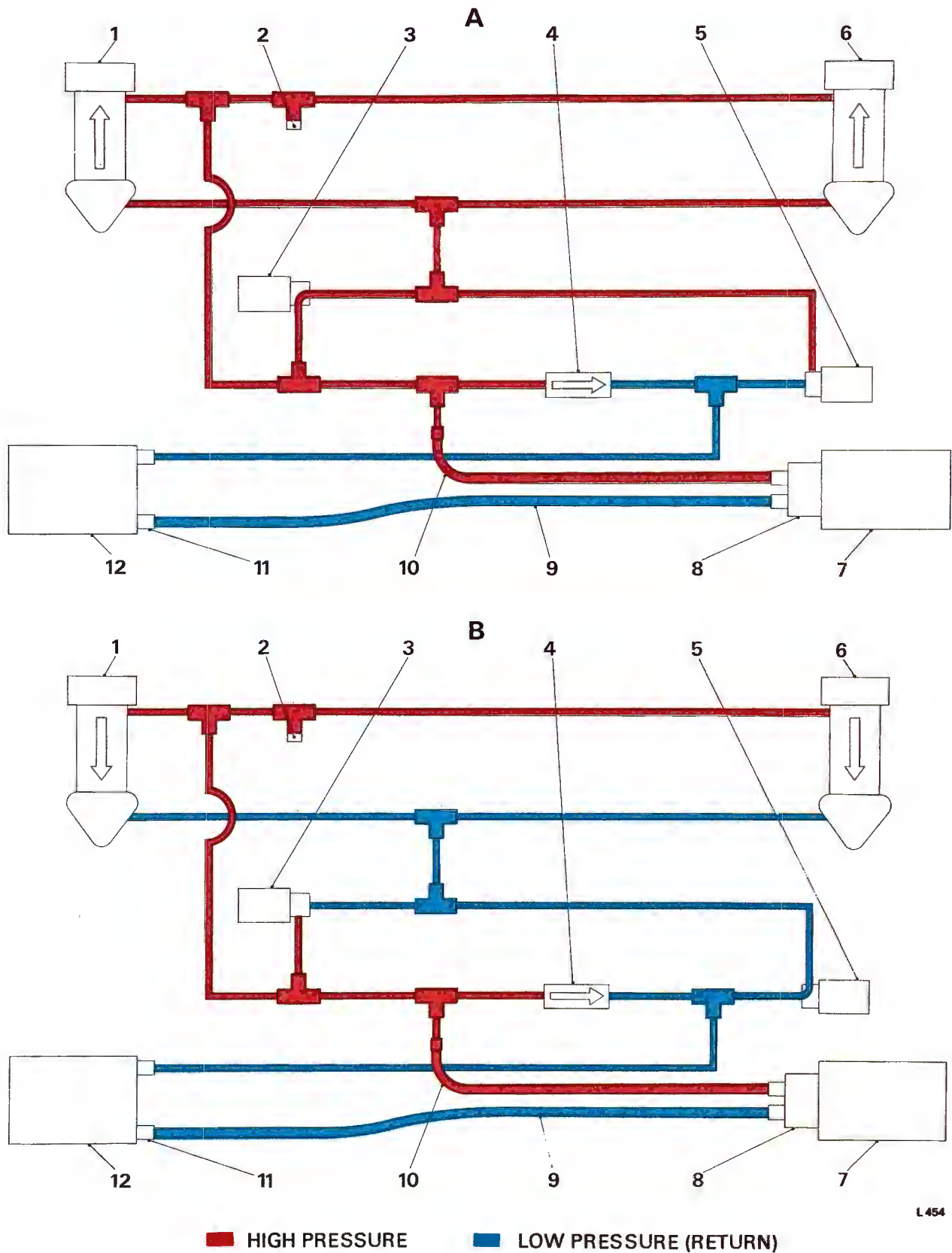


FIG. S68 POSITION OF THE HOOD SAFETY CATCHES

- 1 Hood safety catches
- 2 Top rail of windscreen
- 3 Hood handle

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FIG. S69 DIAGRAM OF THE HYDRAULIC CIRCUIT – RAISING AND LOWERING

- | | | | |
|-------------------|---|---|---|
| A Raising | 1 Left-hand ram
2 Test connection
3 'Up' solenoid valve
4 Relief valve | 5 'Down' solenoid valve
6 Right-hand ram
7 Pump motor
8 Pump | 9 Nylon tube
10 Flexible hose
11 Filter/outlet connection
12 Fluid reservoir |
| B Lowering | | | |

Emergency operation of the hood

Should the power operated hood become inoperative it may be raised or lowered manually by exerting steady pressure on both sides of the hood side frames, at the forward end. Resistance will be felt as the fluid is forced out of the rams.

Power operation

The electric motor of the power operated hood system runs off the car battery through a solenoid operated switch mounted adjacent to the motor (*see Fig. S71*). The power operated hood system will not operate if the battery voltage falls below 9 volts, therefore it is essential that the battery is maintained in a fully charged condition.

When the hood operating switch is pressed, the electric motor drives the pump through a small tongue and slot coupling. The pump supplies hydraulic fluid to the system and two solenoid valves direct the flow of fluid to the rams according to the direction of travel required. Both valves are identical and are open in the 'rest' or de-energised position. Figure S69 illustrates the position of both valves in the hydraulic circuit.

An eye bolt in the upper end of each ram piston is coupled to the folding framework of the hood. To extend (raise the hood) high pressure fluid is supplied to both sides of the ram piston. To retract (lower the hood) high pressure fluid is supplied to the annulus side only, the lower connection being open to the reservoir.

Lowering the hood (*see Fig. S69*). When the switch is pressed to lower the hood, the pump supplies fluid to the system at approximately 1 000 lb/sq. in. (70,31 kg/sq. cm.) and the 'Up' solenoid valve is energised to close that side of the system. Pressure is thus applied to the upper side of the ram pistons which are pressed back into their cylinders thereby retracting the hood and exhausting the fluid from the lower end of the rams through the 'Down' (de-energised) solenoid valve into the reservoir.

Raising the hood (*see Fig. S69*). When the switch is pressed to raise the hood, the pump supplies fluid to the system at approximately 1 500 lb/sq. in. (105,46 kg/sq. cm.) and the 'Down' solenoid valve is energised to close the return to the reservoir.

Fluid is supplied to both sides of the ram pistons but, as the pressure is applied over a greater area on the lower surface of each piston, the pistons are pressed upwards, thus raising the hood.

Hydraulic system

The hydraulic circuit is self-bleeding and does not require any venting operation. Each time the hood mechanism is operated the hydraulic fluid passes under pressure around the system and any air entering the system is returned to the reservoir where it escapes through the vent hole in the filler cap.

The reservoir is filled initially with a high grade mineral oil. Filling or topping-up the reservoir must be carried out with the hood fully lowered and an approved fluid (*see Chapter D, Section D4, Approved Lubricants*) must be used. **Under no circumstances must a castor oil base fluid (i.e. brake fluid, etc.) be used or added to the system.**

When disconnecting any hydraulic connection, immediately blank off the open ports to prevent loss of fluid and ingress of dirt.

The hydraulic system has proved to be very reliable in service and failure of the hood to raise or lower is rarely caused by a fault in the hydraulic system. A more likely cause of such a failure is that the mechanical linkage of the hood folding framework has become strained or that one of the pivot points is stiff due to lack of lubrication. Therefore, before attempting any service work on the hydraulic equipment, the mechanical links in the folding frame of the hood must first be checked and any fault corrected.

The following is a brief description of each unit in the hydraulic system.

Fluid reservoir

Fluid is drawn out of the reservoir through a gauze filter in the outlet connection and returned via the $\frac{1}{4}$ in. (6,35 mm.) outer diameter metal pipe.

The recommended fluid level is to the 'Full' mark on the dipstick attached to the filler cap. It is important that filling or topping-up the reservoir is only carried out with the hood fully retracted (open).

The pump and motor unit

The 12 volt electric motor is directly coupled through a small tongue and slot coupling to the pump.

The pump comprises three radial plungers, each being spring-loaded and reciprocating in its own liner. The plungers are operated by a central camshaft through a concentric bearing ring (*see Fig. S72*).

Fluid entering the liner is forced past a spring-loaded disc valve into a common annulus in the end housing and out into the hydraulic circuit. The disc valves are the non-return type and prevent fluid flowing back through the pump.

Chapter 5

Solenoid valves

(see Fig. S69)

Two identical solenoid valves are fitted and are open in the 'rest', or de-energised, position. By energising (closing) the appropriate valve, fluid is directed to the rams so that they extend or retract as required.

A coil is fitted to one end of the valve body (see Fig. S73). When the coil is energised, it attracts the armature and valve assembly towards a pole piece in the end of the valve body, against the resistance of the spring. The cone of the valve is then in contact with the valve seat and prevents fluid flowing through the valve.

When the coil is de-energised, by releasing the hood operating switch, the spring in the armature returns it to its normal open position.

Hydraulic rams

(see Fig. S69)

Two identical rams are fitted and they operate on the differential double-acting principal.

To extend the rams, fluid is supplied to both sides of the piston and as the piston base area is greater than the annulus area the ram will extend.

To retract the rams, fluid is delivered to the annulus area only the base connection being open to the reservoir.

Relief valve

(see Fig. S69)

The function of the line relief valve is to control the maximum pressure allowable in the hydraulic system. The valve opens at 2 000 lb/sq. in. (140,62 kg/sq. cm.).

Excessive pressure in the system will cause the cone valve to move off its seating in the valve body against the resistance of the spring, and allow fluid to exhaust to the reservoir.

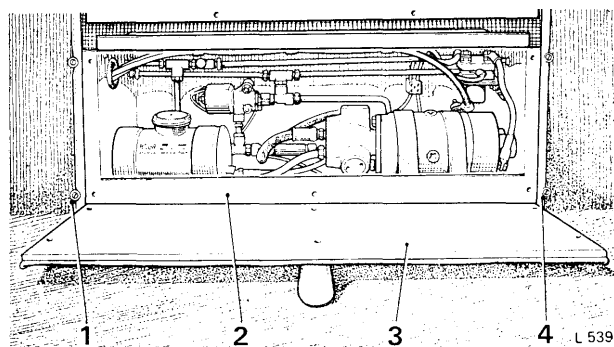


FIG. S70 ACCESS TO THE POWER PACK UNIT

- 1 Screw securing left-hand panel (4 off)
- 2 Power pack assembly
- 3 Centre access panel (shown removed)
- 4 Screw securing right-hand panel (4 off)

Hood folding mechanism

A system of links moving in prescribed arcs, enables the whole of the roof framework to fold down into the rear quarter.

The complicated part of the movement to arrange is the raising of the front part of the hood and the 'breaking' of the pivot joint in the side cantrail over the door windows when the system is operated to lower the hood. This movement is governed by a control link in the quarter behind the trim panel, operating through leverage on a triangle of links in the first cantrail joint. If any of these components become damaged or strained resulting in mis-alignment, the hood will not move properly and will possibly 'jam' preventing the hood from opening or closing.

Alternatively, the pivot points in any part of the folding mechanism may become dry through lack of lubrication creating undue pressure in the hydraulic system and causing the relief valve to open. Refer to Hood folding mechanism – Fault diagnosis, on Page S78 and also the Fault Diagnosis chart at the end of this Section for possible causes of trouble and the action to be taken.

SERVICING

Hydraulic components

Faulty units in the hydraulic system should be replaced on a service exchange basis and not dismantled for repair. However, in the event of urgent attention being required further information in addition to the removal and fitting procedure is given.

Hood mechanism

If the mechanical linkage in the hood folding mechanism becomes damaged or strained out of alignment it may be possible to rectify by following the instructions on Page S78 under Hood folding mechanism – Fault diagnosis. In certain cases, however, it may be necessary to replace the whole mechanical framework of the hood. This involves removing not only the head lining and the Everflex hood but also the 'wiggling' (i.e. the hair padding between the head lining and the hood). Fitting the 'wiggling' to retain the smooth contour of the hood is a highly specialised operation and this should be borne in mind if replacing the whole framework of the hood is contemplated.

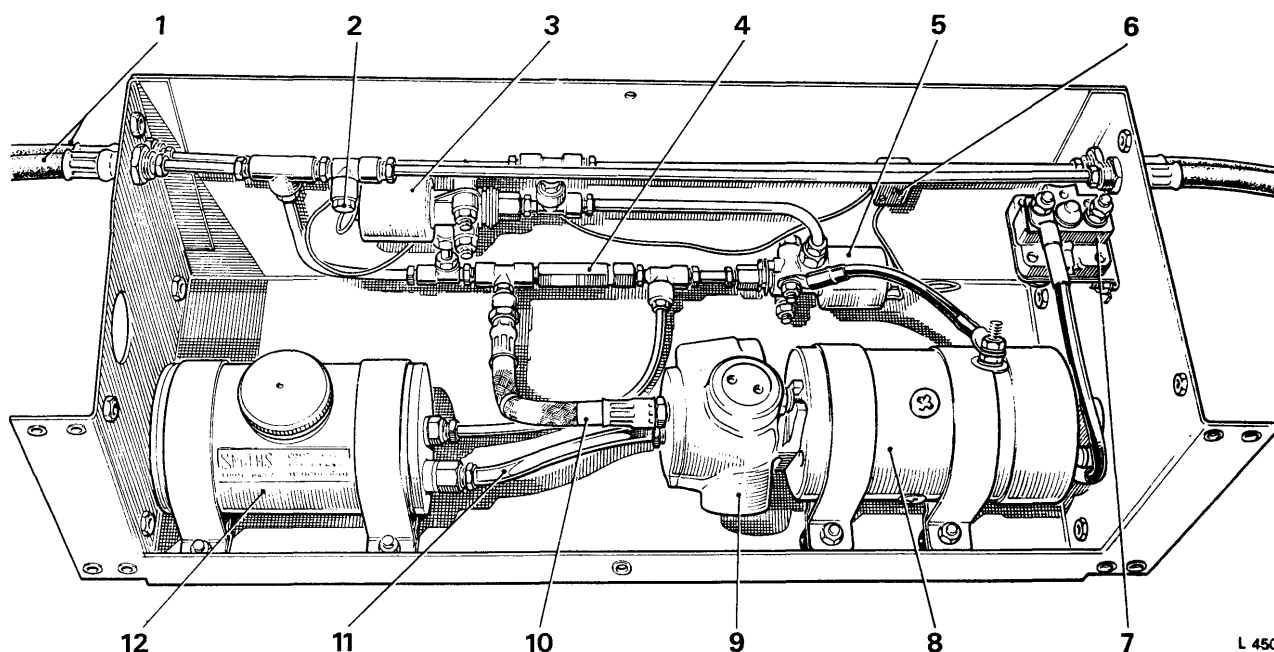


FIG. S71 COMPONENTS IN THE POWER PACK UNIT

- | | | |
|--------------------------|-----------------------------|--------------------|
| 1 Hoses to left-hand ram | 5 'Down' solenoid valve | 9 Hydraulic pump |
| 2 Test connection | 6 Electrical junction block | 10 Flexible hose |
| 3 'Up' solenoid valve | 7 Motor solenoid switch | 11 Nylon tube |
| 4 Relief valve | 8 Pump motor | 12 Fluid reservoir |

Fluid reservoir—To remove

1. Lower the hood as described on Page S69.
2. Remove the carpet from the luggage compartment floor.
3. Remove the six screws securing the centre trim panel in the forward section of the luggage compartment (see Fig. S70).
4. Disconnect the flexible pipe at the 'Tee' junction (see Fig. S71) and place the free end of the pipe in a suitable container. Blank off the open end of the 'Tee' connection.
5. Operate the hood switch to pump all the fluid out of the reservoir.
6. Disconnect the battery leads.
7. Remove the screws securing the two side panels in the forward section of the luggage compartment.
8. Remove the four 2 B.A. setscrews on each side of the power pack box which secure the box to the car body.
9. Carefully draw the power pack assembly into the luggage compartment.
10. Disconnect the fluid supply and return pipes from the reservoir. Blank off the open ends of the hydraulic pipes to prevent ingress of dirt.
11. Remove the four nuts and bolts securing the fluid reservoir retaining straps to the power pack box; remove the reservoir and retaining straps.

Fluid reservoir—To fit

To fit the reservoir reverse the procedure given for removal noting the following points.

1. After fitting the battery leads fill the reservoir with fresh approved fluid.
2. Operate the hood switch intermittently for about ten seconds to purge all air from the system, then operate the switch normally several times to ensure that the hood opens and closes correctly and that fluid does not leak from the pipe connections.
3. Finally, check the level of fluid in the reservoir and top-up to the 'FULL' mark on the dipstick if necessary.

Fluid filter—To remove

1. Remove the centre trim panel in the front of the luggage compartment and drain the fluid from the reservoir (see *Fluid Reservoir - To remove, Operations 1 to 5 inclusive*).
2. Disconnect the nylon outlet tube from the hexagonal outlet connection on the reservoir (see Fig. S71).
3. Unscrew the hexagon outlet connection from the reservoir and remove together with the integral filter tube.

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Fluid filter—To fit

To fit the filter, reverse the procedure given for removal noting the following point.

1. Before fitting the power pack access panel connect the battery leads and carry out the reservoir filling procedure described under Fluid reservoir – To fit, Operations 1 to 3 inclusive.

Hydraulic pump

The hydraulic pump should normally be changed for a service exchange unit, but in case urgent attention is required further details are given as follows.

The pump does not require regular attention as all moving parts are continually immersed in hydraulic fluid. Except through oil seal failure trouble should not be experienced with the camshaft other than normal operational wear. If, however, a seizure does occur at the camshaft, the camshaft and bearing ring must be renewed as a set.

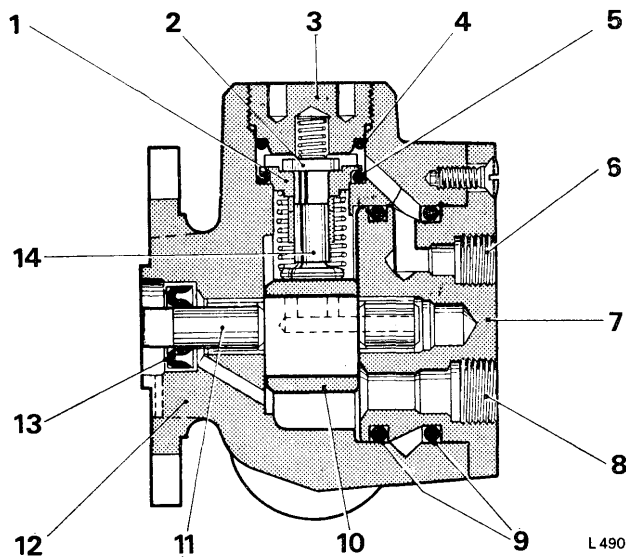


FIG. S72 SECTIONAL VIEW OF THE PUMP

- 1 Liner
- 2 Disc valve
- 3 Cylinder plug
- 4 'O' ring—plug
- 5 'O' ring—liner
- 6 High pressure fluid outlet
- 7 End cover assembly
- 8 Fluid inlet from reservoir
- 9 'O' rings—end cover
- 10 Bearing ring
- 11 Camshaft
- 12 Pump body
- 13 Shaft oil seal
- 14 Plunger

Unless trouble with the camshaft is definitely suspected attempts to dismantle the pump should not be made.

If a pump is dismantled, great care must be taken to maintain absolute cleanliness of all components and to avoid damage to the camshaft oil seal. Leakage from the camshaft oil seal will necessitate renewal of the pump.

All dismantled metal parts must be cleaned with thinners or a similar fluid and all interior components must be smeared with clean approved fluid before assembly.

When removing a pump plunger, always retain each plunger with its respective liner (*see Fig. S72*). Never fit a new plunger in an old liner or vice versa. When necessary renew them as a set together with a new disc valve.

If after prolonged use a disc valve becomes 'dished' or embedded with particles of swarf, etc., it must be renewed.

Hydraulic pump—Fault diagnosis

A. Failure of the pump to hold pressure could be due to one or more of the following causes.

(i) **Leakage at the disc valves.**

Remove the cylinder plugs and examine the valves and seals for dishing or wear; renew the valve if necessary.

(ii) **Leakage at the 'O' rings.**

Remove the 'O' rings and examine for damage; renew 'O' rings if necessary.

(iii) **Leak under liners.**

Remove the liner and examine the sealing faces between the liner and pump body for wear. Fit a new liner if necessary or renew the pump.

B. An external leakage of fluid could be due to either of the following causes.

(i) **Leakage from the 'O' rings.**

If leakage is from a cylinder plug, remove the plug; renew the 'O' ring and also the plug if necessary.

If the leakage is from the end housing, remove the housing and renew the 'O' rings.

(ii) **Leakage from the camshaft oil seal.**

A leakage past the camshaft oil seal will necessitate renewal of the pump.

C. Failure of the pump to deliver maximum pressure although operating at maximum speed could be due to one or more of the following causes.

(i) **One or more of the plungers being seized in the liner bore.**

(ii) **A broken plunger return spring.**

(iii) **Leakage at one or more of the disc valves.**

In the case of (i), (ii) or (iii), remove the cylinder plugs and renew components as necessary.

(iv) **Seizure of the cam bearing.**

If the cam bearing is found to be seized remove the camshaft and renew the camshaft and bearing ring as a set.

D. If the pump overheats or becomes noisy the cause may be due to either of the following causes.

In either case the pump must first be removed from the motor.

(i) **A worn or damaged tongue and slot coupling.**

If the coupling is found to be worn or damaged, renew the coupling. Also check the mating tongue and slot on the pump motor and the pump for wear or damage; renew either or both units if necessary.

(ii) **Seizure of the drive shaft.**

The drive shaft should rotate freely when the drive end is turned with the aid of pliers, if the pump shaft will not rotate freely (with the aid of pliers), dismantle the pump and examine the journal bearing bushes; renew the pump body or end housing, if the bushes are damaged or severely worn. Also, examine the cam ring (*see Fig. S72, item 10*) and renew if scored or worn.

E. A continuous delivery of foamy fluid indicates that air is being drawn into the pump body. Check all inlet pipe connections for tightness and if the fault persists, examine the pump shaft oil seal for leakage. If the seal is leaking, fit a new pump.

Hydraulic pump—To remove

1. Disconnect the battery leads.
2. Remove the six screws securing the centre trim panel in the forward section of the luggage compartment (*see Fig. S70*); remove the panel.
3. Disconnect the nylon tube and flexible hose from the pump (*see Fig. S71*) and blank off the open ends to prevent loss of fluid and ingress of dirt.
4. Remove the two setscrews securing the pump to the electric motor; remove the pump, retaining the coupling. Note the relative position of the pump to the motor to ensure correct assembly.

If difficulty is experienced in gaining access to the lower pump setscrew, remove the four nuts securing the pump motor retaining straps (*see Fig. S71*), disconnect the electrical cables from the motor and remove the pump and motor together. Note the position of the cables to ensure correct assembly.

To fit hydraulic pump to motor

1. Fit the coupling into the drive end of the motor armature shaft.
2. Pack the coupling with grease.
3. Locate the spigot of the pump in to the motor end plate.
4. Position the pump on the motor and rotate the pump until the slots in the flange are in line with the tapped holes of the motor end plate.
5. Carefully remove the pump from the motor without rotating the armature shaft.
6. Screw one setscrew complete with a plain and a spring washer two or three threads into the motor end plate.
7. Locate the flange of the pump under the plain washer.
8. Fit the remaining setscrew complete with a spring and plain washer.
9. Carefully tighten each setscrew in turn ensuring that the pump spigot is located in the motor.

Hydraulic pump—To fit

To fit the pump, reverse the procedure given for removal noting the following point.

1. Before fitting the power pack access panel, top-up the fluid reservoir with approved fluid and test the system as described on Page S73 (*see Fluid reservoir – To fit, Operations 1 to 3 inclusive*).

Solenoid valve—Fault diagnosis

A. Complete failure of the valve to operate may be due to an electrical fault. The wiring, switches and solenoid coils should therefore be checked for continuity (*see Chapter M – Electrical System*).

B. If a mechanical fault is suspected check that the solenoid valve is being energised, movement inside the valve can be felt when the hood switch is operated.

Note The lead to the pump motor must be disconnected while this test is being carried out.

C. Failure of the valve to release (open) could be due to the bobbin being jammed (*see Fig. S73*). Dismantle the valve and examine; check that the armature release spring is free.

D. Failure of the valve to hold pressure may be due to a damaged valve or valve seat (*see Fig. S73*). To remedy this, remove the valve and inspect the valve seat for score marks; renew one or both components if necessary.

E. Leakage of fluid past the coil casing or the valve seat adjuster could be due to damaged 'O' rings. Dismantle the valve and fit new 'O' rings.

Chapter S

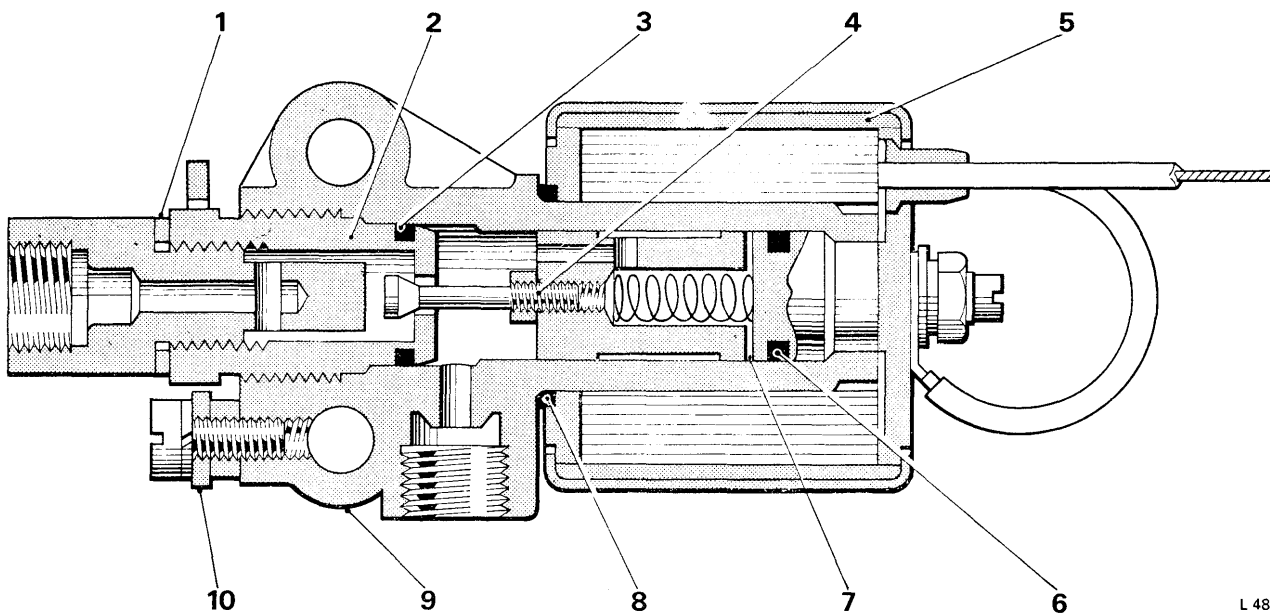


FIG. S73 SECTIONAL VIEW OF A SOLENOID VALVE

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- | | | |
|-----------------------|-----------------------|------------------------|
| 1 Sealing washer | 4 Valve | 8 'O' ring—coil |
| 2 Valve seat adjuster | 5 Coil assembly | 9 Valve body |
| 3 'O' ring—adjuster | 6 'O' ring—pole piece | 10 Lock plate—adjuster |
| | 7 Air gap | |

Solenoid valve—To remove

The removal procedure is identical for both valves.

1. Disconnect the battery leads.
2. Remove the six screws securing the centre trim panel in the luggage compartment (see Fig. S70); remove the panel.
3. Disconnect the appropriate electrical lead from the junction block (see Fig. S71).
4. Disconnect the two hydraulic pipes from the solenoid valve and blank off the open ends of the pipes.
5. Remove the two nuts and washers securing the valve to the bolts in the power pack casing, remove the valve.

Note On early cars it will be necessary to draw the power pack assembly into the luggage compartment (see Fluid reservoir – To remove, Operations 7 to 10 inclusive) as the valve securing bolts on these cars are not fitted with lock-nuts as they are on later cars.

Solenoid valve—To fit

To fit the solenoid valve, reverse the procedure given for removal noting the following.

1. Before fitting the centre trim panel, carry out the

filling and topping-up procedure described on Page S73 (see Fluid reservoir – To fit, Operations 1 to 3 inclusive).

Relief valve—To remove

1. Disconnect the battery leads.
2. Remove the centre trim panel in the luggage compartment.
3. Disconnect the hydraulic pipe from each end of the valve and blank off the open ends of the pipes.
4. Remove the relief valve.

Relief valve—To dismantle
(see Fig. S74)

Because the valve is not externally adjustable, it is not advisable to dismantle this unit unless a hand pump and pressure gauge is available. If the necessary equipment is available proceed as follows.

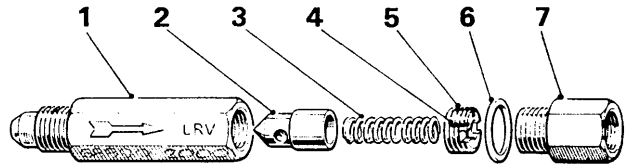
1. Unscrew the hexagon adaptor from the valve body.
2. Using a suitable screwdriver remove the threaded internal adjuster from inside the relief valve body; remove the pressure spring and cone-seated valve.

Note Nylon strips, inset into the threads of the adjuster, provide a self-locking effect.

Relief valve—To assemble and set

Clean all parts with thinners or a similar fluid prior to assembly then proceed as follows.

1. Ensure that the valve and seat are clean and undamaged; renew parts as necessary.
2. Fit the valve, spring and adjuster into the valve body, ensuring that the spring is located correctly in the valve and the adjuster.
3. Using a screwdriver, screw the adjuster in as far as possible then unscrew for 3 or 4 turns.
4. Connect a hand pump and gauge to the cone-shaped end of the valve body, holding the open end of the valve over the supply tank.
5. Apply pressure and screw the threaded adjuster in or out until a pressure of 2 000 lb/sq. in. (140,62 kg/sq. cm.) is required to open the valve.
6. Remove the hand pump and fit the hexagon adaptor to the valve body using a new sealing washer.



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FIG. S74 EXPLODED VIEW OF THE RELIEF VALVE

- 1 Valve body
- 2 Cone valve
- 3 Spring
- 4 Adjusting piece
- 5 Nylon locking strip
- 6 Washer
- 7 Adaptor

ing the rear seat cushion, seat backrest and the main quarter trim panel. If a ram is faulty a replacement unit should be fitted, but if a ram is dismantled, extreme care must be taken to prevent damage occurring to the hard chrome finish on the ram piston.

Relief valve—To fit

To fit the relief valve, reverse the procedure given for removal noting the following.

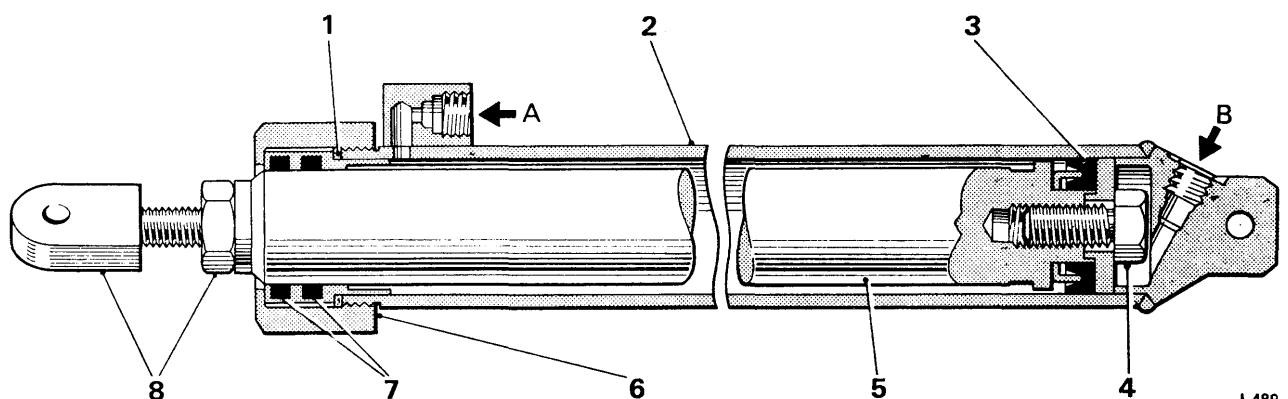
1. Before fitting the centre trim panel, top-up the fluid reservoir and test the hydraulic system as described on Page S73 (see *Fluid reservoir—To fit, Operations 1 to 3 inclusive*).

Hydraulic rams

The two hydraulic rams are situated one in each quarter and are connected to the power pack assembly by flexible hoses. Access to a ram is gained by remov-

Hydraulic ram—Fault diagnosis

- A. Failure of a ram to retract may be due to a faulty oil seal. Dismantle the ram and fit a new seal.
- B. Leakage of fluid past the threads of the bearing retainer (see Fig. S75) would be due to a faulty sealing washer. Remove the bearing retainer and fit a new sealing washer.
- C. Leakage of fluid past the piston and bearing would be due to a faulty 'O' ring. Dismantle the ram sufficiently to gain access to the 'O' rings and renew the 'O' rings.



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FIG. S75 SECTIONAL VIEW OF A HYDRAULIC RAM

- | | | |
|--|--|--|
| <p>A Fluid connection to annulus side of ram</p> <p>B Fluid connection to base of piston</p> | <p>1 Sealing washer—bearing retainer</p> <p>2 Ram body</p> <p>3 Piston seal</p> <p>4 Gland support screw</p> | <p>5 Piston</p> <p>6 Bearing retainer</p> <p>7 'O' rings—piston</p> <p>8 Eye bolt and lock-nut</p> |
|--|--|--|

Chapter 5

Hydraulic ram—To remove

The removal procedure for each ram is identical.

1. Lower the hood as described on Page S69.
2. Disconnect the battery leads.
3. Remove the rear seat cushion and backrest (see Section S2, *Rear seat – To remove*).
4. Remove the rear quarter trim panel (see Section S5, *Quarter window – To remove, Operations 4 to 9 inclusive*).
5. Disconnect the two flexible hoses from the ram and blank off the open ends of the hoses.
6. Remove the split pin from the nut and remove the nut and bolt securing the ram eye bolt to the head links of the folding mechanism.
7. Remove the bolt and nut securing the ram to the car body; remove the ram.

Hydraulic ram—To fit

To fit a ram reverse the procedure given for removal noting the following points.

1. Before fitting the quarter panel and the power unit access panel, top-up the fluid reservoir with approved fluid and test the system as described on Page S73 (see *Fluid reservoir – To fit, Operations 1 to 3 inclusive*).
2. If the hood ram has been renewed and the hood will not raise fully when the system is operated, proceed as follows.

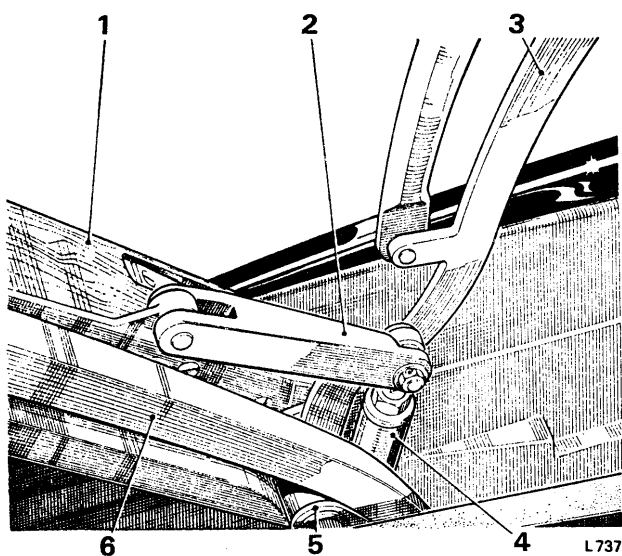


FIG. S76 HOOD LINKAGE TO RAM

- 1 Hood pillar
- 2 Link—ram to main headplate
- 3 Rear cross-member
- 4 Ram
- 5 Main mounting bracket
- 6 Main link—bracket to cantrail

Remove the bolt securing the ram eye bolt to the head link. Secure the hood to the windscreen upper rail with the safety catches. Slacken the bolt and nut securing the ram to the body; do not remove the bolt. Slacken the ram eye bolt lock-nut (see Fig. S76) and adjust the length of the eye bolt until the bolt securing the eye bolt to the head link can be fitted; fit and tighten the bolt. Tighten the eye bolt lock-nut and the bolt securing the ram to the car body.

Hood folding mechanism—Fault diagnosis

The main reasons for the folding framework not operating correctly are damage, mis-alignment of the linkage and lack of lubrication at the pivot points.

A. Typical evidence of slight mis-alignment is when the front of the roof will lift approximately 4 to 6 inches (10 to 15 cm.) but the side cantrail joints will not 'break' and the system then stalls with the hydraulic pump exhausting through the relief valve.

B. If the hood motor is heard to be operating when the switch is pressed but the hood will not move, or will only move a few inches, then the linkage should be checked as follows before investigating a possible hydraulic fault.

- (i) Move the hood manually to the half-way position by exerting a steady pressure on the hood side frames at the forward end.
- (ii) Pull back the hood and headlining and visually check the front part of the mechanical linkage for a broken pivot bolt or a broken or strained link.
- (iii) Remove the wood finishers from the quarter pillars and pull back the head lining in the quarters. Visually check the rear part of the mechanical linkage for a broken bolt or a broken or strained link.
- (iv) Lubricate all pivot points with oil or light grease, ensuring that this does not get onto the hood or head lining.
- (v) If a pivot bolt or link is found to be broken it must be renewed.
- (vi) The alignment of the various components of the folding mechanism has to be extremely accurate if the hood is to operate correctly. It is possible for damage to occur to the folding mechanism, putting it out of alignment, if a heavy weight is placed on the hood when in either the raised or lowered position (i.e. someone standing or sitting on the hood). If damage has occurred, putting the pivot points out of alignment, it will be extremely difficult to reset the links and visually re-align them to restore them to their correct dimensions. In the event of not being able to obtain the correct alignment the whole side assembly of the hood, on one or both sides as necessary, will have to be replaced as follows.

Hood folding mechanism side assembly**—To remove
(see Fig. S76)**

The removal procedure is the same for both side assemblies; if one side only is damaged it will only be necessary to remove that side.

1. Remove the hood outer covering (*refer to Section S10 – Miscellaneous Trim*).
2. Remove the rear seat cushion and back rest (*refer to Section S2*).
3. Remove the quarter panel and the wooden finishers from around the rear quarter window.
4. Remove the wood finisher from the hood pillar and detach the head lining from the pillar.
5. Detach the head lining from the hood peak rail sufficiently to gain access to the screws securing the peak rail to the cantrail; remove these screws and detach the cantrail from the hood peak rail.
6. Disconnect the hood cross-members from the cantrail.
7. Remove the bolt securing the hood rear cross-member to the main head plate on the main mounting bracket (*see Fig. S76*).
8. Remove the split pin from the nut and remove the nut and bolt securing the link to the ram eye bolt (*see Fig. S76*).
9. Remove the bolts securing the main hood mechanism mounting brackets to the quarter panels (*see Fig. S76*); remove the side assembly.

Hood folding mechanism side assembly**—To fit**

To fit the new side assembly reverse the procedure given for removal noting the following points.

1. Lubricate the pivot points after assembly.
2. The damaged hood mechanism which has been replaced because it is out of alignment can be returned to the factory for repair and re-use as a service replacement unit.

MAINTENANCE**Hydraulic system**

Periodically, remove and clean the filter in the fluid reservoir outlet connection (*see Fluid filter – To remove, on Page S73*).

Every 24 000 miles (40 000 km.) or 2 years whichever is the earlier, fully lower the hood then check the level of fluid in the reservoir. Top-up if necessary to the 'FULL' mark on the dipstick with an approved fluid (*see Chapter D, Section D4, Approved Lubricants*).

Under no circumstances must a castor oil based fluid (i.e. brake fluid, etc.) be used in the hydraulic system.

Folding hood mechanism

Regularly, clean all accessible head pivot points and lubricate with oil or light grease with the head partly open. Care must be taken to ensure that the head fitting is left free from excess grease or oil to prevent staining the head lining.

FAULT DIAGNOSIS-GENERAL

SYMPTOM	POSSIBLE CAUSE	ACTION
1. Electro-hydraulic equipment not functioning when the hood switch is operated	<ol style="list-style-type: none"> 1. (a) The battery voltage has fallen below 9 volts (b) The solenoid switch for the pump motor is faulty (c) Faulty hood operating switch (d) Faulty fuse (e) Faulty electric motor (f) Break in electrical wiring (g) Incorrectly tightened or dirty electrical connections 	<ol style="list-style-type: none"> 1. (a) Recharge the battery (<i>see Chapter M – Electrical System</i>) (b) Check the solenoid windings and switch contacts for continuity (<i>see Chapter M – Electrical System</i>) (c) Check the switch contact for continuity (<i>see Chapter M – Electrical System</i>) (d) Renew fuse if faulty (<i>see Chapter M – Electrical System</i>) (e) Check and repair or renew motor if necessary (<i>see Chapter M – Electrical System</i>) (f) Check wiring for continuity and rectify as necessary (<i>see Chapter M – Electrical System</i>) (g) Check connections, clean and tighten as necessary (<i>see Chapter M – Electrical System</i>)

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SYMPTOM	POSSIBLE CAUSE	ACTION
<p>2. The power unit is working correctly but the hood will not open or close</p>	<p>2. (a) Broken pivot pin or link in the hood folding mechanism, pivot points binding or seized due to mis-alignment or lack of lubrication</p> <p>(b) Both solenoid valves are not operating</p> <p>(c) Lack of hydraulic fluid</p>	<p>2. (a) Check the mechanism and rectify as necessary (<i>see Hood folding mechanism – Fault diagnosis, on Page S78</i>)</p> <p>(b) Check the wiring, switch and solenoid coil for continuity (<i>see Chapter M – Electrical System</i>) If correct, check solenoid valves for mechanical fault (<i>refer to Solenoid valve – Fault diagnosis, on Page S75</i>)</p> <p>(c) Check the level of fluid in the reservoir and top-up if necessary (<i>see Fluid reservoir – To fit, on Page S73</i>) If topping-up is required check also for fluid leaks in system and rectify as necessary</p>
<p>3. The hood will not open although the pump is working</p>	<p>3. (a) Fault in the hood folding mechanism (<i>see 2(a)</i>)</p> <p>(b) The 'UP' solenoid valve is not closing</p> <p>(c) The piston gland seal in a hood ram is leaking</p> <p>(d) Lack of hydraulic fluid</p>	<p>3. (a) Same actions as noted under 2(a)</p> <p>(b) Check the wiring, switch contacts and solenoid valve coil for continuity and repair or renew components as necessary (<i>see Chapter M – Electrical System</i>) If a mechanical fault is suspected, check that the solenoid valve is being energised (<i>see Solenoid valve – Fault diagnosis, on Page S75</i>) If the valve is faulty, renew or repair</p> <p>(c) Renew ram or fit new seal (<i>see Hydraulic ram – Fault diagnosis, on Page S77</i>)</p> <p>(d) Same action as noted for 2(c)</p>
<p>4. The hood will not close although the pump is working</p>	<p>4. (a) Fault in the hood folding mechanism (<i>see 2(a)</i>)</p> <p>(b) The 'DOWN' solenoid valve is not closing</p> <p>(c) The piston gland seal in a hood ram is leaking</p> <p>(d) Lack of hydraulic fluid</p>	<p>4. (a) Same action as noted for 2(a)</p> <p>(b) See action noted under 3 (b) for the 'UP' solenoid valve and repeat for the 'DOWN' valve</p> <p>(c) Same action as noted for 3(c)</p> <p>(d) Same action as noted for 2(c)</p>
<p>5. The hood opens and closes very slowly</p>	<p>5. (a) Fault in the hood folding mechanism (<i>see 2(a)</i>)</p> <p>(b) Faulty pump</p> <p>(c) The relief valve is leaking</p> <p>(d) The filter in the fluid reservoir outlet connection requires cleaning</p>	<p>5. (a) Same action as noted for 2(a)</p> <p>(b) Renew or repair pump (<i>see Hydraulic pump – Fault diagnosis, on Page S74</i>)</p> <p>(c) Remove and dismantle the relief valve as described on Page S76. Check that the cone valve and valve seat are clean and free from damage. Renew or repair valve if faulty Check that the valve blows off at the correct pressure and reset if necessary (<i>see Relief valve – To assemble and set, on Page S77</i>)</p> <p>(d) Remove and clean the filter (<i>see Fluid filter – To remove, on Page S73</i>)</p>

Section S8

ACCIDENT REPAIRS

General

Body repairing is a very specialised trade and under no circumstances should repairs be contemplated by an inexperienced person. This Section has been written to assist the specialist.

Before attempting to carry out any work on the body, time will be well spent estimating the extent of the damage and the section(s) requiring renewal. When estimating, reference to all the illustrations in this Section and to the Parts List, (Publication T.S.D.

2201) will be necessary to ensure that the damaged portion of the body can be repaired, also to familiarise oneself with the various parts available.

Usually, the majority of damage can be rectified without removing major units from the body, however, if the damage is extensive, the units should be removed as described in the appropriate Chapter of this Workshop Manual, e.g. reference should be made to Chapter H, Section H2 for removal of the engine and front sub-frame.

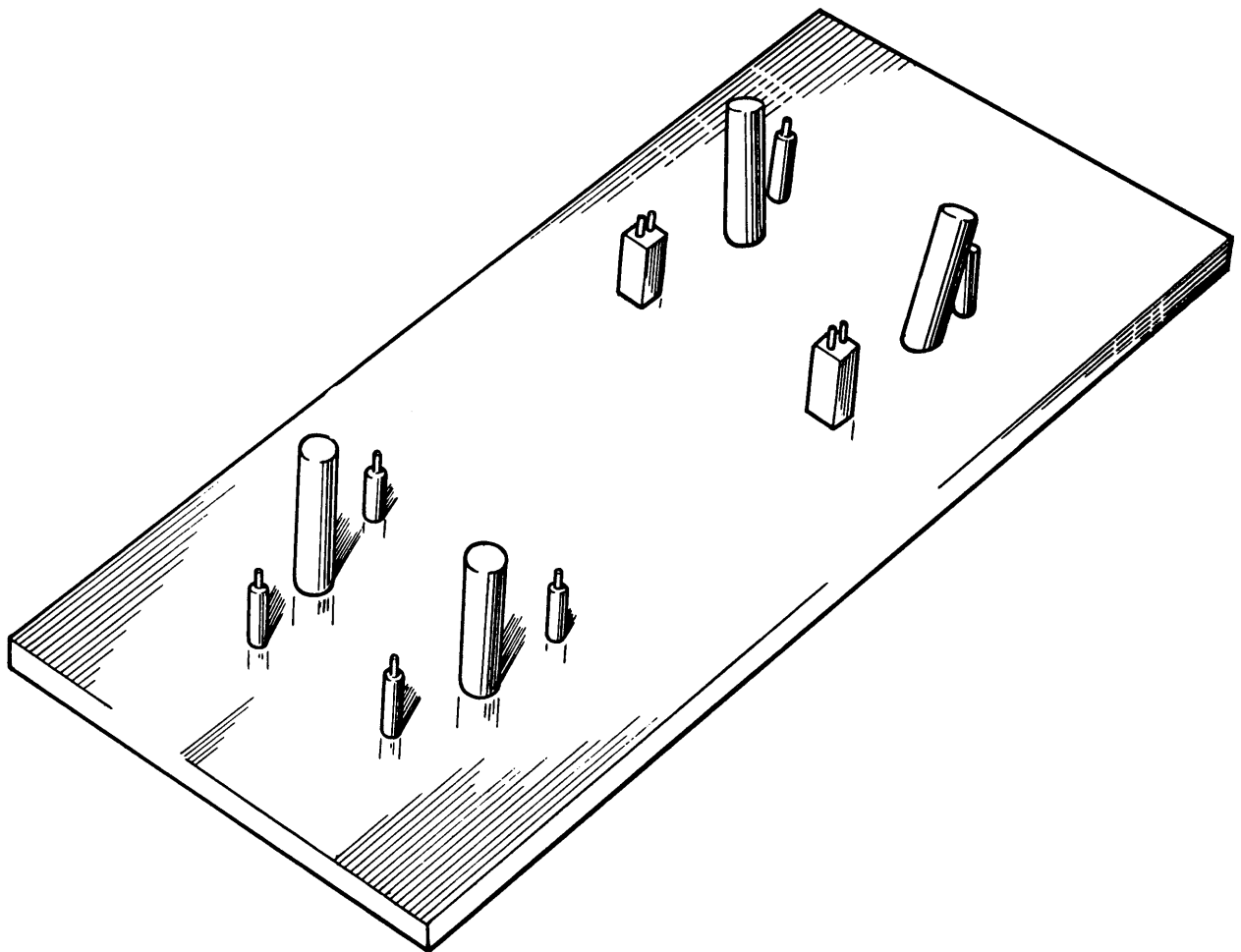
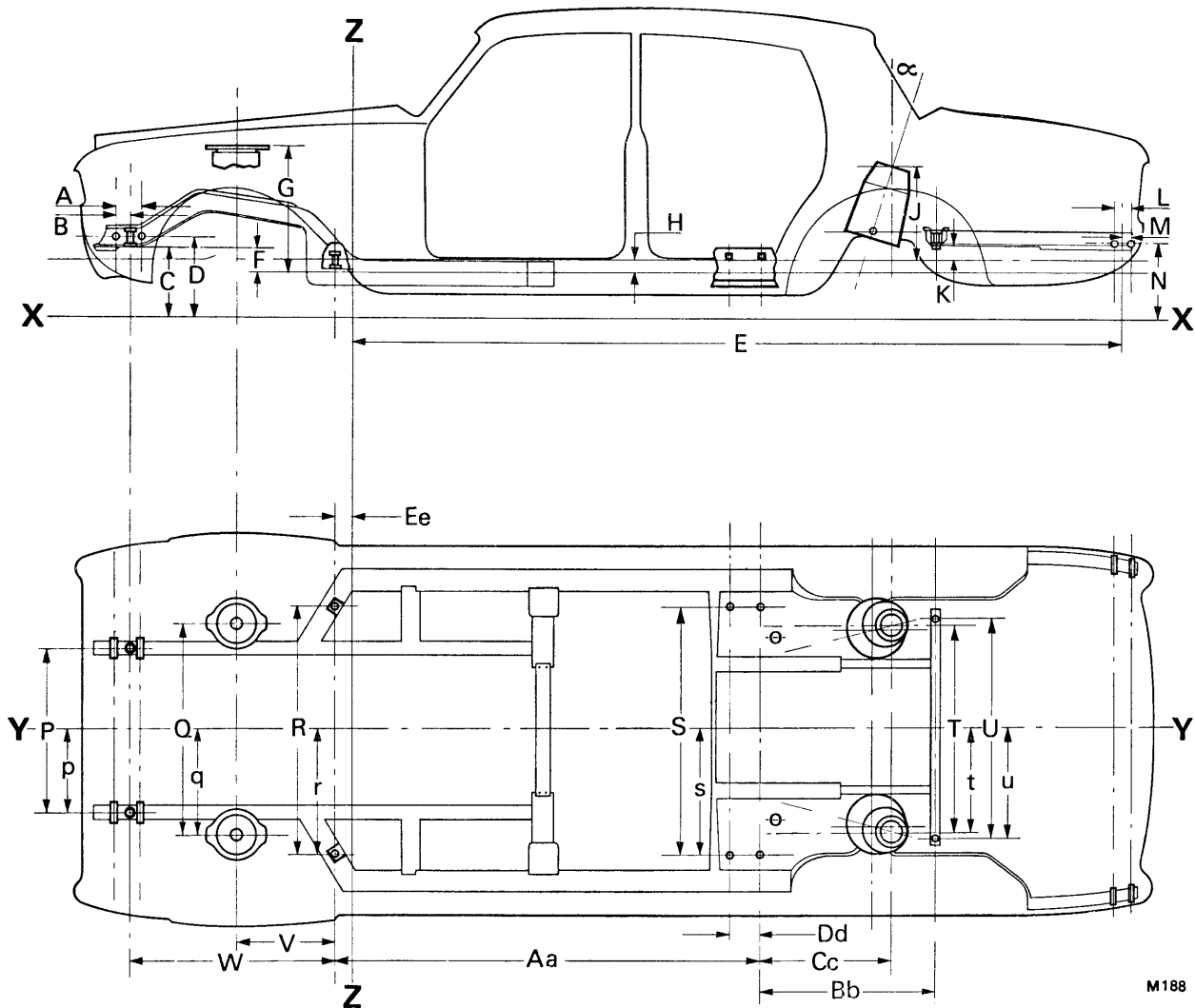


FIG. S77 SUGGESTED BODY MOUNTING FIXTURE

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FIG. S78 BODY MOUNTING POINT DIMENSIONS (4-Door Saloon and Long Wheelbase Cars)

A	4 ¹ / ₄ in. (10,80 cm.)	R	43 ¹³ / ₃₂ in. ± ¹ / ₁₆ in. (110,25 cm. ± 1,59 mm.)
B	2 ² / ₄ in. (6,15 cm.)	r	21 ⁴⁵ / ₆₄ in. ± ¹ / ₃₂ in. (55,13 cm. ± 0,79 mm.)
C	11 ¹³ / ₃₂ in. (28,97 cm.)	S	45 ³ / ₈ in. ± ¹ / ₁₆ in. (115,25 cm. ± 1,59 mm.)
D	12 ⁷ / ₃₂ in. (31,04 cm.)	s	22 ¹¹ / ₁₆ in. ± ¹ / ₃₂ in. (57,63 cm. ± 0,79 mm.)
E	{ 140 in. (356,60 cm.)—4-Door Saloon 144 in. (365,76 cm.)—Long Wheelbase Saloon	T	38 ¹ / ₈ in. ± ¹ / ₁₆ in. (96,84 cm. ± 1,59 mm.)
F	3 ¹ / ₂ in. ± ¹ / ₃₂ in. (8,97 cm. ± 0,79 mm.)	t	19 ¹ / ₁₆ in. ± ¹ / ₃₂ in. (48,42 cm. ± 0,79 mm.)
G	21 ⁵ / ₈ in. ± ¹ / ₃₂ in. (54,93 cm. ± 0,79 mm.)	U	39 in. ± ¹ / ₁₆ in. (99,06 cm. ± 1,59 mm.)
H	1 ¹ / ₄ in. ± ¹ / ₃₂ in. (3,18 cm. ± 0,79 mm.)	u	19 ¹ / ₂ in. ± ¹ / ₃₂ in. (49,53 cm. ± 0,79 mm.)
J	17 ¹³ / ₃₂ in. ± ¹ / ₃₂ in. (43,93 cm. ± 0,79 mm.)	V	18 ² / ₃₂ in. ± ¹ / ₁₆ in. (47,39 cm. ± 1,59 mm.)
K	3 ³⁵ / ₆₄ in. ± ¹ / ₃₂ in. (9,01 cm. ± 0,79 mm.)	W	37 ⁵³ / ₆₄ in. ± ¹ / ₁₆ in. (96,08 cm. ± 1,59 mm.)
L	4 ¹ / ₄ in. (10,80 cm.)	Aa	{ 77 ¹ / ₂ in. ± ¹ / ₁₆ in. (196,85 cm. ± 1,59 mm.) —4-Door Saloon 81 ¹ / ₂ in. ± ¹ / ₁₆ in. (207,01 cm. ± 1,59 mm.) —Long Wheelbase Saloon
M	1 ¹ / ₂ in. (3,18 cm.)	Bb	28 ¹⁵ / ₃₂ in. ± ¹ / ₁₆ in. (71,31 cm. ± 1,59 mm.)
N	13 ³¹ / ₆₄ in. (34,25 cm.)	Cc	22 ⁵⁹ / ₆₄ in. ± ¹ / ₁₆ in. (58,22 cm. ± 1,59 mm.)
P	31 in. ± ¹ / ₁₆ in. (78,74 cm. ± 1,59 mm.)	Dd	5 ¹ / ₁₆ in. ± ¹ / ₁₆ in. (14,76 cm. ± 1,59 mm.)
p	15 ¹ / ₂ in. ± ¹ / ₃₂ in. (39,37 cm. ± 0,79 mm.)	Ee	1 ¹¹ / ₃₂ in. (3,41 cm.)
Q	38 ³ / ₁₆ in. (97,00 cm.)	alpha	15° 40'
q	19 ³ / ₃₂ in. ± ¹ / ₃₂ in. (48,50 cm. ± 0,79 mm.)	theta	4° 40'

Dents and minor damage

Dents and minor damage to the outer skin should be rectified as follows.

1. Surround the area affected by damage with masking tape and felt.
2. Gain access to the inner side of the damaged

panel, e.g. in the case of the doors, remove the door trim, etc., as explained in Section S1 of this Chapter.

3. Using conventional hand tools, beat out the dents and other damage.

4. Using a suitable paint stripper (i.e. Synstrip or its equivalent) remove the paint from the damaged area.

5. Clean the damaged area then polish using emery paper.

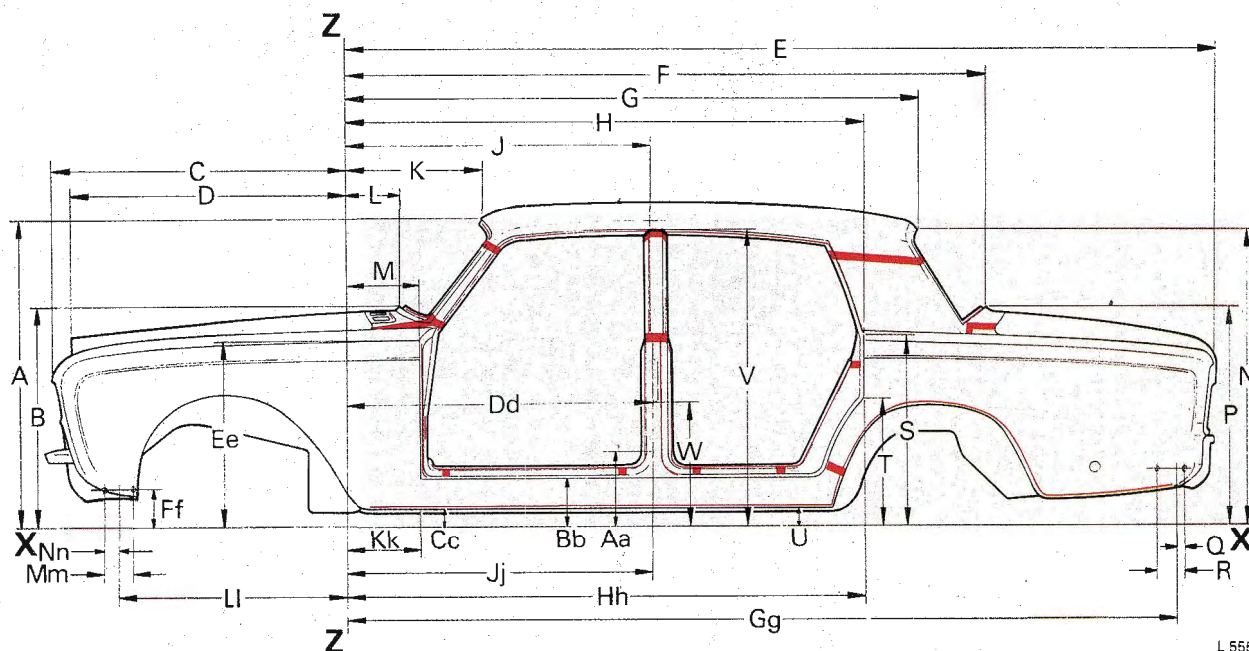


FIG. S79 SIDE ELEVATION OF BODY
(4-Door Saloon and Long Wheelbase Cars)

A	52 $\frac{17}{64}$ in. (132,76 cm.)	Q	1 $\frac{1}{4}$ in. (3,18 cm.)
B	37 $\frac{1}{16}$ in. (95,72 cm.)	R	4 $\frac{1}{4}$ in. (10,80 cm.)
C	48 $\frac{3}{16}$ in. (123,98 cm.)	S	33 $\frac{3}{4}$ in. (85,73 cm.)
D	46 in. (116,84 cm.)—to rear face of radiator shell	T	23 $\frac{9}{16}$ in. (59,85 cm.)
E	{ 145 $\frac{27}{32}$ in. (370,44 cm.)—4-Door Saloon 149 $\frac{27}{32}$ in. (383,60 cm.)—Long Wheelbase Saloon	U	3 $\frac{7}{8}$ in. (9,48 cm.)
F	{ 107 $\frac{13}{16}$ in. (273,84 cm.)—4-Door Saloon 111 $\frac{13}{16}$ in. (284,00 cm.)—Long Wheelbase Saloon	V	50 $\frac{37}{64}$ in. (128,14 cm.)
G	{ 95 $\frac{57}{64}$ in. (243,56 cm.)—4-Door Saloon 99 $\frac{57}{64}$ in. (253,26 cm.)—Long Wheelbase Saloon	W	22 $\frac{19}{64}$ in. (56,63 cm.)
H	{ 87 $\frac{7}{32}$ in. (221,54 cm.)—4-Door Saloon 91 $\frac{7}{32}$ in. (231,69 cm.)—Long Wheelbase Saloon	Aa	15 $\frac{3}{16}$ in. (38,58 cm.)
J	51 $\frac{1}{16}$ in. (129,70 cm.)	Bb	9 in. (22,86 cm.)
K	23 $\frac{3}{8}$ in. (59,37 cm.)	Cc	3 $\frac{7}{8}$ in. (9,84 cm.)
L	8 $\frac{9}{16}$ in. (20,68 cm.)	Dd	50 $\frac{21}{32}$ in. (128,67 cm.)
M	12 $\frac{5}{32}$ in. (32,46 cm.)	Ee	32 $\frac{1}{4}$ in. (81,92 cm.)
N	50 $\frac{43}{64}$ in. (128,71 cm.)	Ff	12 $\frac{7}{32}$ in. (32,64 cm.)
P	37 $\frac{9}{64}$ in. (94,34 cm.)	Gg	{ 140 in. (356,60 cm.)—4-Door Saloon 144 in. (365,76 cm.)—Long Wheelbase Saloon
		Hh	{ 87 $\frac{7}{32}$ in. (221,54 cm.)—4-Door Saloon 91 $\frac{7}{32}$ in. (231,69 cm.)—Long Wheelbase Saloon
		Jj	50 $\frac{29}{64}$ in. (128,15 cm.)
		Kk	12 $\frac{3}{4}$ in. (32,39 cm.)
		LI	39 $\frac{13}{64}$ in. (99,58 cm.)
		M	4 $\frac{1}{4}$ in. (10,80 cm.)
		Nn	2 $\frac{27}{64}$ in. (6,15 cm.)

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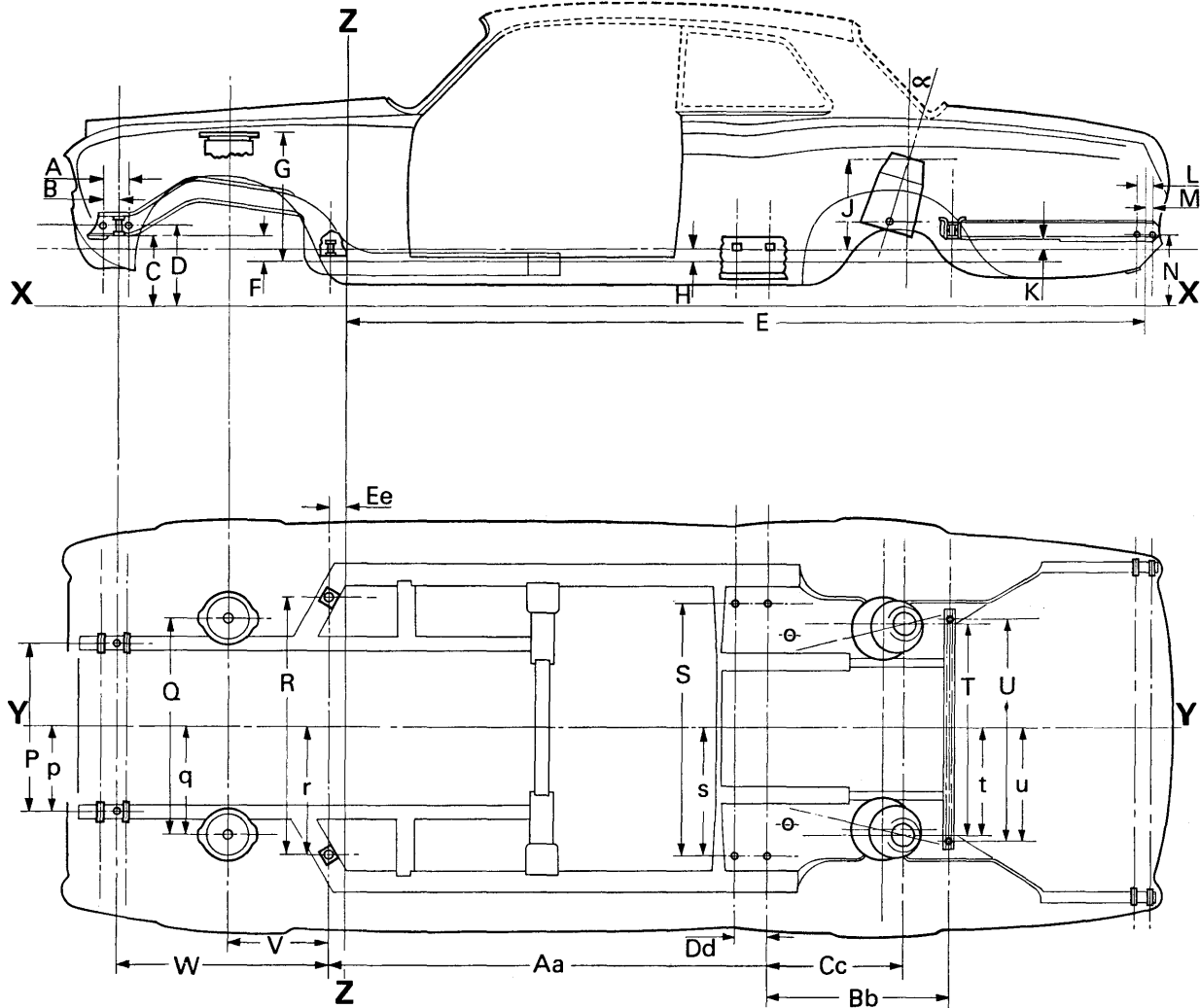


FIG. S80 BODY MOUNTING POINT DIMENSIONS

(2-Door Saloon and Convertible Cars)

A	4½ in. (10,80 cm.)	R	43½ in. ± 1/16 in. (110,25 cm. ± 1,59 mm.)
B	2¼ in. (6,15 cm.)	r	21¼ in. ± 1/32 in. (55,13 cm. ± 0,79 mm.)
C	11½ in. (28,97 cm.)	S	45½ in. ± 1/16 in. (115,25 cm. ± 1,59 mm.)
D	12¾ in. (31,04 cm.)	s	22¼ in. ± 1/32 in. (57,63 cm. ± 0,79 mm.)
E	140 in. (356,60 cm.)	T	38½ in. ± 1/16 in. (96,84 cm. ± 1,59 mm.)
F	3½ in. ± 1/32 in. (8,97 cm. ± 0,79 mm.)	t	19¼ in. ± 1/32 in. (48,42 cm. ± 0,79 mm.)
G	21⅝ in. ± 1/32 in. (54,93 cm. ± 0,79 mm.)	U	39 in. ± 1/16 in. (99,06 cm. ± 1,59 mm.)
H	1¼ in. ± 1/32 in. (3,18 cm. ± 0,79 mm.)	u	19 in. ± 1/32 in. (49,53 cm. ± 0,79 mm.)
J	17½ in. ± 1/32 in. (43,93 cm. ± 0,79 mm.)	V	18½ in. ± 1/16 in. (47,39 cm. ± 1,59 mm.)
K	3½ in. ± 1/32 in. (9,01 cm. ± 0,79 mm.)	W	37½ in. ± 1/16 in. (96,08 cm. ± 1,59 mm.)
L	4¼ in. (10,80 cm.)	Aa	77½ in. ± 1/16 in. (196,85 cm. ± 1,59 mm.)
M	1½ in. (3,18 cm.)	Bb	28½ in. ± 1/16 in. (72,31 cm. ± 1,59 mm.)
N	13¼ in. (34,25 cm.)	Cc	22½ in. ± 1/16 in. (58,22 cm. ± 1,59 mm.)
P	31 in. ± 1/16 in. (78,74 cm. ± 1,59 mm.)	Dd	5½ in. ± 1/16 in. (14,76 cm. ± 1,59 mm.)
p	15½ in. ± 1/32 in. (39,37 cm. ± 0,79 mm.)	Ee	1½ in. (3,41 cm.)
Q	38¾ in. (97,00 cm.)	α	15° 40'
q	19¾ in. ± 1/32 in. (48,50 cm. ± 0,79 mm.)	θ	4° 40'

6. Fill in the depressions using a suitable filler or body-solder; when using body-solder a raw linseed oil should be used as a lubricant. It should be borne in mind that body solder is not suitable for the doors, bonnet or boot lid as these are made from light alloy.

7. When the filler is dry, smooth off the surface using a draw file and sanding disc and finish with wet and dry abrasive paper.

8. Inspect the area under repair to ensure that the contours of the outer skin are followed perfectly and that there are no depressions or raised areas.

9. Paintspray the repaired area; prior to spraying, mask or remove the rubber seals and chromium strips, etc., to prevent over-spraying.

10. When carrying out paintwork rectification it may be necessary to place the car in a drying oven operating at high temperatures. At these temperatures the seals in the air conditioning system may adopt a permanent 'set' if the air conditioning controls are in the fully open or fully closed positions.

Therefore, before placing the car in a drying oven, carry out the following procedure.

- (i) Switch on the ignition.
- (ii) Pull the 'UPPER' and 'LOWER' heater switch controls out two notches from the closed position.

(iii) Turn the 'UPPER' and 'LOWER' heater switch controls clockwise two notches from the fresh air position.

(iv) Withdraw the control knob on the fascia adjacent to each circular outlet to fully open the flap in each outlet.

(v) Fully open the rectangular flap in the centre of the fascia, or in the centre console as applicable.

(vi) Fully open the flap in the driver's side scuttle wall, and also the flap in the passenger's side scuttle wall if fitted, by withdrawing the control knob(s) on the fascia.

(vii) Switch off the ignition.

Note Long Wheelbase cars with a centre division are fitted with duplicate heater switch controls in the front and rear compartments.

Therefore, when carrying out items (ii) and (iii) of the procedure on these cars, operate the heater switch controls that are energised, e.g. with the 'HEATER' change-over switch on the centre console panel in the position marked 'FRONT', operate the heater switch controls on the front compartment fascia.

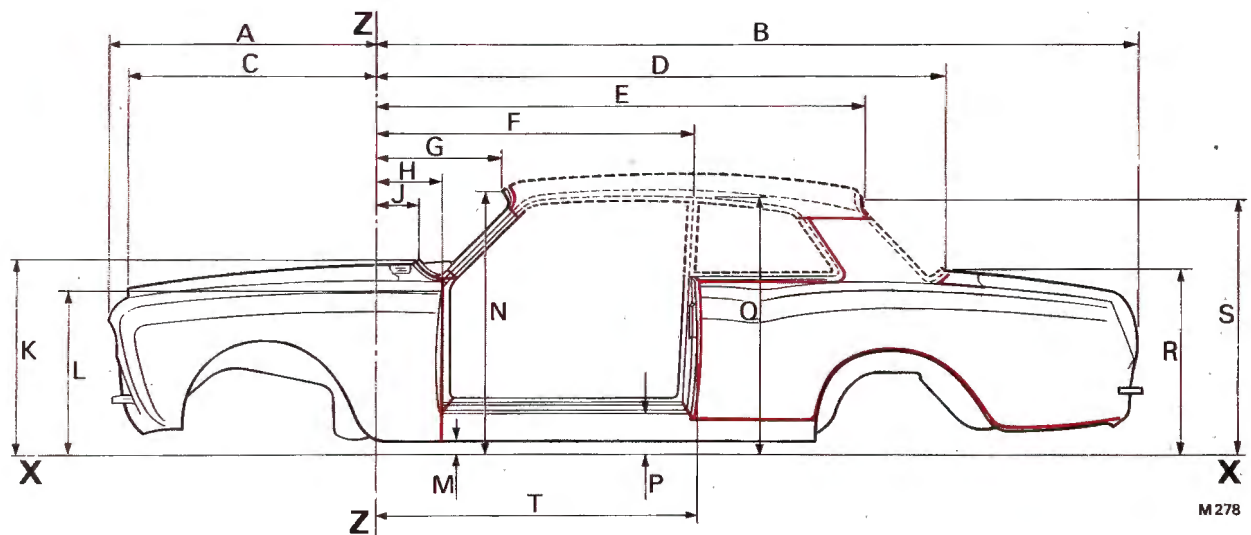
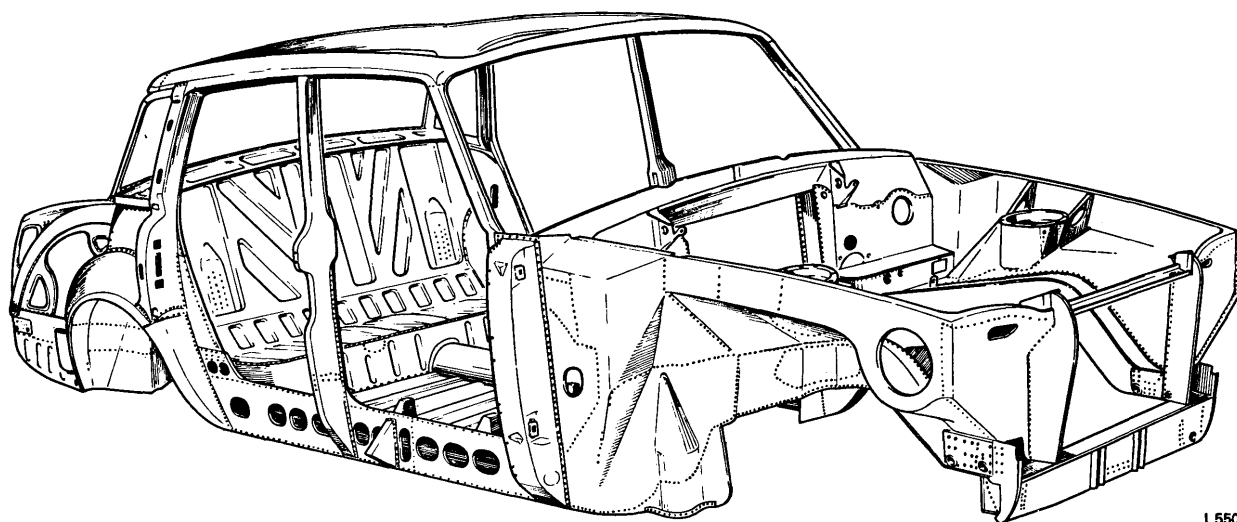


FIG. S81 SIDE ELEVATION OF BODY
(2-Door Saloon and Convertible Cars)

A	48 $\frac{1}{2}$ in. (126,30 cm.)
B	145 $\frac{1}{2}$ in. (380,68 cm.)
C	45 $\frac{3}{4}$ in. (116,20 cm.)
D	108 $\frac{3}{4}$ in. (275,67 cm.)
E	93 $\frac{1}{2}$ in. (237,49 cm.) — Saloon only
F	61 $\frac{3}{4}$ in. (156,85 cm.) — Saloon only
G	27 $\frac{3}{8}$ in. (63,18 cm.)
H	71 $\frac{1}{2}$ in. (20,16 cm.)
J	12 $\frac{7}{8}$ in. (32,70 cm.)

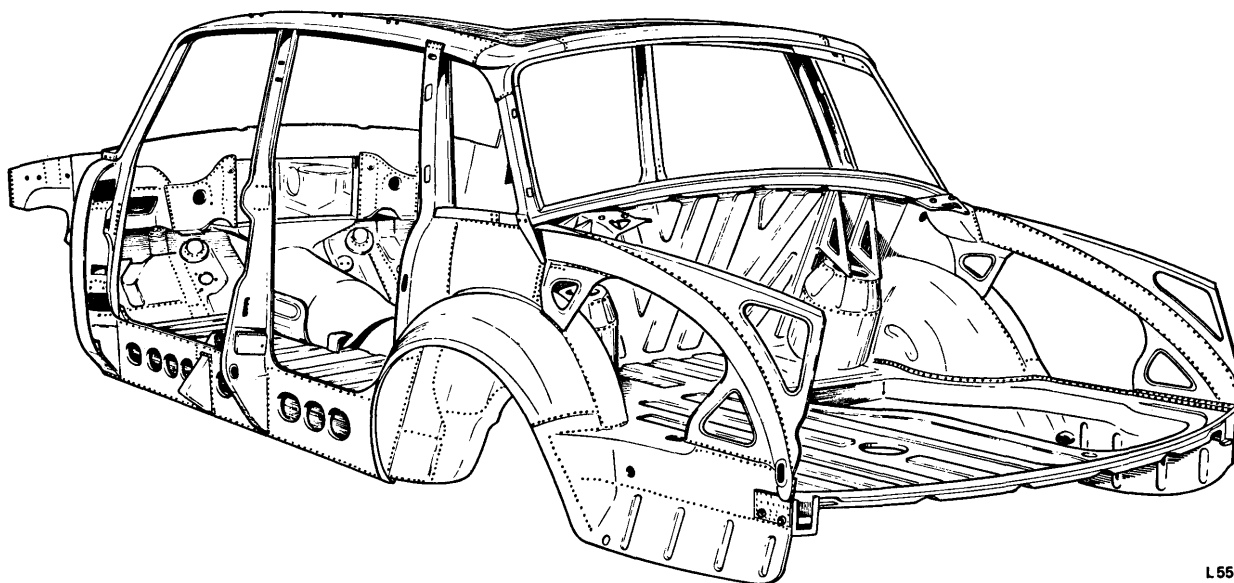
K	37 $\frac{3}{8}$ in. (94,46 cm.)
L	32 in. (81,28 cm.)
M	3 $\frac{7}{8}$ in. (9,84 cm.)
N	51 $\frac{1}{2}$ in. (130,65 cm.)
P	9 $\frac{1}{8}$ in. (23,17 cm.)
Q	49 $\frac{1}{2}$ in. (126,84 cm.) — Saloon only
R	36 $\frac{1}{8}$ in. (91,76 cm.)
S	50 $\frac{7}{8}$ in. (128,11 cm.) — Saloon only
T	61 $\frac{1}{8}$ in. (156,69 cm.)

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FIG. S82 THREE-QUARTER FRONT VIEW OF BODY (4-Door Saloon Cars)



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FIG. S83 THREE-QUARTER REAR VIEW OF BODY (4-Door Saloon Cars)

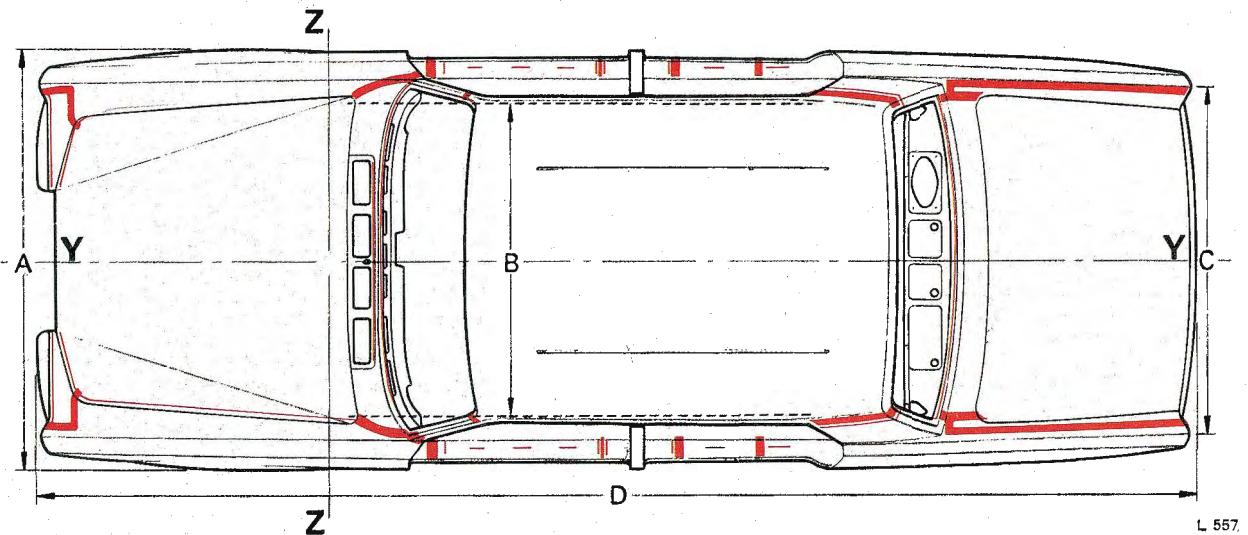
Major damage—To check

If damage to the body is more than superficial proceed as follows.

1. Remove the front and rear sub-frames from the body as described in Chapter H.
2. Check the body mounting point dimensions given in Figures S78 and S80.

To check these dimensions, use a checking fixture similar in design to the one shown in Figure S77 noting the following points.

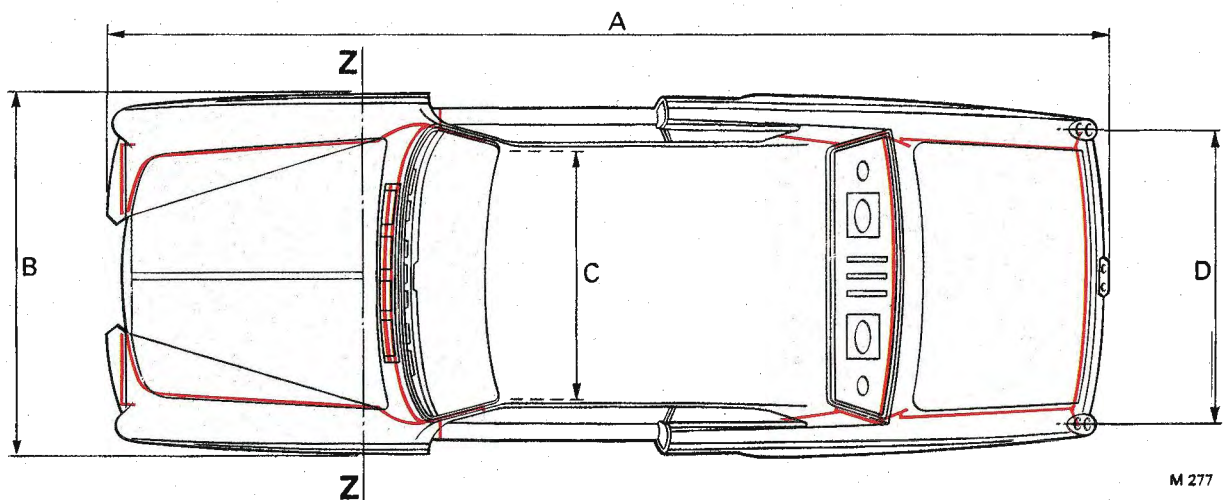
3. It is essential that the working surface (i.e. datum line xx) used to secure the mounting posts, is perfectly flat and square (preferably on a steel surface table), otherwise it will be impossible to carry out an accurate dimensional check.



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FIG. S84 PLAN VIEW OF BODY (4-Door Saloon and Long Wheelbase Cars)

- | | |
|--|---|
| <p>A 70$\frac{3}{8}$ in. (179,71 cm.)</p> <p>B 57$\frac{1}{8}$ in. (145,10 cm.)—dimension to underneath edge of sill</p> | <p>C 58$\frac{1}{8}$ in. (148,27 cm.)</p> <p>D { 195$\frac{7}{8}$ in. (497,52 cm.)—4-Door Saloon
199$\frac{1}{8}$ in. (507,68 cm.)—Long Wheelbase Saloon</p> |
|--|---|

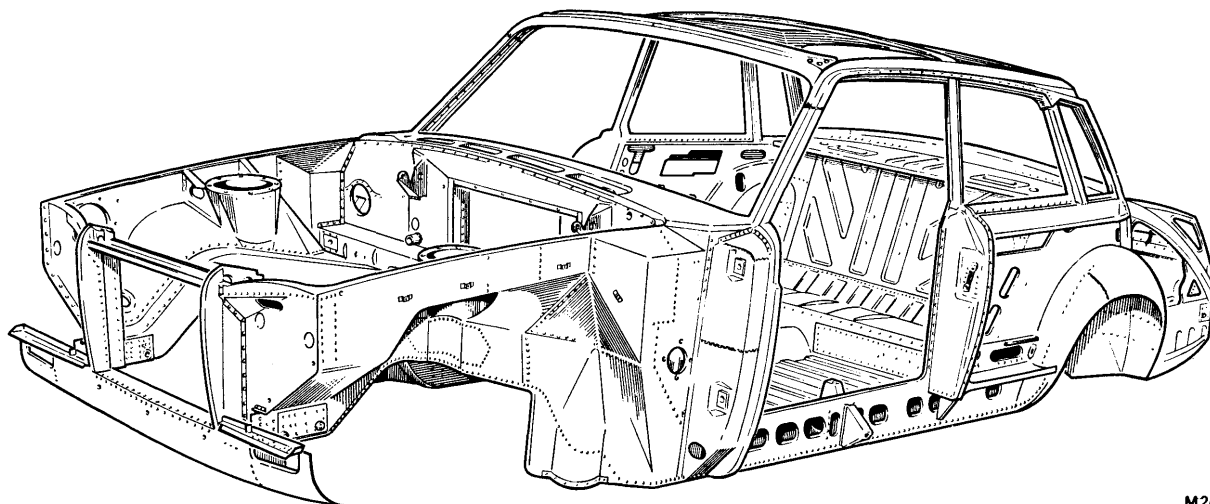


M 277

FIG. S85 PLAN VIEW OF BODY (2-Door Saloon and Convertible Cars)

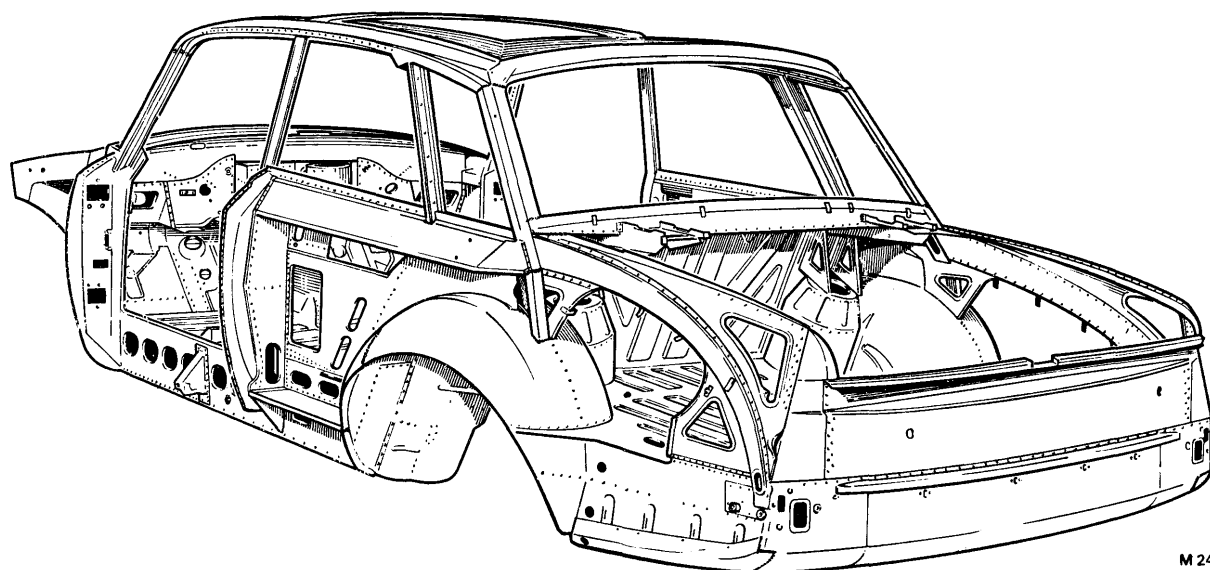
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|---|---|
| <p>A 198$\frac{2}{16}$ in. (504,35 cm.)</p> <p>B 71$\frac{7}{8}$ in. (182,56 cm.)</p> | <p>C 57$\frac{1}{8}$ in. (144,78 cm.)</p> <p>D 59$\frac{3}{8}$ in. (150,81 cm.)</p> |
|---|---|

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FIG. S86 THREE-QUARTER FRONT VIEW OF BODY (2-Door Saloon Cars)



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FIG. S87 THREE-QUARTER REAR VIEW OF BODY (2-Door Saloon Cars)

4. The posts should be machined to dimensions which will enable the various points to be checked. As a temporary fixture the posts can be machined from hard wood, but for a more permanent fixture, stronger materials should be used.

5. When the feet are made, they should be secured to the surface table in their respective positions within the limits given in Figures S78 and S80.

6. Place the body on the fixture and rectify any mis-alignment using body clamps.

Note The full surface areas used to mount the sub-frames should be flat and square to their respective centre lines to within $\frac{1}{32}$ in. (0,79 mm.).

7. The advantage of making a strong and permanent fixture is that the body may be welded whilst in position, provided that the welding is not in the immediate vicinity of the posts.

8. If the extent of the damage necessitates the renewal of a portion or complete panel(s), member(s) or section(s), reference should be made to Figures S79, S81, S84, S85, S88, S89, S92 and S93, bearing in mind that if a new member(s) is fitted, the body mounting points must be checked.

Note The relation of the datum lines, xx, yy and zz to each other and to the body, are identical in each of the dimensional illustrations.

Welded seams and joints

In addition to giving dimensional information, Figures S79, S81, S84, S85, S88, S89, S92 and S93 indicate by a coloured line, where possible, the location of the outer skin welded joints. It has been considered unnecessary to point out with illustrations the frame welding joints as they should be immediately apparent to an experienced body builder once the skin panels have been removed. However, as a guide to the construction of the frame Figures S82, S83, S86, S87, S90 and S91 are also included.

To separate sections that have been spot welded together proceed as follows.

1. Carefully locate the points where fusion has taken place.

2. Drill the centre of each spot weld using a $\frac{3}{16}$ in. (4,76 mm.) diameter drill.

It should not be necessary to drill through both layers of sheet metal.

3. When the drilling operation is complete separate the sections with the aid of a thin, sharp chisel.

Weld repairs

When welding, in addition to the usual techniques and precautions, the following points should be borne in mind.

1. Disconnect both leads of the battery before any form of welding is carried out (see Chapter M – Electrical System.)

2. Where spot welds have been opened up and it is impossible to re-spot weld, the use of side tacking and plug welding can be used as an alternative.

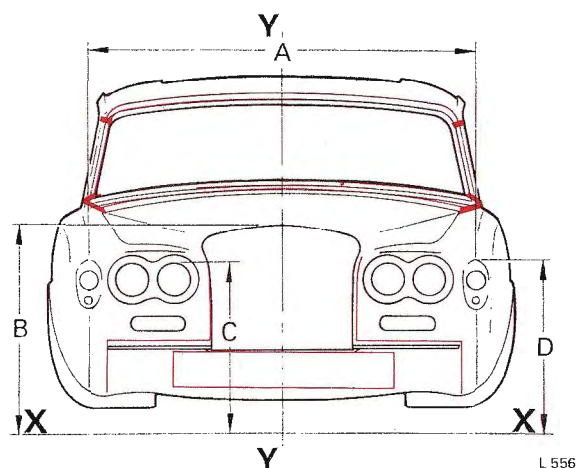


FIG. S88 FRONT VIEW OF BODY (4-Door Saloon and Long Wheelbase Cars)

- A $59\frac{1}{4}$ in. (150,50 cm.)
 B $\begin{cases} 32\frac{1}{2}$ in. (82,31 cm.)—Bentley T \\ $32\frac{3}{4}$ in. (83,11 cm.)—Silver Shadow \end{cases}

C $25\frac{1}{2}$ in. (65,88 cm.)

D $26\frac{1}{8}$ in. (66,36 cm.)

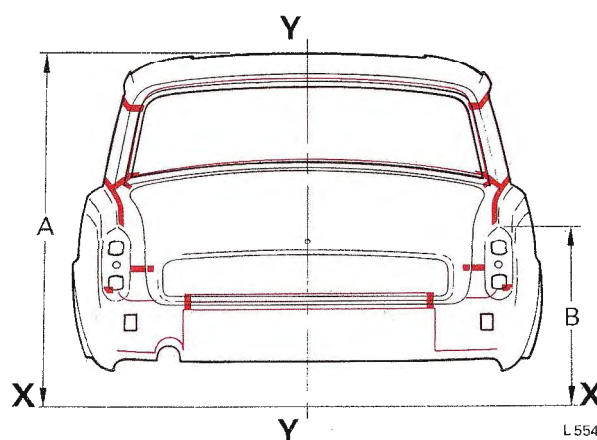
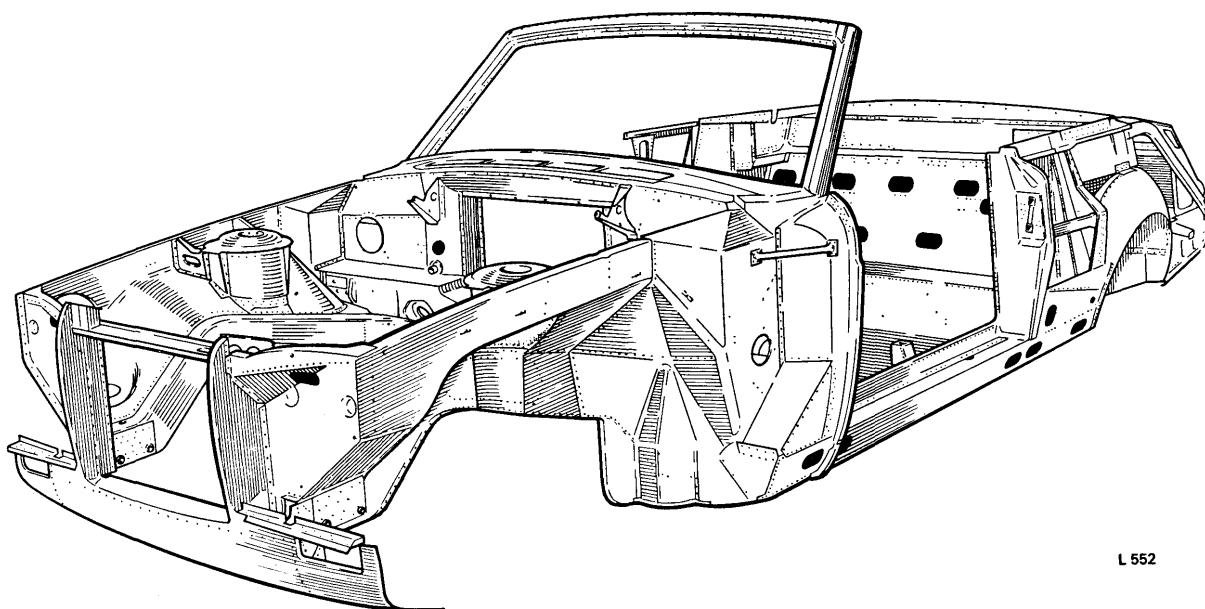


FIG. S89 REAR VIEW OF BODY (4-Door Saloon and Long Wheelbase Cars)

A 56 in. (142,24 cm.)

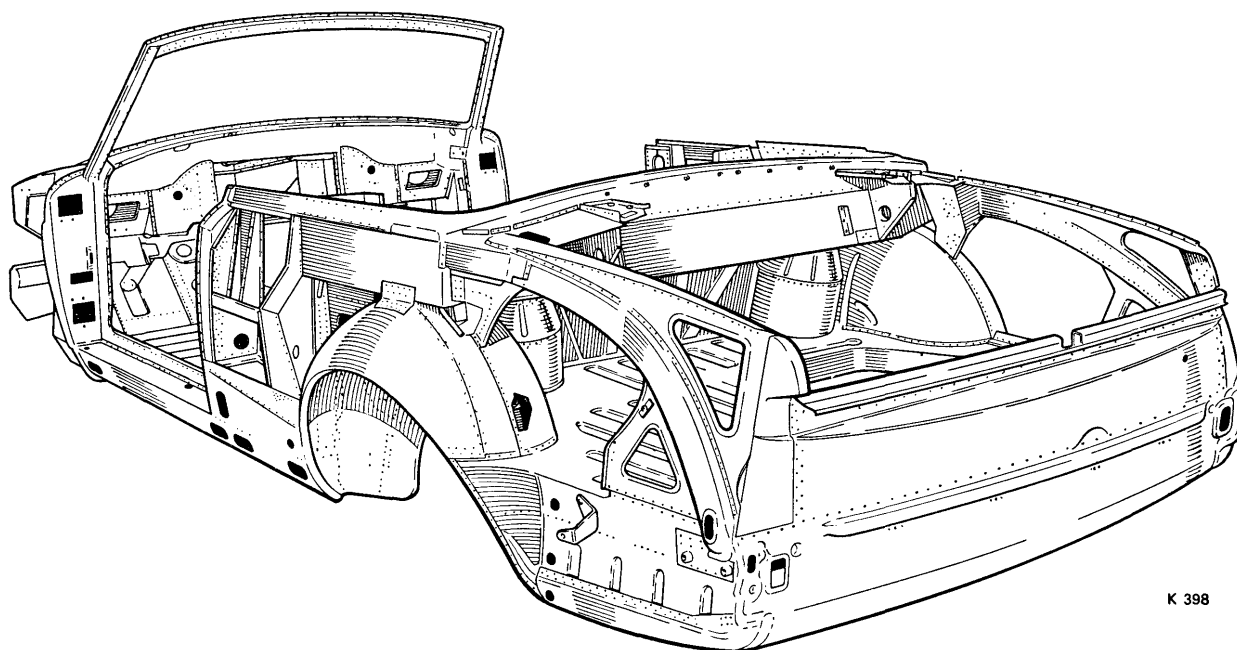
B $27\frac{5}{8}$ in. (70,84 cm.)

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FIG. S90 THREE-QUARTER FRONT VIEW OF BODY (Convertible Cars)



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FIG. S91 THREE-QUARTER REAR VIEW OF BODY (Convertible Cars)

3. When gas welding Birmabright (i.e. doors, luggage boot lid and bonnet) use Birmabright BB3 welding rod or its equivalent, together with a suitable flux; a soft flame is essential.

4. When gas welding the steel body, use welding rod to B.S. Specification 1453/A1.

5. If welding is necessary in the vicinity of the fuel tank, it is of the utmost importance that strict fire precautions are taken.

6. Where a replacement panel is to be fitted which forms part of an aperture, for example a door aperture, an undamaged component should be temporarily fitted into position and used as a template to ensure that the panel is fitted in its best possible position.

7. A radiator grille should be used when fitting new wings.

8. In some cases due to welding difficulties or shortage of time, it may be advantageous to remove only part of the damaged panel or member and replace it by an identical section cut from a new panel or member. For example, if the centre door pillar requires renewal but the damage has not affected the extreme ends of the pillar, the pillar should be cut at arrows A as shown in Figure S95, and the new pillar cut to suit and gas welded in position (see Operation 6).

If the repair is not carried out in this manner, the head lining would have to be removed, also, there would be a very great danger that the roof would buckle and distort in the vicinity of the door pillar, due to the heat from the welding torch. In any event the roof or part of the roof would have to be sprayed.

9. After welding, depressions, etc., should be dealt with in a similar manner to that already described for minor damage (see *Dents and minor damage*, on Page S83).

Fitting replacement body panels and members to Long Wheelbase cars

The body shell of the Long Wheelbase car is very similar to that of the 4-Door Saloon the main differences being in the reduced rear window area and the extra length of the Long Wheelbase body. This additional length comprises an extra section, 4 in. (10,16 cm.) long, inserted into the Long Wheelbase body just rearward of the body centre pillar.

As shown in the current Parts List catalogue (publication T.S.D. 2201, Section L), body panels, wings, frame members, etc., are available for replacement when required. Most of these parts are common to both the Long Wheelbase Saloon and the 4-Door Saloon and the specialist body repairer, following

the accepted practice of removing the unwanted section and welding the new section into position should have no problems when replacing these parts (see 'Welded seams and joints' and 'Weld repairs', in this Section).

However, if it becomes necessary to replace a section of a Long Wheelbase body which includes the area where the 'extra 4 in. (10,16 cm.)' has been inserted, for example a roof panel, floor panel, sill member or a complete body side member, difficulties

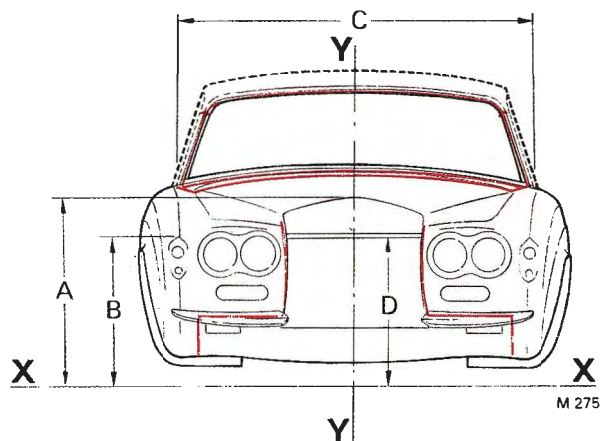


FIG. S92 FRONT VIEW OF BODY (2-Door Saloon and Convertible Cars)

- A $32\frac{3}{4}$ in. (81,28 cm.)
 B $26\frac{1}{8}$ in. (66,36 cm.)
 C $59\frac{7}{16}$ in. (151,29 cm.)
 D $25\frac{3}{4}$ in. (65,40 cm.)

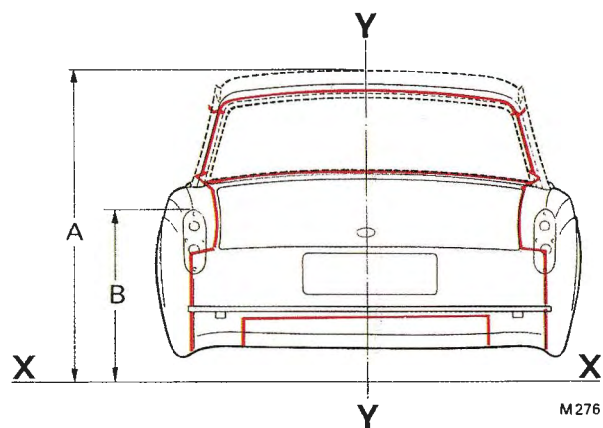
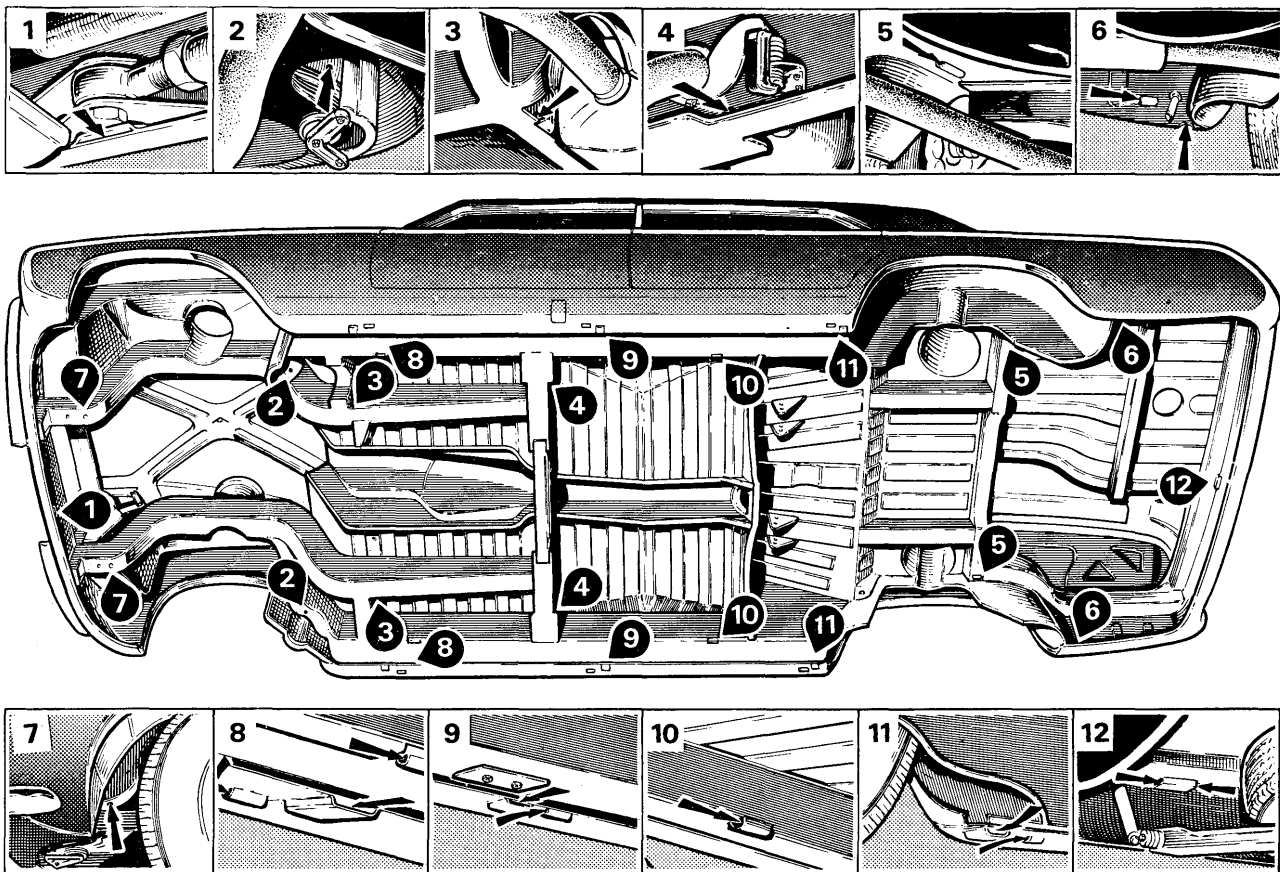


FIG. S93 REAR VIEW OF BODY (2-Door Saloon and Convertible Cars)

- A $\begin{cases} 54\frac{5}{16}$ in. (139,54 cm.)—Convertible \\ 53\frac{1}{16} in. (137,00 cm.)—2-Door Saloon \\ B $30\frac{3}{8}$ in. (77,15 cm.)

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FIG. S94 POSITION OF THE BODY DRAIN HOLES (4-Door Saloon Car Illustrated)

Note The numbered symbols on the main illustration indicate position of the drain holes and the most convenient direction in which to view them.

The arrows on the insets indicate the drain holes.

- 1 Single drain hole located on the lower edge of the body front sill, immediately below the bolt which secures the panhard rod.
- 2 Two circular drain holes located adjacent to the top of the front sub-frame rear mounting point. Inset 2 shows the right-hand drain hole.
- 3 Two drain holes, one in each side member. The left-hand hole is located adjacent to the front inboard corner of the exhaust silencer box (see inset 3); the right-hand hole is obscured by the brake actuator box shield.
- 4 Two drain holes in the central body cross-member. The left-hand hole is located adjacent to the exhaust flexible mounting (see inset 4); the right-hand hole is obscured by one of the fuel pump suppressors.
- 5 Two drain holes located immediately above the outer rear corners of the final drive cross-member; inset 5 shows the left-hand drain hole.
- 6 Double drain points located in the lower edge of each tonneau inner panel, rearward of the rear wheel arches; inset 6 shows the left-hand drain holes.
Note On 2-Door Saloon and Convertible cars there are three additional drain holes in each inner panel.
- 7 Two circular drain holes located one in each body side member, rearward of the front sub-frame front mounting point; inset 7 shows the left-hand drain hole.
- 8 Triple drain points on each side of the body, approximately 14 in. (35 cm.) rearward of the front wheel arches. The two outer holes are located on the lower edge of the sill panels; the inner drain hole is located on the body side member. Inset 8 shows the left-hand drain holes.
- 9 Two double drain points located on the lower edges of the body sill outer panels approximately 7 in. (18 cm.) rearward of the jacking flaps; inset 9 shows the left-hand drain holes.
- 10 Two drain holes located on the body side members, mid-way between the central cross-member and the rear wheel arches; inset 10 shows the left-hand drain hole.
- 11 Two double drain points located on the lower edges of the body sill outer panels just forward of the rear wheel arches; inset 11 shows the left-hand drain holes.
- 12 Double drain point located mid-way along the rear sill inner panel, adjacent to the point where the spare wheel platform lowering bolt tube emerges from the luggage compartment floor.

may arise as these parts are obtainable only in dimensions to suit the standard wheelbase car.

To achieve the additional length when replacing these parts (i.e. roof panel, floor panel, sill members, etc.) on a Long Wheelbase Saloon body therefore, it would be necessary to obtain the section suitable for the 4-Door Saloon and, if possible, fabricate it in position using part of the original section. In cases where it is not possible to incorporate part of the original section it will be necessary to obtain double quantities of the section or sections required so that the extra 4 in. (10,16 cm.) can be removed from one section and welded into the other section to obtain the required length.

Great care must be taken when marking the sections to be fabricated to ensure that the dimensions given in Figures S79, S84, S88 and S89 are maintained. In most cases replacement of sections which require fabrication involve the rear door aperture. It will be helpful therefore if the rear door is used as a template and positioned in the aperture during the repair.

It is possible to obtain rear door panels for the Long Wheelbase car.

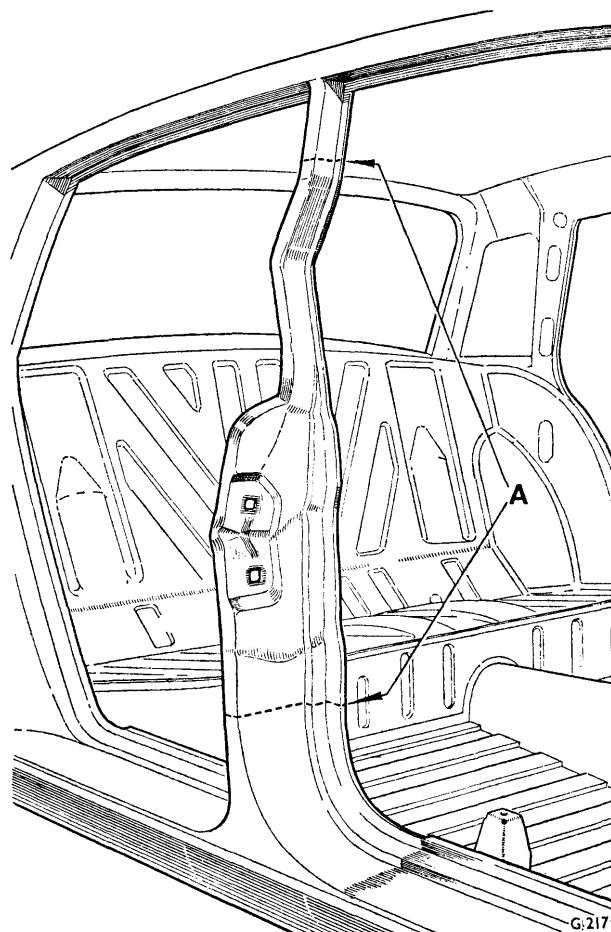


FIG. S95 CUTTING A DAMAGED SECTION FROM A BODY CENTRE PILLAR (4-Door Saloon or Long Wheelbase Cars)

A Arrows indicate line of cut

Body sealing

As a precaution against rust and corrosion, the underneath part of the body must, where necessary, be prepared and undersealed in the usual manner noting the following points.

1. Any seams that have been disturbed during the repair should be re-sealed using Bostik sealer 1222 or its equivalent prior to undersealing.
2. Ensure that any grommets, removed from the body underframe during repair, are replaced.
3. On completion of the body undersealing, ensure that the body drain holes are free from obstructions; Figure S94 shows the location of the body drain holes.

Note Although the shape of the drain holes on Coachbuilt (2-door) cars vary slightly from those shown in Figure S94, they should easily be located by reference to this illustration as the body drain holes are in the same relative position on both 2-Door and 4-Door cars. However, 2-Door cars also have six additional drain holes; these are located three in each rear tonneau panel, rearward of the drain holes shown in item 6.

4. Finally, water test the body to ensure that the body sealing is satisfactory.

Paintwork

It will be noticed that no mention has been made throughout this Section as to the procedure for painting Rolls-Royce and Bentley cars. The reason for this being that painting is a complex subject and beyond the scope of this Workshop Manual. It is therefore suggested that the method of painting be left to the people concerned. However, the following points **must** be noted before commencing any paintwork rectification.

1. It must be stressed that in order to achieve the high quality finish expected, the need for meticulous attention to detail is essential.
2. Before any paintwork rectification is carried out the original paintwork specification of the car **must** be checked.

This is important in order to ensure that the correct paint and thinners is used.

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3. Each paint manufacturer develops thinners to suit individual requirements of the finisher produced. It is **essential** therefore that the correct amount of the specified thinners is used with each paint otherwise a poor finish may result.

4. The original paintwork specification of a car will be found in the handbook for that particular car.

Should difficulties arise, and advice be needed, information can be obtained from the Paint and Plastics Laboratory, Rolls-Royce Motors Limited, Crewe.

Section S9

SEAT BELTS

General

Seat belts are now a mandatory requirement in many countries including the United Kingdom and seat belt anchorage points are provided on all Rolls-Royce Silver Shadow and Bentley T Series cars.

When seat belts are not fitted at the works the threaded anchorage points are blanked off with anchorage bolts or nylon plugs; on 4-Door Saloon and Long Wheelbase cars, the holes in the sill channel for mounting the automatic seat belt reel mechanism are blanked off with grommets.

When seat belts are required, lap and diagonal belts are fitted for the front seat occupants and either lap belts only or lap and diagonal belts are fitted for the rear seat occupants; the rear seat lap belts can be fitted in sets of two or three, as required.

From January 1971, Britax automatic seat belts are fitted as standard equipment for the front seat occupants on all cars, except Long Wheelbase cars fitted with a centre division, when seat belts are required and local regulations permit the use of Britax belts. When front seat belts are required on Long Wheelbase division cars, Britax static lap and diagonal belts are fitted.

On earlier cars Britax automatic or static seat belts were fitted, as required. However, before the automatic belt could be fitted to very early 4-Door Saloon and Long Wheelbase cars, modification to the sill was necessary (*see Sill—To modify, in this Section*).

Precautions

The following points must be noted when carrying out any work or servicing on the seat belts.

1. Do not alter the fittings or mountings of the seat belts in any way.
2. Replace any seat belt that has been subjected to stress arising from a severe accident and carefully inspect all anchorage points.
3. Replace any seat belt that is cut, frayed or damaged.
4. Do not replace part of a seat belt; if one section of the belt is damaged, fit a new complete seat belt.

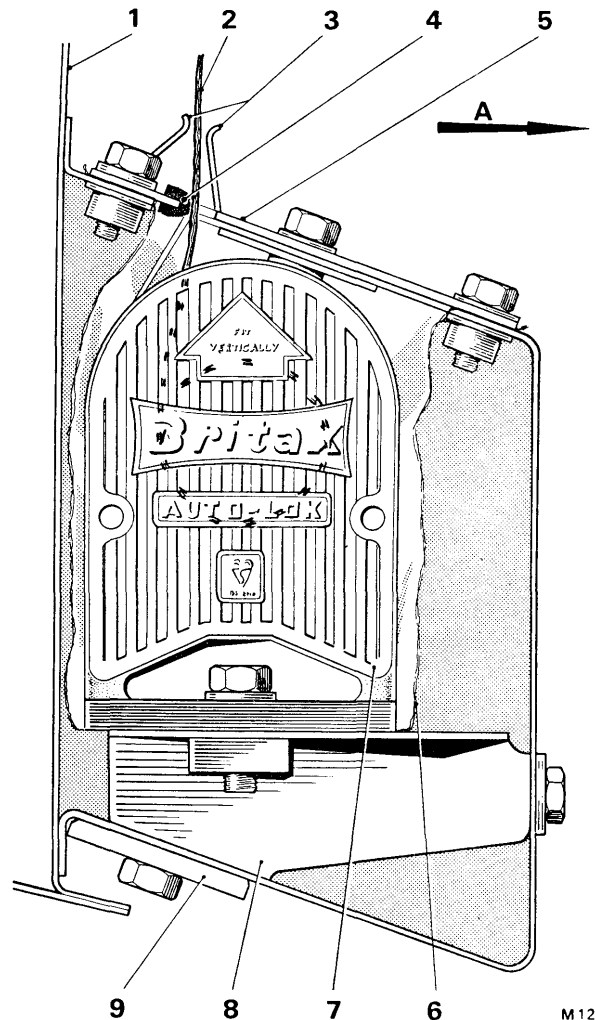


FIG. S96 INSTALLATION OF THE EARLIER BRITAX AUTO-LOK REEL MECHANISM IN THE SILL (4-Door Saloon and Long Wheelbase Non-division Cars)

- A** Arrow points to centre of car
- 1 Body centre pillar panel
 - 2 Belt webbing
 - 3 Belt guide brackets
 - 4 Flange finisher
 - 5 Sill cover plate
 - 6 Polythene sheath
 - 7 Reel assembly
 - 8 Reel support beam
 - 9 Stiffener

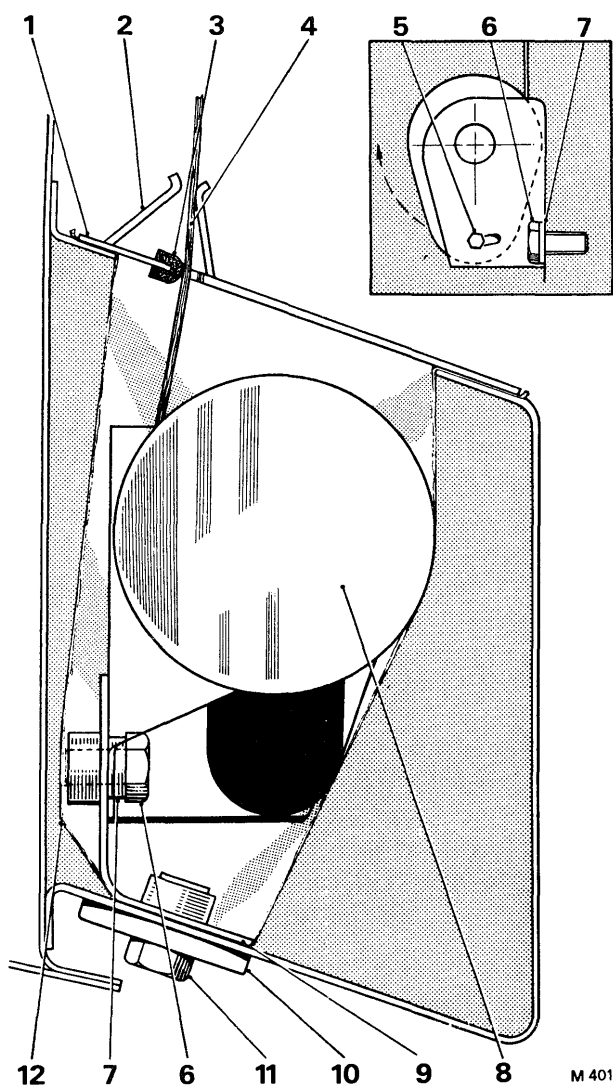
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5. Do not use a bleach or dye on the webbing as this may impair the efficiency of the seat belt; if the webbing requires cleaning, sponge with a mild soap and water solution.

6. Keep the seat belt away from any sharp corners or protrusions.

7. On cars fitted with the automatic front seat belt, ensure that the movement of the webbing from the reel unit to the upper anchorage is not hampered or trapped in any way.

8. Torque tighten the special $\frac{7}{16}$ in. diameter UNF seat belt anchorage bolts to between 21 lb. ft. and 23 lb. ft. (2,903 kgm. and 3,179 kgm.); when tightening the bolts securing the reel unit mounting brackets, on cars fitted with the automatic front seat belt, refer to the appropriate torque figures shown in Chapter P – Torque Tightening Figures.



Britax automatic front seat belt—To remove

4-Door Saloon and Long Wheelbase non-division cars

1. Operate the front seat controls so that the seat is in its most forward position.
2. Remove the carpets from the rear compartment; do not remove the carpet trim from the transmission tunnel.
3. Remove the four self-tapping screws securing the small trim strip at the foot of the body centre pillar; remove the strip.
4. Remove the anchorage bolt securing the end lug of the reel belt to the sill cover plate.
5. Remove the anchorage bolt securing the free running bracket on the reel belt to the body centre pillar; carefully retain the distance pieces and washers with the anchorage bolt.

On cars fitted with the Autolock III seat belt it will first be necessary to remove the button from the bracket cover to gain access to this anchorage bolt (see Fig. S99); to remove the button, insert the tip of a small screwdriver into the recess at the bottom of the button then gently lever the button out of the bracket cover.

6. Slacken the sill finisher screws then remove the body centre pillar trim pad by gently levering the trim pad clips free from the pillar.

7. Remove the ten $\frac{7}{16}$ in. A/F setscrews securing the cover plate to the sill; lift the cover plate from the sill, sliding the plate along the reel belt.

If the original seat belt is to be fitted again, the belt can remain threaded through the cover plate. If it is necessary to separate the plate and belt however, first remove the two self-tapping screws securing the belt guide plates to the cover plate then remove the guide plates and the flange finisher from the cover plate. Finally, remove the belt from the cover plate via the small cut-out channel.

8. Working underneath the car, remove the setscrews securing the reel unit, polythene bag and support bracket assembly into the sill channel.

FIG. S97 INSTALLATION OF THE LATER BRITAX AUTOLOK III REEL MECHANISM IN THE SILL (4-Door Saloon and Long Wheelbase Non-division Cars)

- 1 Sill cover plate
- 2 Guide brackets
- 3 Flange finisher
- 4 Belt webbing
- 5 Locking screw
- 6 Setscrew—reel mechanism to mounting bracket
- 7 Spacer
- 8 Reel mechanism
- 9 Mounting bracket
- 10 Backing plate
- 11 Setscrew—mounting bracket to sill (2 off)
- 12 Polythene sheath

Note that on cars fitted with the Autolok III seat belt this assembly is secured by two $\frac{1}{2}$ in. A/F setscrews (see Fig. S97), while on cars fitted with the earlier Auto-lok seat belt the assembly is secured by two $\frac{1}{2}$ in. A/F setscrews and two $\frac{1}{16}$ in. A/F setscrews (see Fig. S96).

9. From inside the car, lift the reel unit and support bracket assembly through the aperture in the car floor and out of the sill channel.

10. Lift the carpet trim and remove the anchorage bolt securing the short inboard section of the belt to the transmission tunnel; carefully retain the distance piece and washers with the anchorage bolt.

If a stiffener and sheath is fitted to this section of the safety belt, remove the nut and screw securing the tag of the sheath to the stowage bin (Autolok III type belt only).

11. To remove the reel unit from its support bracket proceed as follows.

(a) **Cars fitted with the earlier type Auto-lok seat belt** (see Fig. S96). Remove the two $\frac{1}{2}$ in. A/F setscrews securing the reel unit and the polythene bag to the support bracket then lift the reel unit out of the polythene bag.

(b) **Cars fitted with the Autolok III seat belt** (see Fig. S97). First remove the reel unit and its support bracket from the polythene bag then remove the small screw situated on the side of the reel casing. Rotate the drum of the reel unit, in its casing, until access can be gained to the bolt securing the reel unit to its support bracket; remove this bolt together with the distance piece and separate the reel unit from the mounting bracket. Rotate the drum of the reel unit to its original position in its casing then fit the small screw.

Britax automatic front seat belt—To remove

Coachbuilt cars

1. Operate the front seat to its most forward position.

2. Disconnect the battery leads.

3. Remove the carpet from the rear compartment.

4. Remove the rear seat cushion and backrest (see Section S2).

5. Remove the anchorage bolt securing the upper bracket on the reel belt to the quarter panel mounting point; if the anchorage bolt is the hooked type, first detach the bracket from the hook and slacken to the lock-nut.

6. Remove the quarter panel.

7. Remove the nut securing the end bracket on the reel section of the belt to the stud on the lower face of the reel support bracket; remove the belt bracket from the stud, carefully retaining the nut, washers and distance piece.

8. Remove the two $\frac{1}{2}$ in. A/F bolts and nuts securing the reel unit to the support bracket; remove the reel unit noting the finisher plate fitted between the reel and support bracket.

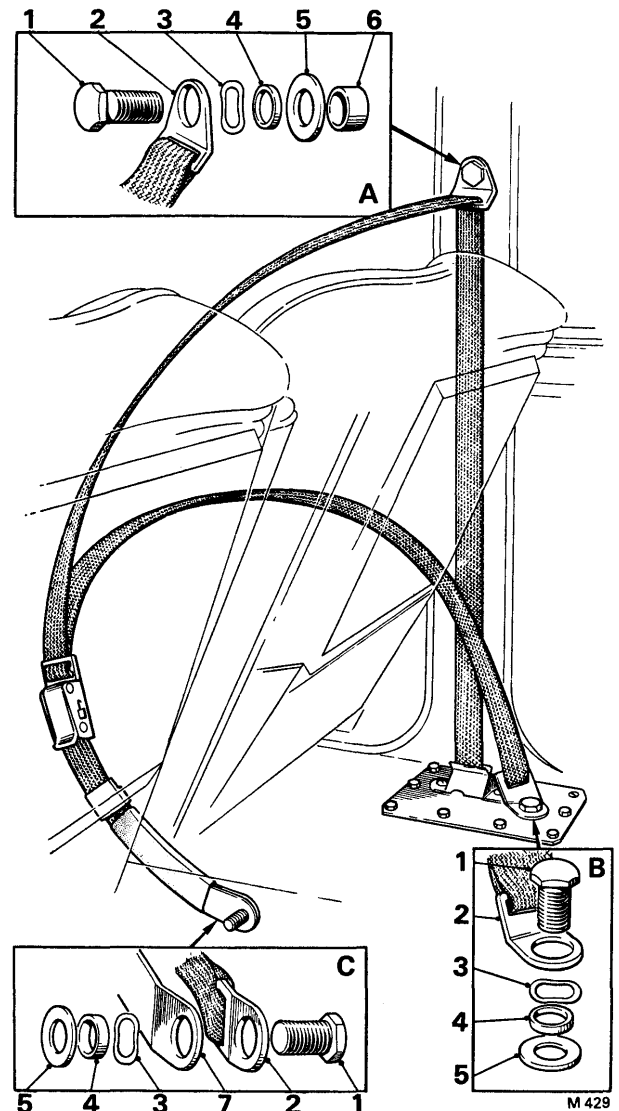


FIG. S98 FRONT SEAT BELT MOUNTINGS—EARLY BRITAX AUTOMATIC SEAT BELT (4-Door Saloon and Long Wheelbase Non-division Cars)

- A** Centre pillar mounting
- B** Sill cover plate mounting
- C** Transmission tunnel mounting
- 1** Anchorage bolt
- 2** Seat belt bracket
- 3** Waved washer
- 4** Distance piece
- 5** Chromed washer
- 6** Distance piece
- 7** Belt stiffener (if fitted)

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9. Remove the anchorage bolt securing the short inboard section of the seat belt to the transmission tunnel; carefully retain the washers and distance piece with the anchorage bolt.

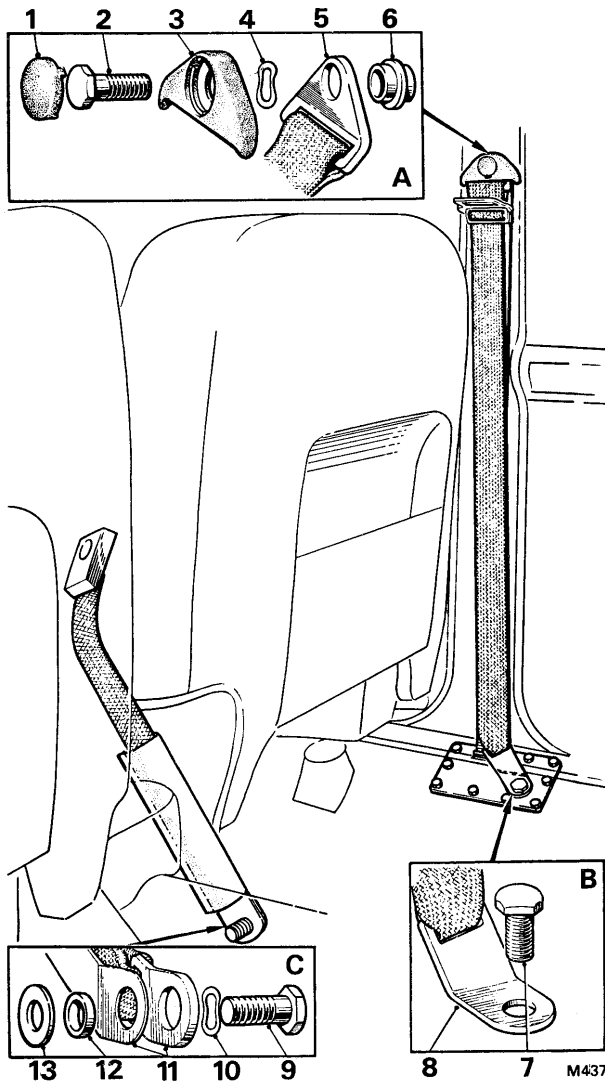


FIG. S99 FRONT SEAT BELT MOUNTINGS—LATER TYPE BRITAX AUTOMATIC SEAT BELT (4-Door Saloon and Long Wheelbase Non-division Cars)

- A** Centre pillar mounting
- B** Sill plate mounting
- C** Transmission tunnel mounting
- 1 End cap—bracket cover
- 2 Anchorage bolt
- 3 Bracket cover
- 4 Waved washer
- 5 Seat belt bracket
- 6 Double-shouldered distance piece
- 7 Anchorage bolt
- 8 Seat belt bracket
- 9 Anchorage bolt
- 10 Waved washer
- 11 Seat belt bracket and stiffener
- 12 Distance piece
- 13 Washer

Britax automatic front seat belt—To fit

To fit the automatic seat belt reverse the procedure given for removal noting the following points.

4-Door Saloon and Long Wheelbase non-division cars

1. When fitting the reel unit to the support bracket ensure that the following conditions are complied with.

- (a) **Cars fitted with the earlier type Auto-lok seat belt** (see Fig. S98). Ensure that the two $\frac{1}{2}$ in. A/F setscrews securing the reel unit to the support bracket pass through the polythene bag (see Fig. S96); tighten the setscrews to between 16 lb. ft. and 18 lb. ft. (2,212 kgm. and 2,488 kgm.).
- (b) **Cars fitted with the Autolok III seat belt** (see Fig. S99). Ensure that the distance piece is fitted under the head of the bolt securing the reel unit to the support bracket and also that the mounting lug of the reel unit is located between the two protrusions on the support bracket; tighten the bolt to between 21 lb. ft. and 23 lb. ft. (2,903 kgm. and 3,179kgm.).

Ensure also that the small screw on the side of the reel casing is positioned at the end of the slot furthest away from the back face of the casing as shown in Figure S97; tighten this screw to between 24 lb. in. and 48 lb. in. (0,276 kgm. and 0,553 kgm.).

2. Ensure that the neck of the polythene bag is trapped between the sill and the cover plate, sealing the reel unit inside the bag.

3. Ensure that the backing plate is fitted to the two setscrews securing the reel support bracket to the lower face of the sill channel.

4. Ensure that the webbing between the reel unit and the upper anchorage is free from twist and that the webbing runs off the outboard side of the reel unit.

5. Tighten the special $\frac{7}{16}$ in. diameter UNF anchorage bolts in the sill cover plate, centre pillar and transmission tunnel to between 21 lb. ft. and 23 lb. ft. (2,903 kgm. and 3,179 kgm.).

Coachbuilt cars

6. Tighten the special $\frac{7}{16}$ in. diameter UNF anchorage bolts, the nut securing the end lug of the reel belt and the lock-nut on the hooked anchorage bolt (if fitted) to between 21 lb. ft. and 23 lb. ft. (2,903 kgm. and 3,179 kgm.).

All cars

7. After fitting the reel unit to its support bracket, check that the webbing can be pulled easily from the reel; note that the construction of the belt makes it sensitive only to crash conditions, fierce braking and hard cornering.

8. When fitting the anchorage bolts refer to Figures S98, S99 and S100 which show the seat belts in position and the order of assembly of the bolts, distance piece and washers (when fitted) in the belt mounting brackets.

9. If the belt is fitted with a cranked mounting bracket, ensure that the crank is pointing away from the anchorage point.

10. When fitting the waved washer to any of the anchorage points (see Figs. S98, S99 and S100) ensure that the washer fits over the distance piece and is not trapped between the face of the distance piece and the bracket (or washer).

Sill and channel—To modify

Early Standard and Long Wheelbase non-division cars only

Early 4-Door Saloon and Long Wheelbase non-division cars were not provided with the cut-out in the sill to accommodate the reel unit of the Britax Automatic front seat belt. To enable the Britax Automatic seat belt shown in Figure S98 to be fitted to these early cars the sill and channel can be modified as follows. The seat belts together with the necessary brackets, etc., are supplied in kit form (see *Parts List publication T.S.D. 2201*) and can be obtained from Rolls-Royce Motors Limited, Crewe.

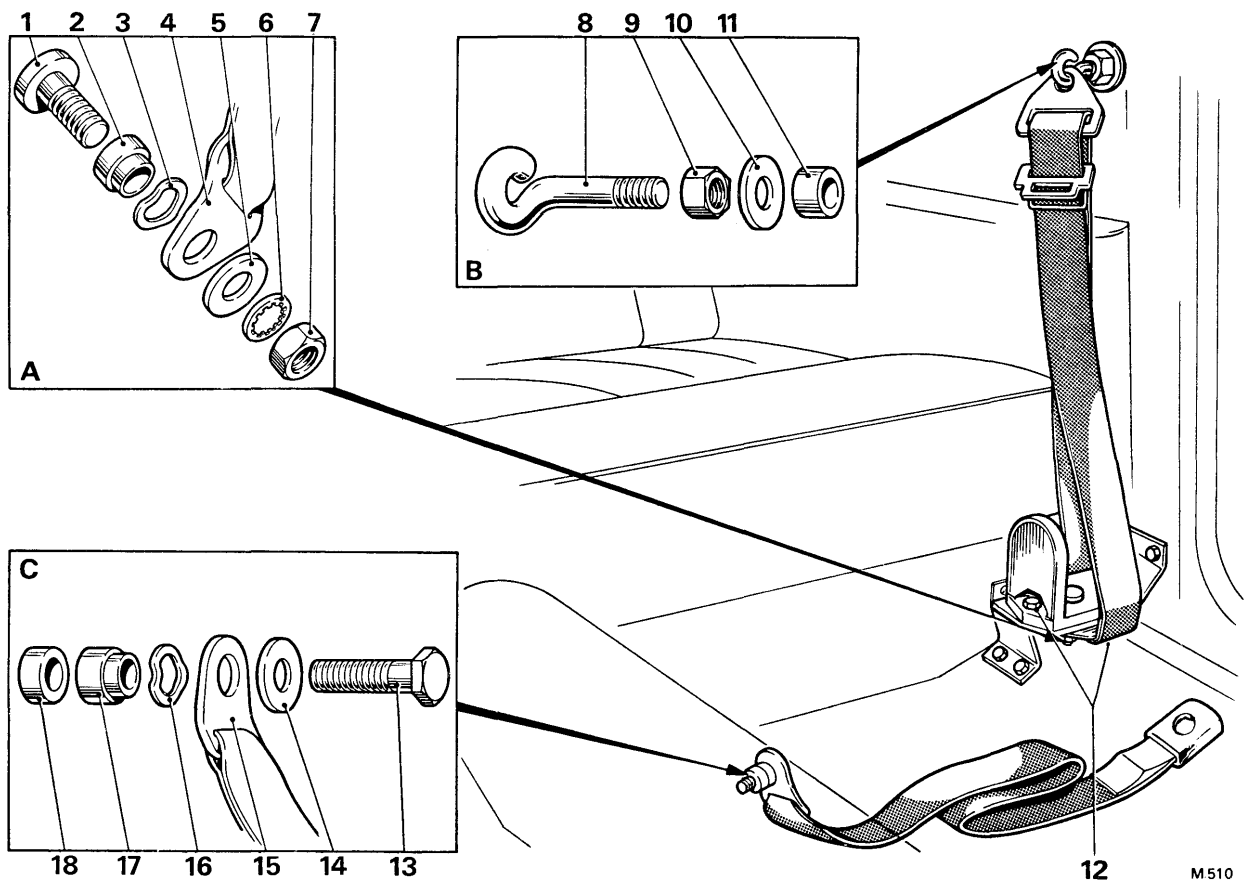


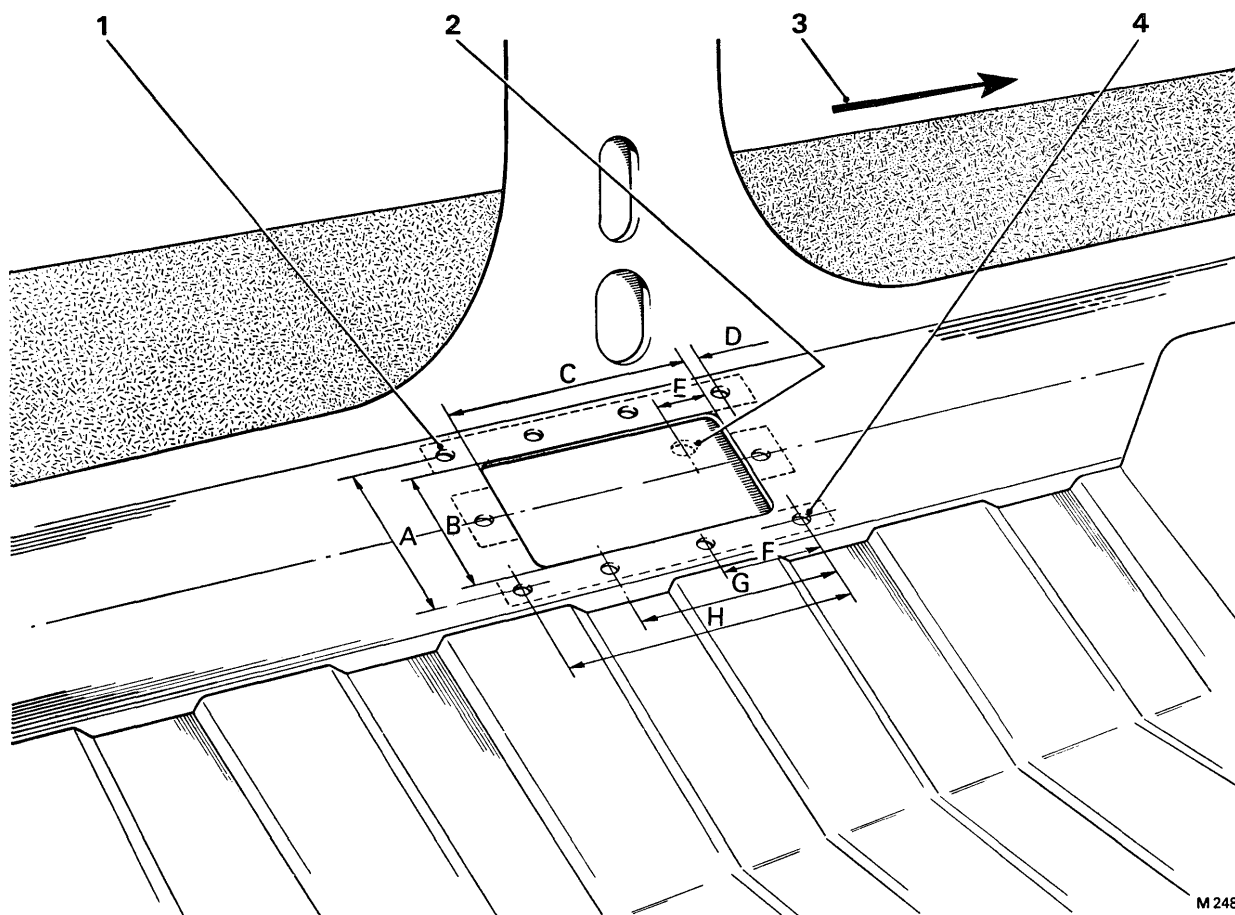
FIG. S100 FRONT SEAT BELT MOUNTING—BRITAX AUTOMATIC SEAT BELT (Coachbuilt Cars)

- | | |
|---|---|
| A Reel mounting bracket anchorage | 9 Nut |
| B Quarter panel anchorage | 10 Chromed washer |
| C Transmission tunnel anchorage | 11 Distance piece |
| 1 Stud (brazed to reel mounting bracket) | 12 Bolt (2 off) securing reel unit to mounting bracket |
| 2 Shouldered distance piece | 13 Anchorage bolt |
| 3 Waved washer | 14 Chromed washer |
| 4 Belt bracket | 15 Belt bracket |
| 5 Chromed washer | 16 Waved washer |
| 6 Shake-proof washer (if fitted) | 17 Shouldered distance piece |
| 7 Nut | 18 Distance piece |
| 8 Hooked bolt | |

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1. Remove the front seats (see Section S2).
2. Remove the carpets and the floor insulation material in the vicinity of the sill.
3. Mark out the section of the sill to be removed and the ten holes to be drilled, working to the dimensions shown in Figure S101, note that these dimensions are taken from the centre of the existing seat belt anchorage point (see Fig. S101, item 2).
4. Drill a series of small holes just inside the scribed lines of the section to be removed, then join these holes using a small saw or file; remove the unwanted section of the sill.

5. Carefully file the edges of the aperture to its final shape.
6. Drill the ten holes around the aperture (see Fig. S101), using a 0.462 in. (10,32 mm.) diameter drill; remove any drilling swarf and filings from the sill channel.
7. Coat any bare metal with a zinc rich primer.
8. Fit the backing plates (supplied with the seat belt kit) to the underside of the sill and align the spot welded nuts on the backing plates with the ten drilled holes; secure each backing plate to the floor with two pop rivets to facilitate assembly.



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FIG. S101 DRILLING DIMENSIONS FOR THE SILL FLOOR (Early 4-Door Saloon and Long Wheelbase Non-division Cars)

Note Dimensions shown are for the left-hand sill floor, dimensions for the right-hand side are symmetrically opposite.

- | | |
|---------------------------------|---|
| A 3.500 in. (8,890 cm.) | G 4.625 in. (11,747 cm.) |
| B 2.875 in. (7,350 cm.) | H 6.250 in. (15,875 cm.) |
| C 5.625 in. (14,290 cm.) | 1 Hole for countersunk-headed screw |
| D 0.312 in. (7,900 mm.) | 2 Original seat belt anchorage point |
| E 1.250 in. (3,175 cm.) | 3 Arrow pointing to front of car |
| F 2.312 in. (5,870 cm.) | 4 Ten holes each 0.4062 in. (10,32 mm.) diameter |

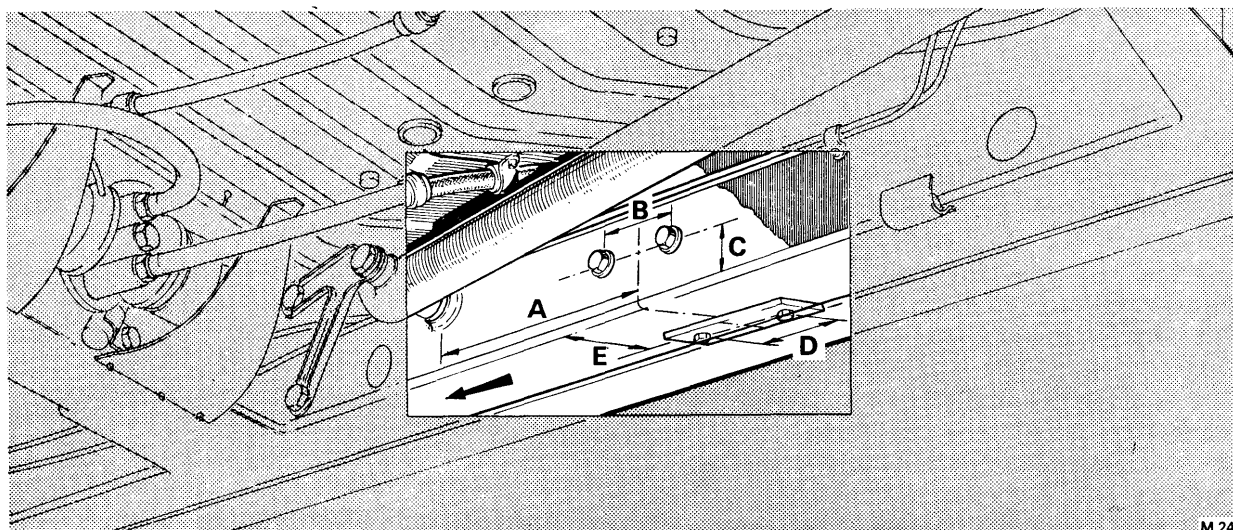


FIG. S102 DRILLING DIMENSIONS FOR THE SILL CHANNEL (Early 4-Door Saloon and Long Wheelbase Non-division Cars)

Note Dimensions shown are for the right-hand sill channel, dimensions for the left-hand channel are symmetrically opposite. The **bold** arrow is pointing to the front of the car.

- | | |
|---|--------------------------------|
| A 7.187 in. (18,256 cm.)—front datum line taken from the centre of torque tube mounting bolt | C 1.720 in. (8,865 cm.) |
| B 1.875 in. (3,762 cm.) | D 1.975 in. (5,016 cm.) |
| | E 3.344 in. (8,494 cm.) |

9. To facilitate drilling the sills remove the two torque tubes connecting the rear sub-frame to the body sills; scribe correlation marks around the washers and note the position of the washers on the mounting bolts to ensure correct assembly.

10. Mark the position of the four holes to be drilled in the sill channel working to the dimensions shown in Figure S102, noting that the centres of these holes have been taken from the centre of the torque tube front mounting point.

Note that Figure S102 illustrates a right-hand sill when facing towards the front of the car; the dimensions for a left-hand sill are symmetrically opposite.

11. Drill the four holes in each sill channel using a 0.375 in. (9,525 mm.) diameter drill; remove any drilling swarf from the channels then coat the edges of the holes with a zinc rich primer.

12. Fit the two torque tubes to their original positions.

13. The Britax automatic front seat belt assembly shown in Figure S98 can now be fitted (*see Britax automatic front seat belt – To fit, in this Section*).

Note that it will be necessary to cut slots in the carpet and floor insulation, and to cut the carpet away from the centre pillar, in order to allow unrestricted movement of the belt; the cut edges of the carpet should be bound with leather to prevent fraying.

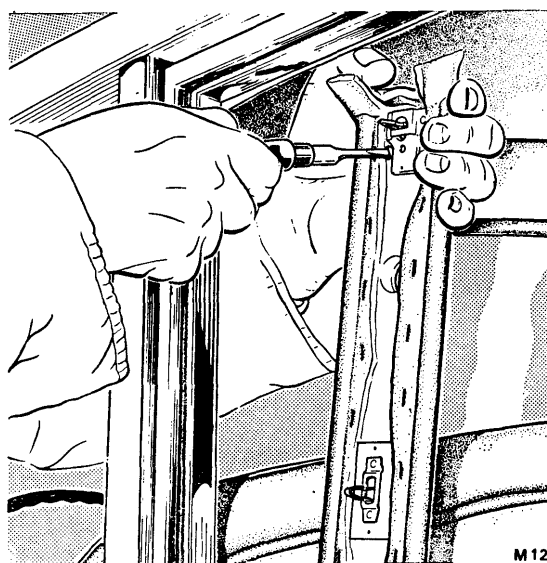


FIG. S103 FITTING A FRONT SEAT BELT STORAGE CLIP TO THE CENTRE PILLAR TRIM PANEL

Note Only required with early type static seat belt

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Front seat static belt—To remove

- 1.(a) Long Wheelbase cars fitted with a centre division. Disconnect the battery leads.
- (b) All cars except Long Wheelbase cars with a centre division. Operate the front seat to its most forward position.

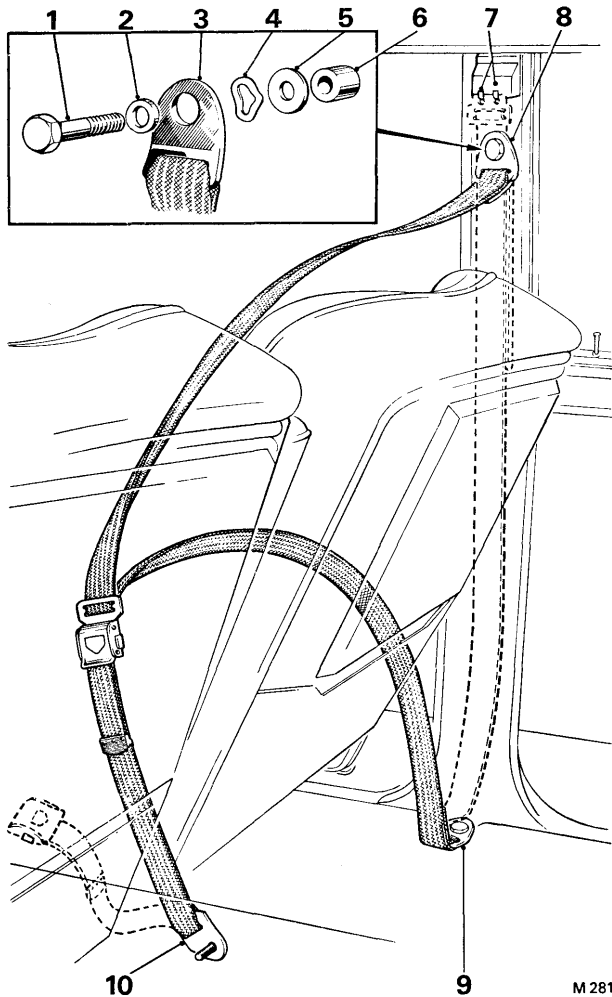


FIG. S104 FRONT SEAT STATIC BELT MOUNTINGS (Britax early type belt with 'Lyfe-Lok' buckle)

- 1 Anchorage bolt
- 2 Distance piece
- 3 Seat belt bracket
- 4 Waved washer
- 5 Chromed washer
- 6 Distance piece
- 7 Stowage clip and block
- 8 Centre pillar mounting—items 1, 2, 3, 4, 5 and 6 required
- 9 Body sill mounting—items 1, 2, 3, 4 and 5 required
- 10 Transmission tunnel mounting—items 1, 2, 3, 4 and 5 required

2. Remove the carpets from the rear compartment; do not remove the carpet trim from the transmission tunnel.

3. Remove the bolts securing the safety belt lugs to (i) the transmission tunnel, (ii) the sill (or cover plate) at the rear of the front seat and (iii) the body centre pillar on 4-door cars or the rear quarter panel on 2-door cars; carefully retain any distance piece(s) or washer(s) with their respective anchorage bolt.

Note that on some later static type seat belts the lap strap and the shoulder strap are separate straps, each having its own buckle but secured at the inboard (short) section of the belt by the same anchorage bolt.

4. Remove the seat belt from the car, noting the following.

- (a) Long Wheelbase cars fitted with a centre division. Remove the belts towards the front of the car carefully guiding the webbing and lugs through the slots in the division. To facilitate assembly, tie a length of string to the lug before removal then, having removed the belt from the division, untie the string leaving the string threaded through the slot in the division.
- (b) 4-Door Saloon and Long Wheelbase cars on which the inboard section of the bolt is fitted with a metal stiffener and sheath. Before the inboard section of the belt can be removed, it will first be necessary to remove the nut and screw securing the tag of the stiffener sheath (if fitted) to the stowage bin.

Front seat static belt—To fit

To fit the front seat static type belt reverse the procedure given for removal noting the following points.

1. On 4-Door Saloon and Long Wheelbase cars fitted with a sill cover plate, ensure that the ten $\frac{7}{16}$ in. A/F screws securing the sill cover plate are correctly torque tightened (see Chapter P, Torque Tightening Figures) before fitting the sill anchorage bolt.

2. When fitting the $\frac{7}{16}$ in. diameter UNF seat belt anchorage bolts, refer to Figure S104; this shows an early Britax seat belt in position and the order of assembly of the anchorage bolts, distance pieces and washers in the belt mounting lugs.

Where a waved washer is fitted, ensure that it fits over the distance piece and is not trapped by the face of the distance piece; finally tighten the anchorage bolts to between 21 lb. ft. and 23 lb. ft. (2,903 kgm. and 3,179 kgm.).

3. On Long Wheelbase cars fitted with a centre division, ensure that any electrical connections are not inadvertently disconnected while threading the inboard section of the belt through the slots in the division.

Rear seat belt—To remove

1. Remove the rear seat cushion (see Section S2)
2. Two methods of securing the seat belt to the rear seat pan have been used; to disconnect the belt from the seat pan anchorage proceed as follows.
 - (a) **Shackle type belt lug anchorage** (see Fig. S105). On belts with this type of anchorage, remove the screw (or the nut and bolt in some cases) securing the shackle on each end of the lap belt to the eye bolt in the seat pan.
 - (b) **Belt lugs bolted directly to the rear seat pan** (see Fig. S106). Remove the bolts securing the belt lugs to the seat pan. Note that when three sets of rear belts are fitted, the two inner bolts each secure two sections of a seat belt.
3. If a diagonal belt is fitted, remove the bolt securing the upper lug of the belt to the anchorage point at the rear of the seat backrest; carefully retain the distance piece(s) and washers with the anchorage bolt.
4. Remove the rear seat belt.

Rear seat belt—To fit

To fit the rear seat belt reverse the procedure given for removal noting the following points.

1. When fitting a lap and diagonal seat belt, secure the upper lug of the diagonal strap to its anchorage as shown in Figure S105 noting the correct order of assembly for the distance pieces and washers; ensure that the crank of the lug is uppermost and that the waved washer is not trapped by the small distance piece.

Tighten the anchorage bolt to between 21 lb. ft. and 23 lb. ft. (2,903 kgm. and 3,179 kgm.) and ensure that the lug will swivel about its anchorage.

2. On cars fitted with seat belts having shackle type belt lug anchorages (see Fig. S105), ensure that the screws securing the shackles to the eye bolts in the rear seat pan are at right angles to the centre line of the car.

3. On cars where the seat lap belts are bolted directly to the rear seat pan, refer to Figure S106 which shows the correct positioning of the belt lugs when three rear seat lap belts are permitted.

When the lugs are positioned correctly, tighten the anchorage bolt to between 21 lb. ft. and 23 lb. ft. (2,903 kgm. and 3,179 kgm.); ensure that the belts are not twisted.

Note When three sets of lap belts are fitted, the belts from a double anchorage point must be of the same end fixing, i.e. either two buckle sections together or two tongue sections.

Britax automatic seat belt—To adjust

1. Initially, adjust the tongue on the reel section of the seat belt so that it hangs just below the upper anchorage point when the belt is fully retracted; on belts incorporating a tongue stop, adjust the position of the tongue stop so that it holds the tongue in the required position.

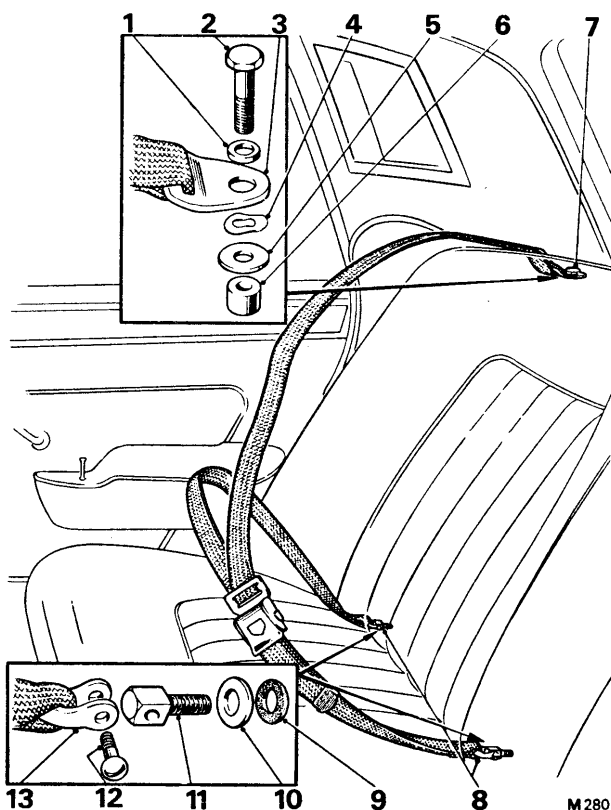


FIG. S105 BRITAX LAP AND DIAGONAL REAR SEAT BELT IN POSITION (Early 4-Door Saloon Cars)

- 1 Distance piece
- 2 Anchorage bolt
- 3 Seat belt bracket
- 4 Waved washer
- 5 Chromed washer
- 6 Distance piece
- 7 Upper anchorage point—shoulder strap
- 8 Rear seat pan anchorage points—lap straps
- 9 Rubber washer
- 10 Washer
- 11 Eye bolt
- 12 Screw (nut and bolt fitted to later belts)
- 13 Shackle

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2. Sit in the car and fasten the seat belt; check that the belt is not twisted.

3. **Short inboard section of the Seat Belt** (strap with buckle attached).

Note If this section of the seat belt is the semi-rigid type fitted with a stiffener, no adjustment is required and the following does not apply.

Operate the front seat to the required position, then adjust the short inboard section of the seat belt so that the clasp is level with the side of

the hip adjacent to the centre line of the car: this adjustment is carried out as described for static seat belts (see *Static seat belt – To adjust, Operation 1*).

4. **Reel section of the Seat Belt** (lap and diagonal strap). No adjustment of the reel section of the belt is required as the design of the reel always keeps the webbing comfortably in position across the body; this allows complete freedom of movement until fierce braking, hard cornering or crash conditions activate the reel locking mechanism.

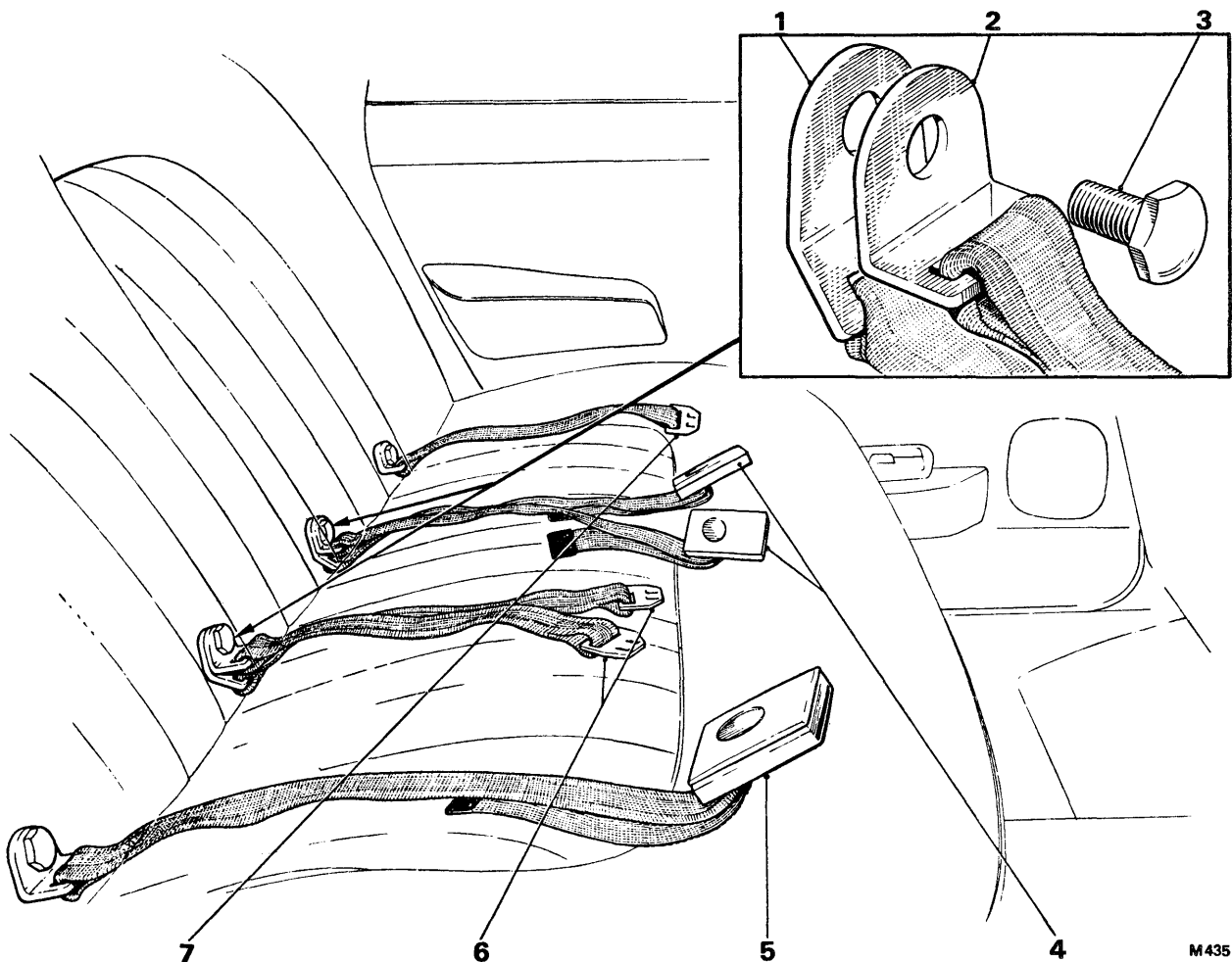


FIG. S106 LATER TYPE BRITAX REAR SEAT LAP BELTS IN POSITION

Note Illustration shows mountings when **three** seat belts are permitted

- 1 Seat belt bracket
- 2 Seat belt bracket
- 3 Anchorage bolt

- 4 Mounting point—two buckle sections of a belt
- 5 Mounting point—one buckle section of a belt
- 6 Mounting point—two tongue sections of a belt
- 7 Mounting point—one tongue section of a belt

Static seat belt—To adjust

1. Adjustment is provided on the buckle section of the seat belt. Two types of buckle fastener are employed on Britax seat belts and the method of adjustment is different on each. To adjust one of these seat belts proceed as follows.

(a) **'Lyfe-Lok' buckle** (see Fig. S104). To lengthen the belt, grip the two arrowed finger pieces on the sides of the buckle with the thumb and forefinger and pull firmly upwards.

To shorten the belt, pull the loose end of the webbing.

(b) **'Press-button' buckle** (see Fig. S106). To lengthen the belt, lift the lower end of the buckle until it is at 90° to the webbing when it will slide along the webbing quite freely.

To shorten the belt, pull the loose end of the webbing.

When adjusting the seat belt the following points should be noted.

2. Before adjusting the front seat belts, operate the seat to the required position.

3. The buckle should always rest on the side of the hip.

4. The belt should be adjusted so that the hand will just pass between the webbing and the chest of the diagonal belt; the lap belt should be reasonably tight.

Britax automatic seat belt—To test

1. Fasten and adjust the seat belt (see *Automatic seat belt - To adjust*).

Fit a 'g' meter to the front windscreen for carrying out tests 2 and 4; zero the meter with the car stationary on a level surface.

2. **Acceleration.** Accelerate the car at a rate increasing to 0.2 g.; ensure that the belt does not lock.

3. **Cornering.** Make a sharp 'U' turn to the left; check that the belt locks and subsequently releases on completion of the turn.

Repeat the test on a similar right-hand turn.

4. **Deceleration.** Brake progressively from 40 m.p.h. (64 k.p.h.); check that the belt locks at a figure between 0.2 g. and 0.6 g. and subsequently releases.

5. With the car stationary, lean forward to the maximum extent that the webbing permits then return to the normal sitting position; check that the belt remains in contact with the body during this movement and during subsequent normal driving movements (e.g. operating the handbrake).

6. Release the buckle and allow the belt to retract; check that the belt retracts until the tongue is about 6 in. (15.2 cm.) from the upper anchorage point and that with a small push on the tongue the belt retracts completely.

7. If, after checking that the belt is fitted correctly, the belt fails any of these test conditions, fit a new seat belt.

Section S10

MISCELLANEOUS TRIM

Top roll—To remove

4-Door Saloon and Long Wheelbase cars

1. Remove the screws securing the lower parcel shelf below the facia; to gain access to one of these screws it will be necessary to remove the polythene plug from the inboard wall of the parcel shelf.

Remove the parcel shelf.

2. Unscrew the knurled nut securing the main fuse box cover and fully lower the fuse box.

3. Remove the four screws securing the trim pocket around the handbrake lever; remove the trim pocket.

4. Remove the $\frac{7}{8}$ in. A/F setscrew securing each side leg of the top roll to the facia panel.

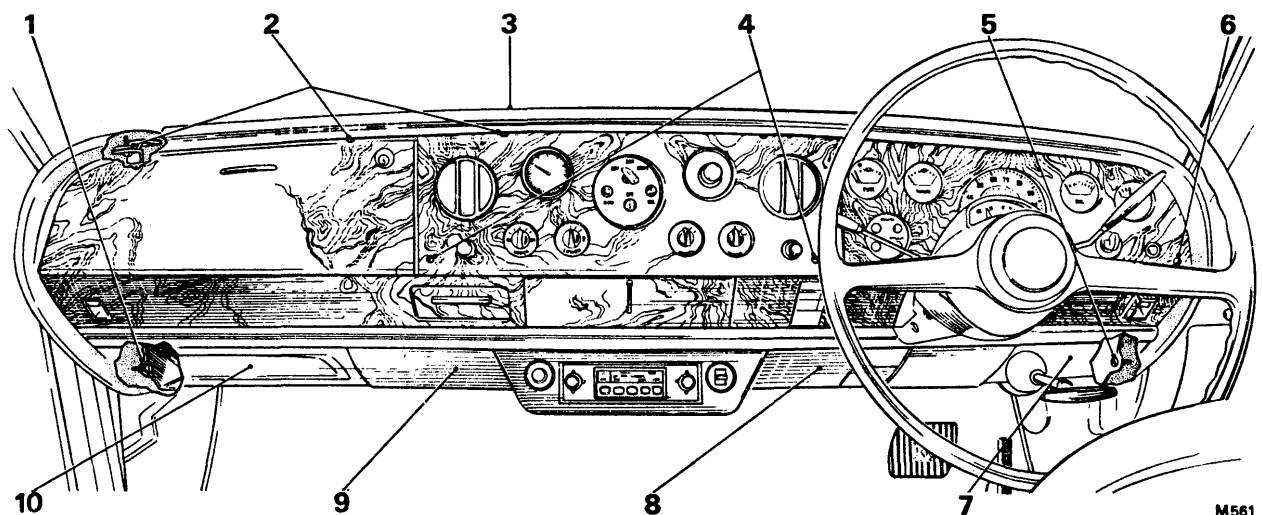
5. On later cars (see Fig. S108), remove the polished wood facia as follows.

Remove the small grub screw securing each air outlet control knob to its spindle and remove both knobs. Remove the screws securing the two sections of the polished wood facia; remove the polished wood facia.

6.(a) Early cars (see Fig. S107). Remove the screws located under the protruding edge of the top roll.

(b) Late cars (see Fig. S108). Remove the setscrews securing the top roll to the instrument board; also remove the two $\frac{7}{8}$ in. A/F nuts and washers situated above the door aperture inside the lockable cubby box.

7. Remove the top roll.



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FIG. S107 VIEW OF TYPICAL FACIA TRIM (4-Door Saloon and Long Wheelbase Cars Prior to Car Serial Number 6001)

- 1 Screw securing side leg of top roll
- 2 Screws—top roll to facia brackets (6 off)
- 3 Top roll
- 4 Screws securing centre facia panel
- 5 Screw securing side leg of top roll

- 6 Screw securing end facia panel
- 7 Trim panel surrounding handbrake lever
- 8 Trim panel surrounding bonnet release lever
- 9 Left-hand lower trim panel
- 10 Parcel shelf

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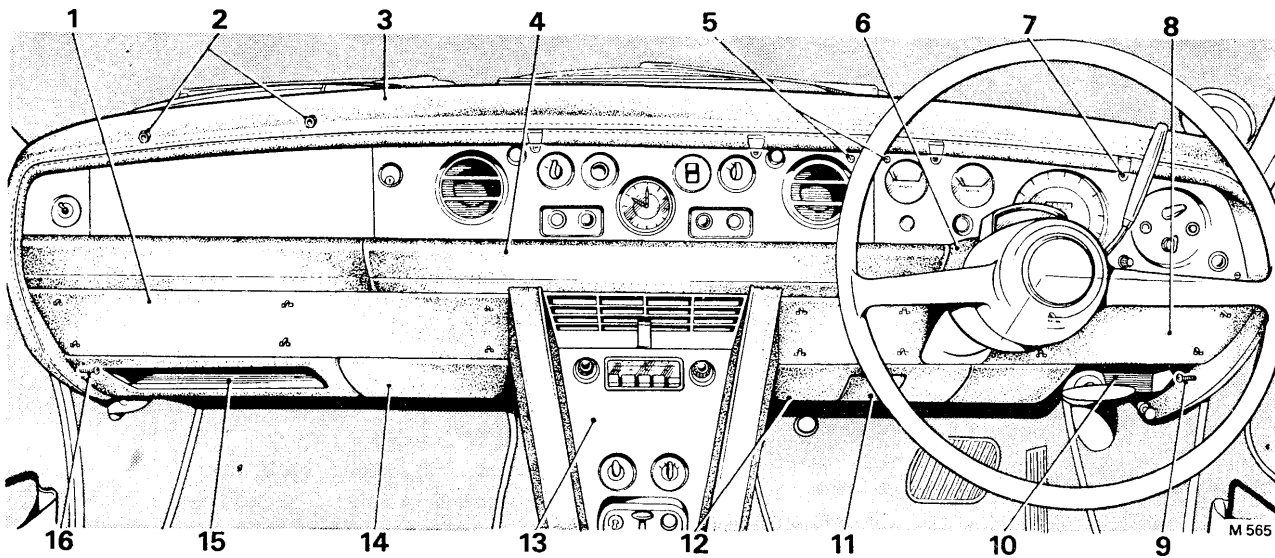


FIG. S108 VIEW OF TYPICAL FACIA TRIM (4-Door Saloon and Long Wheelbase Cars after Car Serial Number 6000)

- | | |
|--|---|
| 1 Knee trim pad | 9 Screw securing side leg of top roll |
| 2 Nuts securing top roll to instrument panel (2 off) | 10 Handbrake lever trim panel |
| 3 Top roll | 11 Knee trim pad |
| 4 Lower roll | 12 Trim panel around bonnet release lever |
| 5 Screws securing polished wood facia | 13 Centre console |
| 6 Steering column cowl fairing trim | 14 Lower trim panel |
| 7 Screw—top roll brackets to instrument panel | 15 Parcel shelf |
| 8 Knee trim pad | 16 Screw securing side leg of top roll |

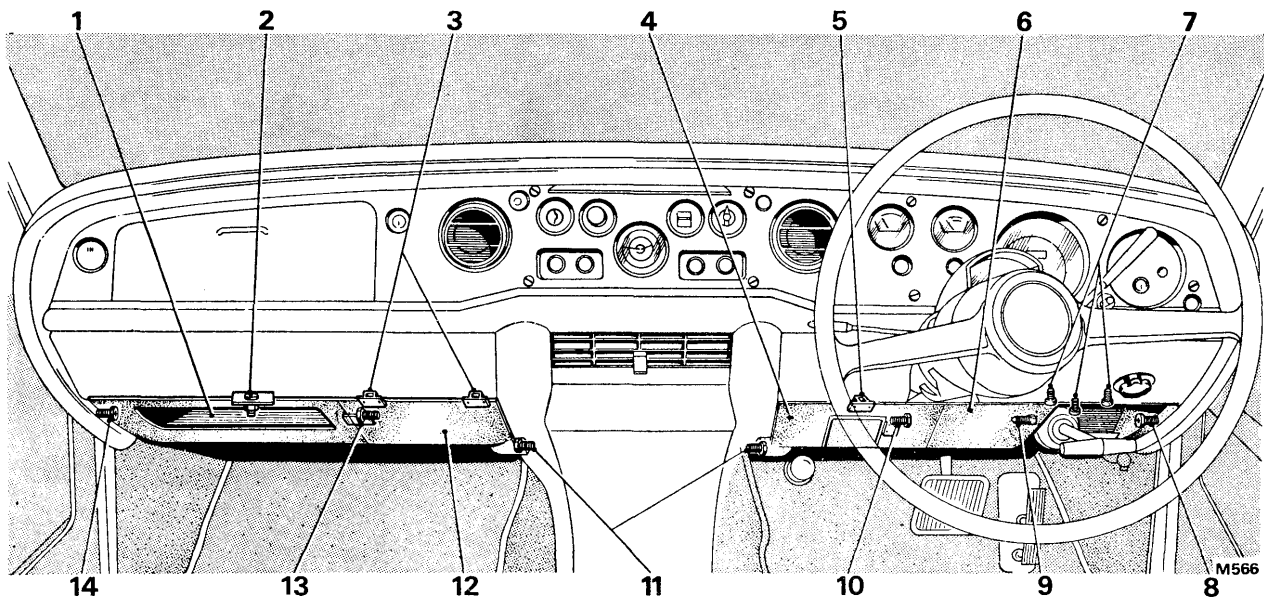


FIG. S109 LOWER FACIA TRIM PANELS

- | | |
|--|---|
| 1 Parcel shelf | 9 Fusebox retaining screw |
| 2 Screw—parcel shelf to support bracket | 10 Setscrew securing trim panel to facia bracket |
| 3 Locating bracket—lower trim panel | 11 Setscrews securing trim panels to centre console |
| 4 Trim panel around bonnet release lever | 12 Lower trim panel |
| 5 Trim panel locating bracket | 13 Setscrew securing parcel shelf and trim panel to facia bracket |
| 6 Fusebox cover | 14 Screw securing parcel shelf and side leg of top roll |
| 7 Screws securing handbrake lever trim panel | |
| 8 Screw securing trim panel and side leg of top roll | |

Top roll—To remove**Coachbuilt cars**

1.(a) **Cars prior to Car Serial Number 6001.** Remove the six screws situated underneath the protruding edge of the top roll; draw the roll away from the windscreen to disengage the clips securing the front edge and remove the top roll.

To remove the trim panel situated between the top roll and the windscreen, remove the screws securing the rear edge of the panel; draw the panel away from the windscreen to disengage the front edge of the panel from its retaining clips and remove the panel.

(b) **Cars after Car Serial Number 6000.** To remove the top roll follow the same procedure described for late 4-Door Saloon and Long Wheelbase cars (see *Top roll – To remove, Operations 1, 2, 3, 4, 5 and 6(b)*).

Top roll—To fit**All cars**

To fit the top roll reverse the procedure given for removal.

Instrument board—To remove**4-Door Saloon and Long Wheelbase cars**

1. Disconnect the battery leads.
2. Remove the top roll above the facia (see *Top roll – To remove, in this Section*).
- 3.(a) **Early cars not fitted with a front centre console** (see *Fig. S107*). Remove the radio receiver mounted below the facia (see *Chapter M – Electrical System*).
- (b) **Late cars fitted with a front centre console** (see *Fig. S108*). Slacken the centre console assembly and move it away from the facia (see *Centre console – To remove, Operations 1 to 6 inclusive, in this Section*).
4. Remove the two 2 B.A. screws securing each of the two trim panels below the facia; one pad is adjacent to the bonnet catch operating lever, the other pad is adjacent to the lower parcel shelf.

Remove both pads in a downward direction to disengage the brackets on the back of each pad from the lugs on the facia (see *Fig. S109*).

5. Remove the small trim pad (if fitted) situated between the steering column and the facia; lift the pad upwards out of the spring retaining clip.

6. **On early cars not fitted with a centre console** (see *Fig. S107*), remove the screws securing the two sections of the polished wood facia; remove the facia.

7. **On late cars fitted with a centre console** (see *Fig. S108*), remove the three trim pads situated below the lower roll; the pads are secured to the facia by spring type upholstery clips and a wedge-shaped removal tool will be required.

On cars fitted with a 'PARKING' switch, it will be necessary to remove the switch knob and escutcheon before the trim pad adjacent to the steering column can be removed. To remove the knob, depress the spring plunger in the shank of the knob then remove the knob; remove the two screws securing the switch escutcheon and remove the escutcheon.

8. Disconnect the electrical leads to the instruments, lamps, switches, etc., on the instrument board (see *Chapter M – Electrical System*); in view of the numerous electrical connections involved, it is advisable to label each one as it is disconnected to facilitate assembly.

9. Disconnect the drive cable from the speedometer (see *Chapter M – Electrical System*).

10. **On early cars not fitted with a front centre console** (see *Fig. S107*), remove the two $\frac{7}{16}$ in. A/F nuts securing the lower edge of the instrument board to the mounting brackets; the nuts are situated under the lower edge of the facia behind the two outer lugs for the lower trim pads (see *Operation 4*).

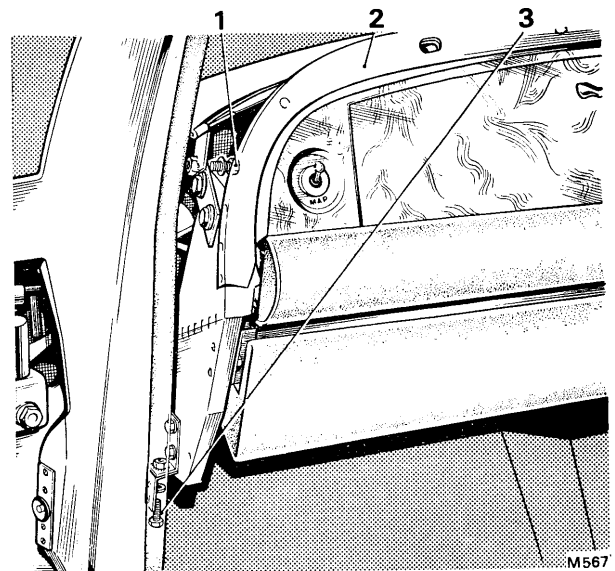


FIG. S110 POSITION OF THE SETSCREWS SECURING LEFT-HAND SIDE OF THE INSTRUMENT BOARD

Note Position of right-hand screws symmetrically opposite

- 1 Setscrew—upper bracket to body bracket
- 2 Instrument board
- 3 Setscrew—lower bracket to body bracket

Chapter 5

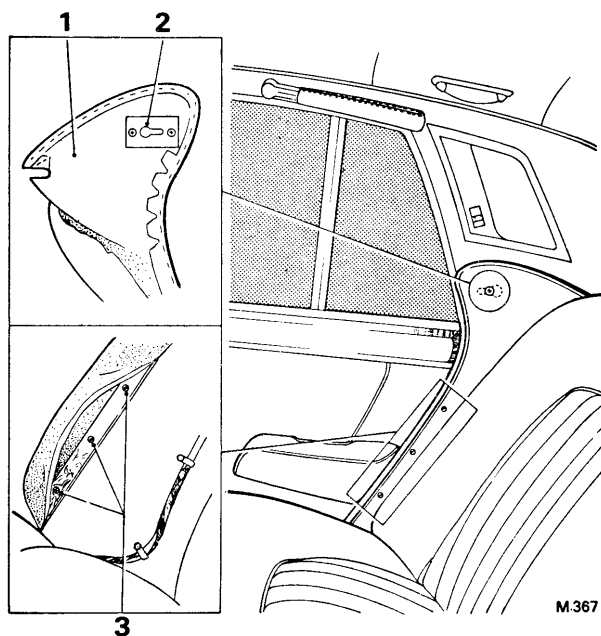


FIG. S111 POSITION OF THE REAR CHEEK PAD SECURING SCREWS (4-Door Saloon and Long Wheelbase Non-division Cars)

- 1 Cheek pad
- 2 Slotted bracket attached to rear of cheek pad
- 3 Wood screws (3 off)

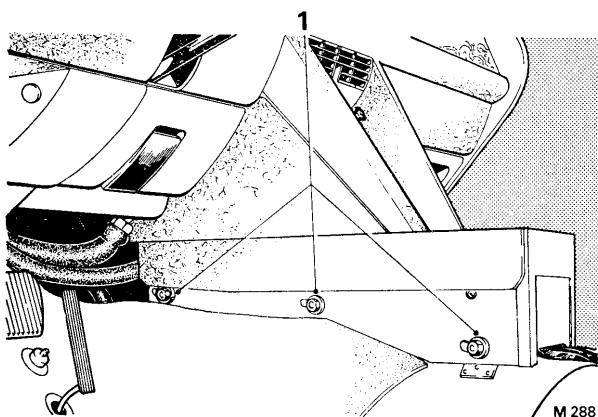


FIG. S112 POSITION OF THE CENTRE CONSOLE MOUNTING SCREWS (4-Door Saloon and Long Wheelbase Cars)

Note Left-hand side securing screws illustrated; the right-hand side securing screws are symmetrically opposite

- 1 Setscrews (6 off) securing console to transmission tunnel

11. Remove the eight $\frac{7}{16}$ in. A/F setscrews securing the instrument board to the car; four of these setscrews secure the board to the two centre mounting brackets, the other four setscrews secure the outer ends of the board to the side scuttle brackets (see Fig. S110).

Two assistants will be required to support the instrument board as the setscrews are removed.

12. Carefully remove the instrument board from the car.

Instrument board—To fit

To fit the instrument board reverse the procedure given for removal noting the following points.

1. Before fitting the instrument board check that the rubber seal is in position on the two outlets from the air conditioning unit under the facia.
2. Before fitting the top roll check the operation of the lamps, switches, instruments, etc., on the instrument board.

Cheek pad—To remove

To remove the cheek pad fitted below the rear quarter panel on 4-Door Saloon and Long Wheelbase cars (see Fig. S111), proceed as follows noting that the removal procedure is the same for both cheek pads.

1. Remove the rear seat and backrest (see Section S2, *Rear seat – To remove, in this Chapter*).
2. Detach the leather trim of the cheek pad from the body; the trim is secured with adhesive and also, on late cars, with tacks and clips.
3. Lift back the leather trim of the cheek pad to expose the three screws securing the pad to the body; remove the three screws.
4. Grip the lower part of the cheek pad and free it from its position between the draught welt and the seat valance; as the lower part of the cheek pad is being lifted, ease the upper part of the pad away from the quarter panel then move it forward approximately $\frac{3}{4}$ in. (19,05 mm.) until the slotted bracket attached to the inside of the cheek pad is felt to free itself from the head of the Phillips screw (see Fig. S111).

Remove the cheek pad.

Cheek pad—To fit

To fit the cheek pad reverse the procedure given for removal noting the following point.

1. Use Dunlop adhesive L107 or its equivalent to secure the cheek pad leather trim to the body.

Centre console—To remove (see Fig. S112)

4-Door Saloon and Long Wheelbase cars from Car Serial Number 6000

1. Remove the front seats (see Section S2, Front seat—To remove, in this Chapter).
2. Lift out the ashtray at the rear of the centre console.
3. Remove the stowage bin (see Stowage bin—To remove, in this Section).
4. Disconnect the bonding cable and the earthing leads secured to the transmission tunnel by removing the 2 B.A. nut and washer; this nut is situated in the ashtray well at the rear of the centre console.
5. Remove the six $\frac{7}{16}$ in. A/F setscrews securing the centre console to the transmission tunnel.
6. The centre console can now be moved away from the fascia sufficiently for fascia components (the instrument board for example) to be removed.
However, if it is required to move the centre console any distance from the fascia or remove it completely from the car, proceed as follows.
7. Remove the trim pad from each side of the centre console; a wedge-shaped tool will be required to free the spring type upholstery clips securing the pads.
8. Disconnect the centre console electrical looms at the terminal blocks on the forward end of the console and also at the switch connections where necessary (see Chapter M, Electrical System); disconnect any bonding leads from the transmission tunnel.
9. Disconnect the aerial lead from the radio mounted in the console.
10. On Long Wheelbase cars fitted with a centre division, it will be necessary to disconnect the looms to the centre division electrical components and also to disconnect the rear radio aerial at the junction block on the centre console side trim pad, if the centre console is to be removed from the car.
11. Remove the centre console.

Centre console—To remove

Coachbuilt cars after Car Serial Number 6000

1. Disconnect the battery leads.
2. Lift back the carpet trim to expose the two feet on each side of the console; remove the self-tapping screws securing the feet to the car floor.
3. Disconnect the electrical looms to the switches and the cigar lighter mounted in the console.
4. Remove the centre console assembly.

5. Remove the radio receiver (see Chapter M—Electrical System).

6. Remove the screws securing the trim panels on each side of the radio console (see Fig. S113); remove the trim panels.

7. Remove the screws securing the radio console and the air conditioning outlet grille to the lower face of the instrument panel.

8. Remove the setscrews securing each side of the radio console to the transmission tunnel; remove the console, detaching any looms which may be clipped to the console.

Centre console—To fit

All cars after Car Serial Number 6000

To fit the centre console reverse the procedure given for removal noting the following point.

1. When fitting the centre console ensure that none of the electrical looms are trapped between the console and the transmission tunnel.

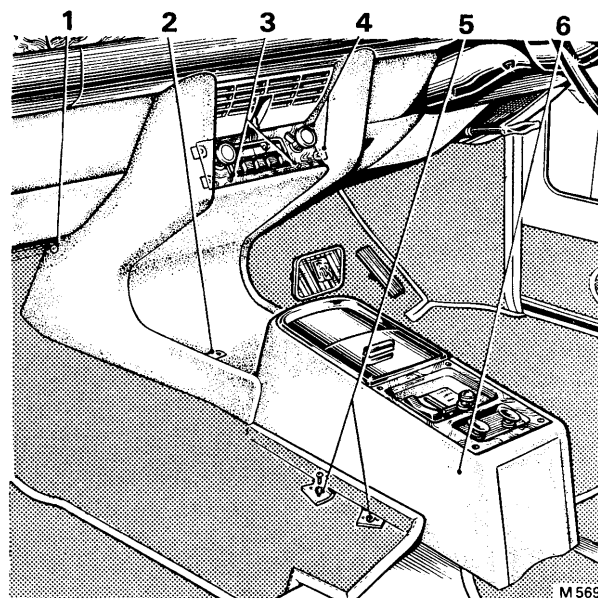


FIG. S113 VIEW OF TYPICAL CENTRE CONSOLE TRIM (Coachbuilt Cars)

- 1 Side trim panel securing screw
- 2 Screw securing side and centre trim panels
- 3 Screws securing centre trim panel to radio console
- 4 Screws securing side trim panel to radio console
- 5 Centre console mounting feet
- 6 Centre console

Chapter 5

Stowage bin—To remove

To remove the stowage bin fitted between the front seats on 4-Door Saloon and Long Wheelbase cars proceed as follows.

Early cars (see Fig. S114)

1. Disconnect the battery leads.

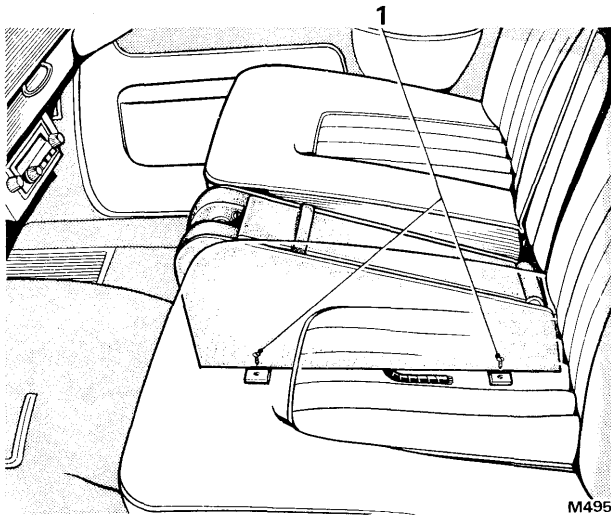


FIG. S114 METHOD OF SECURING THE STOWAGE BIN (4-Door Saloon and Long Wheelbase Cars prior to Car Serial Number 6001)

- 1 Screw (4 off)

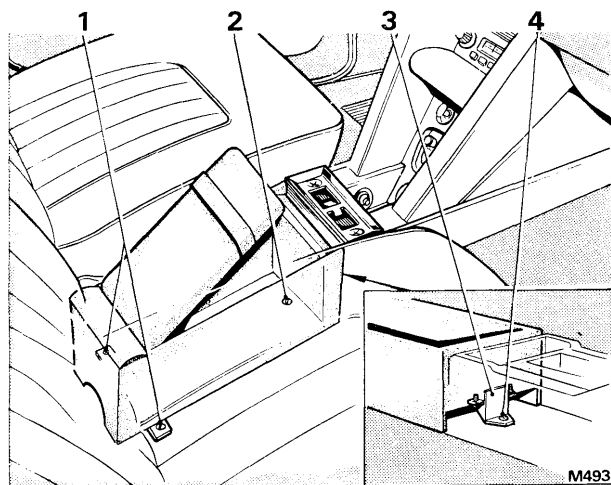


FIG. S115 METHOD OF SECURING THE STOWAGE BIN (4-Door Saloon and Long Wheelbase Cars after Car Serial Number 6000)

- 1 Screw—rear feet (2 off)
 - 2 Screw—when bin is fitted with a lid
 - 3 Bracket
 - 4 Screw
- } when bin is not fitted with a lid

2. Remove the front seat cushions.
3. Lift back the carpet to expose the feet of the stowage bin then remove the screws securing the feet to the transmission tunnel; there are two feet on each side of the stowage bin.
4. Disconnect the seat switch loom plug and socket and detach the clip securing the loom to the seat mechanism.
5. Remove the stowage bin together with the wiring loom.

Late cars fitted with a centre console (see Figs. S115 and S116)

1. Remove the front seat cushions.
2. Lift back the carpet to expose the feet of the stowage bin then remove the screws securing the feet to the transmission tunnel; there is one foot on each side of the bin.

Note that on Long Wheelbase cars fitted with a centre division these screws also secure the clips for the division electrical looms.

3. The front end of the stowage bin may be retained by either a screw or a spring clip; if the front radio receiver is mounted into the centre console the bin will be retained by a screw, if the front radio is mounted between the console ashtray and the stowage bin the bin will be retained by a spring clip.

To detach the front end of the stowage bin proceed as follows.

- 4.(a) **Radio mounted into the centre console** (see Fig. S115). If a padded lid is fitted to the stowage bin, lift the lid then remove the Phillips screws situated at the forward end of the stowage recess.

If a padded lid is not fitted to the stowage bin, lift out the ashtray at the rear of the centre console then remove the Phillips screw situated at the bottom of the ashtray recess in the centre console.

- (b) **Radio mounted between the centre console ashtray and the stowage bin** (see Fig. S116). Grip the stowage bin and pull towards the rear of the car to disengage the spring clip.

5. Remove the stowage bin noting that on some late cars fitted with front seat belts, it will be necessary to detach the inner belt sheath strap (if fitted) before the bin can be removed from the car; to detach the sheath strap, remove the screw securing the strap to the stowage bin.

Stowage bin—To fit

To fit the stowage bin reverse the procedure given for removal.

Head lining—To remove

4-Door Saloon and Long Wheelbase cars

1. Disconnect the battery leads.
2. Remove the trim surrounding the windscreen until the edge of the head lining above the windscreen is exposed; refer to the basic procedure described for removing the windscreen (see Section S3, *Windscreen—To remove, in this Chapter*).
3. On early cars, remove the sun visors and also the hazard warning lamp (if fitted); these items are not included in the removal procedure referred to in Operation 2.

To remove the sun visors, first remove the ten self-tapping screws securing the sun visor pivot brackets and the retention brackets to roof; remove the sun visors.

To remove the hazard warning lamp refer to Chapter M – Electrical System.

4. Remove the trim surrounding the rear window until the edge of the head lining is exposed; refer to the basic procedure described for removing the rear window (see Section S3, *Rear window—To remove, in this Chapter*).

5. On 4-Door Saloon cars after Car Serial Number 6910 (also including 6901 and 6860), remove the following items of interior trim as these are not covered in the removal procedure referred to in Operation 4.

Remove the cheek pads, rear parcel shelf trim pad, vanity mirrors and the rear quarter/cantrail trim panels following the removal procedure described for earlier cars (see Section S3, *Rear window—To remove, All 4-Door Saloon and Long Wheelbase cars prior to Car Serial Number 6911 (excluding 6901 and 6860), Operations 4 to 7 inclusive*).

6. On Long Wheelbase cars after Car Serial Number 6599 (i.e. cars with smaller rear window), remove the following items of trim as these are not covered in the removal procedure referred to in Operation 4.

- (a) **Non-division cars.** Remove the cheek pads, rear parcel shelf trim pad, rear vanity mirrors and the rear quarter/cantrail trim panels following the procedure described for 4-Door Saloon cars in Operation 5.
- (b) **Cars fitted with a centre division.** Remove the cheek pads and the rear cold air outlet ducts (see Chapter C, Section C10, *Outlet ducts—To remove, Operations 7 and 8*). Remove the rear parcel shelf trim pad, using a wedge-shaped tool to free the upholstery clips securing the trim pad to the rear bulkhead.

On both division and non-division cars, remove the trim pad surrounding the rear window as follows.

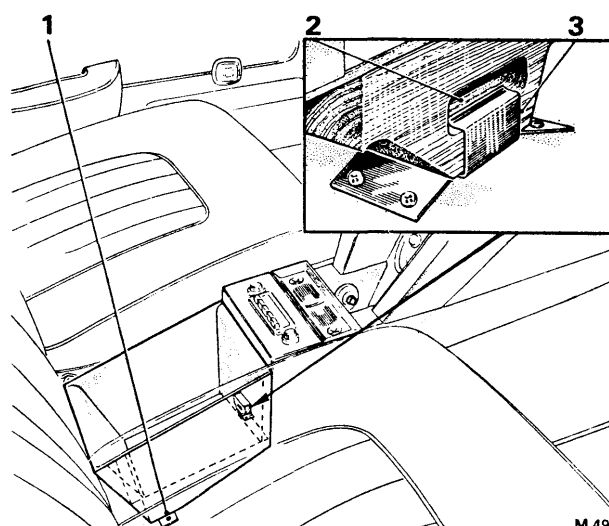


FIG. S116 METHOD OF SECURING THE STOWAGE BIN WHEN A TAPE PLAYER IS FITTED INTO THE FRONT CENTRE CONSOLE (4-Door Saloon and Long Wheelbase Cars)

- 1 Screw—rear feet (2 off)
- 2 Recessed block on front of bin
- 3 Spring retaining clip attached to transmission tunnel

Detach the pad trim from around the sides and the lower edge of the rear window aperture and turn back to expose the seven self-tapping screws securing the trim pad; remove these seven screws. Detach the spring type upholstery clips securing the upper edge of the trim pad and remove the pad.

7. Remove the screws securing the various fittings on the cantrail trim panels, i.e. the front brackets for windscreen side finisher pads, the rear compartment hand pulls (if fitted) and the coat hooks (if fitted).

On Long Wheelbase cars fitted with a centre division, it will also be necessary to remove both perspex end windows and the screen upper channels from the division (see Section S6, *Electrically operated division glass—To remove, Operations 1 to 15 inclusive*).

8. Remove the cantrail trim pads using a wedge-shaped tool to free the spring type upholstery clips; the trim pads are secured to the door draught welts with staples and, unless it is required to remove the trim pads completely from the car, the trim pads should be moved carefully to one side.

9. Remove the roof lamps as follows, the removal procedure being the same for each roof lamp.

Pull the lens cover from the lamp; the cover is only retained by a spring clip. Remove the two screws securing the lamp body to the roof then lower the lamp body sufficiently to gain access to the electrical connections; disconnect the Lucar connections and remove the lamp body.

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10. Remove the clips, drive nails and screws securing the head lining to the roof; free the extremities of the head lining where it is secured with adhesive.

On Long Wheelbase cars after Car Serial Number 6599 (i.e. cars with smaller rear window),

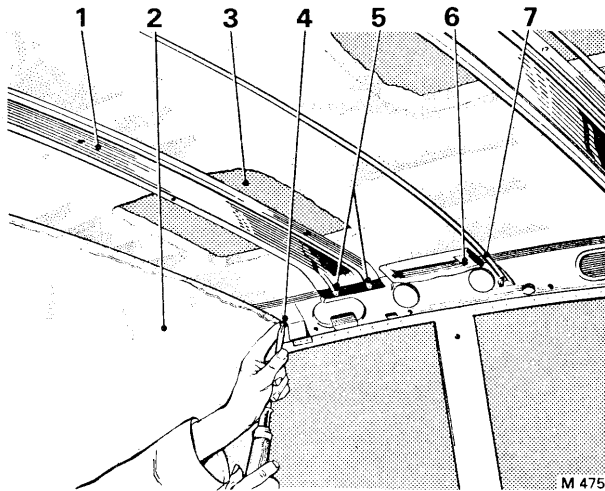


FIG. S117 FITTING A HEAD LINING LISTING BAR (4-Door Saloon and Long Wheelbase Cars)

- 1 Roof bow
- 2 Head lining
- 3 Anti-drum pad
- 4 Listing bar securing screw
- 5 Roof bow securing screws
- 6 Roof lamp mounting bracket
- 7 Listing bar

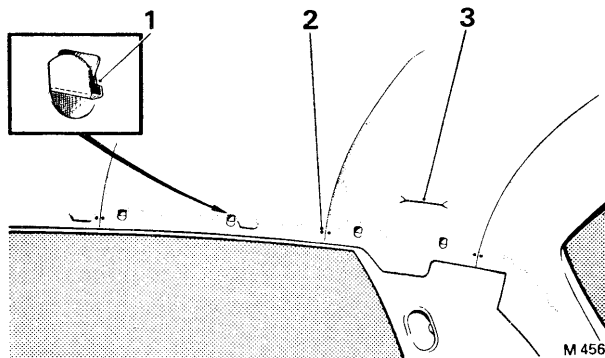


FIG. S118 POSITION OF THE HEAD LINING SECURING CLIPS AND TACKS (4-Door Saloon and Long Wheelbase Cars)

- 1 Retaining clips
- 2 Drive nails
- 3 Slit in head lining for roof lamp

detach the head lining from around the fourteen rear window glass retaining brackets by carefully trimming around each bracket with a sharp knife; do not disturb the fourteen retaining brackets unless the rear window is to be removed also.

11. Remove the self-tapping screw securing each end of the rearmost listing bar to the car roof; remove the listing bar from the loop in the head lining.

12. Pull the head lining forward to the next listing bar then temporarily replace the rearmost listing bar and screws.

Note Listing bars are individually matched to the body therefore this operation should be carried out immediately after withdrawing each bar from the head lining.

13. Continue to remove each listing bar in turn, repeating Operations 11 and 12 until the head lining is free then remove the head lining.

Head lining—To remove

2-Door Saloon cars

- 1. Disconnect the battery leads.
- 2. Remove the trim surrounding the windscreen until the edge of the head lining above the windscreen is exposed; refer to the basic procedure described for removing the windscreen but do not remove the windscreen (see *Windscreen - To remove, Coachbuilt cars*).
- 3. On cars prior to Car Serial Number 6001, remove the sun visors and also the hazard warning lamp if fitted; these items are not included in the removal procedure referred to in Operation 2.

To remove the sun visors, first remove the screws securing the brackets on each end of the sun visors to the roof then remove the sun visors.

To remove the hazard warning lamp, refer to Chapter M - Electrical System.

- 4. Remove the rear seat cushion and backrest (see *Section S2*).
- 5. Remove the screws securing the wood finishers on the cantrail, around the rear quarter windows and around the rear window; remove the wood finishers.
- 6. Remove the screws securing the rear parcel shelf trim pad then detach the loose trim at the front of the pad from the rear bulkhead; this trim is secured with adhesive.

Remove the parcel shelf trim pad.

7. Detach the trim on the lower edge of the cantrail/rear quarter panel and lift to expose the tacks securing the panel to the body; the trim is secured to the body with adhesive.

Lift the tacks and remove the cantrail/rear quarter trim panel.

8. Remove the tacks securing the trim on each end of the trim panel above the rear window; finally remove this panel following the same procedure described in Operation 7 for removing the cantrail/rear quarter trim panel.

9. Remove the lens cover of the three roof lamps. To remove the cover from the two rectangular roof lamps, first remove the two screws securing each of the covers; to remove the circular roof lamp lens cover, unscrew the cover in an anti-clockwise direction.

Remove the screws securing each lamp to the roof then disconnect the electrical leads to each lamp; remove the three roof lamps.

10. Remove the tacks and staples securing the extremities of the head lining to the body.

11. Detach the head lining from the roof listing bars following the same procedure described previously for 4-Door Saloon and Long Wheelbase cars (see *Head lining—To remove, 4-Door Saloon and Long Wheelbase cars, Operations 11, 12 and 13*).

Head lining—To fit

All cars except Convertibles

To fit the head lining reverse the procedure given for removal noting the following points.

1. Before commencing to fit the head lining, check the tightness of the screws securing the roof stays and anti-drum pads (see *Fig. S117*); tighten the screws if necessary.

2. When fitting the listing (see *Fig. S117*) bars do not fully tighten the securing screws until all the listing bars are in position.

3. To avoid wrinkles in the head lining, ensure that each end of the loops, through which the listing bars are fitted, are gripped between the roof and the end of the listing bar.

4. After fitting the head lining to the listing bars, secure the outer edges of the head lining as follows.

(a) **4-Door Saloon and Long Wheelbase cars.** Fix the extremities of the head lining to the body with Dunlop S1127 adhesive or its equivalent. Secure the head lining at each end of the listing bars with two drive nails, one each side of the listing bar, ensuring that the head lining is free from wrinkles. Using a sharp knife, trim the surplus material from the head lining; make shallow 'V' shaped cut-outs in the material where it fits into the rear window and windscreen aperture. Cut holes in the sides of the head lining to align with the clip holes in the body pressing along the cantrail (see *Fig. S118*); fit the retaining clips.

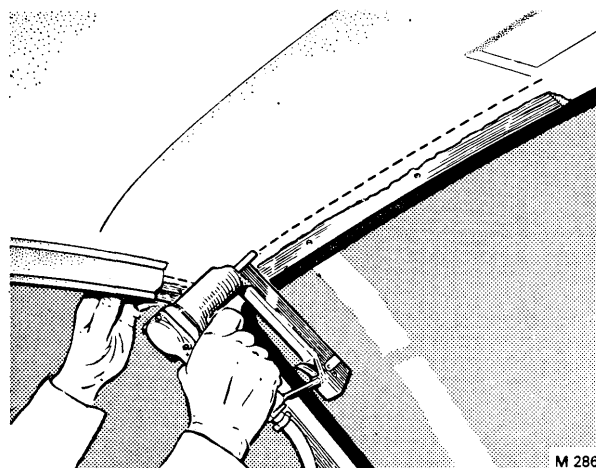


FIG. S119 SECURING THE HEAD LINING TO THE ROOF (2-Door Saloon Cars)

(b) **2-Door Saloon cars.** Secure the head lining at each end of the listing bar with two drive nails, one each side of the listing bar. Using a staple gun (see *Fig. S119*), secure the head lining to the wooden fillets along the sides of the roof, above the windscreen and over the rear window; ensure that the head lining is free from wrinkles, and that the staples will not be visible when the trim panels around the sides of the head lining are fitted. (see *Fig. S120*).

5. It will be necessary to slit the new head lining at the appropriate positions to accommodate the roof lamp electrical leads (see *Fig. S118*).

6. **On 2-Door Saloon cars,** secure the trim of the cantrail/rear quarter trim panel and the trim of the panel above the rear window, to the body, using Dunlop L107 adhesive.

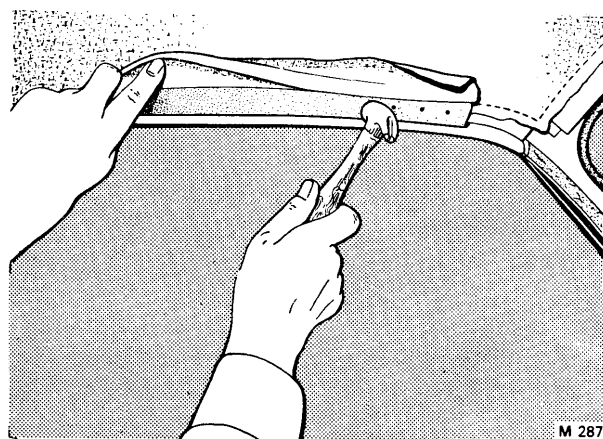


FIG. S120 SECURING THE CANTRAIL TRIM PANEL (2-Door Saloon Cars)

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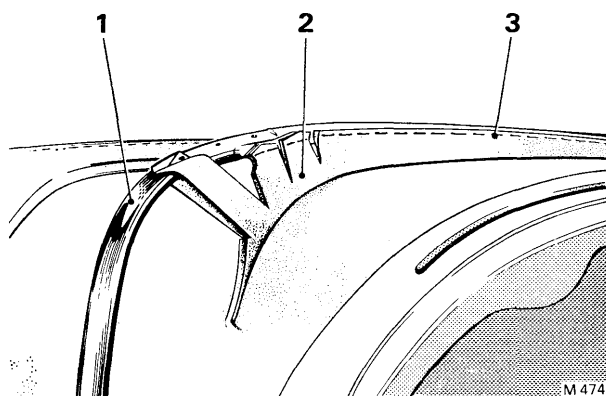


FIG. S121 METHOD OF SECURING THE HEAD LINING TO A HOOD CROSS-STICK (Convertible Cars)

Note The 'wiggling' and outer covering are omitted for clarity

- 1 Cross-stick
- 2 Raised flap of head lining
- 3 Line of securing staples (tacks were used on some cars)

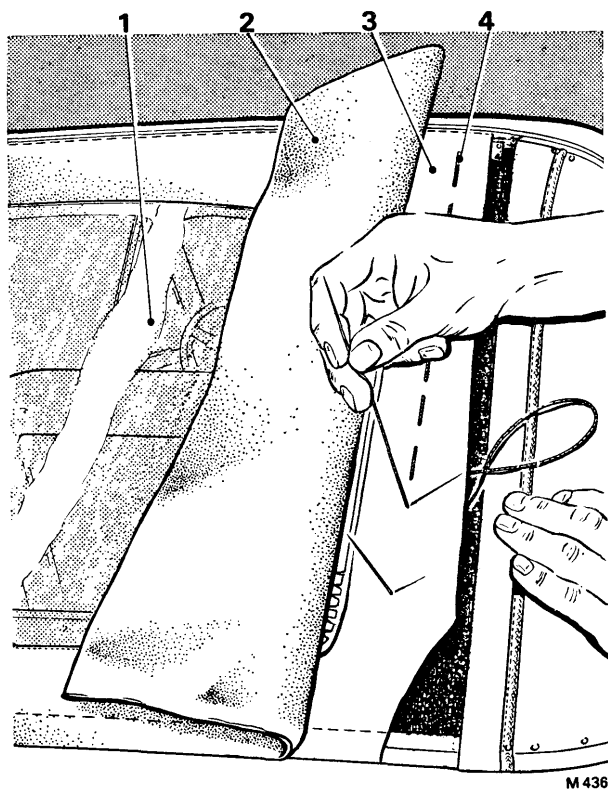


FIG. S122 SECURING THE HEAD LINING TO THE BACKLIGHT TRIM (Convertible Cars)

- 1 Backlight
- 2 Backlight outer trim
- 3 Backlight inner trim
- 4 Line of securing stitches

Head lining—To remove

Convertible cars

1. Lower the electrically operated rear quarter windows then release the hood safety catches; partly raise the hood.
2. Disconnect the battery leads.
3. Remove the screws securing the hood safety catches to the hood peak; remove the safety catches retaining any packing pieces with its respective catch.
4. Remove the screws securing the trim panel to the hood peak; on cars after Car Serial Number 6000, also remove the crash padding from the hood peak.
5. Remove the rear seat and backrest (*see Section S2*).
6. Remove the screws securing the polished wood finishers on each hood pillar; remove both finishers.
7. Carefully detach the head lining from the hood pillars; the head lining is secured to the pillars with tacks and adhesive.
8. Remove the screws securing the trim panel to the base of the hood stowage well. Using a suitable wedge-shaped tool to free the spring upholstery clips, remove the trim panel.
9. Carefully detach the trim panel from the rear wall of the hood well; the panel is secured with adhesive and care will be necessary to avoid damaging the panel during removal.
10. Detach the head lining from the sides of the hood well.
11. Unscrew the press stud fasteners from the welt finisher on the rear edge of the hood; carefully prise the welt finisher from the body.
12. Mask the body along the rear edge of the hood outer covering then lightly mark the position of the hood backlight vertical seams onto the masking tape.
This is to ensure correct positioning of the hood covering when fitting the head lining.
13. Carefully detach the rear edge of the hood outer covering from the body then fold the hood covering forward as far as the rear cross-stick assembly (*see Fig. S47*).
14. Detach the head lining from the backlight trim surround by removing the stitches down each side of the backlight trim.
15. Remove the tacks securing the head lining to each side of the rear cross-stick assembly.
16. Pull the rear of the head lining towards the front of the car to expose the line of staples (or tacks) securing the head lining to the cross-stick situated immediately forward of the rear cross-stick assembly (*see Fig. S121*); remove these staples (or tacks) and detach the head lining from the cross-stick.
17. Detach the head lining from the remaining cross-sticks by repeating the procedure described in Operation 16.

18. Using a sharp knife, or similar tool, detach the head lining from the hood peak by carefully cutting the head lining level with the rear edge of the hood peak; **do not cut the 'wiggling' or hood outer covering while carrying out this operation.**

Removing the head lining invariably means that a new head lining is to be fitted; therefore cutting the head lining free from the hood peak is suggested as the most practicable method in order to avoid disturbing the 'wiggling' and hood outer covering.

19. Remove the head lining from the car but do not discard it as it may be required as a pattern to produce a new head lining.

Head lining—To fit

Convertible cars

To fit the head lining reverse the procedure given for removal noting the following points.

1. If the original head lining is used as a pattern to produce a new head lining, ensure that the new head lining is approximately 3 in. (7.62 cm.) longer, at the front end; this extra length is to compensate for the portion lost by cutting the head lining during removal.

2. West of England cloth is used for the head lining.

3. When fitting the head lining to the cross-sticks, first fully raise the hood by hand. Attach the head lining to the hood peak and to the rear stick assembly with temporary tacks, altering the position as required until the most satisfactory position is obtained; remove the temporary tacks securing the head lining to the rear stick assembly. Secure the head lining to the cross-sticks with staples or tacks, starting at the hood peak and working rearward (*see Fig. S121*).

4. Use a water-proof thread, such as Terylene Thread 30/3, to secure the backlight trim to the head lining and 'wiggling'.

5. Use Dunlop L107 adhesive or its equivalent, to secure the head lining to the hood pillars and the sides of the hood well.

6. Use Evo-stik adhesive to secure the rear edge of the hood outer covering to the car body.

7. Use a mastic filler to seal between the hood outer covering and the welt finisher.

8. When the head lining is fitted, remove any surplus material protruding below the lower edge of the hood peak.

Hood outer covering—To remove

Convertible cars

1. Release the hood safety catches then partly open the hood.

2. Using thick clean felt or a similar protective material, cover the paintwork on the rear decking panel and along the sides of the body adjacent to the hood outer covering quarter panels.

3. Remove the screws securing the polished wood finisher on each hood pillar; remove both finishers.

4. Carefully detach the hood outer covering from the pillars.

5. Remove the screws securing the hood tensioning cable bracket on each hood pillar.

6. Lift one side flap of the hood outer covering to expose the front end of the hood tensioning cable (*see Fig. S123*); remove the screw locking the cable nipple in the slotted channel then detach the cable from the bracket. Withdraw the cable from the tunnel in the side of the hood outer covering.

Remove the tensioning cable from the other side of the hood in a similar manner.

7. Remove the press-stud fasteners from the finisher welt on the rear edge of the hood; using a screwdriver, carefully lever the finisher welt from the body.

8. Mask the body along the rear edge of the hood outer covering; using a soft pencil lightly mark the position of the hood vertical seams at each side of the backlight, onto the masking tape.

9. Detach the rear edge of the hood outer covering from the body.

10. Remove the screws securing the closing plate and rubber seal to the lower edge of the hood peak; remove the closing plate and seal.

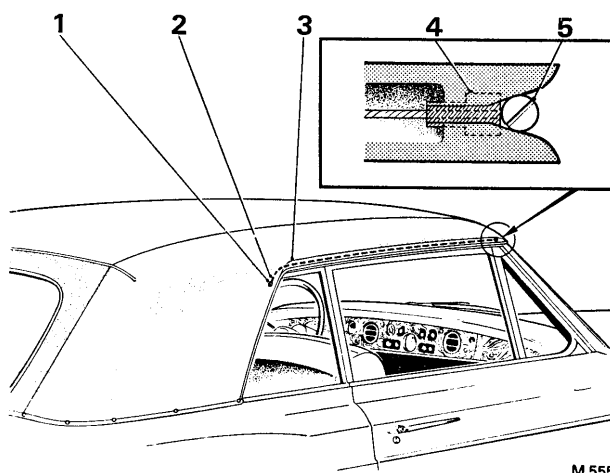


FIG. S123 HOOD OUTER COVERING SIDE TENSION CABLE (Convertible Cars)

- 1 Screw—cable to hood pillar
- 2 Cable
- 3 Tunnel in underside of covering
- 4 Soldered nipple
- 5 Locking screw

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11. Carefully detach the hood outer covering from the hood peak. The hood outer covering is secured to the peak with adhesive and it is recommended that a solvent such as Evo-stik Cleaner is used to soften the adhesive before attempting to remove the covering from the peak.

12. Using a screwdriver, carefully lever the Everflex covered strip out of its channel in the top of the hood rear cross-stick assembly. Carefully remove the staples (or tacks) securing the hood outer covering into the channel; note the position and spacing of the staples (or tacks) to facilitate assembly.

13. Remove the hood outer covering.

that the two seams in the hood covering are each 21 in. (53,3 cm.) from the centre line of the roof. Use **tack** to temporarily secure the corners of the covering until the correct position is obtained.

2. When securing the hood outer covering to the hood peak, rear cross-stick, body and hood pillar, tension the covering to remove any fullness or wrinkles.

3. Use Evo-stik adhesive to secure the hood outer covering to the hood peak and centre pillars.

4. When fitting the hood outer covering to the channel in the rear cross-stick assembly, ensure that the front edge of the hood covering overlaps the rear edge to prevent water leakage.

5. After fitting the tensioning cables, fully raise the hood and secure the hood catches, then check that the side flaps of the hood outer covering are held taut by the cables.

Any slackness in the side flaps can be rectified by re-positioning the tensioning cable brackets on the hood pillars.

Hood outer covering—To fit

To fit the hood outer covering reverse the procedure given for removal noting the following points.

1. When fitting the hood outer covering, align the reference marks made during removal; also, ensure

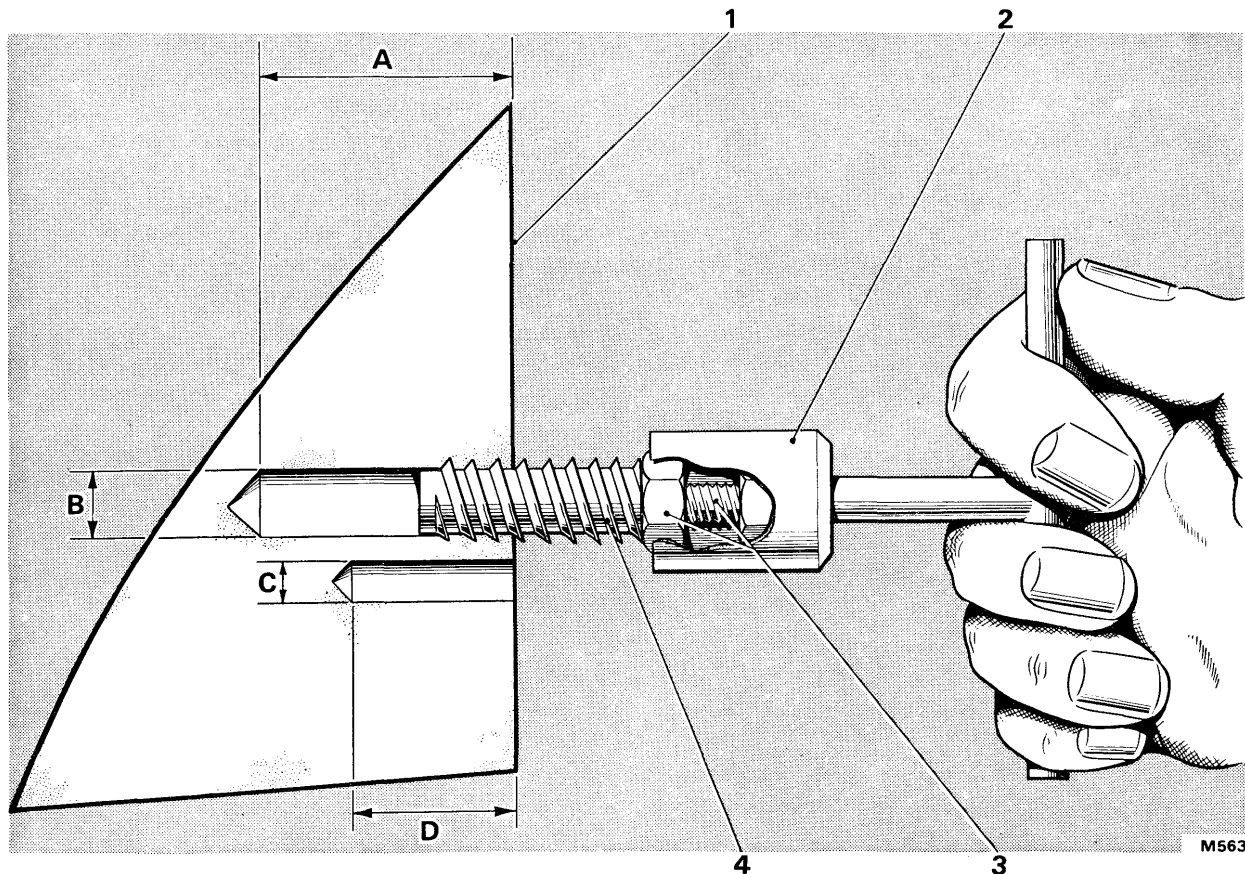


FIG. S124 HOOD CATCH MODIFICATION—DRILLING DIMENSIONS AND METHOD OF FITTING THE BRASS INSERT

- A** 1.125 in. (28,575 mm.)
- B** 0.312 in. (7,937 mm.) diameter
- C** 0.109 in. (2,768 mm.) diameter
- D** 0.625 in. (15,875 mm.)

- 1** Rear face of hood peak rail
- 2** 'Tee' spanner, engaged on the 2 B.A. setscrew and lock-nut
- 3** 2 B.A. setscrew and lock-nut
- 4** Brass insert (part number CBD 2904)

Head rail catches—To modify

Applicable to Convertible cars prior to Car Serial Number CRX 6596.

Complaints of wind noise, rattles or rain leaks on the above Convertible cars may stem from the wood screws, which secure the safety catches of the folding hood to the hood head rail, coming loose after a period in service. An effective and permanent cure for this has been devised and should be applied in such cases of complaint.

The modification entails replacing the upper wood screw in each head rail catch with a 2 B.A. screw, screwed into a brass insert fitted in the head rail, and replacing the lower wood screws with longer, 1.50 in. (3.81 cm.) wood screws. The necessary parts to enable this modification to be carried out are contained in Kit Number 10, obtainable from Rolls-Royce Motors Limited, Crewe.

To carry out this modification proceed as follows.

1. Lower the hood.
2. Remove the three wood screws holding each safety catch to the hood head rail and remove the catches.
3. Remove any packing pieces which may be fitted under the catches.
4. Remove the head rail padding (if fitted), by taking out the screws holding it in position.
5. Using the two lower wood screws as attachments, fit the guide plate provided in the modification kit to the head rail.
6. Fit a 0.312 in. (7.937 mm.) diameter drill with a stop, and drill out the upper centre screw hole to a depth of 1.25 in. (2.857 cm.) as shown in Figure S124.

This depth is critical and extreme care must be taken to ensure that the drill stop is fitted correctly.

Note As only 0.125 in. (3.175 mm.) of wood remains between the bottom of the hole and the outside of the hood after drilling, it is recommended that this operation be carried out using a hand drill rather than an electric one since the action of the latter tends to be too vigorous.

7. Remove the guide plate and clean away all drill cuttings from the hole.
8. Take one of the brass inserts (CBD 2904) and ensure that the 2 B.A. setscrew and lock-nut, fitted to the end opposite the lead-in (see Fig. S124), is well engaged with the threads in the insert.
9. Smear the buttress thread of the insert with a suitable lubricant such as Molytone 265 grease.
10. Using a 'Tee' spanner, engaged with the lock-nut rather than the head of the setscrew (see Fig. S124), screw the insert squarely into the 0.312 in. (7.937 mm.) diameter hole drilled out in the head rail until it is

flush with the rear face of the head rail; remove the setscrew and lock-nut.

11. Repeat Operations 5 to 10 inclusive on the upper centre screw hole of the other hood safety catch.
12. Drill out the remaining two screw holes for each head rail catch with a 0.109 in. (2.768 mm.) diameter drill to a depth of 0.625 in. (15.875 mm.) (see Fig. S124).
13. Clean away all drill cuttings which may be remaining.
14. Fit the head rail padding when applicable (see Operation 4).
15. Fit the head rail safety catches, and distance pieces where applicable, using chrome plated 2 B.A. raised head screws in the top holes and 1.50 in. (3.81 cm.) long, chrome plated wood screws in the lower holes.
16. Tighten all the screws firmly and evenly.
17. Raise the head and secure the safety catches.

Spare wheel platform—To remove

1. Turn the spare wheel platform lowering bolt anti-clockwise and fully lower the platform.
2. Remove the spare wheel from the platform.
3. Scribe the outline of the large washer, at the platform rear pivot assembly, onto the lowering tube bracket; remove the rear pivot bolt, nut and large washer and lower the rear end of the platform.
4. Remove the two $\frac{1}{2}$ in. A/F pivot bolts and nuts together with the large washers securing the platform at the two forward pivot points; remove the platform.

If difficulty is encountered when removing the outer pivot bolt due to its close proximity to the car body, slacken the two $\frac{1}{2}$ in. A/F setscrews and the $\frac{7}{16}$ in. A/F nut and bolt securing the outer mounting bracket to the body; the head of the $\frac{7}{16}$ in. A/F bolt is located under the carpet and trim in the luggage compartment.

5. To remove the lowering bolt and tube, first slacken the $\frac{1}{2}$ in. A/F lock-nut on the lower end of the bolt then remove the lock-nut, full nut and plain washer; unscrew the bolt from the tube.

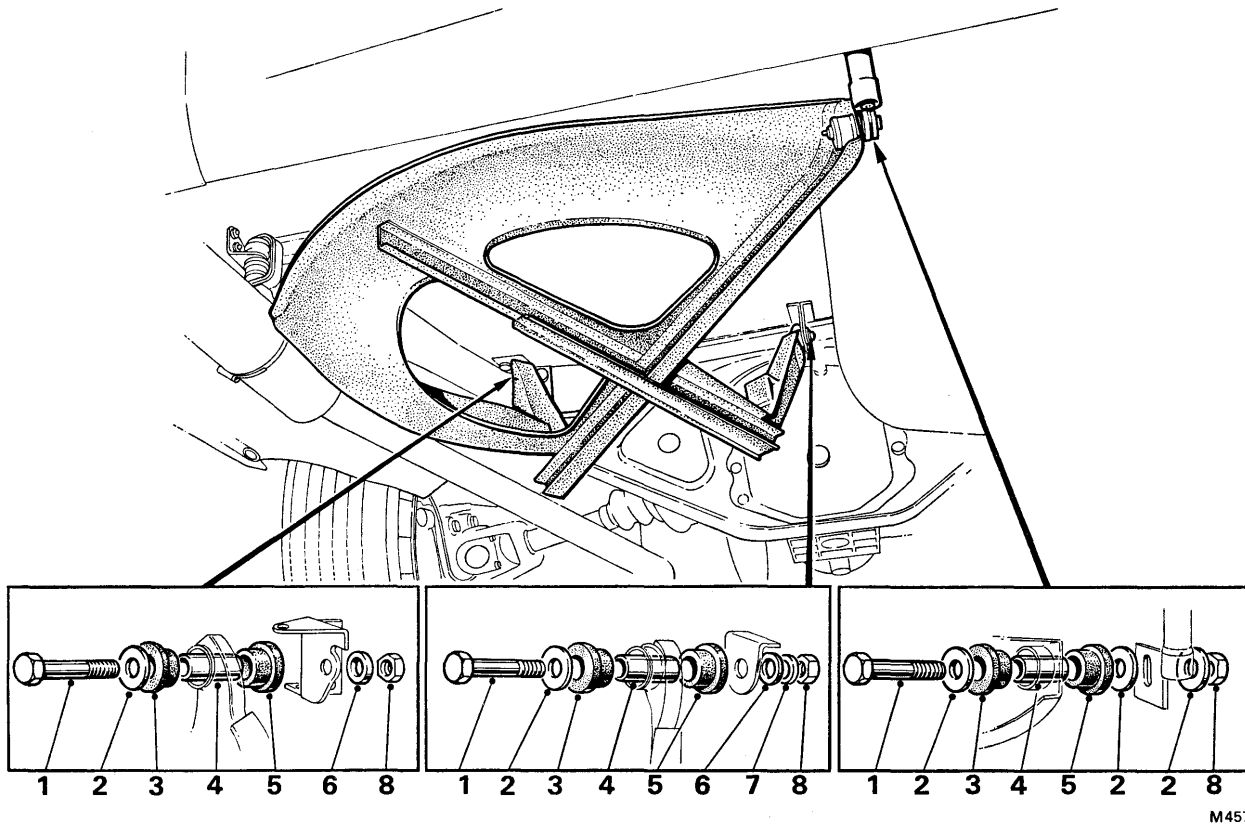
Note that the bolt is removed from inside the luggage compartment while the tube is removed from underneath the car.

Spare wheel platform—To fit
(see Figs. S125 and S126)

To fit the spare wheel platform reverse the procedure given for removal noting the following points.

1. Lubricate the platform lowering bolt and also the three $\frac{1}{2}$ in. A/F pivot bolts with Rocol MTS 1000 grease or its equivalent, prior to fitting.

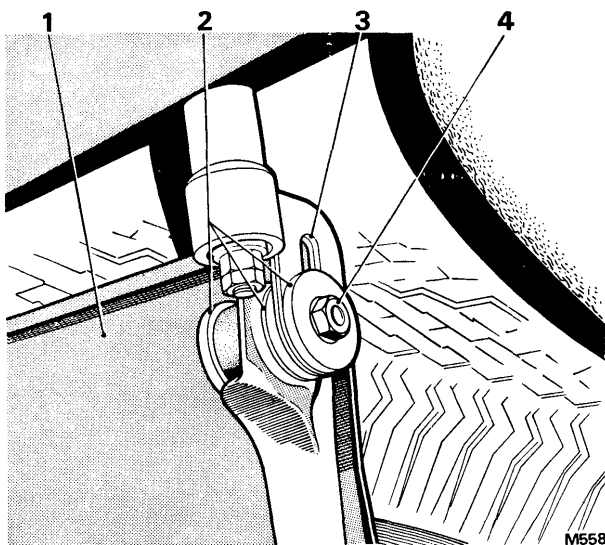
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FIG. S125 SPARE WHEEL CARRIER MOUNTINGS

- | | | | |
|-------------------------|-----------------|------------------|----------------|
| 1 Bolt | 3 Rubber bush | 5 Rubber bush | 7 Plain washer |
| 2 Large diameter washer | 4 Distance tube | 6 Spacing washer | 8 Nut |



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FIG. S126 SPARE WHEEL CARRIER ADJUSTMENT POINT

- 1 Spare wheel carrier
- 2 Large diameter washer (3 off)
- 3 Adjustment slot in tube lowering bracket
- 4 Bolt

2. Check the condition of the rubber bushes in the platform pivot points and fit new bushes if necessary.
 3. Ensure that the rubber bushes, distance tubes and large washers are fitted correctly at the three pivot points (see Fig. S125).

4. Do not tighten the two front pivot bolts until the rear pivot bolt has been fitted, then tighten all three pivot bolts; when tightening the rear bolt ensure that the correlation marks made during removal are correctly aligned.

5. After fitting the spare wheel and tightening the lowering bolt, check that the spare wheel is held firmly in position. If any slackness is present, adjust as follows (see Fig. S126).

Slacken the platform lowering bolt four or five complete turns. Slacken the platform rear pivot bolt and nut then move the bolt and platform upward in the slotted hole of the bracket attached to the lowering bolt tube; tighten the pivot bolt and nut in this new position. Tighten the lowering bolt and check that the spare wheel is now held securely.

Radiator shell—To remove

1. Working underneath the car, remove the three $\frac{7}{16}$ in. A/F nuts securing the bottom of the radiator shell to the mounting brackets.
2. Lift the bonnet, then remove the four $\frac{7}{16}$ in. A/F setscrews securing the top of the radiator shell to the deflector panel; support the radiator shell assembly before removing the last setscrew.
3. Lift the radiator shell assembly until the lower end is clear of the front bumper then remove from the car.

Radiator shell—To fit

To fit the radiator shell assembly reverse the procedure given for removal noting the following point.

1. Before fitting the radiator shell, ensure that the two rubber strips are in position on the outer edges of the shell.

Use Bostik adhesive 89AA or its equivalent to secure the rubber strips to the shell. Remove any surplus adhesive using Bostik cleaner 6001.

Radiator shell—To dismantle

1. To remove the grille from the radiator shell proceed as follows.
 - (a) **Rolls-Royce Silver Shadow radiator.** Remove the six $\frac{7}{16}$ in. A/F nuts and plain washers securing the grille to the radiator shell; remove the grille from the shell.
 - (b) **Bentley T Series radiator.** Remove the eight 2 B.A. setscrews securing the triangular shaped bottom plate to the radiator shell; remove the plate.

Remove the six $\frac{7}{16}$ in. A/F setscrews securing the lower edge of the grille to the shell.

Remove the four $\frac{7}{16}$ in. A/F setscrews securing the two grille upper support brackets to the shell; remove the grille together with the brackets from the shell.

2. To remove the mascot, slacken the socket headed screw securing the mascot to the clamping boss on the radiator shell; access to this screw is through the central hole in the upper rear face of the radiator shell (see Fig. S127).

When a mascot is not required, cars are fitted with a chromed finisher, comprising a button and spring on Silver Shadow cars and a motif on Bentley T Series cars. To remove the finisher, follow the same procedure described for removing the mascot; note that the spring fitted under the button on Silver Shadow cars will eject the button when the socket headed screw is slackened.

3. To remove the mascot clamping boss from the shell, first remove the mascot then proceed as follows.

- (a) **Rolls-Royce Silver Shadow radiator.** Remove the four 2 B.A. setscrews securing the clamping boss to the shell; these screws are situated on the inner face of the shell.

Remove the clamping boss.

- (b) **Bentley T Series radiator.** Using a screwdriver, remove the two 2 B.A. screws securing the clamping boss to the shell; remove the clamping boss.

4. To remove the winged 'B' badge fitted to the front of the Bentley T Series radiators, first remove the two 2 B.A. nuts and the washers securing the badge to the shell then remove the badge; the nuts are situated on the inner face of the shell and there is a shakeproof washer and a waved washer under each nut.

Do not attempt to remove the Rolls-Royce badge fitted to the front of the Silver Shadow radiator.

Radiator shell—To assemble

To assemble the radiator shell assembly reverse the procedure given for removal noting the following point.

1. When fitting the mascot, or finisher, to the radiator shell ensure that the socket headed screw locates correctly in the recess on the mascot, or finisher.

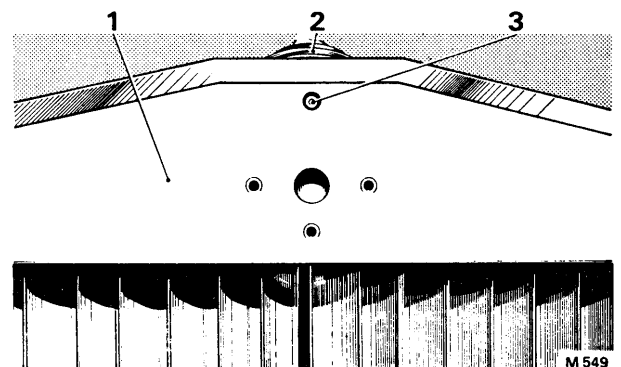


FIG. S127 POSITION OF THE RADIATOR MASCOT SECURING SCREW

- 1 Rear face of radiator shell
- 2 Mascot
- 3 Mascot securing screw

Chapter 5

Front bumper—To remove

1. Support the front bumper, then remove the four nuts, bolts and washers securing the bumper spring brackets to the mounting brackets attached to the body side members; note that on late cars it will not be necessary to remove the four bolts from the mounting brackets, as these bolts are trapped in position on the mounting brackets with a locking plate secured by a $\frac{7}{16}$ in. A/F setscrew.
2. Carefully remove the bumper to avoid damaging the paintwork.

Rear bumper—To remove

1. Using a ring spanner, slacken the two $\frac{9}{16}$ in. A/F setscrews securing the legs of the bumper to the forked mounting bracket on each side of the body; the setscrews are situated to the rear of the forked mounting brackets between the legs of the bumper and the rear wings.
2. Support the bumper, then remove the four nuts, bolts and washers securing the bumper spring brackets to the mounting brackets attached to the body side members (see *Front bumper – To remove, Operation 1*).
3. Carefully remove the bumper to avoid damaging the paintwork.

Front bumper—To fit

To fit the front bumper reverse the procedure given for removal.

Rear bumper—To fit

1. Fit the bumper to the forked mounting brackets on each side of the body but do not fully tighten the setscrews.
 2. Secure the rear bumper spring brackets to the mounting brackets on the body using the four nuts, bolts and washers; tighten the nuts.
 3. Check that the gap between the body and the front edge of the bumper is between 2.328 in. and 2.453 in. (5,913 cm. and 6,230 cm.) midway along the bumper as shown in Figure S128.
- If adjustment of the bumper is required, slacken the setscrews securing the mounting brackets to the body then move the bumper until the correct gap is obtained between the bumper and the body; ensure that the two over-riders are an equal distance from the body and tighten the mounting bracket to body setscrews.
4. Finally, tighten the two setscrews in the forked brackets on each side of the car.

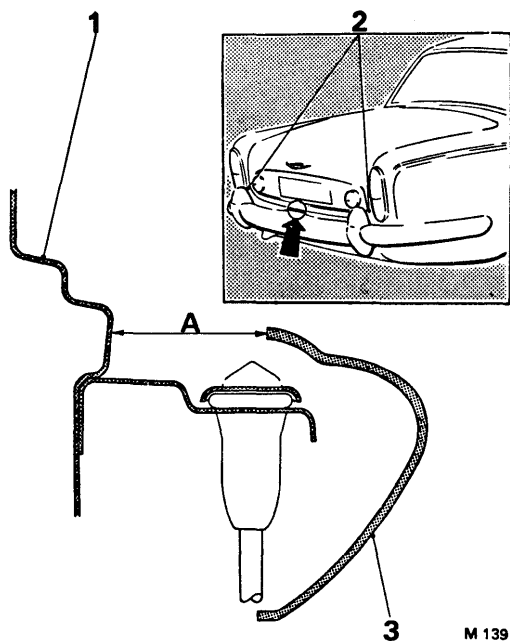


FIG. S128 REAR BUMPER TO BODY CLEARANCES (4-Door Saloon Illustrated)

- A** 2.328 in. to 2.453 in.
(5,913 cm. to 6,231 cm.)
- 1 Rear body panel
 - 2 Over-riders to body gap—to be equal at these points
 - 3 Rear bumper

Fixed type rear view mirror—To fit

When it is required to fit a fixed type rear view to the front door of a 4-Door Saloon or Long Wheelbase car not previously fitted with such a mirror, proceed as follows.

Note that kits of these mirrors, together with the necessary screws, etc., can be obtained from Rolls-Royce Motors Limited, Crewe. The mirrors are available for either right-hand or left-hand front doors and with either plain or convex glass (see *Parts List publication T.S.D. 2201*).

1. Disconnect the battery leads.

2. Dismantle the driver's door until the black dust cloth is removed (see Section S1, Door trim - To remove).

3. Note the position of the lock-nut on the sill control rod. Slacken the nut, then unscrew and withdraw the control rod.

4. Remove the setscrews securing the waist rail finisher and carefully withdraw the finisher assembly.

5. Remove the existing striker plate and gently ease out the rubber vent seal in the vicinity of the lower rear corner.

6. Unscrew the small nut, remove the washer and bolt which passes through the base of the channel. Collect the frame to waist connector.

7. Drill out and remove the rear hank bush (see Fig. S129).

8. Position the tapping block in the channel and fit the frame to waist connector; the two assemblies are located by a new setscrew which passes through the connector and channel frame and screws into the front (underside) of the tapping block (see Fig. S129).

9. Fit the new striker plate securing it with the two countersunk screws. The front screw fits into the original hank bush, while the rear one passes through the hole in the vent frame and screws into the tapping block.

10. Using the striker plate as a guide, drill through the inner section of the window frame into the hole through the tapping block; this will then provide a suitable guide for drilling the outer section of the frame. Repeat the operation for the second hole.

11. Any rough edges around the two holes should now be removed and the complete area cleaned with the aid of compressed air.

12. Offer the mirror into position and secure with the two Allen screws provided.

13. Before replacing the rubber vent seal, it will be necessary to cut away small sections along the base; this is to allow the seal to seat properly in the channel and around the tapping block. The rubber vent seal should then be glued into the channel using a small quantity of Bostik Cement 2402 parts 1 and 2.

14. When refitting the waist rail finisher it will be necessary to cut two recesses in the underside to accommodate the heads of the Allen screws.

15. To assemble the remainder of the door reverse the procedure given for removal (see Section S2, Door trim - To fit).

16. Finally, connect the battery leads.

Adjustable door-mounted driving mirror — To remove (see Fig. S130)

1. Fully lower the electrically operated window.

2. Disconnect the battery leads.

3. Remove the door trim panel and the polished wood finisher (see Section S1, Door trim - To remove, in this Chapter).

4. Remove the two 2 B.A. screws securing the adjustable mirror control unit mounting bracket to the door.

5. Remove the 2 B.A. screws securing the waist channel to the door; remove the waist channel.

6. Remove the cable retaining band from around the control unit (see Fig. S130, item 7), then disconnect the cables from the control unit; remove the control unit.

7. Remove the screw securing the cowl and mirror assembly to the stem.

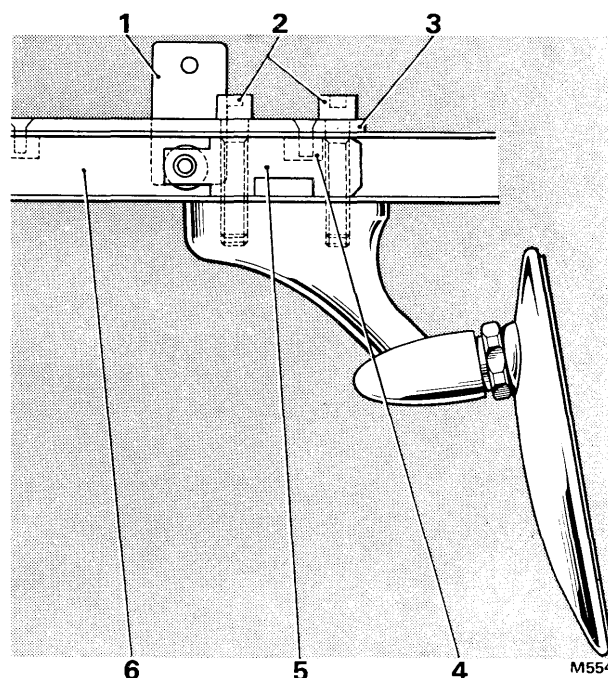


FIG. S129 METHOD OF FITTING A FIXED DRIVING MIRROR TO THE FRONT DOOR (Early 4-Door Saloon and Long Wheelbase Cars)

- 1 Frame to waist connector
- 2 Allen screws (2 off)
- 3 New striker plate
- 4 Hank bush to be removed
- 5 Tapping block
- 6 Window channel

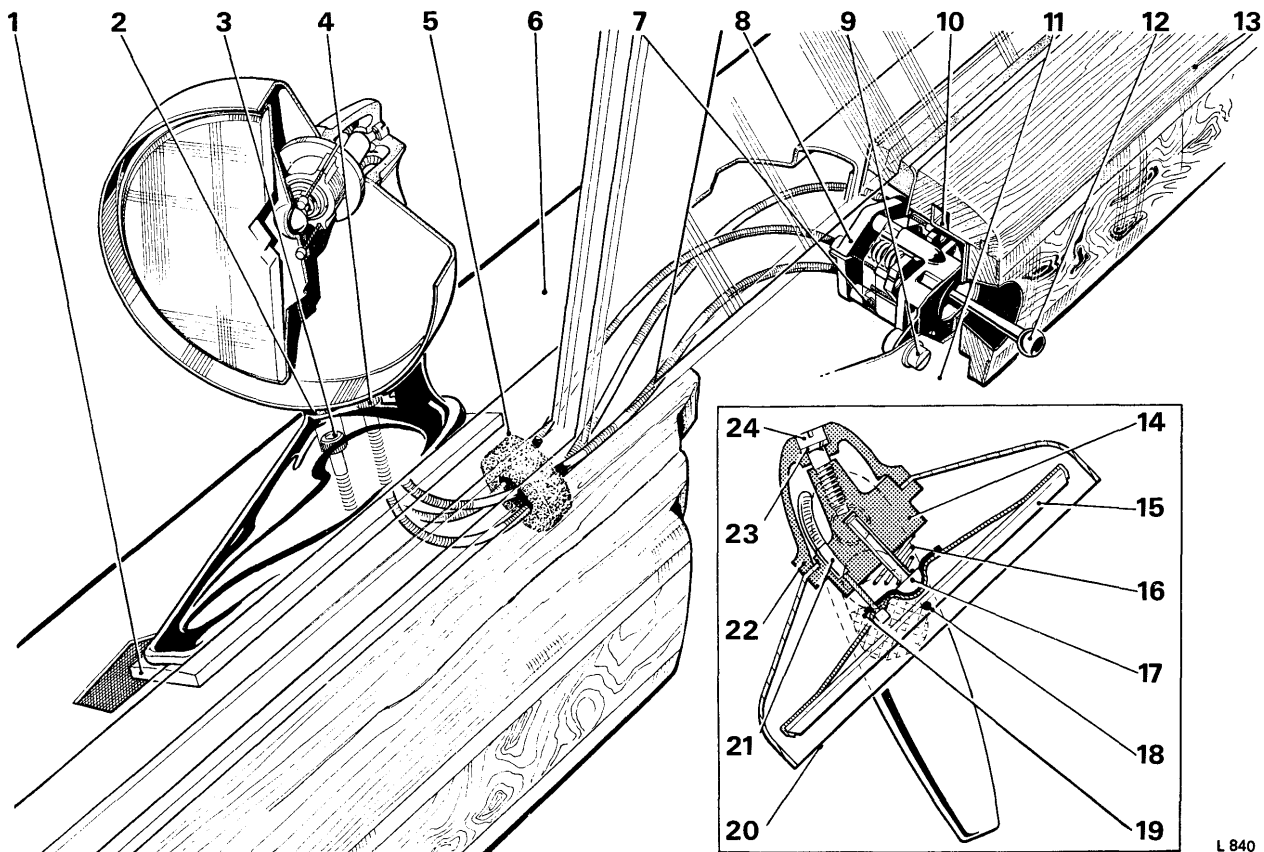
Chapter 5

8. Remove the cowl and mirror assembly from the stem, carefully guiding the cables through the aperture in the door and out of the stem; remove the cowl from the mirror assembly.

On later type adjustable mirrors, the cables can be disconnected from the mirror without first disconnecting them from the control unit, thus enabling the mirror and cowl to be removed from the door

without disturbing the door trim, control unit, etc. (Operations 1 to 6 inclusive).

To remove the mirror and cowl assembly only on these later type adjustable mirrors, carry out Operation 7 then detach the cables from the slotted holes in the backplate; remove the mirror and cowl assembly.



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FIG. S130 ADJUSTABLE DOOR-MOUNTED DRIVING MIRROR—PICTORIAL VIEW

- | | |
|--|--|
| <ul style="list-style-type: none"> 1 Stiffener 2 Damper (shown cross-hatched on inset) 3 Screw—stem to door (short) 4 Screw—stem to door (long) 5 Anti-rattle sleeve—control cables (not fitted to early type mirror) 6 Door outer panel 7 Cable retaining band (if fitted) 8 Control unit assembly 9 Screw—control unit bracket to door (2 off) 10 Waist channel (4-Door Saloon and Long Wheelbase cars only) 11 Door inner panel 12 Control knob | <ul style="list-style-type: none"> 13 Polished wood finisher 14 Sleeve—pivot assembly 15 Mirror 16 Conical spring 17 Pivot pin 18 Drain hole—lower edge of cowl (not to be obscured by damper) 19 Retaining plate (not fitted to early type mirror) 20 Cowl 21 Cables (3 off) 22 Stem 23 Washer 24 Screw securing cowl and mirror assembly to stem |
|--|--|

9. To remove the pivot sleeve from the mirror, press the pivot sleeve towards the mirror against the pressure of the conical spring (*see Fig. S130, item 16*) then disconnect the cables from the pivot sleeve; release the pressure on the conical spring then remove the pivot sleeve, spring and pivot pin from the mirror.

10. To remove the stem, remove the two socket-headed screws securing the stem to the door and remove the stem.

Adjustable door-mounted driving mirror —To fit

To fit the adjustable driving mirror to the door reverse the procedure given for removal noting the following points.

1. Ensure that the cables are fitted into their correct locations on the pivot sleeve and control unit.

The cable locations are identified by the letters 'R', 'Y' and 'G' embossed on the pivot sleeve and the control unit adjacent to the locations.

Fit the cable bearing the red coloured sleeve into the location marked 'R', the cable bearing the yellow coloured sleeve into the location marked 'Y' and the cable bearing the green coloured sleeve in the location marked 'G'.

2. When fitting the cowl and mirror assembly to the stem ensure that the following conditions are complied with.

- (i) the damper is in position on the stem (*see Fig. S130, item 2*).
- (ii) the cables are not trapped.
- (iii) the flange on the pivot sleeve locates correctly in the slot on the stem.
- (iv) the drain hole (*see Fig. S130, item 18*) is located at the bottom of the cowl and is not obstructed by the damper.

3. Finally, when the mirror is fitted, check that the mirror is square to the cowl, both laterally and vertically, with the control knob in the central position. Check also that full mirror movement is obtainable (i.e. that the mirror bottoms on the cowl in any direction). If either of these conditions do not exist check the following.

- (i) the cables are not kinked.
- (ii) the cables and their sheaths are correctly located in the control unit and the pivot sleeve.

If either of the check conditions are still unobtainable, renew the mirror and cable assembly.

MAINTENANCE

Paintwork

The paint which is used on all Rolls-Royce and Bentley cars is of the highest quality, but even so it is unable to withstand 'weathering' indefinitely without some care and attention.

Weathering occurs gradually and can be recognised by a slight surface film which results in a reduction of the gloss and a tendency to show rain spot marks. This can be overcome and the paintwork restored to its original condition by suitable maintenance polishing.

The thermo-plastic types of nitrocellulose lacquers used on Rolls-Royce and Bentley cars readily respond to friction polishing, due to the surface flow encouraged by the heat generated during the polishing process.

The period of time during which the restored paintwork will remain in good condition will vary according to the type of exposure to which it is subjected. If the paintwork is polished every three months, this should be sufficient for the average British climate; under more severe conditions such as are encountered in other parts of the world, however, and even in places in the British Isles which enjoy more than average sunshine, more frequent polishing may be necessary.

If regular polishing is not carried out, the original gloss will become obscured and 'rain-spotting' may reach objectionable proportions. Therefore, friction emulsion polishing should be carried out as soon as the gloss begins to fade and not left until the paintwork has become too dull and dirty.

Cleaning and polishing of Paintwork

The following points must be noted when cleaning and polishing the paintwork.

1. Always wash the paintwork with clean cold water; apply the water with a sponge and remove with a chamois leather.

2. Under no circumstances should any attempt be made to remove dirt or mud when dry.

3. Automatic car washers are not recommended as, due to the detergents and methods used, the paintwork may become stained or slightly scratched.

4. Always wash the paintwork prior to polishing.

5. Polishing should not be carried out in a dusty, gritty atmosphere. Grit, which is present in an atmosphere such as may be found outdoors where the ground surface is loose, is harder than the surface of the paint, and scratching will result.

6. Friction emulsion polishing should be employed whenever possible; merely polishing with a solid wax polish is not sufficient and an excessive build-up of wax polish can induce its own type of 'rain-spotting'.

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7. A slight discoloration may appear on the polishing cloth when using a friction emulsion polish. This should cause no concern as it is a weathered product of the paint and is no longer an essential part of the paint film.

8. The Formula 2 polish and the Formula 3 sealer supplied with the car when new should be used regularly to enable the initial high quality finish to be maintained; further supplies of the polish and sealer can be obtained from Rolls-Royce Motors Limited.

Leather upholstery—To clean

The leather upholstery can usually be cleaned by wiping over with a damp cloth.

More obstinate marks or ingrained dirt can be removed using a mild (neutral) soap and water, however, **caustic soaps and detergents should not be used.**

A concentrated cleaning agent (e.g. Decosol) can also be used provided it is used strictly in accordance with the instructions printed on the container; the cleaner must not be used in its concentrated form.

On no account should 'quick' cleaners be used as such agents, whilst removing dirt very effectively, may cause damage to the surface finish of the leather.

To clean the leather upholstery using a concentrated cleaning agent (e.g. Decosol), proceed as follows noting that if soap and water is used instead the procedure is very similar.

1. Make up a solution consisting of one part of cleaner to twelve parts of warm water.
2. Immerse a soft clean cloth in the solution then wring out the cloth.
3. Using the damp cloth, lightly rub the surface to be cleaned; avoid 'over-wetting' and change the surface of the cloth frequently.

If necessary, a small brush such as a nail brush can be used to remove dirt which has become ingrained in seat cushions or the top and corners of the seat backrest; to avoid damaging the leather, ensure that the brush is not too 'hard'.

4. Using a fresh cloth and clean water, repeat Operations 2 and 3 in order to remove any residue.

5. Thoroughly dry the cleaned surface with a soft cloth.

Leather upholstery—To preserve

An occasional application of Connolly's Hide Food will preserve the upholstery.

This compound should be applied with a clean soft cloth, then polished with a second clean dry cloth.

Leather upholstery—To restore

If the surface of the leather has been scratched or abraded, the affected parts should be treated with a Coloured Lacquer.

In certain cases it will suffice to 'touch-in' the damaged parts with the lacquer using a suitable brush or swab.

If it becomes necessary to treat an entire surface proceed as follows.

1. Ensure that the conditions are warm and dry; this will prevent blushing on the finished work.
2. Thoroughly clean and dry the area to be treated (*see Leather upholstery – To clean, in this Section*).
3. Ensure that the lacquer is well stirred, then pour a small quantity into a shallow container.
4. Dip a swab of stockinette into the lacquer, then apply evenly and sparingly to the leather; if necessary a further coat can be applied after the first has dried.
5. To obtain a more even finish, a second coat can be applied with a spray gun; add Cellulose Thinners to the lacquer to achieve an even flow through the gun.

Cloth upholstery

Cloth upholstery should be brushed regularly to remove dust. A soft brush should be used and the use of a vacuum cleaner is approved.

Everflex roof covering—To clean

Everflex is used for the hood outer covering on Convertibles; this material is also used to cover the roof panel on Long Wheelbase cars (and certain other Saloons when fitted as a special request item).

To clean the Everflex material wash with clean cold water.

To remove ingrained dirt, wash the material with a solution of water and **mild** detergent such as Teepol. If necessary, a soft bristled brush may be used to work the detergent and water solution into the material; brush in a fore-aft direction along the line of the stitching and **not across** the material. Afterwards, wash with clean cold water to remove any residue.

When the Everflex material is dry, it may be treated with Formula 3 sealer. To ensure a good finish, the maximum amount of solvent and the minimum amount of wax suspension are required; this is obtained by **not** shaking the container.

Under no circumstances must solvents, polishes or detergents (other than those specified) be applied to the Everflex material.

Section S11

WORKSHOP TOOLS

<i>Tool Number</i>	<i>Description</i>
RH 7674	Circlip Pliers—Rear Door lower Hinge Pin and Lock Bolt Roller.

Chapter T

TRANSMISSION - PART 1

4-SPEED AUTOMATIC GEARBOX

SECTION	PAGE
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T3 Testing	T13
T4 Fault Diagnosis	T15
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T21 Drum Assemblies	T125
T22 Gearbox Casing	T141
T23 Workshop Tools	T143

FIG. T1 THE 4-SPEED AUTOMATIC GEARBOX AND GEARCHANGE ACTUATOR—CUTAWAY VIEW

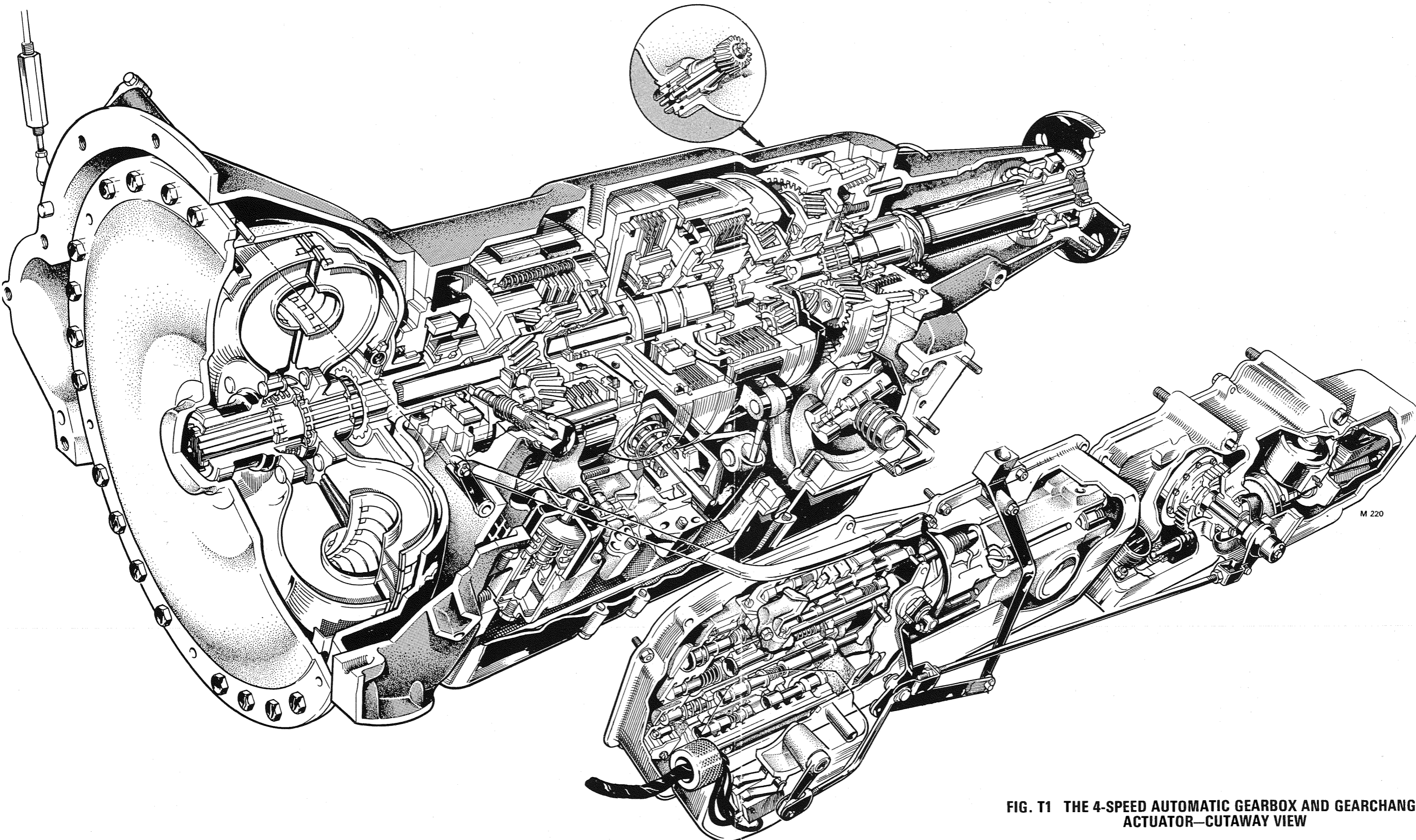


FIG. T1 THE 4-SPEED AUTOMATIC GEARBOX AND GEARCHANGE ACTUATOR—CUTAWAY VIEW

Chapter T TRANSMISSION — PART 1

Section T1 INTRODUCTION

Early Rolls-Royce Silver Shadow and Bentley T series motor cars were fitted with the 4-Speed Automatic Gearbox as follows:

All right-hand drive cars prior to Car Serial Number SRH 4033.

All right-hand drive cars destined for the United Kingdom prior to Car Serial Numbers SBH 4478, SRH 4488 (except SRH 4487).

The Automatic Gearbox (*see Fig. T1*) transmits tractive power from the engine to the propeller shaft in four forward ratios and in reverse. The gear changes are made automatically and are obtained through a fluid coupling and three hydraulically controlled epicyclic gear trains. In all forward ranges the driving torque is applied continuously to the road wheels during the changes from one ratio to another. Engine braking on overrun is obtained in 3rd and 4th gear; increased engine braking can be obtained by selecting Range 2 at speeds below 35 m.p.h. (56 k.p.h.).

A gear range selector lever is provided on the steering column of the car and can be used by the driver, within certain speed ranges, to overrule the automatic mechanism and to select the gear he considers most suitable for the road and traffic conditions. The selector lever, which is in the form of a switch, has five positions: 'R', 'N', '4', '3' and '2', representing Reverse, Neutral and three forward ranges. When the selector lever is moved from the neutral position, an electric actuator, fitted to the gearbox rear extension, will automatically select the required range. The gearbox will remain in the selected range until the steering column mounted lever is again moved.

In all ranges except Neutral, when the engine is running, the drive is engaged. At low throttle openings

and with the handbrake applied the car will remain stationary due to slip in the fluid coupling; at higher engine speeds the car will move off whenever the brakes are released.

Range 4

For normal driving the selector lever should be placed in Range 4. The car will start from rest in first gear at low throttle openings and, when accelerated, will change progressively through second and third into fourth or 'top' gear. Greater throttle openings will cause the changes to be delayed progressively so that they occur at higher road speeds and provide more rapid acceleration of the car.

If, at any time, the accelerator is depressed beyond the full throttle position (kick-down), a full throttle down-change occurs (depending upon the speed of the car) which increases driving torque and so further increases the car's acceleration.

Range 3

Under normal driving conditions only first, second and third gears are obtainable in Range 3. A 'safety' up-change to fourth gear is provided however, to prevent the engine from being 'over-revved' in third gear. The 3-4 up-change is delayed in Range 3 until a speed of approximately 76 m.p.h. to 78 m.p.h. (122 k.p.h. to 125 k.p.h.) is reached. Thus, maximum acceleration can be obtained in third gear and for this reason Range 3 is often known as the performance range.

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If, at any time, the driver requires a change from fourth to third gear under less than full throttle conditions, for example, to avoid the 4-3, 3-4 gear changes when driving in heavy traffic, he can promote the change from fourth gear to third gear by moving the selector gear lever to Range 3.

Range 2

In Range 2, under normal driving conditions, only second gear is obtainable. The car will start from rest in second gear and will remain in that gear until the selector lever is moved. **There is no safety up-change, therefore, a speed of 42 m.p.h. (70 k.p.h.) must never be exceeded in Range 2** otherwise serious damage to the engine may result.

First gear is temporarily obtainable by means of full throttle 'kick-down', or should extreme loading on the engine at low speeds demand it. Such circumstances are extremely rare and will probably never be met under normal driving conditions.

Range 2 may be used in extremely slow traffic conditions to avoid the continual gear changes. It can also be used when the engine is required to assist braking when descending steep or dangerous gradients.

Neutral

In Neutral the drive is disconnected, allowing the planet gears to idle without transmitting torque. The selector linkage is designed so that the electrical supply to the starter motor is broken except when in Neutral; this is a safeguard to prevent the engine from being started with the car in gear, where it would have a tendency to move forward, especially as the engine automatic choke system causes the engine to run at a fast-idle speed when starting from cold.

Reverse

It is possible to select Reverse while the car is moving forward below a speed of approximately 8 m.p.h. to 10 m.p.h. (13 k.p.h. to 16 k.p.h.). **This action places great stress upon the transmission and should not, therefore, be attempted.**

Reverse has an important secondary effect on the transmission. When the selector lever is moved to the Reverse position while the engine is stationary, a pawl engages with an annular gear on the reverse unit in the transmission and prevents the car from moving even when parked on the steepest of gradients. When the car is parked on a hill the handbrake must be firmly applied before the selector lever is moved to another range, as the parking lock will be released and the

car will move if it is not held by the brakes.

Construction and mechanical arrangement

The gearbox main casing, bell housing, rear extension, side cover and sump are all manufactured from aluminium alloy castings and combine strength with lightness.

An underbonnet dipstick and filler tube is supplied to facilitate quick and easy servicing.

The torus cover is sealed so that no joints are required when fitting the gearbox to the engine. The T.V. may be adjusted by a micro adjuster which is in the T.V. control system and can be reached after lifting the bonnet. Gearbox breathing is effected in one of the following two ways, on early models by drillings which terminate in a fine mesh gauze opposite a further drilling in the rear of the bell housing and on later models by a pipe which runs from the top of the gearbox and terminates beyond a clip on the side of the casting.

The four forward gears are obtained through two sets of epicyclic gears of differing ratios. Reverse is obtained through another epicyclic gear train compounded with the rear train.

Gear ratios are varied by means of friction bands, multi-plate clutches and a sprag clutch. Both the servo actuated friction bands and the clutches are hydraulically operated. When the friction bands and sprag clutch hold the drums stationary the relevant clutches are disengaged and the epicyclic gears are in reduction. When the friction bands are released the clutches are engaged (*in the case of the rear clutch, the sprag allows one way rotation—see Section T21—Drum assemblies*), locking two elements of the epicyclic gear train together, thus providing a direct drive through the unit.

The gearbox fluid coupling is driven by a flex-plate from the engine crankshaft. The torus cover drives the rear torus member, via the gear train of the front epicyclic unit, at a reduced speed. This speed reduction allows slip at higher engine speeds than would otherwise be possible, thus reducing the tendency of the car to creep forward.

Automatic control

The automatic gear changes are controlled by hydraulic pressure, which is regulated according to road speed and accelerator position. The pressure is directed by way of shift valves to the appropriate clutch and servo pistons. A pressure, dependent upon engine torque, is obtained by connecting a hydraulic valve to the engine throttle. An indication of road speed is given by a transmission driven governor which controls two hydraulic valves. The driver

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superimposes his requirements on the automatic control by means of selector valves.

Oil flow to the servos and clutch pistons is controlled by three shift valve assemblies (*see Fig. T2*), each one positioned by governor and throttle pressure to control a gear change. The 1-2 shift valve assembly controls the gear change between the first and second gear, the 2-3 shift valve assembly controls the change between second and third gear and the 3-4 shift valve assembly controls the three to four change. As each valve moves to change gear, ports are opened to permit main line oil pressure to act on the appropriate clutch and servo pistons until in fourth gear all the shift valves have moved across. The process is reversed for normal down-changes.

Oil pressure is generated by two oil pumps, one driven by the input shaft and the other by the output shaft, thus ensuring that oil pressure is available whenever the engine is running or the car is moving.

The two pumps draw oil from the gearbox sump through a common wire mesh scavenge filter and feed it at varying pressures between 70 lb/sq. in. and 170 lb/sq. in. (4,92 kg/sq. cm. and 11,95 kg/sq. cm.) approx. into a common outlet passage leading to the

governor and to the manually controlled selector valves. A spring-loaded, non-return valve is interposed between the two pumps to prevent loss of oil when one pump is not operating. Oil is also delivered to the fluid coupling and provides lubrication for the gearbox bearings as explained under 'Oil circulation' later in this chapter.

The governor provides a signal of road speed in terms of oil pressure. Two pressures are indicated; the pressures increase at different rates to provide accurate control at high and low road speeds. Oil from the governor is prevented from passing to the control valve unit whilst the car is stationary, but when the car begins to move centrifugal force causes the valves to move and open the valve ports. Oil then flows through the open ports at pressures which progressively increase as the car gathers speed.

In addition to the selector valves and the automatic control valves, the control valve unit contains a throttle valve (T.V.) which is connected by rods and levers to the engine throttle; this provides a signal of engine torque in terms of oil pressure. When the main selector valve is in any of the drive positions, oil at pump pressure is directed to the throttle valve ports

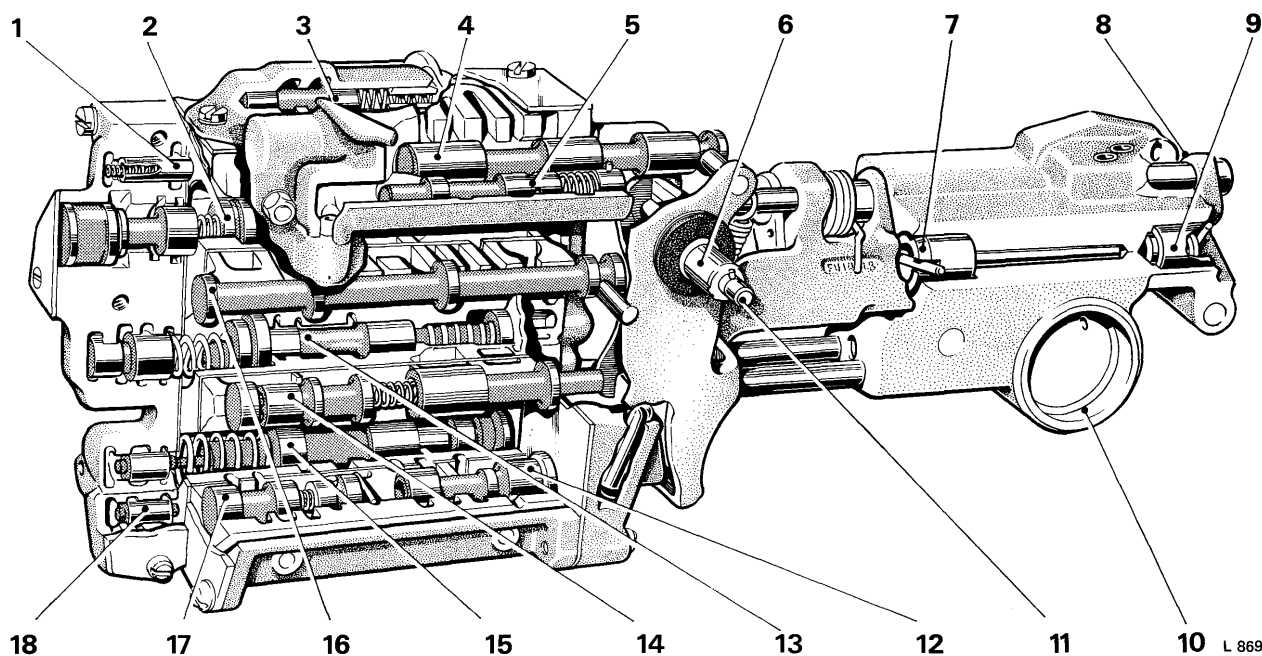


FIG. T2 CONTROL VALVE UNIT ASSEMBLY

- | | | |
|---------------------------------------|--------------------------|--------------------------|
| 1 T.V. regulator valve | 7 Reverse blocker piston | 12 Transition valve |
| 2 2-3 Shift valve group | 8 Parking pawl crank | 13 1-2 Shift valve group |
| 3 3-2 Timing valve | 9 Parking blocker piston | 14 Throttle valve group |
| 4 Neutral and rear servo manual valve | 10 Governor sleeve | 15 3-4 Shift valve group |
| 5 Rear band control valve | 11 T.V. operating shaft | 16 Selector valve |
| 6 Selector shaft | | 17 Compensator valve |
| | | 18 3-4 Shuttle valve |

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which are opened and closed with the throttle, thus providing an oil pressure which progressively increases with throttle opening.

This pressure is passed into the control valve unit to oppose the governor pressures acting on each of the shift valve assemblies. These valves are therefore positioned to direct oil pressure to apply the lowest gear ratio when the governor pressure is nil (road wheels not turning). As governor pressures increase and overcome the opposing throttle pressure, the shift valves move and select higher gear ratios. It will be seen also that lower gear ratios will be selected whenever increasing throttle opening causes throttle pressure to overcome governor pressure and move the shift valves the other way.

When selecting the gear ratios in the above manner, the shift valves are positioned to direct oil to the servos which apply or release the friction bands, and the clutches which engage or disengage in various combinations as shown in the following table.

These results are obtained by intermediate oil pressures which act on various relay, timing and locking valves and plugs, some of which are positioned solely by oil pressure and others by oil and spring pressure.

The function of the oil pressures may be summarised as follows.

Main pressure is applied through the shift valve ports to the clutch pistons and band servos.

Throttle pressures act upon the shift valves in opposition to governor pressures; the shift valves are therefore positioned to permit the main pressure to pass to the appropriate servo and clutch positions.

Bearings and thrust washers

The complete rotating assembly is carried in plain bearings at the front and centre and in ball bearings at the rear. Axial thrust is opposed by phosphor bronze thrust washers backed by steel washers.

The front plain bearings are positioned between the front of the intermediate shaft and the front pump drive gear, the pump drive gear and front pump and between the front pump and the torus cover. When in reduction the front drum rotates upon the intermediate shaft on two plain bearings.

The centre plain bearing is also an oil delivery sleeve and supports the intermediate shaft between the front and rear drums. The sleeve provides a bearing surface for the rear drum when in reduction.

A spigot bearing in the front end of the output shaft supports the rear end of the mainshaft; the front of the mainshaft is splined to the driven torus which is supported in a plain bearing in the torus end cover.

The output shaft revolves in two ball bearing races in the rear extension. A plain bearing supports the reverse sun gear at the forward end of the output shaft.

Thrust washers are positioned as follows.

A phosphor-bronze thrust washer and a steel backing washer between the driving torus hub and the front pump drive-shaft.

A phosphor-bronze thrust washer between the front pump drive-shaft and the hub of the front planet gear carrier.

A phosphor-bronze thrust washer and a steel backing washer between the hub of the front planet gear carrier and the front sun gear. These washers are retained when the planet gears are fitted and cannot be removed.

A phosphor-bronze thrust washer and a steel backing washer behind the front unit sun gear. These washers are secured on the intermediate shaft by a snap ring.

A phosphor-bronze thrust washer at the rear of the sprag outer race, between the race and the rear drum cover and a phosphor-bronze retainer at the front of the race. The retainer is an interference fit in the outer race.

A phosphor-bronze thrust washer on each side of the rear unit clutch hub.

A thin steel washer between the front face of the

TABLE OF CLUTCH AND BAND POSITIONS

	FRONT BAND	FRONT CLUTCH	CENTRE CLUTCH	SPRAG	REAR CLUTCH	REVERSE CLUTCH
NEUTRAL	OFF	OFF	OFF	—	OFF	OFF
1st GEAR	ON	OFF	ON	ENGAGED	OFF	OFF
2nd GEAR	OFF	ON	ON	ENGAGED	OFF	OFF
3rd GEAR	ON	OFF	ON	FREEWHEEL	ON	OFF
4th GEAR	OFF	ON	ON	FREEWHEEL	ON	OFF
REVERSE	ON	OFF	OFF	—	OFF	ON

Note The rear band is applied in Range 2 only.

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rear unit clutch hub and a snap ring on the intermediate shaft.

A phosphor-bronze adjusting washer between the rear face of the rear unit sun gear and the front face of the rear unit planet carrier. The thickness of this washer is to be selected to give the required end float for the mainshaft.

A phosphor-bronze thrust washer between the rear unit planet carrier and the reverse driving flange.

Oil circulation

Oil for the fluid coupling, the hydraulic servo system and gearbox lubrication is contained in the gearbox sump. The sump is filled through a filler tube which also houses the dipstick. Access to the filler tube is gained by lifting the car bonnet, then removing the dipstick from the tube. The oil is drawn through a gauze filter in the sump by the two pumps as previously described. Oil flow to the fluid coupling passes forward through the annular space between the front drive-shaft and the pump body, then passes into the fluid coupling. When the coupling has filled with oil, a relief valve (check valve) opens to permit a flow between the main and intermediate shafts in order to lubricate the bearings, and through holes drilled in the shafts to lubricate the clutches, gears, splines and thrust washers of the rotating assemblies (see Fig. T3).

Pipes carry oil from both the pumps to the front servo unit from where it flows through drillings in the main casing to the control valve unit, then back to operate the servo and clutch pistons. Oil supply to the governor is conveyed through a pipe and drillings in the casing. Governor oil pressures pass from the governor sleeve to the control valve assembly through two oil pipes.

The annular spaces in the governor sleeve are sealed from each other by piston ring-type oil seals.

Oil flow from the control valve unit passes through drillings in the main casing to the front and rear servo units and to an oil delivery sleeve on the intermediate shaft between the front and rear drums. The delivery sleeve supplies oil to the front and rear clutches, the centre clutch being supplied with oil through a separate pipe from the control valve unit. Oil leakage from the delivery sleeve is prevented by piston ring-type oil seals.

A pipe from the control valve unit conveys reverse clutch supply oil to drillings in the casing, then to the rear extension from where it flows to the reverse clutch apply piston.

Control pressures

Main oil pressure, obtained direct from the two oil pumps, is used to operate the servo pistons and clutch

pistons and to supply oil for conversion to lower controlling pressures by the governor and the valves in the control valve unit.

Compensator pressure is obtained by metering main line pressure through ports controlled by a compensator valve, spring and auxiliary valve. This pressure is lower than pump pressure and is directed to the front servo to increase the band holding force as torque increases.

Throttle valve (T.V.) pressure, obtained as already described under 'Automatic control', acts on the compensator valve to regulate the compensator pressure in accordance with throttle opening.

T.V. oil is metered past the T.V. regulator valve to act on the shift valves. It is also metered to the regulator plugs which control the ports permitting pressure to act on the shift valves. The regulator plugs lock the shift valves in gear after an up or down-change and so prevents 'hunting' between gears.

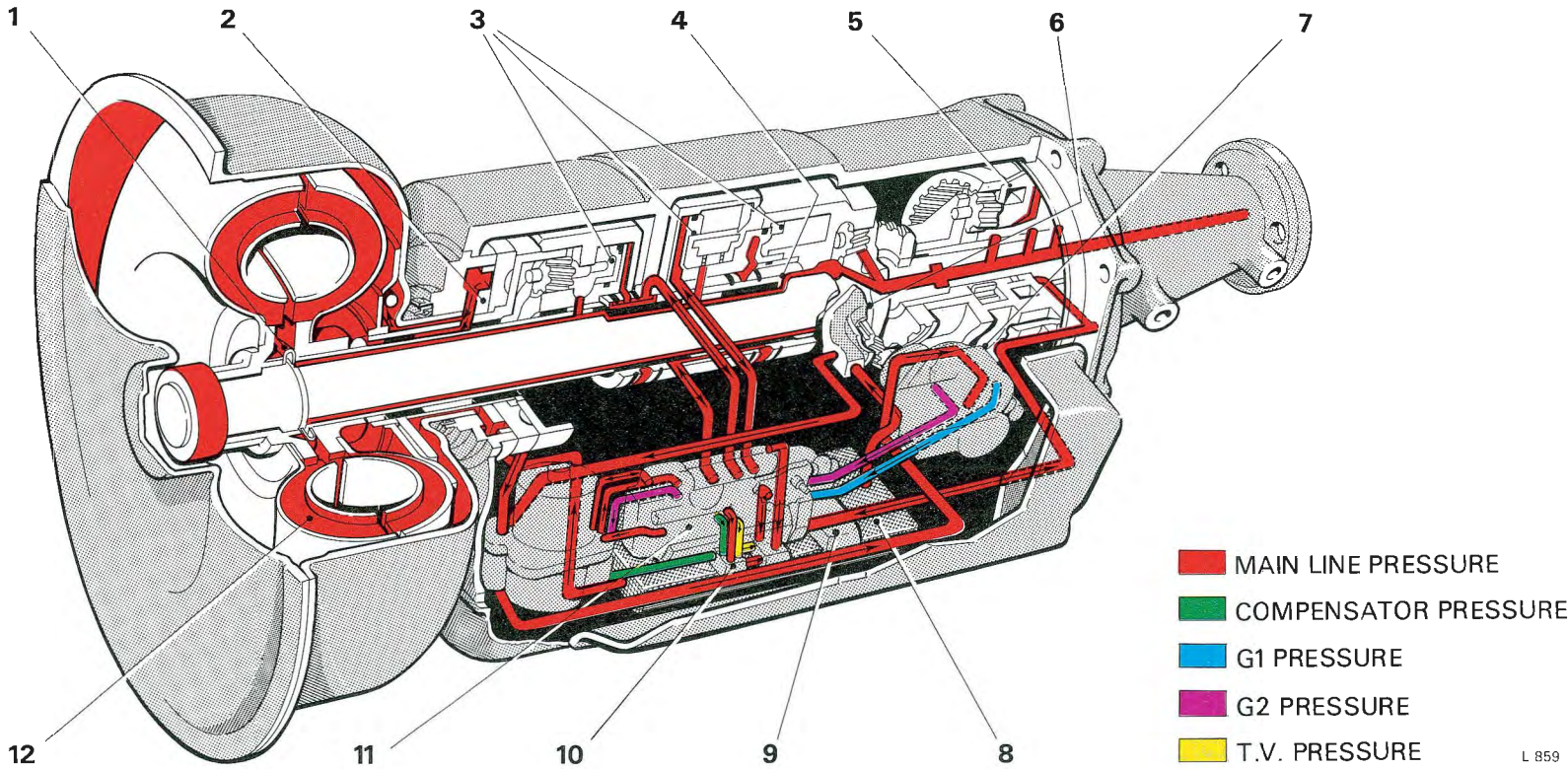
Accumulator pressure is obtained by allowing main line oil to meter past a valve in the accumulator control valve housing on the side of the rear servo. The valve is subject to T.V. pressure so that accumulator pressure varies according to T.V. pressure. Accumulator pressure is lower than main line pressure and is used to oppose rear clutch apply oil during the 2-3 up-change.

Governor pressure No. 1 (G1) is obtained by metering oil past the valve controlled by the large governor weight, and is directed to the 3-4 shift valve, overrun valve, 3-4 overspeed valve, 1-2 shift valve, 2-3 G1 plug, reverse blocker piston and the 4-3 timing valve in the front servo. The high rate of pressure increase caused by the large governor weight gives accurate control at low road speeds.

Governor pressure No. 2 (G2), obtained by metering oil past the lighter weighted valve, is directed to the 2-3 auxiliary valve, the 3-4 overspeed valve and the 3-4 governor plug. The rate of G2 pressure increase is greatest at high road speed, G1 pressure having reached its maximum.

Control linkage

The manual selection of gears is accomplished simply by operating the selector lever on the steering column. This lever is in effect a switch, and fingertip operation of the switch causes the gearbox electric actuator to select the desired gear immediately. The actuator motor is connected by a rod and levers to the selector shaft on the control valve unit. In the unlikely event of electrical or mechanical failure which may render the actuator inoperative, gear changes can be made manually by a separate lever which is connected to the gearchange actuator lever and can be operated from inside the car.



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FIG. T3 OIL CIRCULATION DIAGRAM

- | | | |
|-----------------------|-------------------------|-----------------------|
| 1 Check valve | 5 Reverse clutch piston | 9 Rear servo |
| 2 Front pump | 6 Rear pump | 10 Junction body |
| 3 Clutch pistons | 7 Governor | 11 Control valve unit |
| 4 Oil delivery sleeve | 8 Oil screen | 12 Fluid coupling |

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As the engine and gearbox unit is flexibly mounted and the accelerator pedal is body mounted, it is necessary to prevent relative movement interfering with throttle and T.V. controls.

A compensator mechanism comprising two bow-shaped links is attached, at the bottom, to a bracket on the right-hand side of the engine compartment. The top is secured to a tie rod, the inner end of which is located by the 'A' bank cylinder head control shaft.

Accelerator pedal movement is transmitted to the gearbox throttle valve via the compensator mechanism and the cylinder head control shaft. A cross-shaft in the bell housing transfers the movement to the left-hand side of the gearbox.

T.V. adjustment is effected by a simple micro adjuster which can be operated from the right-hand side of the engine compartment.

Gearbox control levers are mounted on concentric control shafts which pass through oil seals in the gearbox side cover and through a bearing integral with the control valve unit. The levers are splined to their respective shafts and can be fitted in one position only.

The outer shaft operates the selector valve and the neutral and rear servo manual valve by means of pins which engage with a radial groove in the end of each valve. Selector positions are determined by a spring-loaded plunger engaging with notches in a plate which is integral with the lever shaft. A solenoid operated brake in the electric actuator ensures accurate and positive braking of the actuator when a gear position has been reached.

The lever on the inner (T.V.) shaft varies the throttle pressure by acting on the stem of the 'T' valve, compressing the throttle valve spring in the control valve unit.

Section T2 SERVICING

Careful and regular maintenance of the gearbox is necessary to ensure maximum reliability; the following table gives the recommended servicing periods.

SERVICING PERIODS

ESSENTIAL MAINTENANCE	PERIOD
Check oil level	After first 3 000 miles (4 828 km.) then every 6 000 miles (9 656 km.)
Check for leaks	
Drain transmission and fill with new fluid	Every 12 000 miles (19 312 km.)
PREVENTATIVE MAINTENANCE	PERIOD
Lubricate control linkage Road test to check gear changes	Every 6,000 miles (9 656 km.)

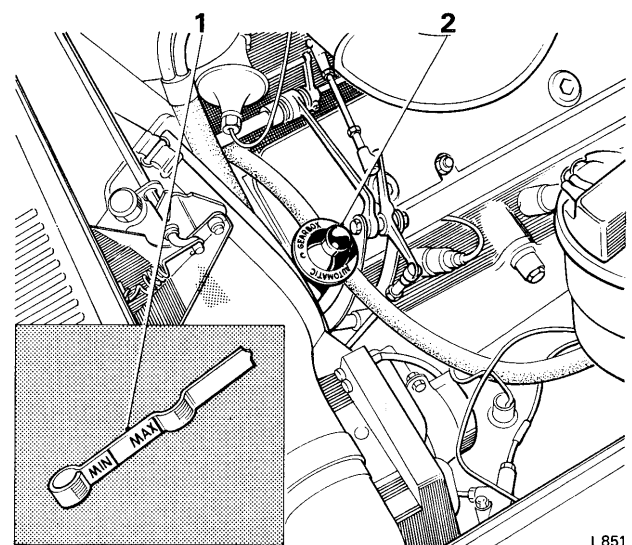
It is absolutely essential that great attention be paid to cleanliness whenever the interior of the gearbox is exposed and when work is being carried out on a particular unit belonging to the gearbox. The smallest particle of dirt in the oil may interfere with the correct operation of the valves, particularly in the control valve unit.

It is recommended that all work on the automatic gearbox, whether it be periodic servicing or the rectification of a fault, should be systematically carried out as follows.

- 1 Check gearbox oil level.
- 2 Check for oil leaks.
- 3 Lubricate control linkages.
- 4 Ensure that the engine is correctly tuned then test the gearbox change points; at the same time check for clutch slip and listen for noise.

If any faults are discovered, further checks may be necessary to assist in quick and accurate fault diagnosis. The checks to be made will, of course, vary with the symptoms but with the majority of faults the checks should be carried out in the following order.

- 1 Check control linkages.
- 2 Check main line oil pressure.
- 3 Check band adjustment.



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FIG. T4 CHECKING THE OIL LEVEL

- 1 MINIMUM and MAXIMUM oil level marks
- 2 Gearbox oil dipstick

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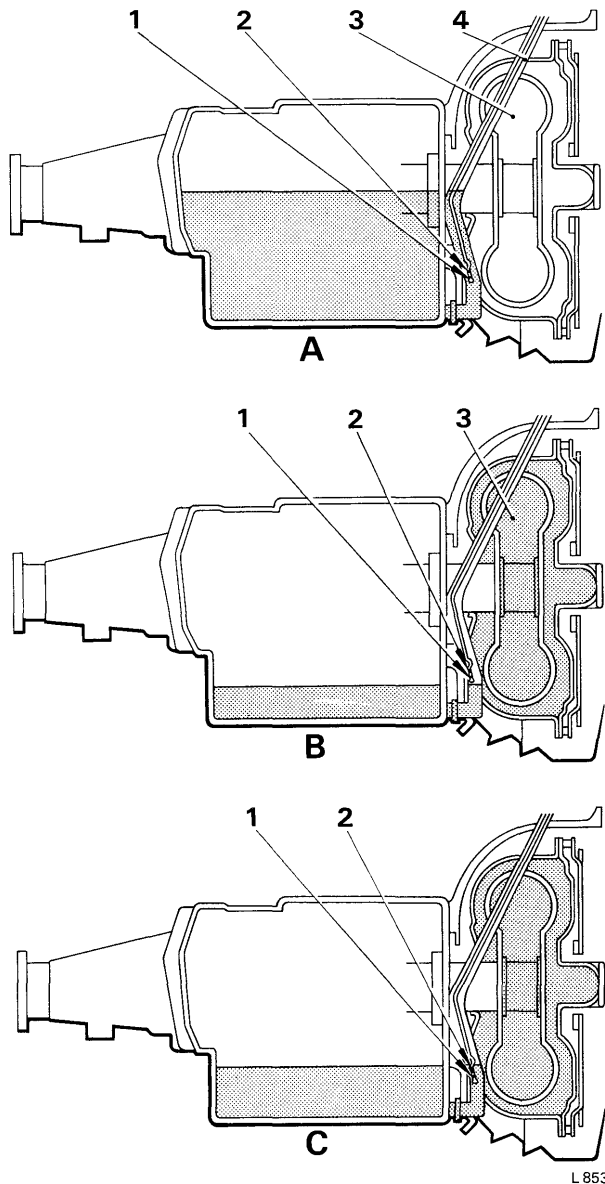


FIG. T5 FILLING AND TOPPING-UP THE GEARBOX

- A** Pour in 1.5 Imp. galls. (6.8 litres, 1.8 U.S. galls.) with engine stationary
- B** Run engine to fill fluid coupling
- C** Top-up to MAX. mark on dipstick with engine running
- 1** Low level on dipstick
- 2** Full level on dipstick
- 3** Fluid coupling
- 4** Dipstick and oil filler tube

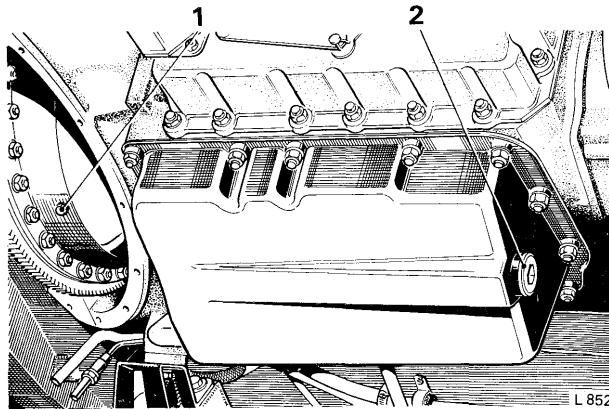


FIG. T6 DRAIN PLUGS

- 1** Torus cover drain plug
- 2** Gearbox sump drain plug

4 Partially dismantle the gearbox in order to isolate the suspect unit by means of an air pressure test.

Warning

To check the gearbox with the engine running and the car stationary, **do not** move the selector lever from the neutral position unless the hand brake is fully applied or the rear wheels are jacked clear of the ground. This is particularly important if the engine is running faster than the correct 'hot', slow idle speed. Chock the wheels and apply the foot brake when using high engine r.p.m.

Gearbox — To drain and fill

Efficient draining of the oil from the gearbox will be assisted by warming-up the gearbox prior to draining. Do not flush the gearbox but ensure that it has thoroughly drained.

Proceed as follows.

- 1 Place a clean container, capacity 3 gallons, under the sump drain plug.
- 2 Remove the plug and allow the oil to drain.
- 3 Remove the bell housing bottom cover.
- 4 Rotate the flywheel until the torus drain plug is in its lowermost position.
- 5 Place the container under the drain plug; remove the plug and drain the oil. Figure T6 shows the position of both drain plugs. If the car has covered only a low mileage since its last gearbox oil change and the oil is drained to facilitate some minor repair e.g. oil leak or sticking valve, the existing oil may be used again. The oil must be drained into a clean container

then passed through a fine mesh filter before being poured into the gearbox.

Note If there is any doubt about the suitability of the oil for further use it should be discarded and the gearbox should be filled with clean, fresh oil. Always examine the oil residue in the container for evidence of gearbox wear e.g. particles of clutch plate, band lining, etc.

- Fit both drain plugs together with new sealing washers. Torque tighten the plugs to the following figures.

Fluid coupling drain plug — between 5 lb.ft. and 7 lb.ft. (0,691 kg.m. and 0,968 kg.m.).

Sump drain plug — between 40 lb.ft. and 45 lb.ft. (5,530 kg.m. and 6,222 kg.m.).

When filling the gearbox with transmission fluid ensure that the container is scrupulously clean. The fluid coupling and the sump are filled through the same orifice i.e. the dipstick and oil filler tube.

A new or overhauled gearbox requires approximately 24 Imperial pints (13,638 litres) of fluid. A gearbox which has only been drained of fluid will require approximately 2 Imperial pints (1,137 litres) less than this quantity to reach the MAX mark on the dipstick.

Fill the gearbox as follows (see Fig. T5).

- Remove the dipstick then pour in 12 Imperial pints (6,819 litres) of fluid.
- With the steering column lever in Neutral and the handbrake applied, start the engine and allow it to run at fast-idle for a few minutes.
- Stop the engine then add a further 10 Imperial pints (5,683 litres).
- Again start the engine and while it is running at slow-idle check the fluid level on the dipstick. If necessary, add sufficient oil to bring up the level to the MAX mark on the dipstick.

Do not overfill.

- Road test the car, or run it until the gearbox has reached normal operating temperature, then finally check the gearbox oil level. Top-up to the MAX mark on the dipstick as required.

To check for leaks

If the level of oil is low when measured with the dipstick, examine the gearbox externally for signs of an oil leak.

Possible sources of leakage at the front of the gearbox are shown in Figure T7; the action to be taken when leakage is confirmed is given in the table on page T12.

If the action to be taken requires the removal of the gearbox, a road test should be made after topping-up and before removal.

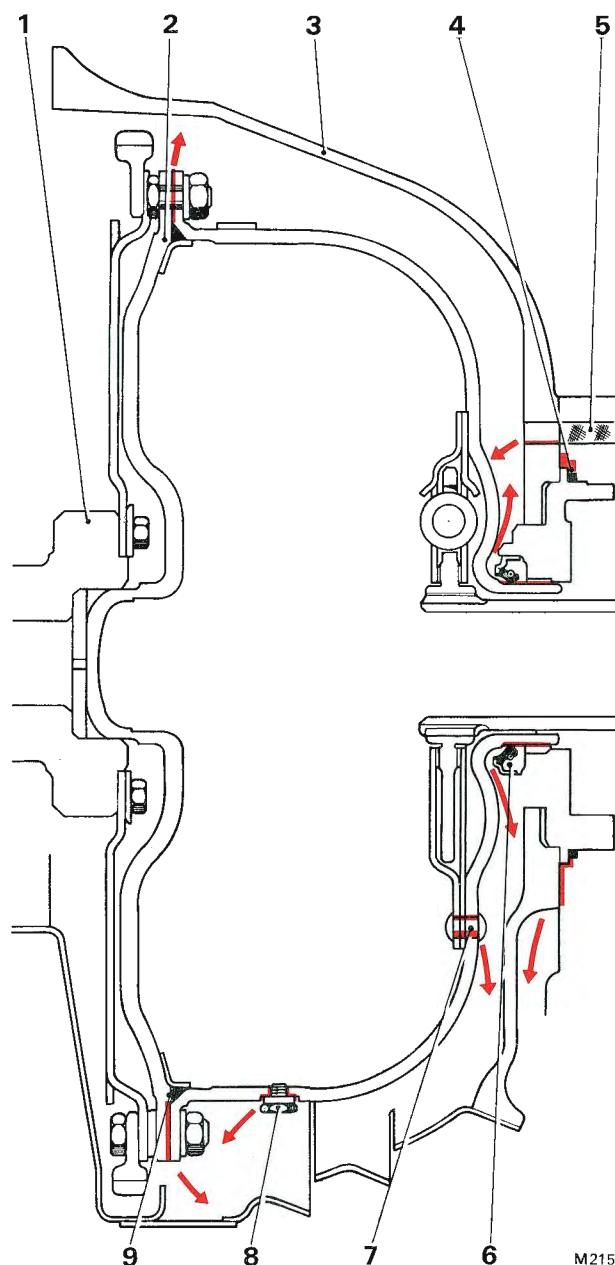


FIG. T7 SOURCES OF LEAKAGE

- Crankshaft
- End cover
- Torus cover
- Front pump to gearbox joint
- Gearbox breather
- Front pump oil seal
- Damper rivets
- Drain plug
- Torus cover to end cover joint

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Oil level — To check

The gearbox oil level can be accurately checked only when the engine is running and the gearbox has warmed up to 80°C. (176°F.), its correct operating temperature.

If the oil level is near or below the MIN mark on the dipstick, top-up to the MAX mark while the engine is still running and check for oil leakage as described under 'To check for leaks'.

The following transmission fluids are approved for use in the Rolls-Royce and Bentley 4-Speed Automatic Gearbox.

All lubricants listed are approved for world wide use.

B.P.	..	B.P. Autran DX (Dexron)
Castrol	..	Castrol TQ (Dexron ®)
Esso	..	Esso Automatic Transmission Fluid (Dexron)
Mobil	..	Mobil ATF 220 (Dexron)
Regent	..	Regent Texamatic (Dexron)
Shell	..	Shell Automatic Transmission Fluid (Dexron ®) or Shell Donax T6 (Dexron R)

Note Dexron is a registered trade name.

The lubricants listed supersede the Type A Suffix A automatic transmission fluids but as both types of fluid are miscible, Type A Suffix A automatic transmission fluids can still be used for topping-up purposes.

The procedure to be adopted for topping-up is as follows.

- 1 Select 'N', ensure that the handbrake is applied then start the engine and run it at idling speed to warm up the transmission fluid.
- 2 Remove the dipstick (*see Fig. T4*); clean the dipstick blade before checking the oil level.
- 3 If topping-up is necessary pour in the correct oil in small quantities, checking frequently to ensure that the level of oil does not rise above the MAX mark on the dipstick. Take care not to overfill as this may cause loss of oil through the gearbox breather.

Control joints — To lubricate

All control ball joints should be lubricated with Molytone 265 grease which should be worked into each ball socket with the fingers. If, during greasing, excessive end play is discovered, adjust the ball joint taking care not to disturb the control settings. If end play in the joints is excessive, it may be necessary to alter the controls as described under 'Controls — To adjust'.

Control rods which are retained in a lever by a split pin should be lubricated with a few drops of light oil.

The T.V. control cross-shaft which runs transversely in the bell housing and the 'Get You Home' lever are supported on oilite bushes and do not require lubrication.

OIL LEAKAGE SOURCES

LOCATION OF OIL	POSSIBLE SOURCE	ACTION TO TAKE
Outside of torus cover and inside of bell housing.	1 Front pump-to-torus cover oil seal.	Remove gearbox. Renew front pump oil seal.
	2 Torus cover drain plug.	Check tightness of plug. Renew joint washer.
	3 Torus cover-to-end cover joint.	Remove gearbox. Renew 'O' ring between torus cover and end cover.
	4 Torus cover damper rivets.	Remove gearbox. If rivets are loose, renew torus cover assembly.
Front of gearbox behind bell housing.	Front pump-to-gearbox 'O' ring.	Remove gearbox. Renew 'O' ring between front pump and gearbox. Ensure that the bell housing 'nips' the pump body.
Oil sump.	1 Sump drain plug.	Check tightness of plug. Renew joint washer.
	2 Sump-to-casing gasket.	Drain and remove sump. Check joint faces. Fit new gasket. Torque tighten nuts.
Side cover.	1 Main line blanking plug (oil pressure test point).	Check tightness of plug. Renew joint washer.
	2 Side cover-to-casing gasket.	Drain sump and remove side cover. Check joint faces. Fit new gasket.
	3 T.V. and selector shaft oil seal.	Check fit and condition of seal. Renew, if necessary.
Rear extension.	Rear extension oil seal.	Remove propeller shaft and coupling flange. Renew oil seal.

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Section T3

TESTING

There are two tests which can be made in order to check the functioning of the automatic gearbox. They are as follows.

- 1 A road test is necessary to ensure that the gear changes are occurring at the correct road speed and engine power.
- 2 The second test is to check the operating oil pressures to assist diagnosis of a suspected defect. This entails the fitting of a gauge to a pressure tapping in the gearbox top face then recording the operating pressures.

Change points — To check

The gearbox change points are given in the following table in the sequence in which the tests should be made. The gearbox oil level, engine tune and control settings should be correct before the test is made, otherwise subsequent analysis of the results will be very difficult.

The point at which the gear change occurs can be recognised by a tendency for the engine to speed up at the change point on the up-changes or a tendency for the car to lose road speed on the down-changes.

The speedometer readings at which each change point occurs should be noted, whether correct or incorrect, then the test should be continued until all the results are obtained. The test should not be terminated because of a defect unless damage to the transmission is likely to be caused by continued running.

Compare the noted change points with the table of change points and, if a defect exists, consult the fault diagnosis section which gives the action required for rectification, on the assumption that gearbox oil level, engine tune and engine idling speed are correct.

Although the symptoms for incorrect control settings are included in 'Fault Diagnosis', it will

CHANGE POINTS

RANGE 4						
	UP-CHANGES m.p.h. (k.p.h.)			DOWN-CHANGES m.p.h. (k.p.h.)		
	1-2	2-3	3-4	4-3	3-2	2-1
Light throttle.	5-8 (8-13)	12-15 (19-24)	22-25 (35-40)	18-16 (29-26)	9-6 (14-10)	6-3 (10-5)
Full throttle.	18-21 (29-34)	33-37 (53-59)	73-75 (117-121)	73-71 (117-114)	24-22 (39-35)	
Kick-down.						
RANGE 3						
	1-2	2-3	3-4	4-3	3-2	2-1
Light throttle.	5-8 (8-13)	12-15 (19-24)	75-77 (121-124)	77-75 (124-121)	9-6 (14-10)	6-3 (10-5)
Full throttle.	18-21 (29-34)	33-37 (53-59)			24-22 (39-35)	
Kick-down.						

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simplify matters if the controls are checked before road testing the car. Many gearbox faults can be traced to incorrect setting of the controls.

The speedometer reading at which the change occurs will be dependent upon throttle position and

increases progressively from light throttle to full throttle. Slight variation from the figures quoted in the table is permissible provided that the changes are smooth and that there are no other symptoms of incorrect operation.

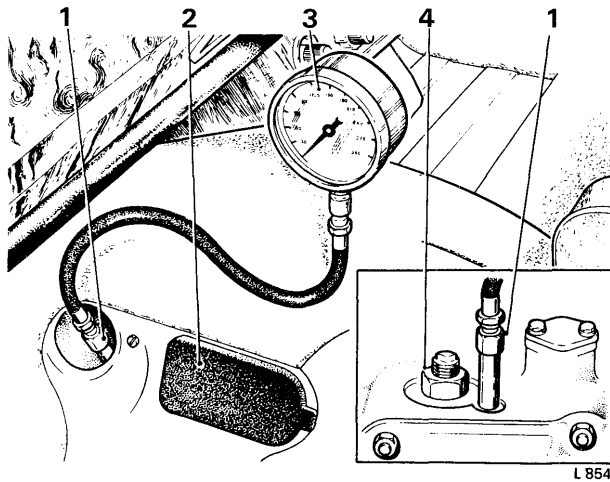


FIG. T8 CHECKING THE OIL PRESSURE

- 1 Adaptor
- 2 Rubber plug
- 3 Oil pressure gauge
- 4 Front band adjuster and lock-nut

Oil pressure — To check

If a road test is being made to test for a suspected defect, or if a defect has been found on a previous road-test, some of the possible causes listed in the Fault Diagnosis Section can be eliminated by jacking up the rear wheels then checking the operating oil pressures with the figures given in the following table.

For this test it is necessary to fit a tachometer in order to check engine r.p.m. Also fit a pressure gauge (R5244) to the pressure tapping between the band adjusting screws in such a manner that the gauge can be observed during the check. It will be necessary to partially remove the carpet from the front passenger's side, then lift out the forward rubber blank which is fitted in the left-hand side of the transmission tunnel (see Fig. T8).

Oil pressure tests should be carried out in the order given in the table after fitting the gauge and tachometer and running the engine for a few minutes to warm up the gearbox.

OIL PRESSURE TESTS

TEST CONDITION	RANGE	TACHOMETER OR SPEEDOMETER READING	OIL PRESSURE LB/SQ.IN
Engine running, car stationary.	N	1 200 r.p.m.	68 to 72 (4,781 kg/sq.cm. to 5,062 kg/sq.cm.)
Car reducing speed with throttle closed.	4	30 m.p.h. (48 k.p.h.)	68 to 72 (4,781 kg/sq.cm. to 5,062 kg/sq.cm.)
Car increasing speed at full throttle.	4	40 m.p.h. (64 k.p.h.)	105 to 110 (7,383 kg/sq.cm. to 7,734 kg/sq.cm.)
Car reducing speed with throttle closed.	3	30 m.p.h. (48 k.p.h.)	68 to 72 (4,781 kg/sq.cm. to 5,062 kg/sq.cm.)
Car reducing speed with throttle closed.	2	20 m.p.h. (32 k.p.h.)	68 to 72 (4,781 kg/sq.cm. to 5,062 kg/sq.cm.)
Car reducing speed with throttle closed.	R	10 m.p.h. (16 k.p.h.)	170 (11,953 kg/sq.cm.)
Coasting with engine stopped.	4	Not more than 25 m.p.h. (40 k.p.h.)	50 (min.) (3,515 kg/sq.cm.)

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Section T4

FAULT DIAGNOSIS

Reliable and accurate fault diagnosis and the rectification of faults, when discovered, will be made easier if servicing and testing are carried out in the correct order. The results of each test should be recorded before consulting the Fault Diagnosis Table in this Section.

The following sequence of tests may help to simplify the diagnosis of some obscure defects.

- 1 Check gearbox oil level then examine the outside of the gearbox for leaks.
- 2 Lubricate and check the setting of the control

linkages.

- 3 Fit a pressure gauge to the gearbox then carry out a road test, recording oil pressures and gear change points.
- 4 Adjust the front band if necessary.

The following Fault Diagnosis Table is arranged in three columns. The first column gives the conditions under which the fault may occur. The second column lists the probable cause of the condition in the most likely order of occurrence whilst the third column gives the action to be taken in order to remedy the fault.

DIAGNOSIS

CONDITION	CAUSE	REMEDY
High up-shifts 1 All up-shifts.	1 T.V. linkage too long. 2 Governor valves sticking. 3 Broken or sticking governor oil sealing rings.	1 Adjust T.V. linkage. 2 Remove side cover, parking brake bracket and governor. Check governor valves. 3 Remove side cover and parking brake bracket. Check governor rings.
Low up-shifts 1 All up-shifts.	1 T.V. linkage too short. 2 Governor valves sticking. 3 Leaking throttle pressure.	1 Adjust T.V. linkage. 2 Remove side cover, parking brake bracket and governor. Check governor valves. 3 Remove side cover and control valve unit. Overhaul control valve unit. Check regulator plug. Check rear servo accumulator T.V. pipe.
Misses up-shifts 1 No up-shift above 1st.	1 Shift valves sticking. 2 Governor valves sticking. 3 Low oil pressure due to oil delivery sleeve rings broken or sticking.	1 Remove side cover and control valve unit. Overhaul control valve unit. 2 Remove side cover, parking brake bracket and governor. Check governor valves. 3 Remove sump, side cover and control valve unit. Air test oil delivery sleeve for excessive leakage.

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CONDITION	CAUSE	REMEDY
<p>Misses up-shifts—continued</p> <p>2 Misses 1st and 3rd.</p> <p>3 Misses 2nd and 4th.</p>	<p>1 Front band incorrectly adjusted.</p> <p>2 Broken front band.</p> <p>3 Front servo rings broken or sticking.</p> <p>4 Missing or loose plug in front servo.</p> <p>5 Front unit locked due to mechanical failure.</p> <p>1 Excessive leakage from oil delivery sleeve.</p>	<p>1 Drain and remove sump. Adjust front band.</p> <p>2 Remove gearbox and renew front band.</p> <p>3 Drain and remove sump. Remove side cover and control valve unit. Air test front servo for operation and overhaul if necessary.</p> <p>4 Drain and remove sump to check. Fit and tighten plug as required.</p> <p>5 Remove gearbox, overhaul front unit.</p> <p>1 Drain and remove sump. Remove side cover and control valve unit. Air test oil delivery sleeve for excessive leakage; check correct fitting of bearing cap.</p>
<p>Slips during up-shifts</p> <p>1 Slips — light throttle up-shifts.</p> <p>2 Slips—heavy throttle up-shifts.</p> <p>3 Slips 1-2, 3-4.</p> <p>4 Slips 2-3.</p>	<p>1 T.V. linkage incorrectly adjusted.</p> <p>2 Front band incorrectly adjusted.</p> <p>3 Low oil pressure.</p> <p>4 Throttle valve forced out of bore.</p> <p>1 T.V. linkage incorrectly adjusted.</p> <p>2 T.V. pipe loose.</p> <p>3 Front band incorrectly adjusted.</p> <p>4 Low oil pressure.</p> <p>5 Throttle valve forced out of bore.</p> <p>6 Sticking T.V. plug in regulator valve.</p> <p>7 Damaged oil seals in regulator valve.</p> <p>8 Oil delivery sleeve rings broken or sticking. Heavy grooving in ring bore of clutch housing.</p> <p>9 Clutch plates worn or burned.</p> <p>1 Low oil pressure due to oil delivery sleeve rings sticking or broken.</p> <p>2 Front servo rings sticking or broken.</p> <p>3 Front unit clutch plates worn or burned.</p> <p>4 Broken or collapsed oil seal in front clutch piston.</p> <p>1 T.V. linkage incorrectly adjusted.</p> <p>2 Front band incorrectly adjusted.</p> <p>3 Restriction or heavy oil leak in oil circuit.</p> <p>4 Rear servo accumulator valves sticking or broken piston rings.</p> <p>5 Sticking control valves.</p> <p>6 Rear clutch plates worn or burned.</p>	<p>1 Adjust T.V. linkage.</p> <p>2 Drain and remove sump; adjust front band.</p> <p>3 Check oil pressure then see 'OIL PRESSURE DIAGNOSIS'.</p> <p>4 Remove side cover and control valve unit; overhaul control valve unit.</p> <p>1 Adjust T.V. linkage.</p> <p>2 Remove side cover. Check fitting of T.V. pipe.</p> <p>3 Drain and remove sump; adjust front band.</p> <p>4 Check oil pressure then see 'OIL PRESSURE DIAGNOSIS'.</p> <p>5 Remove side cover and control valve unit; overhaul control valve unit.</p> <p>6 Remove regulator valve and check T.V. pressure plug.</p> <p>7 Remove regulator valve and renew seals.</p> <p>8 Drain and remove sump. Remove side cover and control valve unit. Air test oil delivery sleeve for excessive leakage. Remove gearbox and overhaul drum assemblies as required.</p> <p>9 Remove gearbox. Overhaul front, centre and rear clutch packs.</p> <p>1 Drain and remove sump. Remove side cover and control valve unit. Air test oil delivery sleeve for excessive leakage. Overhaul if necessary.</p> <p>2 Drain and remove sump. Remove side cover and control valve unit. Air test front servo for correct operation. Overhaul if necessary.</p> <p>3 Remove gearbox and overhaul front clutch pack.</p> <p>4 Remove gearbox and overhaul front clutch pack.</p> <p>1 Adjust T.V. linkage.</p> <p>2 Drain and remove sump. Adjust front band.</p> <p>3 Drain and remove sump. Remove side cover and control valve unit. Air test oilways to check front servo and rear clutch. Remove unit or gearbox as required for overhaul.</p> <p>4 With side cover and sump removed, air test servo to check valve and piston operation. Remove body and overhaul. If necessary, remove servo and overhaul.</p> <p>5 Remove side cover and control valve unit. Overhaul control valve unit.</p> <p>6 Remove gearbox. Overhaul rear clutch pack.</p>

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CONDITION	CAUSE	REMEDY
Intermittent slip 1 All ranges.	1 Low oil level. 2 Incorrect oil pressure.	1 Check oil level and top-up as required. 2 Check oil pressure then see 'OIL PRESSURE DIAGNOSIS'.
Rough changes 1 Rough up-shifts. 2 Rough 4-3 down-shift. 3 Rough neutral to drive. 4 Rough Range 3 to Range 2.	1 Throttle linkage incorrectly adjusted. 2 Front band incorrectly adjusted. 3 Incorrect oil pressure. 4 Control valves sticking. 1 Throttle linkage incorrectly adjusted. 2 Incorrect oil pressure. 3 Front band incorrectly adjusted. 4 Control valves sticking. 1 Engine slow running set too fast in closed throttle position. 2 Front band incorrectly adjusted. 1 Sticking rear band control valve.	1 Adjust throttle linkage. 2 Drain and remove sump; adjust front band. 3 Check oil pressure then see 'OIL PRESSURE DIAGNOSIS'. 4 Remove side cover, remove control valve unit. Overhaul control valve unit. 1 Adjust throttle linkage. 2 Check oil pressure then see 'OIL PRESSURE DIAGNOSIS'. 3 Drain and remove sump. Adjust front band. 4 Remove side cover, remove control valve unit. Overhaul control valve unit. 1 Fit tachometer and correctly adjust engine slow running speed. 2 Drain and remove sump. Adjust front band. 1 Remove side cover. Remove control valve unit. Overhaul valve assembly.
No engine braking 1 No engine braking in Range 2.	1 Rear band incorrectly set.	1 Drain and remove sump. Adjust rear band.
No forced down-shift (Kick-down) 1 No 4-3 and 3-2 forced down-shifts.	1 Throttle linkage incorrectly adjusted. 2 Full throttle stop incorrectly set. 3 Control valves sticking.	1 Adjust throttle linkage and accelerator pedal stop. 2 Adjust full throttle stop to obtain correct kick-down. 3 Remove side cover, remove control valve unit. Overhaul control valve unit.
Reverse malfunction 1 Slips in Reverse. 2 Locks in Reverse. 3 Jumps out of Reverse. 4 Cannot select Reverse. 5 Will go into Reverse above 8 to 10 m.p.h. (13 k.p.h. to 16 k.p.h.).	1 Low oil pressure. 2 Damaged reverse piston oil seal. 3 Reverse piston oil supply restricted or leaking. 4 Front band incorrectly adjusted. 5 Stationary cone key missing. 1 Reverse piston sticking or reverse cone sticking to stationary cone. 2 Rear band incorrectly adjusted. 3 Reverse parking pawl incorrectly fitted. 1 Selector linkage incorrectly adjusted. 1 Selector linkage incorrectly adjusted. 2 G1 valve sticking out allowing G1 oil to hold reverse blocker piston out. 3 Reverse blocker piston sticking out. 1 Reverse blocker piston sticking in.	1 Check oil pressure then see 'OIL PRESSURE DIAGNOSIS'. 2 Remove gearbox. Overhaul reverse unit. 3 Remove side cover. Check reverse oil feed pipe for correct fitting or obstruction. 4 Drain and remove sump. Adjust front band. 5 Remove gearbox. Remove rear extension and check fitting of stationary cone key. 1 Try to free clutch by burnishing as described in Section T6—Reverse epicyclic unit. If this fails, remove gearbox and overhaul reverse unit. 2 Drain and remove sump. Adjust rear band. 3 Remove side cover and check correct operation of parking pawl. 1 Adjust selector linkage on gearbox. 1 Adjust selector linkage on gearbox. 2 Remove side cover. If necessary remove governor to free valve. 3 Remove side cover. If necessary remove parking brake bracket to free piston. 1 Remove side cover. If necessary remove parking brake bracket to free piston.

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CONDITION	CAUSE	REMEDY
Reverse malfunction — continued		
6 Clashes when changing to Reverse.	1 Parking blocker piston sticking in allowing pawl to engage.	1 Remove side cover. If necessary remove parking brake bracket to free piston.
7 No forward drive after changing from Reverse.	1 Reverse piston sticking or reverse cone sticking to stationary cone.	1 Try to free clutch by burnishing as described in Section T6 - Reverse epicyclic unit. If this fails, remove gearbox then overhaul the reverse unit.
8 Inoperative parking brake.	1 Parking blocker piston sticking out or parking pawl binding.	1 Remove side cover and parking brake bracket. Check parking blocker piston and pawl then remove the parking brake bracket if necessary to free the piston.
Car fails to move		
1 No drive.	1 Selector linkage disconnected. 2 No oil pressure. 3 Low oil level. 4 Manual control valve operating pin not engaged with manual control valve.	1 Connect and adjust selector linkage. 2 Fit oil pressure gauge. Check oil level. Look for oil leaks. Drain and remove sump. Check correct fitting of oil pipes. 3 Check oil level and top-up as required. Look for oil leaks. 4 Remove side cover. Correctly fit the manual control valve. Ensure also the correct fitting of the neutral and rear servo manual valve.
2 No drive when engine is first started.	1 Low oil pressure. 2 Badly leaking torus check valve. 3 Reverse piston sticking or reverse cone sticking to stationary cone.	1 See 'OIL PRESSURE DIAGNOSIS'. 2 This will be revealed by an abnormally high level of oil in the gearbox due to the check valve failing to hold oil in the torus assembly. In such a case, remove the gearbox and overhaul the check valve in the driven torus. 3 Try to free the reverse clutch by burnishing as described in Section T6 - Reverse epicyclic unit. If this fails, remove the gearbox then overhaul the reverse unit.
3 Car fails to move forward in Range 3 or 4 but moves in Range 2 and Reverse.	1 Centre clutch oil feed pipe blocked or badly leaking. 2 Sprag race 'turned over', allowing the rear drum to rotate.	1 Remove side cover. Remove control valve unit. Examine pipe. Check clutch operation by air test. 2 Remove transmission. Overhaul sprag clutch.
4 Electric actuator will not select a gear.	1 Car battery is flat. 2 Actuator motor thermal cut-out operated due to obstructed gearchange linkage.	1 Renew car battery. 2 Check and correctly adjust gear-change linkage. Re-set thermal cut-out.

It will be seen from reading the Fault Diagnosis Table that a considerable number of defects can be caused by oil pressure which is too high or too low.

The following list of causes of high and low oil pressure is useful when used in conjunction with the Fault Diagnosis Table.

OIL PRESSURE DIAGNOSIS

LOW OIL PRESSURE		HIGH OIL PRESSURE
1 Oil level low.	4 Blocked filter.	1 Pressure regulator valve sticking.
2 Boost plug sticking.	5 Oilfoaming or air locks.	2 Boost plug sticking.
3 Pressure regulator or spring defects.	6 Internal leaks.	3 Pump relief valve sticking.
	7 Pump slide sticking.	4 Blocked oil passages.

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Section T5

CONTROL LINKAGE

It is recommended that the control linkage be checked before road testing the car to investigate a suspected defect. If the symptoms exhibited on a road test are shown by fault diagnosis to be attributable to the control linkage, another check should be made before proceeding any further.

Turning the micro adjuster clockwise (looking from the top) (*see Fig. T10*) will decrease T.V. pressure and may correct such defects as a high up-change or rough up and down-changes. Turning the adjuster anti-clockwise may correct such defects as low, heavy throttle up-changes, slipping or incorrect kick-down.

The selector linkage should be checked by disconnecting the selector rod on the side of the gearbox then checking the lever through its full range. The lever should click into each of its five positions. If the linkage is correctly adjusted it should be possible, with the actuator motor lever in the appropriate position, to connect the rod without springing the lever from any of its notches.

If necessary, adjust the controls to obtain the correct changes following the procedure given under 'Controls — To adjust'. If a fault still persists after road test, refer to the Fault Diagnosis Table for the next check.

Controls—To adjust

The following paragraphs explain the correct method of adjusting the throttle and selector controls, commencing with the throttle controls.

T.V. linkage—To adjust

Drive the car on to a ramp or over an inspection pit, then disconnect the T.V. rod at the gearbox end. Figure T9 shows the layout of the throttle controls, each component being numbered for easy reference.

Ensure that the engine choke is in the OFF position i.e. fast-idle cam inoperative.

Check that the operating lever on the 'A' bank manifold cross-shaft is vertical and that the lever which connects to the T.V. adjusting rod is horizontal. Slacken the lever pinch bolts and, if necessary, adjust the levers; tighten the pinch bolts.

Note Ensure that the choke has not moved on to fast-idle.

Set the micro adjuster to its midway position.

Check that the length of the micro adjuster and rod assembly is 3.812 in. (96.838 mm.) measured from the inside faces of the ball joint lock-nuts. If the rods do not conform to this length, slacken the ball joint pinch bolts, remove the screwed ends then equally adjust the rods to obtain the correct length. Ensure that a reasonable amount of thread remains in the threaded part of the ball joint i.e. a length at least one and a half times the rod diameter. Fit the rod to the levers, fit the screwed ends and pinch bolts; tighten the lock-nuts. The ball joints should be free without having end float.

Slacken the pinch bolts in the levers on each side of the bell housing cross-shaft.

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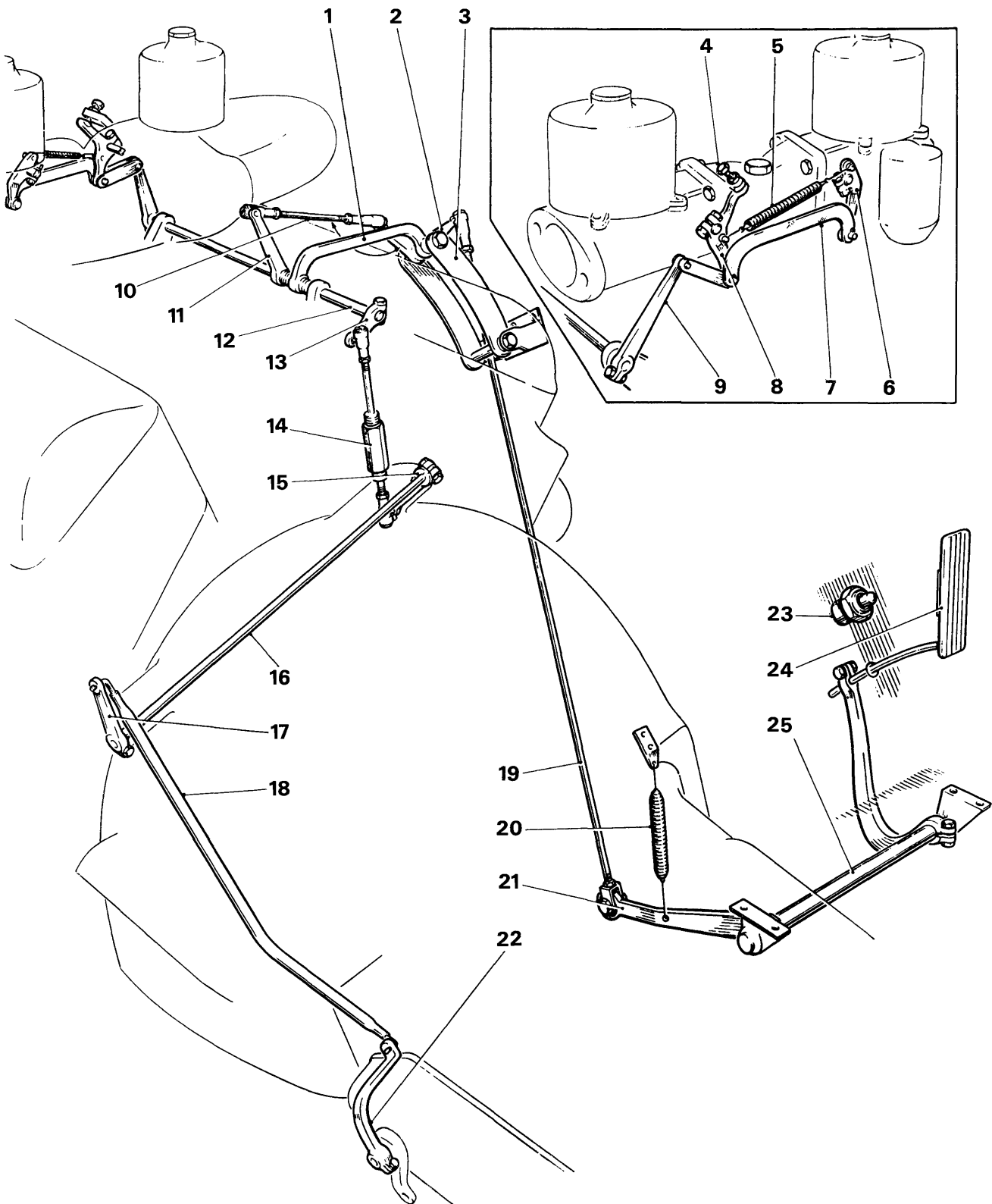


FIG. T9 THROTTLE AND T.V. CONTROLS

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Hold the T.V. lever fully forward in the 'no T.V.' position.

With the engine still in the 'off choke' position, lock the cross-shaft levers to the cross-shaft.

Turn the T.V. adjuster 6 notches (clicks) anti-clockwise, looking from the top (see Fig. T10), to take up free play in the T.V. linkage.

Ensure that the linkage moves freely and that the fully closed and fully open positions on the carburetter are obtainable.

Accelerator pedal linkage—To adjust

Check the length of the rod which connects the vertical lever on 'A' bank head cross-shaft to the fulcrum lever. Initially it should be set at 1.937 in. (49,312 mm.) between the inside faces of the ball joint lock-nuts.

Disconnect the rod between the fulcrum lever and the accelerator cross-shaft lever.

Check that the included angle made by the rod and the fulcrum lever is approximately 165° with the engine throttle in the closed position. Adjust rod, if necessary to obtain this angle.

Allow the accelerator pedal return spring to hold the pedal in the fully returned position. Under these conditions the pedal movement is limited by the rubber boot under the toe board.

Check that the length of the fulcrum lever-to-pedal cross-shaft lever rod is approximately 0.187 in. (4,763 mm.) longer than the actual length required with the accelerator pedal fully-back, as previously described, and with the throttle closed. Connect the

ball joint and lock the pinch bolt.

Check to ensure that full throttle is obtainable. If necessary, adjust the kick-down stop so that full throttle is just obtainable (see *Kick-down stop—To adjust*).

Ensure that the fulcrum lever and the rod cannot toggle over when the accelerator pedal is quickly released. Shorten the rod if necessary, to cure this condition.

Finally, check that all linkages and levers operate freely.

T.V.—Final adjustment

After the throttle and T.V. controls have been adjusted as described, the final setting, to adjust the T.V. micro adjuster and alter the kick-down stop to suit, should be carried out during road test.

The T.V. should be adjusted as follows, assuming that the engine throttle controls have been correctly set.

If the gearbox slips when gear changes occur, or if kick-down is unobtainable, T.V. pressure should be increased by turning the micro adjuster anti-clockwise, looking from the top.

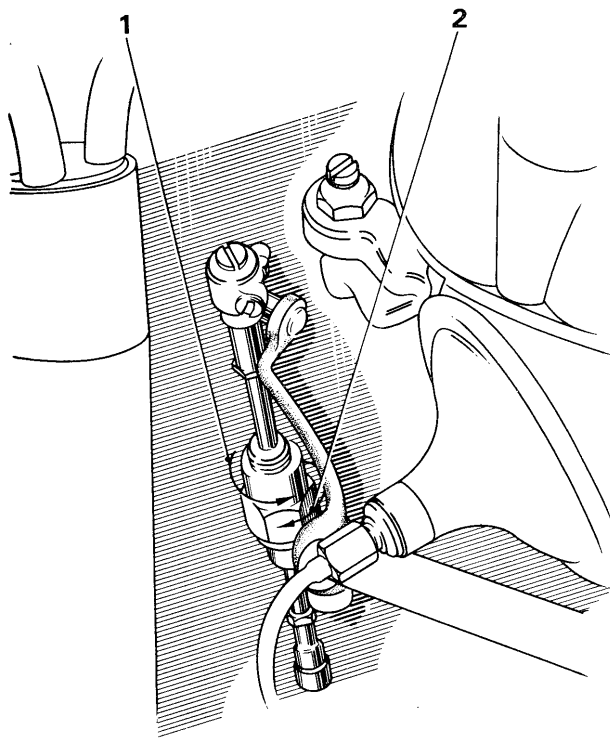
If the gear changes are jerky, or the gear changes are delayed on light throttle up-changes, T.V. pressure should be decreased by turning the adjuster in the opposite direction. Turn the adjuster two or three 'clicks' at a time until the desired conditions are obtained.

When T.V. has been satisfactorily adjusted, set the kick-down stop (accelerator pedal stop) so that kick-down is unobtainable unless the button is depressed.

FIG. T9 THROTTLE AND T.V. CONTROLS

- | | | | |
|----|---|----|--|
| 1 | Tie rod | 15 | Lever—bell housing to T.V. micro adjuster |
| 2 | Fulcrum rod | 16 | Bell housing cross-shaft |
| 3 | Compensator link | 17 | Lever—bell housing to T.V. rod |
| 4 | Slow running throttle stop | 18 | Control rod—bell housing to T.V. lever |
| 5 | Return spring | 19 | Control rod—accelerator to compensator linkage |
| 6 | Throttle lever—'B' bank | 20 | Pull-off spring |
| 7 | Coupling link | 21 | Lever—accelerator pedal cross-shaft |
| 8 | Throttle lever—'A' bank | 22 | T.V. lever |
| 9 | Lever—manifold to carburetter | 23 | Kick-down stop |
| 10 | Control rod—'A' bank | 24 | Accelerator pedal |
| 11 | Lever—'A' bank control shaft to control rod | 25 | Cross-shaft—accelerator pedal |
| 12 | 'A' bank control shaft | | |
| 13 | Lever—'A' bank control shaft to T.V. micro adjuster | | |
| 14 | T.V. micro adjuster | | |

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FIG. T10 T.V. MICRO ADJUSTER

- 1 Increase T.V.
- 2 Decrease T.V.

The button is spring-loaded so that the driver may feel the difference between the full throttle position and the kick-down position.

Kick-down stop — To adjust

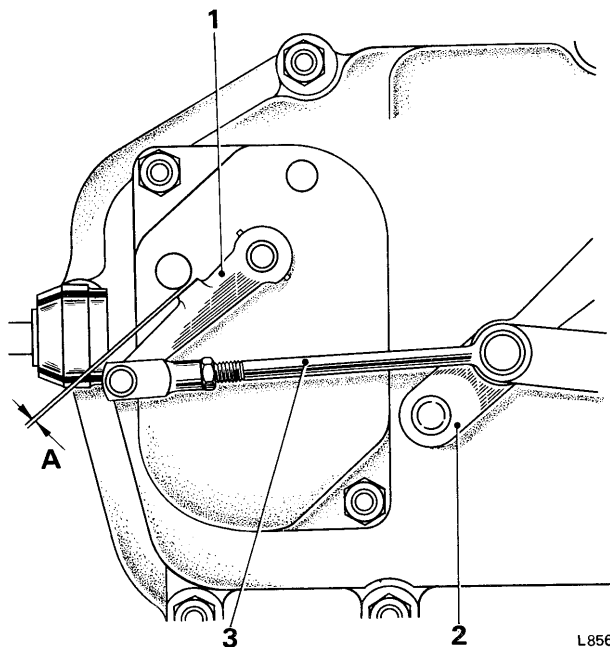
To adjust the kick-down stop proceed as follows.

Remove the floor covering from the toe board on the driver's side of the car; the kick-down stop can be seen under the accelerator pedal.

Slacken the large lock-nut, then adjust the body by screwing it up or down as required; tighten the lock-nut. When setting the kick-down stop care must be taken not to confuse a forced down-change (kick-down) with a normal top gear down-change which occurs below 35 m.p.h. (56 k.p.h.) (see *Change points in Section T3*).

If, when adjusting the kick-down stop, its position is such that it is in danger of being hidden by the carpet, an improvement can be made by shortening the length of the long operating rod. This operation will throw the accelerator pedal further up (away from the toe board) thus allowing the kick-down stop to be raised.

Check that the closed throttle condition is still obtainable.



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FIG. T11 SETTING THE NEUTRAL START AND HEIGHT CONTROL SWITCHES

- A 0.050 in. + 0.010 in.
(1,27 mm + 0,25 mm)
- 1 Neutral start and height control switch actuating lever
- 2 Gearbox lever
- 3 Operating rod

Selector linkage — To adjust

Selector linkage setting is comparatively simple and one rod only need be adjusted.

Select 'R' on the steering column control. When the actuator has moved the selector lever on the gearbox to the reverse position it should be possible to move the gearbox lever a small amount in a rearward direction.

Select 'N', then, when the actuator has moved the gearbox lever to the neutral position, it should be possible to move the gearbox lever a small amount in a forward direction.

Note When fitting an actuating rod on which the lock nuts are released and which is not adjusted to the correct length, ensure that the actuator and the gearbox lever are both in the same gear position when the rod is connected (see *Section T7—Gearbox electric actuator*).

Neutral start and height control switches — To set

If the gear change control levers and rods have been removed for any reason, the setting of the neutral

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start and height control switches must be checked.

To set the switches proceed as follows.

Select Neutral on the steering column control.

Using feeler gauges, check the gap that exists between the forward edge of the switch actuating lever and the stop on the switch cover (*see Fig. T11*).

If necessary, adjust the operating rod until a 0.050 in. plus 0.010 in. (1,270 mm. plus 0,254 mm.)

gauge will just pass between the lever and the stop.

This gap sets both the neutral start and the height control micro switches.

When all the controls have been finally adjusted ensure that all locking nuts, pinch bolts and split pins are secured and that the linkage operates freely.

Ensure that the engine throttle reaches the fully open and the fully closed positions.

Section T6

AIR PRESSURE CHECK AND INVESTIGATION

The air pressure test assists fault diagnosis by indicating which unit is leaking excessively and in some instances it can be used to check for unit functioning.

The tests can be made only after removal of the gearbox sump, the side cover, the control valve unit and the parking brake bracket. After removing the control valve unit and parking brake bracket, the oil holes that lead to the various units will be revealed. Using tool (R 5280) or a similar adaptor connected to a compressed air supply of approximately 80 lb/sq. in. (5,625 kg/sq. cm.) apply air pressure to the oil passages; refer to Figure T12 for identification of the oil passages. Excess oil should be blown out onto a cloth before examination.

Front servo

The front servo will apply the front band when air pressure is applied to the front band apply passage. Small air leaks are permissible only — through the servo-to-casing joint face — from the 4-3 timing valve exhaust hole — and from the front band release passage; no other leaks are permissible. Excessive leakage from the front band apply passage or from the compensator passage may cause slipping on the 2-3 up-change or when starting from rest. As the front servo is returned by spring pressure to the released position, application of air to the front band release passage will not actuate the servo or band but it will indicate excessive leakage. Slight leakage past the

piston ring gaps is permissible. Excessive leakage will cause slipping on the 3-4 up-change and if it is very excessive will cause missing of second and fourth gears.

Air pressure applied to the G1 to 4-3 timing valve passage should give a slight leak only from the front band apply passage. A sticking 4-3 timing valve may cause a rough 4-3 down-change.

Rear servo and accumulator

The rear servo will operate when air is applied to the rear band release passage. The accumulator piston can be felt to move when air is applied to the rear clutch apply port. Air will escape through the piston ring gaps but leakage should not be sufficient to impair operation.

The primary valve will be seen to move if air is applied to the main line oil-to-primary valve port. The valve will not move when air is applied to the T.V. passage but air leakage from both sources should be confined to a slight leak from the valve body joint face.

A sticking primary valve may give a 'slippy' 2-3 up-change.

Front epicyclic unit

The front unit contains the front clutch which can be felt or heard to operate when air pressure is

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applied to the front clutch apply passage. Excessive air leakage will indicate either faulty clutch piston seals or a faulty oil delivery sleeve; the latter can be more accurately checked by removing the servos to enable a closer examination to be made of the source of leakage.

The operation of both front and rear units can be affected by leakage from the oil delivery sleeve.

It may be possible to rectify leakage from the oil delivery sleeve if it is due to loose bearing cap set-screws or incorrect fitting of the cap to the sleeve, but

any other fault will require the removal of the gearbox to permit removal and investigation of the front epicyclic unit or oil delivery sleeve.

A loss of oil pressure or any other fault which causes the clutch to slip will cause slipping on the 1-2 and 2-3 up-changes. If excessive, second and fourth gears will be missed.

A locked front unit, due to faulty gears, will prevent a forced 4-3 down-change and missing of first and third gears; this, of course, will not be shown up by the air pressure check.

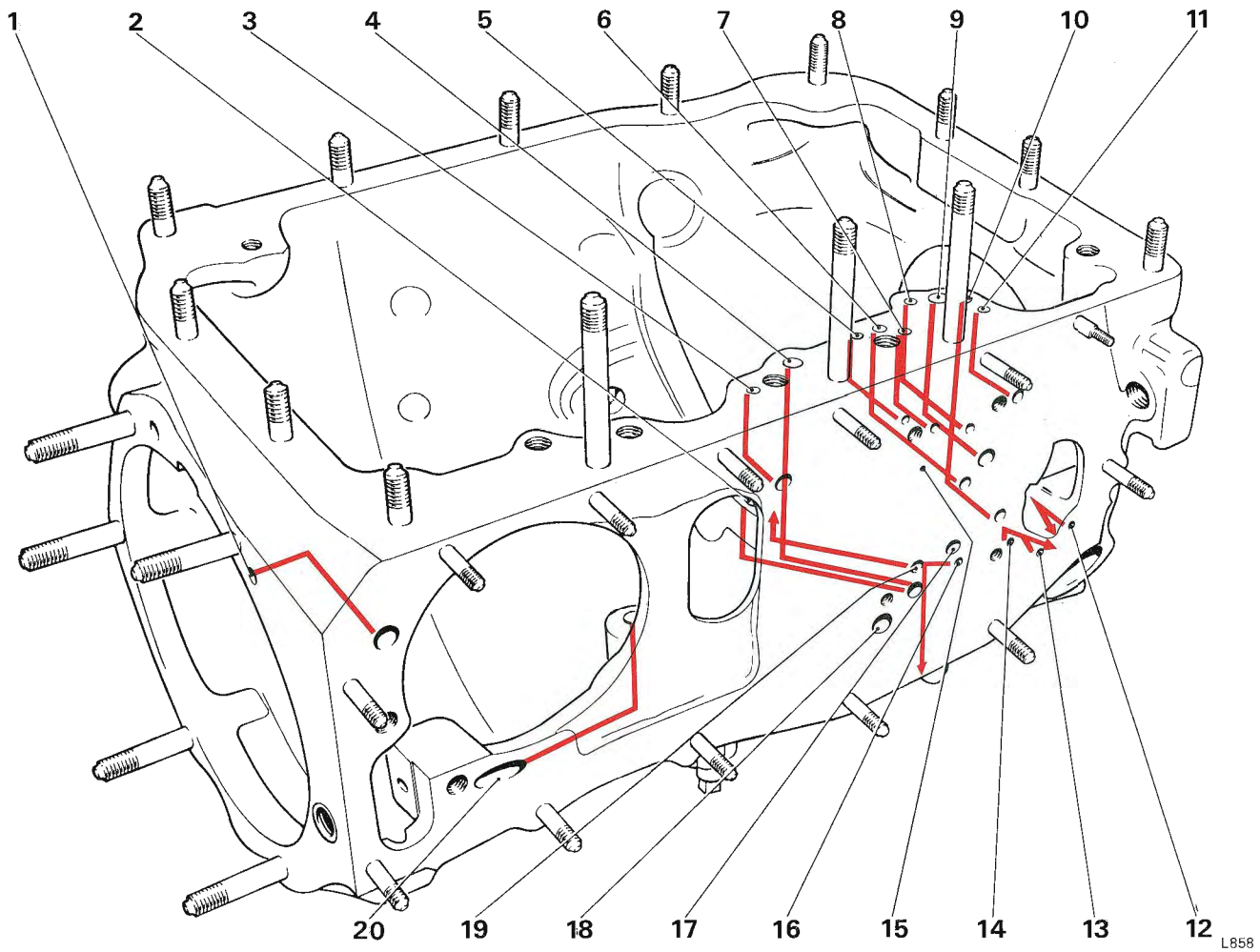


FIG. T12 OIL PASSAGE IDENTIFICATION

- | | | |
|---------------------------------------|-----------------------|-----------------------------------|
| 1 Reverse clutch apply | 7 Compensator | 15 Exhaust |
| 2 Rear clutch apply | 8 G1 Pressure | 16 Main line pressure tapping |
| 3 Rear band release | 9 Main line | 17 Exhaust |
| 4 Main line oil to accumulator piston | 10 Front band release | 18 Main line oil to centre clutch |
| 5 T.V. oil to modulating valve | 11 Front band apply | 19 Front clutch apply |
| 6 Main line to modulating valve | 12 Reverse booster | 20 Governor feed |
| | 13 T.V. oil | |
| | 14 T.V. oil | |

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Centre clutch

When air is applied to the centre clutch apply hole the clutch should be felt and heard to operate. Excessive air leakage will indicate faulty oil seals.

A slipping centre clutch will render the sprag inoperable, allowing the rear drum to rotate. This can cause such symptoms as slip during up-shifts or if the leak is excessive, loss of forward drive.

Rear epicyclic unit

The rear unit and its clutch can be checked in the same manner as the front clutch by applying air pressure to the rear clutch apply passage. A slipping rear clutch will result in slipping on the 2-3 up-change and, if both front and rear clutches are slipping as a result of leakage from the oil delivery sleeve, there may be no up-change above first gear.

Reverse epicyclic unit

The reverse unit clutch test is the same as for the other clutches, the pressure being applied through the reverse clutch apply passage after the removal of the reverse clutch oil pipe. Excessive leakage from around the clutch piston indicates faulty piston seals; this may cause slipping or 'loss of drive' in Reverse. This can be rectified only by removing and dismantling the gearbox to overhaul the reverse clutch.

A tendency for the reverse clutch to stick in engagement after moving the selector lever from Reverse will prevent forward drive as the transmission will lock. It may be possible to rectify such a fault, before detailed investigation, by operating the transmission and by burnishing the clutch surfaces as described in the following paragraphs.

Free the reverse clutch by selecting Reverse and increasing engine speed then select Range 4. When the change occurs reduce engine speed to idling. Repeat this operation until the transmission is free.

If, after five attempts, the transmission is still not free, do not continue the procedure as a more detailed investigation will be necessary to cure the fault.

If the transmission can be freed by the foregoing method the clutch should be burnished by driving the car forward at 1 m.p.h. to 2 m.p.h. (1.61 k.p.h. to 3.22 k.p.h.) selecting Reverse then, when the change is nearly complete, again select forward drive.

Repeat this procedure five or six times then select Range 4 and drive the car at approximately 20 m.p.h. (32 k.p.h.) for a few minutes to cool the gearbox. Repeat this cycle five or six times then road test the car.

Governor and parking brake bracket

checked together for excessive leakage after removing the governor feed pipe and then fitting it so that the servo end of the pipe is swung clear of the gearbox. Air pressure can then be applied to the open end of the pipe.

With the governor weights pressed inward manually to close the ports there will be some leakage past the piston rings where the ring ends interlock; air will escape from the governor sleeve, the G1 passage, G2 passage and the valves but this should not be excessive. There may be slight leakage from the parking and reverse blocker pistons.

There should be little or no leakage from the bracket-to-casing face joint. Excessive leakage would prevent any up-change.

If the reverse blocker piston sticks in, due to insufficient governor pressure or for any other reason, reverse engagement above the maximum speed of 10 m.p.h. (16 k.p.h.) will be possible.

If the reverse blocker piston sticks out due to leakage of main pressure oil into the governor passage (broken piston ring), it will prevent the selection of Reverse below 10 m.p.h. (16 k.p.h.).

If the parking blocker piston sticks out it will prevent the engagement of the parking pawl when Reverse is selected for parking purposes.

Clashing when Reverse is engaged may be caused by incorrect operation of the parking pawl.

The governor valves should not have a tendency to stick and if they are moved outward during the air pressure check, there should be an increase in the air flow from the G1 and G2 passages and governor valve exhaust ports. Sticking valves or excessive leakage in the governor will cause defective operation such as high or low up-changes, slipping in Range 4 and Range 3 or slipping with failure to drive in Reverse.

Other passages which may be checked during this diagnosis procedure are the pump main feed passages, the exhaust ports for the control valve unit and the passage to the pressure gauge blank.

Air pressure applied to the main line passage will result in a large escape of air from between the front drum and the front pump; this is normal and comes from the rear side of the front pump.

The exhaust ports for the control valve unit should allow unrestricted flow into the inside of the main casing.

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Pressure control valve

When removing the pressure control valve care must be taken to retain the damper spring, reverse booster plug and the throttle regulator plug.

After thorough cleaning, blow out the passages to the regulator plug and the reverse booster plug; the plugs should move freely in their bores. The plugs and springs should be assembled using petroleum jelly to retain them in position.

Before fitting the regulator valve into its bore, it is recommended that oil is flushed through the bore by motoring over the engine by means of the starter motor. **Do not** introduce cleaning fluid into the bore.

Control valve unit

The control valve unit cannot be satisfactorily checked in position, therefore, if the foregoing checks indicate that the control valve unit is faulty it should be removed, dismantled and overhauled as described in Section T12. Before removing the unit, check that the securing setscrews are tight as leakage between the joint faces may seriously affect valve operation.

Fluid coupling

Slipping or faulty gearchanges are unlikely to be caused by the fluid coupling, except in the event of damaged torus members which may cause slipping and overheating at all speeds. Damage to these members is most improbable.

Temporary slipping on starting the car, without the recommended three minutes warming-up period can be the result of a leaking torus check valve. This is because there is insufficient oil in the fluid coupling due to excessive flow through the check valve. Such a defect raises the level of oil on the dipstick which can therefore be used to check for the fault.

Check the oil level as previously described then wait for approximately ten minutes with the engine stationary; note the oil level on the dipstick without running the engine. If the level of oil has increased by more than half an inch, excessive leakage is confirmed and rectification is necessary.

Any fault associated with the fluid coupling will require removal of the gearbox before the fault can be rectified.

Noise

The source of any noise that occurs in the gearbox should be traced by the phase of operation associated

with the faulty unit. Before examining the gearbox for noisy units ensure that the noise is not caused by the engine, the final drive or other moving parts. Also ensure that gearbox noise is not being transmitted by adjacent components which may contact the gearbox. All gearboxes are checked for noise during testing at the factory. Any slight gear noises which are emitted by the gearbox should not be audible to the driver or passengers. The following paragraphs may help in locating noise which may become apparent at varying road speeds and gear positions.

Planet gear noise will be heard as a low growl, rising to a high pitched whine as speed is increased. Front unit noise will be at a higher pitch than that of the rear unit, while reverse gear noise can be heard only when accelerating in Reverse.

Tests should be made by accelerating through the gears in Range 4 and noting the characteristics of the noise at the change points. Noise in both first and second gears is caused by the rear unit.

Noise in both first and third gears is caused by the front unit.

Rear unit noise may also be heard when slowing down in Reverse.

Slight gear noise in Neutral, which disappears when drive is selected is usually attributable to the rear unit.

Oil pump noise may be more pronounced at a certain engine or road speed. As the gearbox front pump is operating only when the engine is running, and the rear pump only when the output shaft is rotating, it is possible to detect which pump is defective by static and road tests.

The test should be started in Neutral and the throttle gradually opened whilst noting the engine speed at which noise, if any, is most pronounced. Select Range 4 and drive the car on the road until the noise is most pronounced then quickly switch off the engine and select Neutral to stop the rotation of the front pump.

If the noise still persists and was not noticeable when the car was stationary, the rear pump is suspect.

There are two possible faults which can cause noise in the rear pump.

Noise caused by the rear pump driving gear is a whine similar to axle noise and will usually be most noticeable above 20 m.p.h. (32 k.p.h.). If doubt exists, axle noise can be eliminated by disconnecting the gearbox coupling flange then, with the selector in Range 4, run the engine up to the speed at which the noise was most noticeable.

The other possible cause of noise in the rear pump is inner gear noise, which is usually a low growl occurring at speeds above 35 m.p.h. (56 k.p.h.).

Important In the tests for suspected noise in the rear pump, coasting with the engine switched off should not exceed 25 m.p.h. (40 k.p.h.) and should be kept to the minimum necessary to confirm or eliminate the fault. The possible low oil pressure from a faulty rear pump may cause incorrect operation or inadequate lubrication with possible damage to other units in the gearbox.

The fluid coupling is unlikely to cause noise or slipping unless it is damaged or incorrectly fitted. A metallic scraping noise would result from fouling of the rotating parts. Worn torus member splines may result in increased gear noise in Neutral.

'Get You Home' lever

The 'Get You Home' lever is fitted to a bracket which is secured to the left-hand side of the gearbox by two side cover securing nuts. A link connects this lever to the gearchange lever on the manual control shaft.

In the unlikely event of failure of the gearbox electric actuator it is possible, by using the 'Get You Home' lever, to effect a manual gear change so enabling the car to be driven to a Service Station where the faulty actuator can be serviced or replaced.

Access to the 'Get You Home' lever is obtained by moving back the front passenger seat, lifting the carpet flap to expose the rubber blanking plug, then removing the plug (*see Fig. T13*).

To actuate the lever, fit the tommy bar from the car tool kit into the hole in the top of the lever, then push the lever backward or forward as required.

Pushing the lever fully back will select Neutral. One notch forward from this position will select Range 4. Range 3 and Range 2 follow progressively. Reverse can be obtained by pushing the lever fully forward.

By selecting Range 4 the driver should be able to drive the car normally until he has reached his destination. If he then requires Reverse the lever will have to be moved.

It should be noted that, as this control is on the passenger side of the car, it should not be operated as a normal manual gearchange but only as an emergency feature.

Rectification of units

Units which can be removed and fitted without removing the gearbox from the car are as follows.

- 1 Pressure control valve.
- 2 Control valve unit (requires removal of side cover and parking brake bracket).

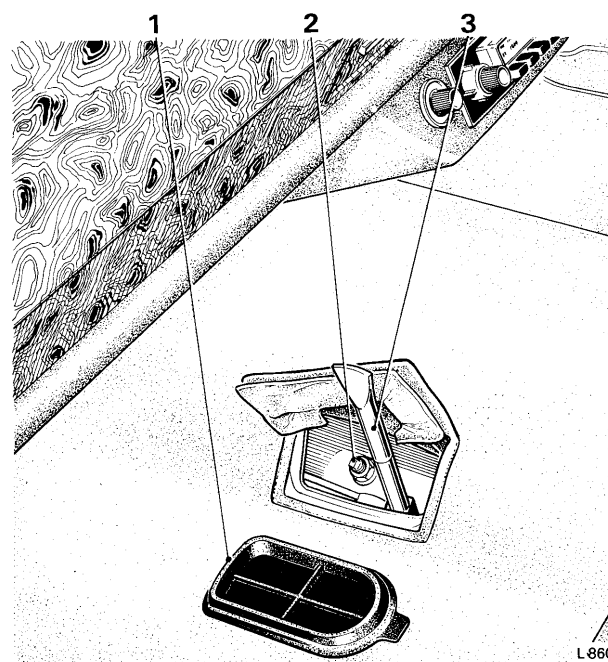


FIG. T13 ACCESS TO GET-YOU-HOME LEVER

- 1 Rubber seal
- 2 Rear band adjusting screw
- 3 Tyre lever

- 3 Parking brake bracket (requires removal of side cover and control valve unit).
- 4 Rear oil pump and governor (requires removal of side cover, sump, control valve unit and parking brake bracket and both servos).
- 5 Both servos (requires removal of sump and re-adjustment of bands).
- 6 Speedometer drive.
- 7 Electric gearchange actuator.

The units which necessitate the removal of the gearbox before they can be rectified are as follows.

- 1 Fluid coupling.
- 2 Front oil pump.
- 3 Front epicyclic unit.
- 4 Sprag clutch assembly.
- 5 Rear epicyclic unit.
- 6 Reverse epicyclic unit.

Towing

Towing or coasting with the engine switched off should be confined to as short a distance as possible and to a speed not greater than 25 m.p.h. (40 k.p.h.).

Before attempting to tow, examine the gearbox for mechanical damage and leaks then check the oil level. The car should not be towed if there is mechanical damage or if the oil level is low unless the propeller

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shaft is removed.

The gearbox should be prepared for towing by slackening the rear band adjusting screw four and a half turns then locking the adjusting screw.

When towing, the selector lever should always be in the neutral position and, where possible, the towing speed maintained between 15 m.p.h. and 20 m.p.h. (24 k.p.h. and 32 k.p.h.).

Section T7

GEARCHANGE ACTUATOR, NEUTRAL AND HEIGHT CONTROL SWITCHES

The electric gearchange actuator (*see Fig. T14*) is mounted on the gearbox rear extension and is connected by levers and rods to the gearchange lever on the gearbox, and to the neutral start and height control switches on the gearbox side cover.

A 12 volt, series wound motor is secured to the rear-most part of the actuator casing and is enclosed by a cover. Both the cover and the actuator casing are magnesium castings.

The motor is able to rotate in both directions, reversal being obtained by employing a double-wound field coil. The windings are of equal resistance, and one winding or the other is energised according to the gearchange selector position. A reset button which neutralises a thermal cut-out is located in the main fuse box on the bulkhead.

The drive from the motor is transmitted to a worm shaft via a flexible coupling. The worm shaft drives a worm gear which is rivetted to a shaft onto which the operating lever is fitted.

A drum is pinned onto the worm shaft, the drum itself forming part of the flexible drive. A solenoid operated brake acts on the drum periphery to arrest lever travel when a particular gear has been obtained.

Seven phosphor-bronze spring contacts are rivetted to a laminated bakelite base plate which is secured to the actuator casing. The spring contacts operate against a silver plated slip ring assembly which is screwed to the worm wheel. Also secured to the base plate is a dual relay arrangement, the contacts of which are

normally open.

The actuator casing is vented to atmosphere but all joints and electrical connections on the casing are fully waterproofed.

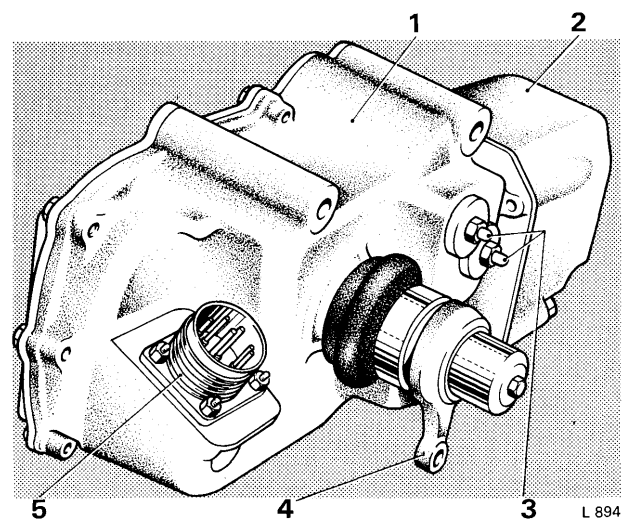


FIG. T14 ELECTRIC GEARCHANGE ACTUATOR

- 1 Actuator casing
- 2 Motor cover
- 3 Solenoid securing nuts
- 4 Actuating lever
- 5 Plug socket

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A rod, which extends forward from the gear change linkage, is connected to a lever which is pinned to the neutral start and height control switch operating shaft. A cam is brazed onto the inner end of the shaft and actuates two micro switches, which are secured to the switch housing. The housing and wire connections are fully waterproofed and the whole assembly can easily be removed from the side cover without disconnecting the wires.

Operation

When the ignition is switched on and the selector lever on the steering column is moved to one of the gear positions, current is allowed to flow to the actuator motor via a relay.

The motor rotates and turns the worm shaft through the flexible coupling. As the worm gear rotates, the slip ring which is secured to the worm gear also rotates until an insulated slot in the slip ring is aligned with the live contact. When this position is reached, the current is cut off and the motor ceases to rotate. Immediately the current ceases to flow, the brake, which is held off by the energised solenoid, is applied to the drum thus positively holding the shaft and lever in the required position.

As soon as the lever on the steering column is moved to another position, the solenoid is again energised, the brake is released and the motor will turn the actuating lever to the selected position.

The electric actuator is so wired that should the

driver stop the car in a gear position other than Reverse then switch off the ignition, he can still lock the transmission by moving the selector lever on the steering column to the reverse gear position.

Having done this, if he now moves the lever out of this position, or the lever is accidentally moved to a drive position, the actuator will not respond until the ignition is switched on.

The neutral start switch is actuated only when the gearbox is in Neutral, and the engine cannot be started until the micro switch is in its operating position. Also actuated when in Neutral is the height control switch which selects fast levelling whilst the car is stationary (*for information concerning the operation of the levelling switch see Chapter G—Section G9—Solenoid valve—T.S.D. 2476 Workshop Manual*).

Actuator—To test

The two tests described are designed to prove if a fault lies within the gearbox actuator or elsewhere in the gearchange electrical circuit.

The first test is designed to discover whether the pins of the actuator loom socket receive the correct electrical signal in sequence, as dictated by the position of the gear range selector lever.

1. Ensure that the gearchange thermal cut-out switch on the distribution board (fuse panel) has not cut-out. This can be done by depressing the Red button. The position of the button will not change whether the switch has tripped or not, however a

TEST CHART—ACTUATOR SOCKET

Socket Pin No.	Gear Range Lever Position					General Notes
	R	N	4	2	3	
A	N	Pos	N	N	N	This pin is Negative when the ignition is ON, and Neutral when the ignition is OFF. This pin is directly connected to the thermal cut-out switch. This pin is fixed to the valance earth point.
B	N	N	N	N	N	
C	N	N	Pos	N	N	
D	N	N	N	Pos	N	
E	N	N	N	N	Pos	
F	Pos	N	N	N	N	
G	Neg	Neg	Neg	Neg	Neg	
H	Pos	Pos	Pos	Pos	Pos	
I	Neg	Neg	Neg	Neg	Neg	
Key Pos. Common with the battery positive terminal Neg. Common with the battery negative terminal N Neutral—no connection to either battery terminal						

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tripped switch will click on pressing the button.

2. Ensure that fuse number 12 is intact.
3. Disconnect the low tension wire from the distributor and turn the ignition switch to the 'on' position.
4. Slightly loosen the actuator loom socket and check the actuator function. This will reveal any poor contact which may exist between the plug and socket.
5. Unscrew and withdraw the loom socket from the plug of the gearchange actuator.
6. Connect the negative side of a suitable voltmeter to a good earth point. The positive side should be connected in turn to the various pins of the loom socket (see *Test Chart—Actuator Socket*).
7. Move the gear range selector lever to the 'Reverse' position and check that all the pins of the loom socket are of the correct polarity or are neutral, as indicated in the 'Test Chart'.

Note Each pin in the socket is identified by a letter which is moulded in the rubber body adjacent to each pin.

8. Carry out the above operation in each of the gear range selector lever positions, checking each pin in turn with the information given in the 'Test Chart'.
9. Switch off the ignition and ensure that pin number G of the actuator socket is now neutral.
10. Reconnect the socket to the actuator and refit the distributor low tension cable.

Note If an incorrect reading is obtained during any of the above tests, this will indicate that the gear-change circuit is probably at fault and not the actuator.

It should be noted that the voltage readings obtained must not be more than 0.25 Volts less than the battery voltage. However, if the test sequence does not reveal a discrepancy, then the fault may be either inside the gearbox actuator or in the gearbox and neutral start switch linkage.

Before removing the actuator the gearbox linkage should be disconnected from the actuator output lever and checked for excessive stiffness.

The gearbox linkage should move into any gear when a load of approximately 10 lb. (4.53 kg.) is applied to the disconnected rod. When selecting 'Reverse' however, this load will be increased to 20 lb. (9.07 kg.).

If the linkage operation is satisfactory then it will be necessary to remove, recondition and test the actuator as described later in this Section.

After fitting the reconditioned actuator to the car, it should be finally tested as follows.

1. Disconnect the earth cable from the battery negative terminal, or from the boot quick release terminal when fitted.
2. Connect an ammeter capable of reading at least 20 Amps. between the battery negative terminal and

the loose end of the earth cable.

3. Ensure that all accessories such as the rear window demister and blower motors are switched off and then switch on the ignition. Note the reading shown on the ammeter.

4. Move the gear lever between 'Neutral' and 'Reverse' gear positions and check that the extra reading on the ammeter caused by the operation of the actuator does not exceed 10 Amps.

5. Check that the actuator moves smoothly and quietly to each position selected and that the output lever stops in the correct position and does not 'hunt' about that position more than once before finally stopping.

6. Remove the ammeter and connect the battery negative cable.

Gearbox electric actuator — To remove

Should the electric gearchange actuator fail to operate it should be noted that the system includes a thermal cut-out. This device prevents the motor from being overloaded should the gearchange linkage become obstructed and, as a result, will give the impression of actuator failure.

Before removing the actuator, ensure that the controls are free and adequately lubricated and that the actuator electrical system is cool enough for the thermal cut-out to permit the motor to operate. Press the reset button in the main fuse box to reset the cut-out.

It is recommended that the easiest and quickest method of dealing with actuator failure, should it occur, is by substituting the faulty actuator for a service exchange unit. If, however, a service exchange unit is not available but adequate repair facilities are, the following procedure should be observed.

Disconnect the negative lead from the battery.

Remove the split pin and clevis pin from the actuating lever on the electric actuator; disconnect the rod from the lever.

Unscrew and remove the 'multi-pin' plug.

Disconnect the breather pipe from the rear extension and the actuator side cover.

Remove the three bolts which secure the actuator to the rear extension then remove the actuator.

Neutral start and height control switches — To remove

Remove the split pin and clevis pin which secures the link rod to the switch actuating lever; disconnect the link rod.

Remove the two nuts and washers which secure the

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switch cover to the gearbox side cover; remove the cover.

Note Before the switches can be removed from the car, the switch assembly must be partially dismantled and the wires disconnected (*see Neutral start and height control switches — To dismantle*).

Gearbox electric actuator — To dismantle

Unscrew the setscrew in the centre of the actuating lever cover then remove the cover.

Using spring compressing tool RH 7843 compress the coil spring sufficiently to enable the hardened steel pin to be removed; drive out the pin.

Remove the spring compressing tool then withdraw the operating lever, spring and spring retaining cup from the shaft.

Remove the nuts and washers which secure the side cover to the main casing; remove the cover.

Note The cover gasket is initially sealed on both sides with jointing compound and, as a result, the cover may not be easily removable. Do not use a screwdriver between the joint faces in an effort to remove the cover as this may cause damage to the joint faces and destroy the waterproofing effect. Discard the gasket.

Disconnect the motor feed to the relays.

Disconnect the motor earth and solenoid feed wires.

Remove the four nuts which secure the motor cover to the main casing; remove the cover.

The gasket is sealed with jointing compound and care should be exercised when removing the cover.

Discard the gasket.

Withdraw the motor from the four long studs. The motor is secured to a mounting plate and this will be removed with the motor. Remove the rubber grommet and withdraw the wires.

Discard the gasket.

Remove the coupling dog from the motor output shaft.

Remove the flexible rubber coupling from the brake drum.

Remove the nuts and washers which secure the motor to its mounting plate. Remove the motor from the mounting plate, withdraw the wires out from the grommet and through the hole in the plate.

Remove the nuts and washers which secure the plug wires to the connection on the insulated base plate; detach the wires from the connections.

Unscrew the nuts and washers which secure the plug assembly to the actuator casing. Remove the plug and withdraw the wires from the casing; retain the rubber gasket which fits between the casing and the plug.

Remove the nuts and washers which secure the insulated base plate to the main casing. Carefully lift

the base plate from the studs.

Note Care should be exercised when handling the base plate assembly to avoid damaging the relays and contacts.

Using tool RH 7841 remove the roll pin which secures the brake drum to the worm shaft.

Push the pin through the drum and shaft until it can be removed; discard the pin.

Remove the drum from the worm shaft. It will be necessary to hold the brake shoe away from the drum whilst the drum is being removed.

Mark the top of the brake shoe in pencil to facilitate correct assembly.

Unscrew the dome nuts which secure the brake solenoid assembly to the main casing; remove the cup washers and the rubber washers. Remove the assembly from the casing. Secure the brake shoe assembly and spring to the solenoid with adhesive tape to retain them as a unit.

Remove the circlip and washers from the outer side of the seal which fits over the actuator casing and around the output shaft; remove the seal.

Remove the circlip which locates the output shaft and slip ring assembly in the main casing then remove the washer.

Withdraw the slip ring and shaft from the bush in the actuator casing; remove the washer from the shoulder behind the slip ring.

Remove the circlip which locates the worm shaft and bearings in the actuator casing. Remove the adjusting washer and label it to ensure the correct washer is fitted during assembly.

Gently tap the worm shaft and the bearings from the casing. The bearings are a push fit in the casing bores and no difficulty should be experienced when removing them.

This last operation will have dismantled the actuator into its main assemblies. It is recommended that no further dismantling be attempted. The base plate assembly, plug assembly, brake shoe assembly, solenoid assembly, brake solenoid assembly and the output shaft and slip ring assembly should be renewed, if necessary, as separate assemblies. The motor should also be removed as an assembly although it may be dismantled for inspection as follows.

Gearchange actuator motor — To dismantle

Unscrew and withdraw the two through-bolts.

Remove the end covers.

Withdraw the armature from the drive end. Retain the shim washers which fit between the shoulder on the drive end of the armature shaft and the drive end bush.

Note the side and the position of each brush to ensure correct assembly then remove the brushes, taking

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care not to stretch the brush tension spring excessively.

Should the pole piece require removal, mark the pole piece and the two retaining screws so that they can be fitted in their original position.

Neutral start and height control switches — To dismantle

If the gearbox has been removed from the car, the switch cover will have been removed from the gearbox side cover but it will still be connected to the car by wires. The procedure for dismantling the switches will therefore be the same as that for dismantling the switches when the gearbox is in position in the car.

To dismantle the neutral start and height control switches, proceed as follows.

Remove the four screws which secure the cover to the casing.

Remove the cover and discard the joint. The gasket is sealed with jointing compound on both sides during initial assembly and this may make separation of the cover and casing difficult. Do not use a screwdriver blade between the joint faces otherwise the water-proofing may be impaired.

Unscrew the knurled nut at the front of the cover.

Unscrew the two 6 B.A. screws which secure the micro switches to the casing.

Remove the switches and separator, disconnect the wires, then remove the wires and rubber grommet from the casing.

It should not be necessary to remove the operating cam and shaft which is secured in the casing by the lever. The lever is positioned and secured on the shaft by a roll pin.

Gearbox electric actuator — To inspect

Examine the magnesium casing for cracks or other damage. Ensure that the joint faces are clean and free from burrs.

Wash the gearchange operating lever, spring and covers in clean paraffin then examine them for general wear.

Ensure that the breather pipe is clear and free from damage.

Examine the driving dog slot for excessive wear, also the mating shaft on the drive end of the motor armature shaft. The dog should be an easy sliding fit on the shaft but without excessive side play.

Examine the rubber coupling for signs of deterioration.

Examine the general condition of the plug assembly. Ensure that no strands of wire are broken where they enter the pins. It is recommended that, in the event of the plug being considered unserviceable, the whole assembly be renewed, rather than an individual con-

nection. Special crimping tools and 'Cannon' insert tools are required for assembly purposes and unless these are available the work should not be attempted.

Examine the seven spring contacts for security on the insulated base.

Care must be exercised when handling the assembled base plate so that the contacts and the relays are not damaged in any way.

Check the height of the contacts from the base plate. The contact point should be approximately 0.485 in (12.3 mm.) from the contact (lower) side of the base. If excessive wear has occurred on the contact points the base assembly should be renewed.

Should the dual relay assembly be unserviceable, it is recommended that the assembly be renewed rather than attempt rectification. The relays are precision units and are accurately set to give the correct operating times. The spring-loaded adjusting screw is set during the initial build of the relay and the setting should not be altered.

Ensure that the terminals and the terminal blocks are secure on the insulated base.

Examine the brake drum for scoring or damage. Ensure that the brake drum is a push fit on the worm shaft. If the drum is slack on the shaft, examine the drum bore and the shaft for signs of fretting.

Remove the adhesive tape from the brake shoe and solenoid assembly.

Ensure that the assembled plunger and brake shoe will slide freely into the solenoid.

If either the brake shoe assembly or the solenoid become unserviceable they should not be renewed separately. The components are tested as one complete assembly during initial build and must remain as such, unless equipment is available that will enable separate assemblies to be tested and 'paired' (see *Dimensional Data*).

Examine the brake linings for wear.

Examine the general condition of the wiring.

If the components are satisfactory, retain them with adhesive tape until they are required for final assembly.

Check the tightness of the four 5 B.A. screws which secure the slip ring assembly to the shaft.

Ensure that a 0.025 in. (0.64 mm.) air gap exists on each side of the silver plated segments which are secured to the slip ring.

Ensure that the edges of the slip ring around the air gap are free from burrs.

Examine the slip ring face for signs of tracking. This should not normally occur but, if signs of tracking are found, the slip ring assembly must be renewed.

Examine the teeth on the worm gear and the worm for damage or uneven wear.

Examine the ball bearing bores in the main casing for signs of fretting. The bearing should be a light push fit in the casing. Reject the casing if the bearings

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have worked loose.

Examine for wear the bush which supports the output shaft. The shaft should be a running fit in the bush without excessive clearance i.e. the shaft should not rock in the bush (see *Dimensional Data*).

Gearchange actuator motor — To inspect

Under normal operating conditions the gearchange actuator motor should need no attention. The porous bronze bearings are impregnated with oil and the brushes are carbon copper.

Details of motor tests and performance are given in *Dimensional Data* at the end of this Section.

Neutral start and height control switches — To inspect

Examine the switch casing for damage to the joint faces.

Ensure that between 0.005 in. and 0.010 in. (0,13 mm. and 0,25 mm.) end float exists between the casing and the operating cam.

Gearchange actuator motor — To assemble

Assemble the gearchange actuator motor as follows (see *Fig. T15*).

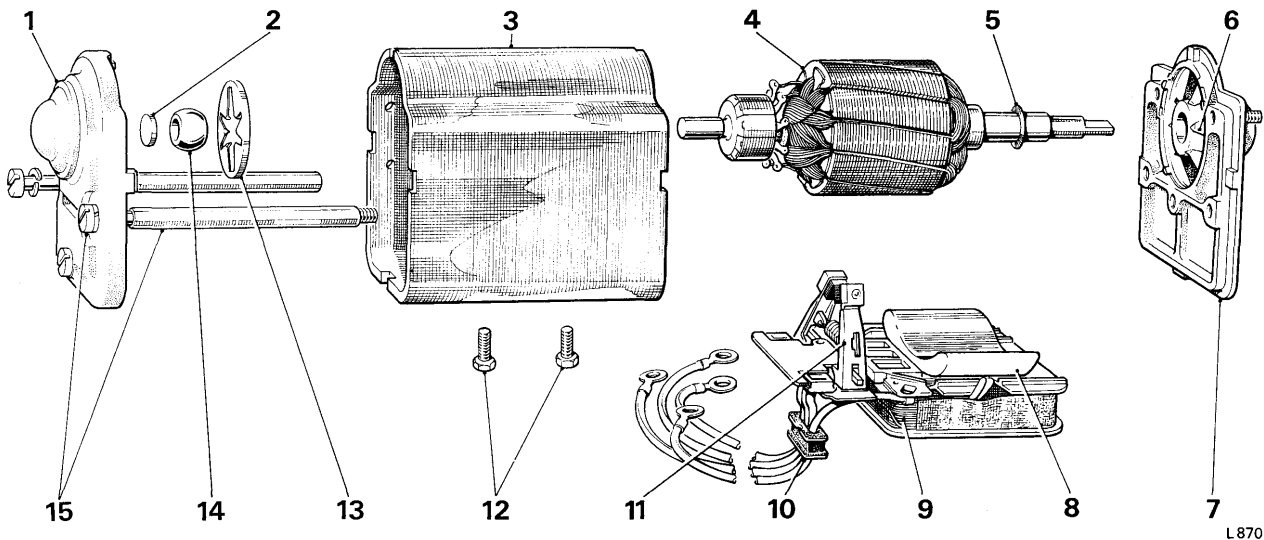


FIG. T15 GEARCHANGE ACTUATOR MOTOR

- | | | |
|--------------------------|---------------------|---------------------------------|
| 1 Commutator end bracket | 7 Drive end bracket | 12 Pole piece securing setscrew |
| 2 Thrust pad | 8 Pole piece | 13 Bearing retainer |
| 3 Yoke | 9 Field coil | 14 Self-aligning bearing |
| 4 Armature | 10 Grommet | 15 Through-bolts and |
| 5 Shim | 11 Brushgear | |
| 6 Bearing retainer | | |

Fit the pole pieces and the two self-tapping screws, ensuring that the marks made during dismantling are aligned.

Fit the brushgear assembly, ensuring that the brushes are fitted in their original position. Take care not to overstretch the brush tension springs. Ensure that the brush arms pivot freely on their terminal plate locations.

Fit the armature.

Fit the shim(s) to the drive end of the armature shaft.

Fit the end covers, securing them with the through-bolts.

Check the end float of the armature. This should measure between 0.002 in. and 0.012 in. (0,05 mm. and 0,30 mm.). If the end float does not conform to these figures remove the drive end bracket and adjust the shim(s) to suit.

Gearbox electric actuator — To assemble

Wash the bearings and shaft assembly in clean paraffin then dry them with compressed air.

Lightly lubricate the bearings with Esso Beacon grease.

Ensure that the actuator casing is clean and dry, then fit the shaft and bearings. Do not use force to fit the bearings to the casing.

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Fit the adjusting washer and the circlip.

Mount a dial test indicator so that the plunger rests on the end of the worm shaft (see Fig. 17).

Using a slave output shaft and gear, move the worm shaft backward and forward, noting the clock reading. If necessary, adjust the washer to give an end float of between 0.002 in. and 0.005 in. (0.05 mm. and 0.13 mm.). It will be appreciated that the bearings must be no more than a light push fit in the casing to achieve this (see *Dimensional Data*).

Ensure that the output shaft and the porous bronze bush are both clean; **do not wipe the bush with a degreasing agent.**

Lightly lubricate the shaft with Shell Tonna E oil.

Fit a washer over the shaft then fit the shaft into the bush in the casing.

Fit a washer over the end of the output shaft then fit the circlip.

Lightly lubricate the nylon worm gear with Esso Beacon grease.

Fit the rubber seal to the casing. A light smear of Esso Beacon grease applied to the inside of the seal will make this operation easier.

Fit the remaining washer and circlip to the shaft.

Ensure that the worm shaft will turn freely.

Rotate the output shaft until the open circuit sections are parallel with the worm shaft.

Note If the open circuits are at 90° to the worm shaft, the actuator will not operate when switched on initially.

Ensure that the pencil mark on the brake shoe is at the top.

Remove the adhesive tape from the brake shoe and solenoid assembly.

Fit the assembly into the actuator casing.

Fit the seal washers, cup washers and dome nuts.

Do not tighten the nuts at this stage.

Push the brake drum down onto the worm shaft until the pin holes are aligned. If either the drum or the shaft are new components, ensure that the fit is such that the drum can be pushed onto the shaft, otherwise it will be difficult to align the holes. It will be necessary to hold the brake shoe in against spring pressure whilst the drum is fitted.

Fit a new roll pin to the shaft and drum using tool RH 7841 as shown in Figure T17.

Remove the tool, ensuring that the pin protrudes equally on each side.

The brake should be set in relation to the brake drum and solenoid as follows.

Obtain a smooth strip of soft metal e.g. aluminium, 0.048 in. (1.22 mm.) thick, 0.750 in. (19.0 mm.) wide and bend it into 1 in. (25.4 mm.) radius semicircle.

Slide the metal onto the outside of the drum.

Push the solenoid assembly in the direction of the brake drum until the brake shoe abuts the metal strip

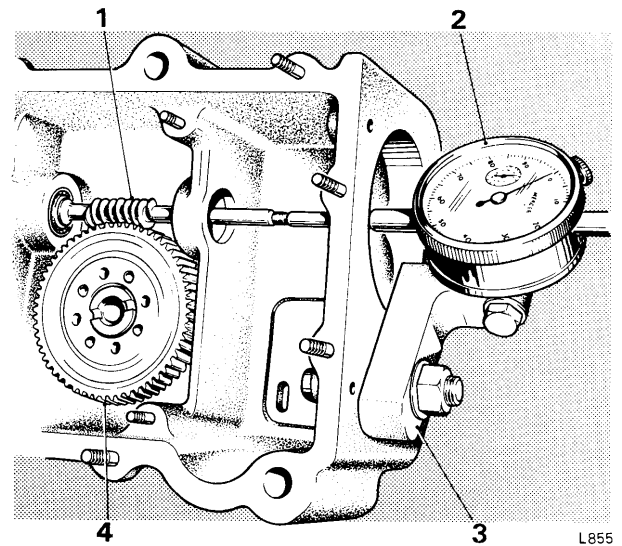


FIG. T16 CHECKING WORM SHAFT END FLOAT

- 1 Worm shaft
- 2 Dial indicator gauge
- 3 Gauge arm
- 4 Slave gear

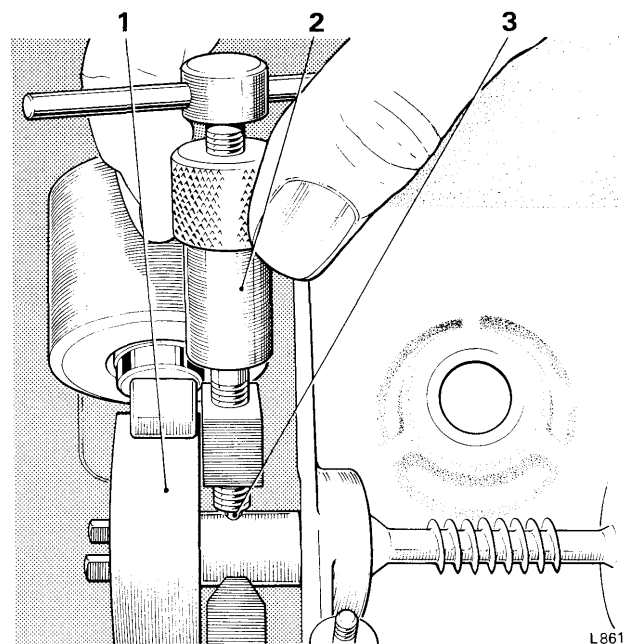


FIG. T17 FITTING THE BRAKE DRUM ROLL PIN

- 1 Brake drum
- 2 Tool
- 3 Roll pin

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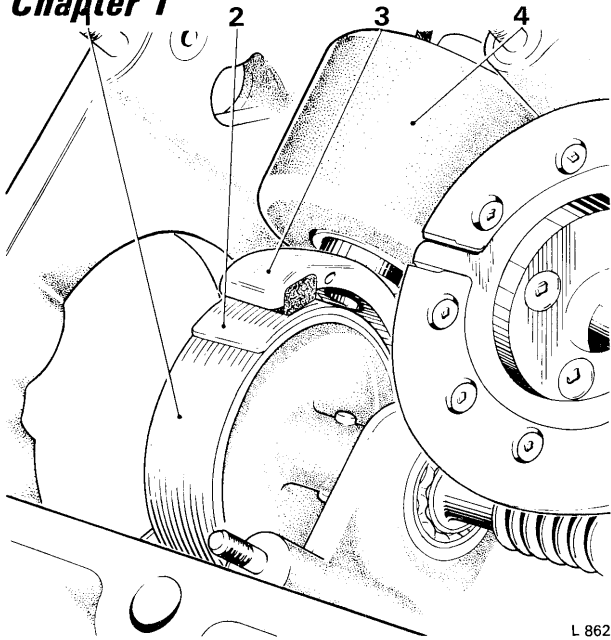


FIG. T18 SETTING THE SOLENOID BRAKE

- 1 Brake drum
- 2 Spacer
- 3 Brake shoe
- 4 Solenoid

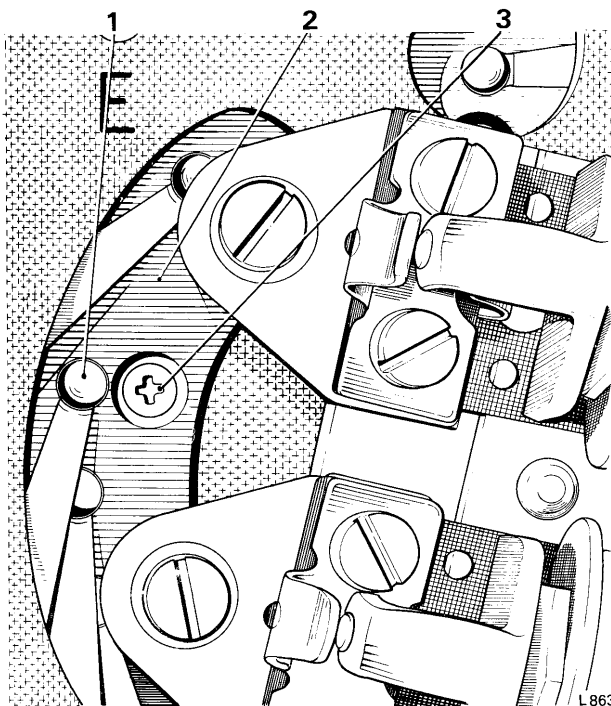


FIG. T19 CHECKING CONTACT POSITION

- 1 Contact
- 2 Slip ring
- 3 Securing screw

(see Fig. T18). Tighten the two dome nuts. Remove the metal strip. When the solenoid is operated, the plunger will then travel a distance of 0.035 in. (0.89 mm.).

Fit the insulated base plate with the seven contacts and the relays. Care should be exercised when performing this operation so that the settings of the relays and the position of the contacts are not disturbed. Evenly tighten the four 3 B.A. nuts.

Ensure that a gap of approximately 0.050 in. (1.3 mm.) exists between each contact. The slip ring and contacts can be seen through the motor mounting orifice.

View the contacts through the gaps in the contact plate and ensure that the contacts touch the slip ring centrally between the outside diameter of the slip ring and the outer perimeter of the rivet countersunk holes. There should be a clearance of approximately 0.062 in. (1.6 mm.) on each side (see Fig. T19).

Fit the rubber gasket to the plug assembly mounting face on the actuator casing.

Fit the plug assembly, ensuring that the two largest pins are lowermost. It will be advantageous to contain the wires with adhesive tape before attempting to thread them through the casing and the contact assembly.

Remove the tape, then run all the wires to their respective connections (see Fig. T20).

Fit the nuts and washers then tighten them, starting at the one furthest away from the plug and progressing toward the plug.

Do not fit any nuts which are tight on the threads of the studs in the terminal blocks. If a tight nut is fitted there is a danger that the terminal screw will turn and the terminal block will become loose, thus, a loose connection will be formed between contact and screw. If doubt exists about the firmness of a contact, the base plate must be removed and the terminal screw tightened.

Fit the actuator motor to its mounting plate studs. Fit and tighten the three 2 B.A. half nuts and spring washers.

Feed the motor supply wires through the mounting plate bore, then through the grommet. The longer end of the grommet fits into the casing.

Ensure that the rear face of the actuator casing and the front face of the mounting plate are clean and free from burrs, then apply a thin coat of Wellseal to the faces.

Fit a new gasket to the rear face.

Fit the flexible coupling onto the brake drum.

Fit the coupling dog onto the drive end of the motor armature shaft.

Fit the motor onto the four long studs.

Feed the wires through to the actuator casing, at the same time position the grommet.

Push the motor forward, align the driving dog with

the rubber coupling, then push the motor fully home. Ensure that the rubber grommet fits correctly into its recess in the casing and has not become trapped.

Ensure that the rear face of the mounting plate and the joint face of the motor cover are clean and free from burrs.

Apply a thin smear of Wellseal to the faces, fit a new gasket to the mounting plate then fit the motor cover. Fit and tighten the four 2 B.A. nuts and washers.

Connect the motor feed and the solenoid feed wires (see Fig. T20). Fit the solenoid wires first with the wires to the eyelets lowermost.

Fit the motor earth and the solenoid connection with the wire to the eyelet uppermost.

Fit the motor feed wires to the relays.

Visually examine all connections to ensure that they are all correctly connected.

Ensure that the slip ring is positioned with the open circuit sections parallel with the worm shaft as described earlier.

Ensure that the joint faces of the actuator casing and the cover are clean and free from burrs.

Apply a thin smear of Wellseal to both faces then fit a new gasket to the casing.

Fit the cover and secure it with the eight 2 B.A. nuts and washers.

Fit the spring retaining cup onto the output shaft.

Liberal apply Rocol M 204 G Ragsine to the inside of the cup and to the output shaft.

Smear both ends of the spring with the same lubricant then fit the spring over the shaft and into the cup.

Lubricate the spring housing in the lever then fit the lever to the shaft with the lever pointing downward.

Smear the detent face of the lever, again using Rocol M 204 G Ragsine.

Using tool No. RH 7843 compress the spring then fit the hardened steel pin.

Coat the inside of the cover with the same lubricant. Fit the cover, securing it with the setscrew.

The lever should now be tested to ensure that the torque required to make the lever slip is correct. Proceed as follows.

Operate the lever at least three times in each direction to relieve any initial stiffness.

Fit a spring balance to the lever, with one end of the spring balance located in the clevis pin hole in the end of the lever.

Move the lever forward until it slips; note the reading on the spring balance.

Move the lever in the opposite direction, again noting the reading. The lever should slip at a load of between 60 lb. and 75 lb. (27,2 kg. and 34 kg.).

If the load required to move the lever is greater or less than the figures quoted check the spring poundage (see *Dimensional Data*) then renew either the spring or the lever to obtain the correct slipping load.

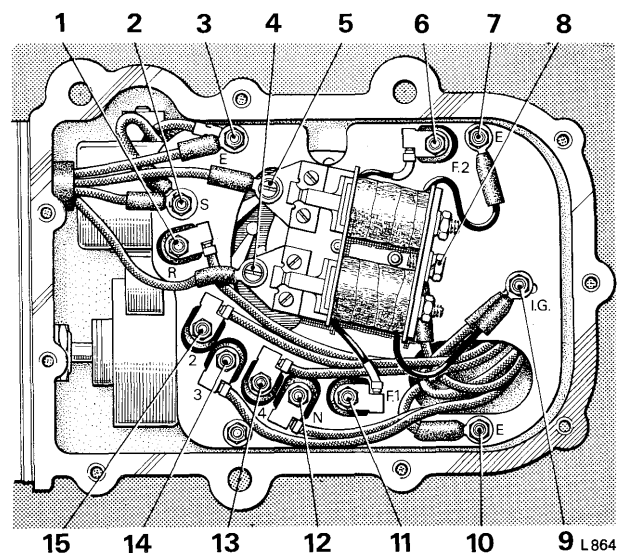


FIG. T20 WIRE CONNECTIONS

- 1 Black/Red, from plug terminal R
- 2 Green, from both solenoid and motor to terminals S
- 3 Black, from solenoid and Black/Green, from motor to terminal E
- 4 Red/Green, from motor to F1 relay terminal
- 5 Blue/Green, from motor to F2 relay terminal
- 6 Black, from relay coil motor end to terminal F2
- 7 Black, from relay coil plug end to terminal E
- 8 Brown/Black, from plug to relay positive feed terminal
- 9 Red, from relay coil plug end and Green/Black, from plug to terminal 1G
- 10 Black, from plug to terminal E
- 11 Red, from relay coil motor end to terminal F1
- 12 Black/Blue, from plug to terminal N
- 13 Black/Green, from plug to terminal 4
- 14 Black/Yellow, from plug to terminal 3
- 15 Black/White, from plug to terminal 2

Fit the breather pipe loose to the rear extension prior to fitting the actuator to the gearbox.

If rig testing facilities are available, the actuator should be tested to the specification given in Dimensional Data at the end of this Section.

Neutral start and height control switches — To assemble

Ensure that the lever and cam assembly is free to rotate.

Ensure that the cork E seal is in good condition. Should the seal require renewal, press out the roll pin using tool No. RH 7841, remove the lever and washer, then renew the seal. Fit the lever using a new roll pin.

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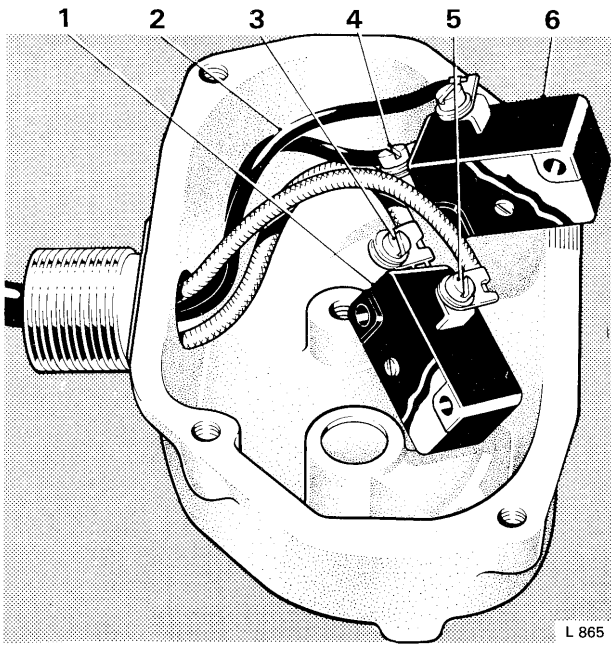


FIG. T21 MICRO SWITCH CONNECTIONS

- | | |
|------------------------|-------------------------|
| 1 Neutral start switch | 4 Green/Black lead |
| 2 Green lead | 5 White/Black lead |
| 3 Red/White lead | 6 Height control switch |

If the cam and shaft assembly has been removed from the casing, lubricate the shaft with Rocol M 204 G Ragsine when fitting the shaft to the casing.

Feed the wires into the casing then connect them to the micro switches as shown in Figure T21.

Fit the micro switches and separator to the casing. The insulated separator fits between the two switches.

Ensure that a gap of 0.050 in. (1.27 mm.) exists between the flat on the lever and the stop on the cover when the cam actuates the switches.

Pull the rubber sealing plug down the loom until it fits into the tapered bore in the casing. Tighten the knurled nut.

Ensure that the joint faces of the casing and cover are clean and free from burrs then apply a thin smear of Wellseal to both faces.

Fit a new gasket to the casing then fit the cover, using four 3 B.A. screws.

Gearbox electric actuator — To fit

Fit the gearbox actuator to the gearbox rear extension. Torque tighten the setscrews.

Fit the 'multi-pin' plug and tighten the knurled nut.

Fit the breather pipe to the actuator cover and to the rear extension.

On early cars, where the actuator breather system terminates by the gearbox rear extension casing, a flexible tube should be attached to the open end of the metal pipe and routed rearwards to terminate inside the centre cross-member.

On later cars (i.e. cars produced after SRX 3254—Standard cars and CRH 3399—Coachbuilt cars), a breather system incorporating the flexible tube is fitted.

It is essential that upon completion of work involving the actuator breather, an inspection be carried out to ensure that both the breather flexible pipe and centre cross-member adaptor are fitted and connected.

Neutral start and height control switches—To fit

Fit the switch to the gearbox side cover. Torque tighten the nuts.

Connect the control rods to both the units then adjust the controls as described in Section T5—Control Linkage.

DIMENSIONAL DATA FOR SECTION T7—GEARCHANGE ACTUATOR AND NEUTRAL START AND HEIGHT CONTROL SWITCHES

DESCRIPTION	DIMENSION	PERMISSIBLE WORN DIMENSION	REMARKS
Output shaft bearing bush i/d.	0.6273 in. — 0.001 in. (15,932 mm. — 0,025 mm.)	—	The bush is oil impregnated phosphor bronze and should not be cleaned with a degreasing agent.
Output shaft o/d.	0.6245 in. — 0.0005 in. (15,863 mm. — 0,013 mm.)	—	

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DESCRIPTION	DIMENSION	PERMISSIBLE WORN DIMENSION	REMARKS
Dimensional Data— continued			
Clearance.	0.0018 in. to 0.0033 in. (0,045 mm. to 0,083 mm.)	—	—
Front bearing bore—actuator casing.	0.7480 in. + 0.0005 in. (19,0 mm. + 0,013 mm.)	—	—
Front bearing o/d.	0.7480 in. - 0.0004 in. (19,0 mm. - 0,010 mm.)	—	—
Clearance.	0.000 in. to 0.0009 in. (0,00 mm. to 0,023 mm.)	—	—
Rear bearing bore — actuator casing.	0.7497 in. + 0.0005 in. (19,041 mm. + 0,013 mm.)	—	—
Rear bearing o/d.	0.7497 in. - 0.0004 in. (19,041 mm. - 0,010 mm.)	—	—
Clearance.	0.000 in. to 0.0009 in. (0,00 mm. to 0,023 mm.)	—	—
Front bearing i/d.	0.2362 in. - 0.0004 in. (6 mm. - 0,010 mm.)	—	—
Worm shaft front bearing diameter.	0.2363 in. - 0.0005 in. (6,001 mm. - 0,013 mm.)	—	—
Interference or clearance.	0.0005 in. tight to 0.0004 in. clear (0,013 mm. tight to 0,010 mm. clear)	—	—
Rear bearing i/d.	0.250 in. ± 0.0002 in. (6,35 mm. ± 0,005 mm.)	—	—
Worm shaft rear bearing diameter.	0.250 in. - 0.0005 in. (6,35 mm. - 0,013 mm.)	—	—
Interference or clearance.	0.0002 in. tight to 0.0007 in. clear (0,005 mm. tight to 0,018 mm. clear)	—	—
Brake drum — shaft diameter.	0.2485 in. + 0.0005 in. (6,312 mm. + 0,013 mm.)	—	—
Worm shaft—drum diameter.	0.2485 in. - 0.0005 in. (6,312 mm. - 0,013 mm.)	—	—
Interference or clearance.	0.000 in. tight to 0.001 in. clear (0,000 mm. tight to 0,025 mm. clear)	—	—
Worm gears backlash.	0.002 in. to 0.007 in. (0,05 mm. to 0,18 mm.)	—	—
Worm shaft end float.	0.002 in. to 0.005 in. (0,05 mm. to 0,13 mm.)	0.005 in. (0,13 mm.)	Adjust end float by selecting suitable adjusting washer.
Motor armature end float.	0.002 in. to 0.012 in. (0,05 mm. to 0,30 mm.)	0.012 in. (0,30 mm.)	Adjust end float by selecting suitable adjusting washer.
Pressure of brushes on commutator.	4.4 oz. to 5.6 oz. (125 g. to 160 g.)	—	Renew spring or brushes to maintain pressure.
Solenoid brake spring—free length.	1.287 in. (approx.) (32,69 mm.) (approx.)	—	—
Load required to compress spring to a length of 1.045 in. (26,55 mm.).	6 lb. 8 oz. to 7 lb. (2,95 kg. to 3,18 kg.)	—	—
Operating spring free length.	1.00 in. (approx.) (25,4 mm.) (approx.)	—	—
Load required to compress spring to a length of 0.70 in. (17,8 mm.).	100 lb. (45,4 kg.)	—	—
2 B.A. half nuts—motor to mounting plate.	Torque tighten to between 30 lb. in. and 36 lb. in. (0,34 kgm. and 0,41 kgm.).	—	—

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DESCRIPTION	DIMENSION	PERMISSIBLE WORN DIMENSION	REMARKS
Dimensional Data— continued			
Remainder of 2 B.A. nuts.	Torque tighten to between 48 lb.in. and 60 lb.in. (0,55 kgm. and 0,69 kgm.)	_____	_____
Pole piece screws.	Torque tighten to between 6 lb.ft. and 8 lb.ft. (0,83 kgm. and 1,11 kgm.)	_____	_____
Setscrews — actuator extension.	Torque tighten to between 16 lb.ft. and 18 lb.ft. (2,21 kgm. and 2,49 kgm.)	_____	_____

ACTUATOR MOTOR TEST DATA

Nominal operating voltage	12.
Torque developed in either direction of armature rotation at 20°C. (68°F.) with a 0.9 ohm solenoid brake load connected in shunt with the armature	40 oz.in. at 200 r.p.m. (min.) at 16.5 amp. (max.) and 20 oz.in. at 700 r.p.m. (min.) at 14.5 amp. (max.)
Test voltage must be measured at the motor flags lead terminals. Motor must be mounted with the field pole mounting screws uppermost for all performance tests.	
Field coil resistance per winding	0.26 ohm. to 0.3 ohm.
Resistance of armature winding (measured between adjacent commutator bars)	0.16 ohm. to 0.19 ohm.

SOLENOID TEST DATA

Voltage required to withdraw plunger against spring loading from a set distance of 0.075 in. (1,91 mm.)	5.0 volts (max.)
Voltage required to hold plunger back against spring pressure	1.0 volts (min.)
Note When the plunger and solenoid assembly has been satisfactorily tested the components should be kept together and fitted as a complete unit.	

ACTUATOR TEST DATA

Voltage required to operate actuator—temperature range 70°C. (158°F.) to minus 17.8°C. (0°F.) ..	9 volts (min.)
Time taken to rotate a 2 in. (50,8 mm.) lever through 80° 15' with a torque of 15.0 lb.in. (0,17 kgm.) applied to the lever	1.5 seconds (max.)
With 9 volts applied at the motor and an ambient temperature of 20°C. (68°F.) the stall torque on the end of the lever must be 40 lb.in. (0,46 kgm.)	
With 12 volts applied at the motor and an ambient temperature of 20°C. (68°F.) the stall torque on the end of the lever must be 70 lb.in. (0,81 kgm.)	
With 12 volts applied at the motor and 10 lb.in. (0,12 kgm.) load applied to the lever, the actuator must select to within 3° of the correct position.	
With 14 volts applied at the motor and no load on the lever, the actuator must not 'hunt' between selector positions. It is permissible for the lever to move slightly past a selected position then return to that position before halting. It is not permissible for the actuator lever to move forward and backward past the selected position before finally halting in the position required.	

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Section T8

REMOTE GEARCHANGE SELECTOR

The remote gearchange selector is clamped to the steering column assembly just below the steering wheel.

An exploded view of the selector is shown in Figure T 22.

Movement of the selector lever moves a pointer over an indicator scale which is marked 'N', '4', '3', '2' and 'R' representing Neutral, three forward gear ranges, and Reverse.

The selector is in the form of a switch. When the lever is moved from Neutral, an electrical signal is transmitted to the electric actuator which is mounted on the gearbox rear extension and connected to the gearchange lever on the gearbox. On receiving the signal, the electric actuator will automatically select the required gear range. The gearbox will remain in the selected range until the lever is again moved.

The electric actuator is wired so that, should the driver stop the car in a gear other than 'Reverse' then switch off the engine, he can still lock the transmission by moving the selector lever to the 'Reverse' gear position.

Having done this, if he moves the selector lever out of this position or the lever is accidentally moved to a drive position, the actuator will not respond until the ignition is switched on.

Remote gearchange selector—To remove

Remove the screws retaining the upper and lower halves of the cowling. These halves should always be

retained as a set. Carefully remove the upper half of the cowling.

Remove the screw retaining the lower half of the cowling to its clamping bracket; remove the lower half of the cowling.

Disconnect the indicator lamp.

Disconnect the micro switch.

Remove the screw securing the switch insulating plate.

Remove the gearchange selector.

Remote gearchange selector—To dismantle

Remove the screws securing the micro switch(es) to the rear face of the base assembly and remove the micro switch(es).

Remove the operating arm from the spindle of the quadrant.

Remove the single 5 B.A. screw securing the pointer to the quadrant boss and remove the pointer.

Note Care must be taken not to scratch the pointer or the indicator scale.

Remove the two 5 B.A. screws and shake-proof washers securing the indicator support bracket to the two bosses on the base assembly, then remove the indicator support bracket assembly.

Remove the two hexagon-headed 3 B.A. screws securing the gate assembly to the underside of the base.

Remove the circlip, clevis pin and spring securing the gear selector lever to the quadrant, then remove the lever with the gate assembly attached.

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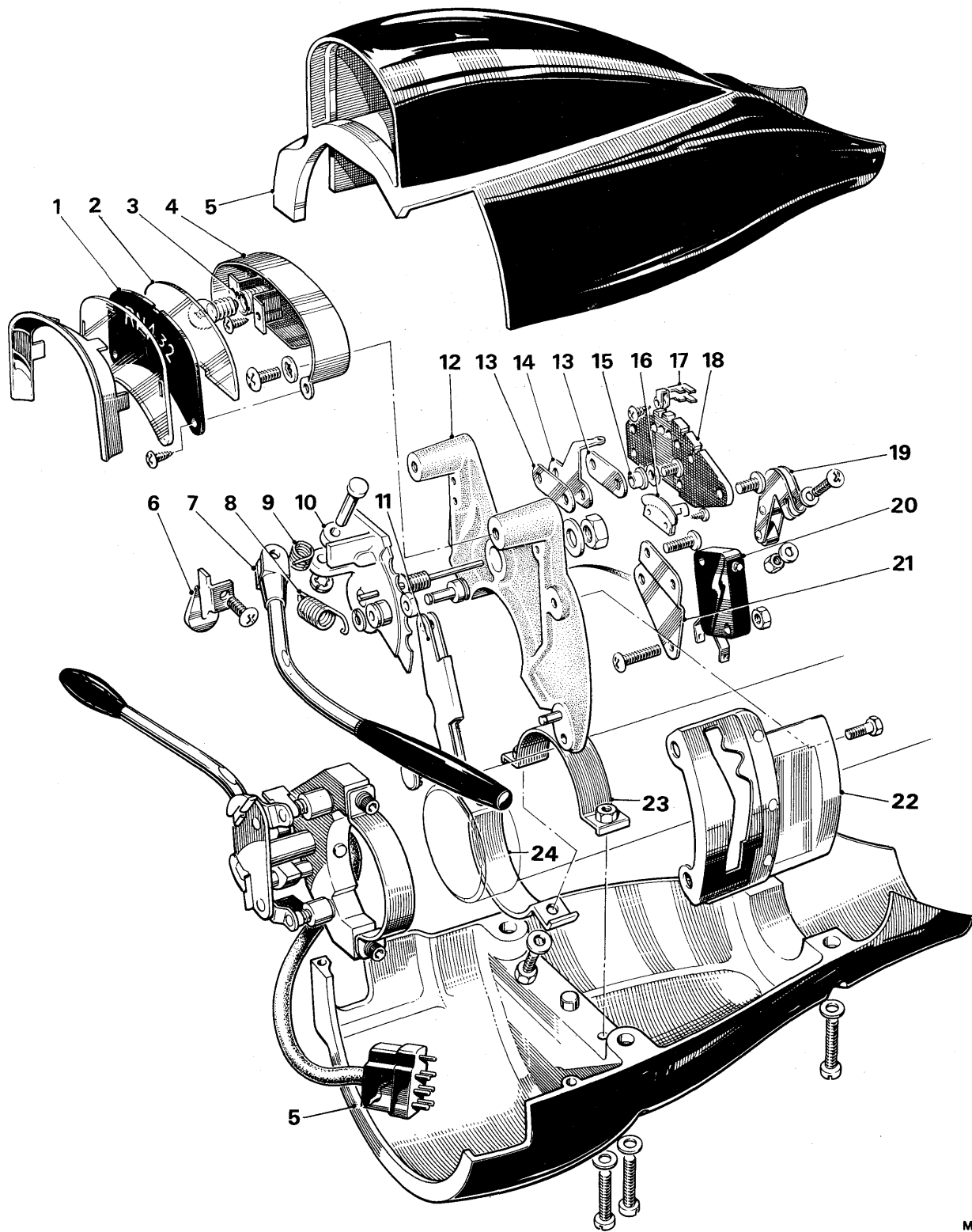


FIG. T22 REMOTE GEARCHANGE SELECTOR

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Remove the two 5 B.A. screws and washers securing the phosphor-bronze contact, two insulating strips and two insulating dowels to the quadrant and remove these items.

Remove the retaining clip from the rocking arm.

Remove the tension spring from the rocking arm and quadrant, and remove the rocking arm assembly.

Remove the $\frac{1}{4}$ in. UNF nut and washer from the quadrant spindle and remove the quadrant assembly from the base assembly.

Remote gearchange selector—To assemble

Fit the quadrant assembly onto the base and nip the $\frac{1}{4}$ in. UNF nut and washer onto the spindle. Check that the quadrant is free to rotate.

Remove the quadrant and lubricate the spindle with Ragsine 204G. Refit the quadrant and finally tighten the $\frac{1}{4}$ in. UNF nut.

Do not overtighten the nut, since the bearing boss tends to spread slightly and a tight bearing may be formed.

Fit the rocking arm assembly, then check to ensure that the roller lines up correctly with the quadrant with respect to height above the base.

Remove the rocking arm and hook the tension spring onto the anchor pin roller on the underside of the quadrant and onto the spring anchor on the underside of the rocking arm.

This operation is made easier by rotating the quadrant anti-clockwise beyond its normal travel, so that the spring is not under tension. Rotate the quadrant clockwise whilst holding the rocking arm clear, then allow the roller to locate on the detent forms. Fit the

spring on the top side of the quadrant and rocking arm.

Note Do not fit the retaining clip to the rocking arm at this stage. (They are difficult to remove, should the need arise).

Move the quadrant to a mid-way selection and fit the phosphor-bronze contact. This contact is assembled between two insulating strips and all are located by two insulating dowels. This sandwich assembly is then secured to the quadrant by two 5 B.A. screws and washers.

Note Extreme caution must be taken with the moving contact, so that it is not bent or damaged in any way.

Before fitting the selector lever assembly carry out the following checks.

Check that the clevis pin will slide through both the fork end on the lever and the holes in the mounting bosses on the quadrant, then check that the fork end will slide between these bosses.

Lightly smear Ragsine 204G on the outside of the fork end, the inside of the bosses, the clevis pin and the clevis pin holes, then locate the fork end in the bosses by the clevis pin and fit the spring inside the fork end and over the clevis pin. Push home the pin and fit the circlip. Check that the lever will return easily under the load of the spring.

Secure the gate assembly to the underside of the base by means of the two hexagon-headed 3 B.A. screws. Check that, when the position of the lever is controlled by the detents, it lines up with the profile of the gate liner and that the extreme positions of the lever are not limited by the gate.

Fit the insulating plate complete with the feed and supply contacts fitted to it. When the unit is screwed

FIG. T22 REMOTE GEARCHANGE SELECTOR

- | | | | |
|----|-------------------------------|----|------------------------------------|
| 1 | Indicator scale | 13 | Insulating strips |
| 2 | Filter—indicator lamp | 14 | Spring—contact gearchange selector |
| 3 | Bulb holder | 15 | Dowel—insulating |
| 4 | Bracket—indicator support | 16 | Supply contact |
| 5 | Cowl halves—upper and lower | 17 | Feed contact |
| 6 | Pointer—gearchange selector | 18 | Plate insulating—5 position |
| 7 | Lever—assembly gear selection | 19 | Operating arm—reverse lamp |
| 8 | Spring—tension rocking arm | 20 | Micro switch |
| 9 | Spring—lever gear selector | 21 | Bracket micro switch mounting |
| 10 | Quadrant assembly—5 position | 22 | Bracket—supply assembly—5 position |
| 11 | Rocking arm | 23 | Clamp—cowl to steering column |
| 12 | Base assembly—gear selector | 24 | Clamp—gearchange selector base |

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down by the three 5 B.A. screws, check that the inside leg of the moving contact is pressing onto the supply contact and that at the extremities of its travel the hemispherical head is still making good contact with the supply contact.

Each selection should then be made in turn, checking that the outside leg on the moving contact lines up correctly with each of the feed contacts.

Mount this assembly on the two bosses on the base by means of the two 5 B.A. screws and shake-proof washers.

Fit the blue filter with its flattened end in front of the bulb and behind the bracket mounting screw heads. Bend the top radiused end over the bulb and check that it follows the contours of the support bracket.

Hold the filter in this position by means of a 0.025 in. (0.64 mm.) feeler gauge held from the front of the unit, fit the indicator scale over the support bracket and secure it with two self-tapping screws. The scale should drop onto the bracket and its lip must not be forced down.

Feed the pointer under the indicator scale, then with '3 range' selected, use a thin-bladed Phillips head screwdriver, to feed the single 5 B.A. screw through the pointer leg and screw it into the quadrant boss. Care should be taken not to scratch either the pointer or the indicator scale.

Each selection should then be made and the alignment of the pointer checked.

Screw the micro switch onto the two bosses on the rear face of the base assembly. Fit the operating arm

onto the spindle of the quadrant. **On a car not fitted with refrigeration** set the operating arm so that the single micro switch is depressed when the selection is 'R'. **On a car fitted with refrigeration** the two micro switches require setting so that the fast idle micro switch is depressed just as the selector is engaging 'N'. Check that the 'R' micro switch is operated satisfactorily. The screw is 5 B.A., therefore it should not be overtightened.

Fit the retaining clip to the rocking arm pivot.

Lightly smear Ragosine 204G on the quadrant detents, then operate the switch several times to ensure that the Ragosine is spread evenly.

Remote gearchange selector—To fit

Fit the remote gearchange selector onto the steering column, locating the dowel in the hole in the column outer tube. The two $\frac{1}{4}$ in. UNF screws which pass through the clamping bracket and into the base are fitted with spring washers.

Connect the selector switch and the micro switch wiring so that the looms leave clearance for fitting the cowling.

Fit the lower half of the cowling onto its clamping bracket then fit the upper half of the cowling.

Note Care must be taken when tightening the cowling retaining screws, since the unit, being made of plastic, will crack if over-stressed.

Check the clearance between the steering wheel hub and the cowling.

Section T9

GEARBOX — TO REMOVE AND FIT

Gearbox — To remove

Drive the car on to a ramp; this is necessary to enable the gearbox to be lowered when it is disconnected from the engine.

Chock both front wheels and one of the rear wheels to prevent the car from moving. Jack up the other rear wheel to enable the propeller shaft to be rotated. Release the handbrake.

Disconnect the negative lead from the car battery which is located in the luggage compartment.

Disconnect the handbrake return spring from the operating lever.

Withdraw the split pin then remove the clevis pin from the pivot point in the end of the operating lever.

Remove the setscrews securing the centre portion of the box-section cross-member on which the hand brake operating and balance levers are mounted. The centre portion may now be moved to one side, or lowered from the underside of the car, but it must be suitably supported to avoid 'kinking' the handbrake cables.

Note The cross-member must not be allowed to hang on the handbrake cables.

Remove the four bolts which secure the propeller shaft rear flange to the final drive flange. It is advisable to leave one bolt loosely in position to support the shaft.

Similarly remove the four bolts from the front of the shaft.

Remove the bolt from the rear flange, then lower the propeller shaft front end and remove the shaft by pulling it forward and downward.

Note Stand the propeller shaft in an upright position with the ball and trunion end uppermost.

Remove the nine cheese-headed screws which secure the under cover to the bell housing and crankcase end cover; remove the under cover.

Place a clean container, capable of holding at least three gallons, underneath the gearbox sump drain plug. Remove the drain plug then allow the oil to drain; fit and tighten the plug.

Carefully rotate the torus cover until the torus cover drain plug is at its lowest point. Place the container under the plug, remove the plug and allow the oil to drain; fit and tighten the plug.

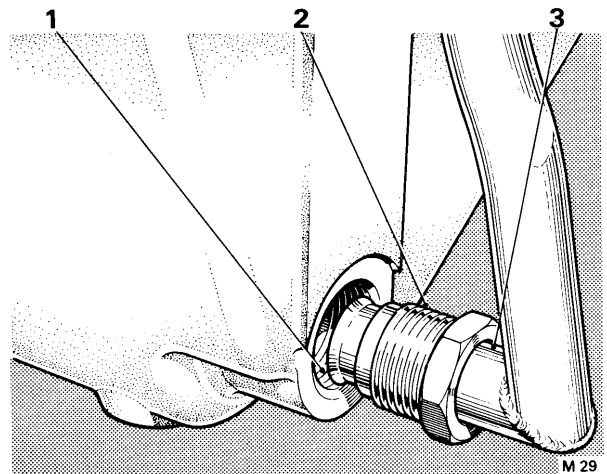


FIG. T23 DIPSTICK AND FILLER TUBE REMOVED

- 1 Sump tapped boss
- 2 Sleeve nut
- 3 Dipstick and filler tube

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Slacken the flared nut which secures the gearbox dipstick tube to the front of the sump. Remove the dipstick from under the bonnet. Disconnect the wiring loom from the dipstick tube. Remove the setscrew which secures the dipstick tube to the rear of 'A' bank cylinder head then remove the dipstick tube (see Fig. T23).

Unscrew and withdraw the speedometer drive cable from the speedometer drive unit in the gearbox rear extension; mask the end of the cable and drive unit to prevent the ingress of dirt.

Remove the controls as follows (see Fig. T24).

Remove the split pin and clevis pin from the gear-change rod at the actuator end.

Slacken the pinch bolt in the T.V. lever then remove the lever.

Remove the split pin and clevis pin from the link rod at the neutral start and height control switch lever end.

Remove the two nuts which secure the 'Get-You-Home' lever pivot to the side cover.

Slacken the pinch bolt in the gear selection lever; withdraw the levers and rods from the side cover.

Loosely fit the T.V. lever to its shaft.

Disconnect the accelerator rod at the fork end, adjacent to the right-hand engine mount.

Remove the pinch bolt from the ball joint at the top of the T.V. adjuster rod at the lever adjacent to the rear of 'A' bank cylinder head; disconnect the rod.

Remove the gearbox electric gearchange actuator as described in Section T7 of this Chapter.

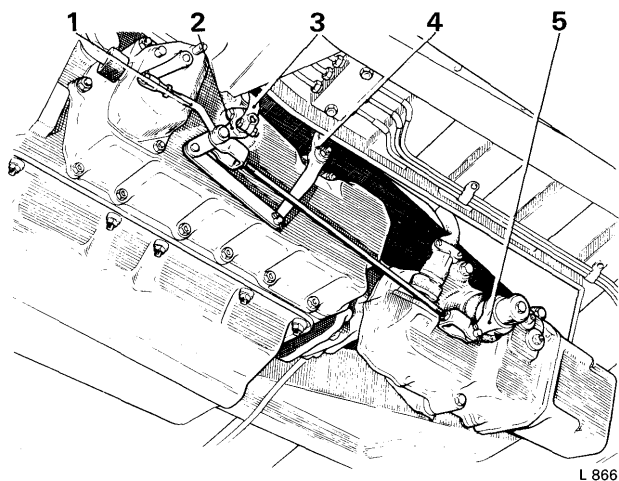


FIG. T24 CONTROLS DISCONNECTING POINTS

- 1 Link rod
- 2 Gear selector lever
- 3 T.V. lever
- 4 Get-you-home lever
- 5 Electric actuator lever

Note It is possible to remove the gearbox with the actuator in position, but if the gearbox is to be dismantled it is advisable to remove the actuator before removing the gearbox.

Remove the two nuts and plain washers which secure the neutral start and height control switches to the gearbox side cover; remove the switch box and tie it to a convenient point under the car to prevent it being damaged while the gearbox is being removed.

Remove the six bolts which secure the torus cover to the engine flex-plate; retain the six spacing washers. It should be noted that the torus cover end plate is secured to the torus cover by the same set of bolts; also the starter ring is secured to the drive-plate in a similar manner. Neither the end cover nor the starter ring need be removed.

Position a jack under the rear of the engine sump, ensuring that the load is spread evenly by placing a piece of wood between the jack head and the sump.

Raise the jack to take the weight of the engine and gearbox.

Remove any dirt from around the engine and gearbox mounting brackets then scribe correlation marks on the upper face of the engine mounts. The marks should coincide with the lower contour of the mounting feet on the bell housing (see Fig. T25). This procedure is necessary to ensure that the engine/gearbox unit is correctly aligned during subsequent refitting.

Note The sub-frame mounted brackets should be correlated to the sub-frame if and when they are removed.

Support the gearbox by using a jack and a suitable, locally manufactured platform, dimensions of which are given in Figure T26.

Remove the four bolts which secure the bell housing mounting bracket to the engine mounts.

Remove the setscrews and plain washers which secure the starter motor to the bell housing then withdraw the starter motor. It is not necessary to disconnect the starter motor wire unless the motor is to be removed completely for overhaul purposes.

Unscrew the setscrews which secure the bell housing to the engine crankcase rear face. The top three setscrews may be seen from the rear underbonnet position.

Note It is not possible to remove completely all the setscrews owing to the close proximity of adjacent components, but the setscrews may be unscrewed sufficiently to clear their mating threads without having first to move the gearbox.

Carefully move the gearbox backward until the nose of the torus end cover has cleared the bore in the engine crankshaft. Remove and retain the thrust washer located in the end of the crankshaft bore. If

the washer is a slight interference fit in the crankshaft it may be left in position.

Lower the gearbox until it clears the underside of the body, then remove the gearbox from the car (see Fig. T27).

Notes on changing a gearbox or engine

A replacement gearbox is supplied less fluid coupling and bell housing. The torus cover, end cover and tori are balanced as an assembly, but the tori may be renewed separately, if necessary. The starter ring is balanced with the crankshaft assembly but this may be renewed, if necessary. If, after renewing any of these items, the engine shows signs of roughness due to out of balance units, the crankshaft and torus assemblies must be re-balanced.

After balancing, prior to initial assembly, the torus cover assembly is marked with paint or indelible ink. The flex-plate on the end of the crankshaft is marked in a similar manner. When fitting the gearbox to the engine these marks should be aligned, as near as possible in order to neutralise any slight out-of-balance residuals.

Gearbox — To fit

Ensure that the gearbox and torus drain plugs are fitted with a new washer and that the plugs are torque tightened to the correct loading.

Fit the setscrew in the bell housing hole adjacent to the near side cross-shaft lever.

Support the gearbox in a cradle on a jack in a similar manner to that used for gearbox removal. Raise the gearbox to a position in line with the engine. Position the T.V. adjusting rod in its approximate operating position.

Fit the thrust washer into the bore in the end of the crankshaft, retaining it with a smear of petroleum jelly.

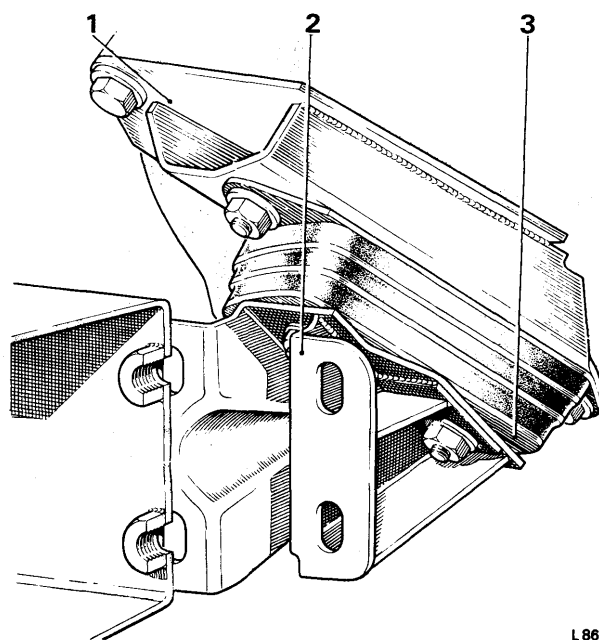
Align the paint marks on the flex-plate and the torus cover as accurately as possible.

Ease the gearbox forward until the end cover spigot is located in the bore in the end of the crankshaft and the bell housing dowels are aligned with the end of the dowel holes. Push the gearbox forward until the bell housing front face meets the rear face of the crankcase.

Fit and tighten the securing setscrews.

Fit the six bolts which secure the torus cover to the flex-plate; fit one spacing washer between the flex-plate and the end cover as each bolt is fitted.

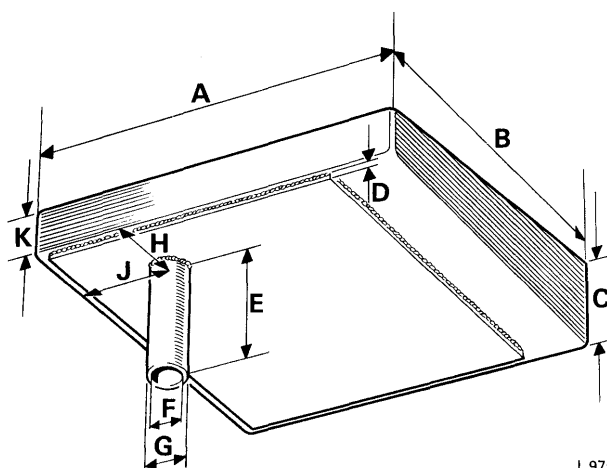
Remove the cradle and jack from beneath the gearbox. The engine and gearbox assembly can be



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FIG. T25 ENGINE REAR MOUNTING AND BRACKETS

- 1 Bell housing bracket
- 2 Sub-frame bracket
- 3 Rear engine mount



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FIG. T26 GEARBOX REMOVAL CRADLE

- | | |
|-----------------------|-----------------------|
| A 15.00 in. (38,1 cm) | F 1.125 in. (2,86 cm) |
| B 10.00 in. (25,4 cm) | G 1.625 in. (4,13 cm) |
| C 3.50 in. (8,89 cm) | H 3.250 in. (8,26 cm) |
| D 0.025 in. (6,3 mm) | J 5.00 in. (12,7 cm) |
| E 4.50 in. (11,4 cm) | K 1.75 in. (4,45 cm) |

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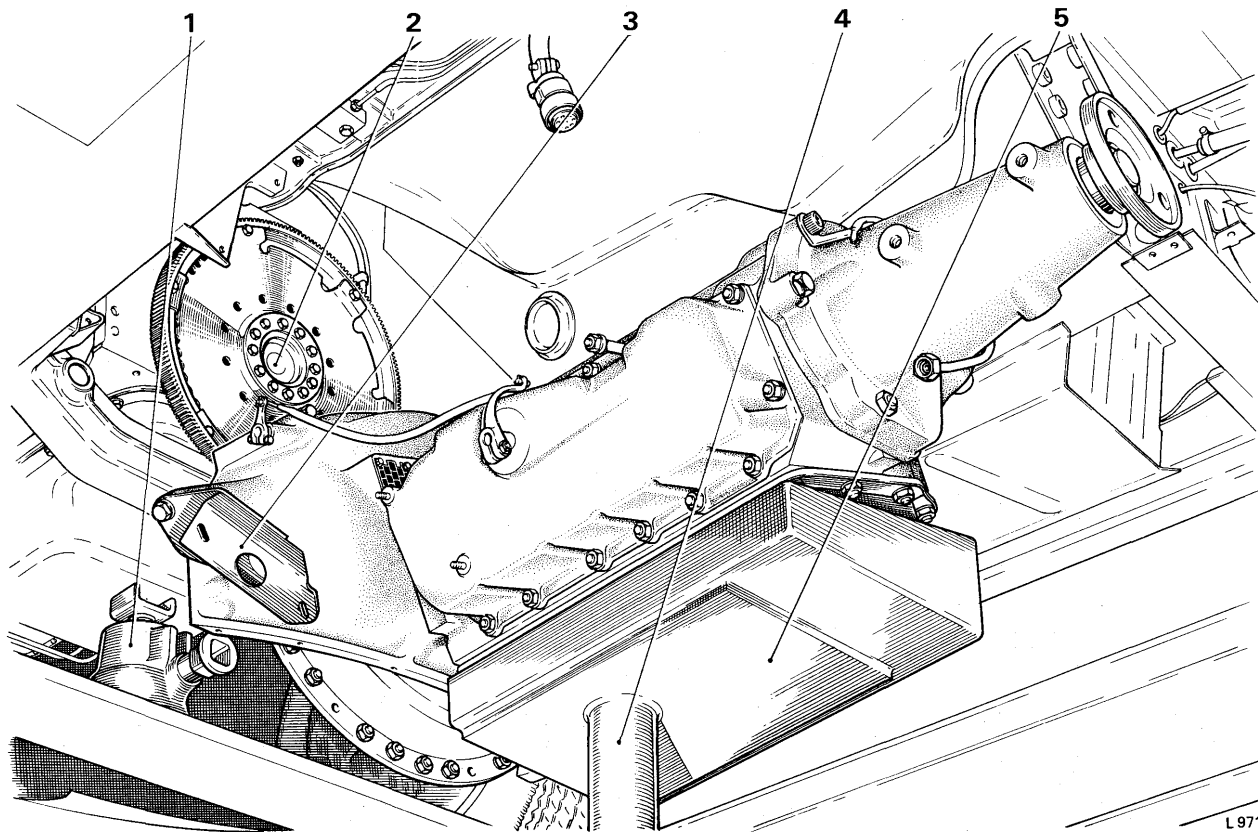


FIG. T27 REMOVING THE GEARBOX

- 1 Engine support jack
- 2 Thrust washer

- 3 Engine mount

- 4 Trolley jack extension
- 5 Platform

manoeuvred as a unit when fitting the rear mounts by operating the jack which supports the engine.

Position the engine rear mounting brackets so that the correlation marks are aligned then fit and torque tighten the bolts. Note that an earthing strip is secured to the right-hand engine mount.

Fit the remainder of the components by reversing the procedure given for dismantling, noting the following points.

Before fitting the bell housing bottom cover, check for correct torque tightness, all the bolts which secure together the starter ring, flex-plate, torus end cover and torus cover.

Road test

Before testing the car, fill the gearbox with Automatic Transmission Fluid as described in Section T2—'Servicing—To drain and fill'.

Test the car on the road, carefully noting the change points then comparing them with the table of change points shown in Section T2—'Servicing'.

If satisfactory changes cannot be obtained after adjusting the controls it may be necessary to remove the sump, then to adjust the bands as described in Section T14.

Finally, when the automatic changes are satisfactory, examine the gearbox for signs of oil leakage.

**DIMENSIONAL DATA FOR
SECTION T9— GEARBOX — TO REMOVE AND FIT**

DESCRIPTION	DIMENSION	PERMISSIBLE WORN DIMENSION	REMARKS
Torus cover drain plug.	Torque tighten to between 18 lb.ft. and 20 lb.ft. (2,5 kgm. and 2,8 kgm.)	—	—
Bolts — torus cover to flex-plate, end cover and starter ring.	Torque tighten to between 18 lb.ft. and 20 lb.ft. (2,5 kgm. and 2,8 kgm.)	—	—
T.V. lever pinch bolt.	Torque tighten to between 3 lb.ft. and 4 lb.ft. (0,415 kgm. and 0,553 kgm.)	—	—
Gear change lever pinch bolt.	Torque tighten to between 8 lb.ft. and 10 lb.ft. (1,1 kgm. and 1,4 kgm.)	—	—
Setscrews — bell housing to crankcase.	Torque tighten to between 29 lb.ft. and 32 lb.ft. (4,01 kgm. and 4,4 kgm.)	—	—
Setscrews—bell housing brackets to engine mounts.	Torque tighten to between 29 lb.ft. and 32 lb.ft. (4,01 kgm. and 4,4 kgm.)	—	—
Bolts — propeller shaft front flange to gearbox coupling flange.	Torque tighten to between 70 lb.ft. and 75 lb.ft. (9,7 kgm. and 10,4 kgm.)	—	—
Bolts — propeller shaft rear flange to final drive flange.	Torque tighten to between 45 lb.ft. and 50 lb.ft. (6,2 kgm. and 6,9 kgm.)	—	—

Section T10 FLUID COUPLING

The fluid coupling is a unit, fitted to the front of the gearbox, which transmits engine torque to the transmission. It is a sealed unit comprising two torus members, housed in a torus cover; the torus cover is sealed at the front by an end cover. The torus cover itself is a partially machined steel pressing which is driven by a flex-plate bolted to the engine crankshaft. Steel pressings are used to fabricate the torus members, the vanes being located in slots and retained by tangs. Oil sealing is effected by an 'O' ring at the front end and a lip-type oil seal at the rear where the torus cover neck adjoins the front pump.

Operation

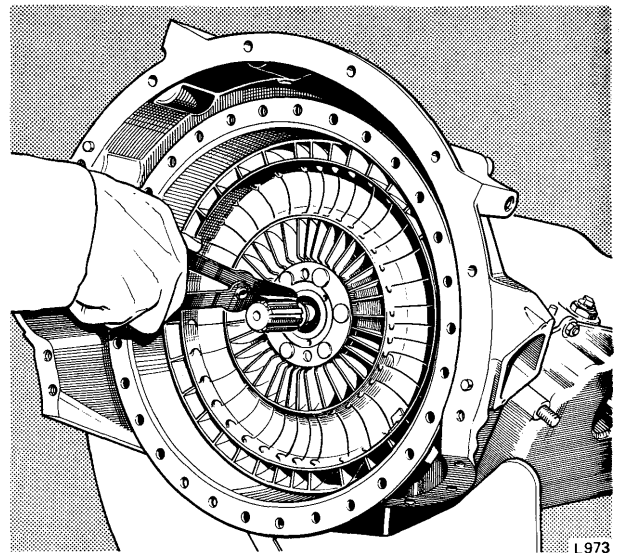
As soon as the engine starts, the gearbox front pump, driven by the shaft on to which the torus cover is splined, transfers oil from the gearbox sump into the torus cover, completely filling it.

The two torus members, which are splined on to separate shafts, rotate in the oil and are so shaped that oil is flung from the driving member on to the vanes of the driven member (see Fig. T29). The reaction of this oil causes the driven member to rotate also. A certain amount of slip between the two members is unavoidable, but this becomes negligible at higher engine speeds. It is the rearmost of the two components which is the driving member.

Fluid turbulence in the coupling is kept to a minimum by careful design of the torus members. The generation of heat by fluid friction is reduced by the provision of a circular flow path between the torus vanes and by maintaining a constant flow of oil through the coupling when the engine is running. In

addition to this, further cooling is effected by the inclusion of vents in the bell housing which permit air at ambient temperature to be drawn into the bell housing interior by the rotary action of the torus cover. This air is then expelled through other vents in the bell housing bottom cover.

The fluid exhaust from the coupling passes through a check valve, situated between the intermediate shaft and the main shaft, then is returned to the gearbox to lubricate the bearings and clutches.



**FIG. T28 REMOVING THE INTERMEDIATE
SHAFT SNAP RING**

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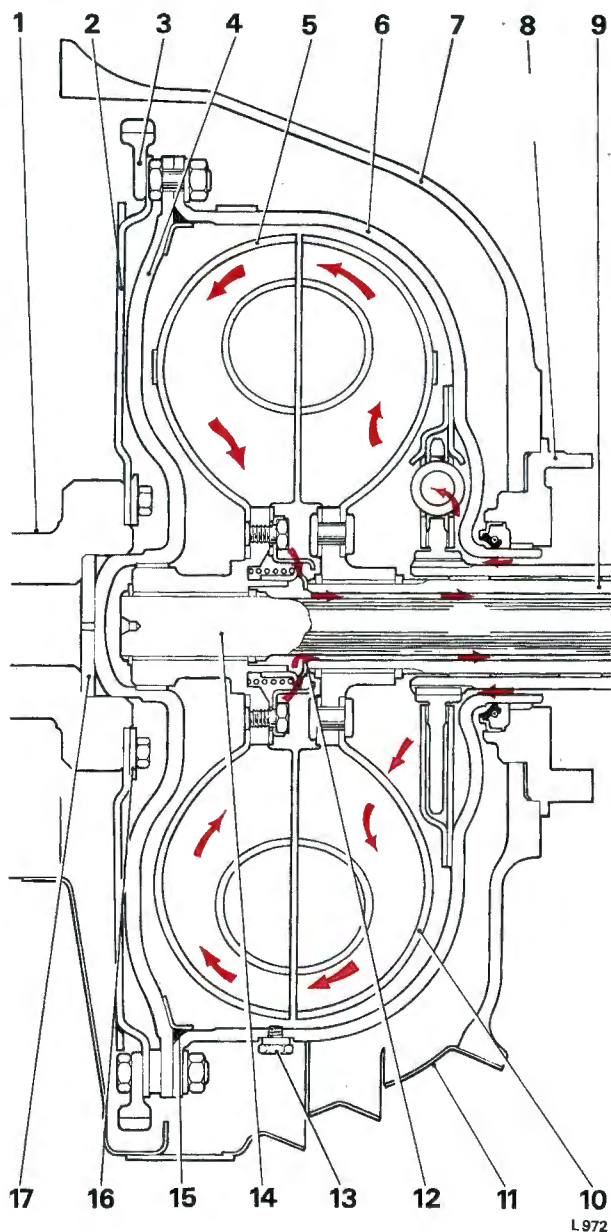


FIG. T29 FLUID COUPLING OIL FLOW

- 1 Crankshaft
- 2 Drive plate
- 3 Starter ring
- 4 End cover
- 5 Driven torus
- 6 Torus cover
- 7 Bell housing
- 8 Front pump
- 9 Intermediate shaft
- 10 Driving torus
- 11 Bottom cover
- 12 Check valve
- 13 Torus drain plug
- 14 Mainshaft
- 15 'O' ring
- 16 Clamping ring
- 17 Thrust plate

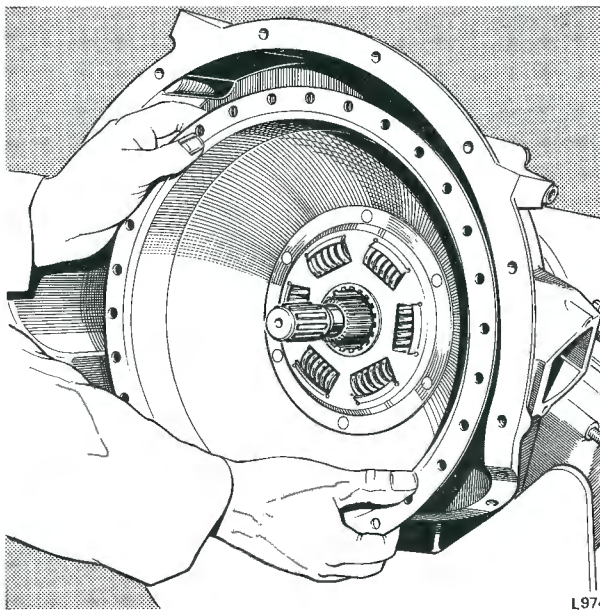


FIG. T30 REMOVING THE TORUS COVER

Fluid coupling — To remove

The fluid coupling can be removed from the gearbox only after the gearbox has been removed from the car (see Section T9—'Gearbox—To remove and fit').

Note It is possible for the gearbox to be removed from the car without draining the oil, thus, before attempting to remove the torus cover, ensure that it has been drained of oil.

Remove the twenty-two $\frac{5}{16}$ in. bolts and the two fitted bolts which secure the end cover to the torus cover; remove the cover and discard the 'O' ring.

Remove the snap ring which secures the driven torus on the main shaft, then withdraw the torus.

Note When removing either torus, check for excessive play on the splined shafts. Excessive play can contribute to noisy operation.

If difficulty is experienced in removing the driven torus, a sharp blow with a soft-headed mallet on the end of the main shaft will free the torus hub from the splines.

Remove the snap ring from the intermediate shaft, then withdraw the driving torus (see Fig. T28).

Remove the torus cover as shown in Figure T30; if it does not slide freely from the splines, care must be exercised to avoid rocking it excessively, otherwise damage may occur to the oil seal and bush in the front

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pump. The cover should be pushed firmly backward then drawn sharply off the shaft. When removing the cover, care must be taken not to damage the machined sealing surface on the neck of the torus cover.

If the gearbox is to be further dismantled, remove the four setscrews which secure the bell housing to the gearbox casing, then lift off the bell housing.

Check the torus relief valve for freedom of movement and full travel in the retainer.

If the valve appears to be serviceable and no complaints of slip have been received, it should be sufficient to clean the valve without dismantling. If, however, it is considered necessary, remove the torus relief valve and spring from the driven torus as follows.

Turn back the locking tabs on the retainer, unscrew the setscrews and lift the retainer, relief valve and spring from the recess in the torus hub (see Fig. T31).

Examine the outside of the torus cover and the inside of the bell housing for signs of oil which may indicate a leaking front pump seal. If signs of oil are evident on the bell housing-to-gearbox casing joint faces, it is probably an indication that the front pump-to-gearbox casing 'O' ring is leaking.

Fluid coupling — To inspect

Examine the splines for signs of wear or damage; check the fit of the torus member and the hub of the spring drive in the torus cover on their respective splines.

Check the torus vanes for slackness.

Examine the neck of the torus cover, particularly the oil seal and bearing diameters; small burrs may be removed with a smooth stone.

Examine the drain plug threads in the torus cover.

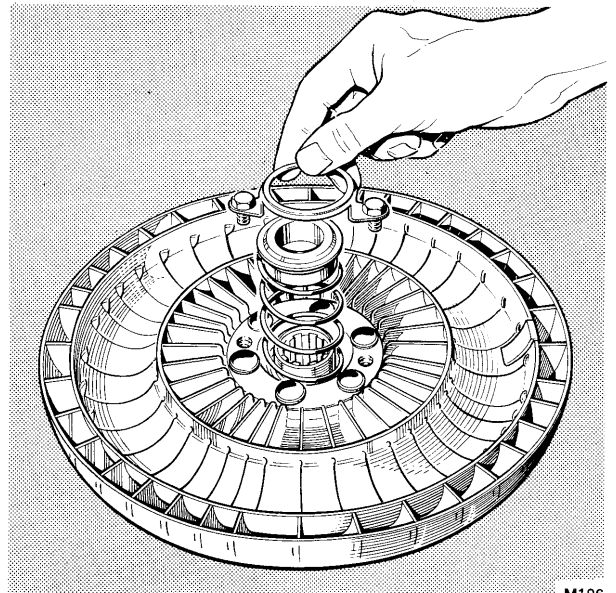
Check, for security and uneven wear, the bush in the torus cover end cover.

Examine, for scores, the sealing face of the relief valve, the inside diameter of the valve and the seating on the end of the intermediate shaft. Examine the spring for distortion.

If the valve has not been removed, check the retaining setscrews for security.

Fluid coupling — To fit

Fit the fluid coupling to the gearbox casing, noting the following points.

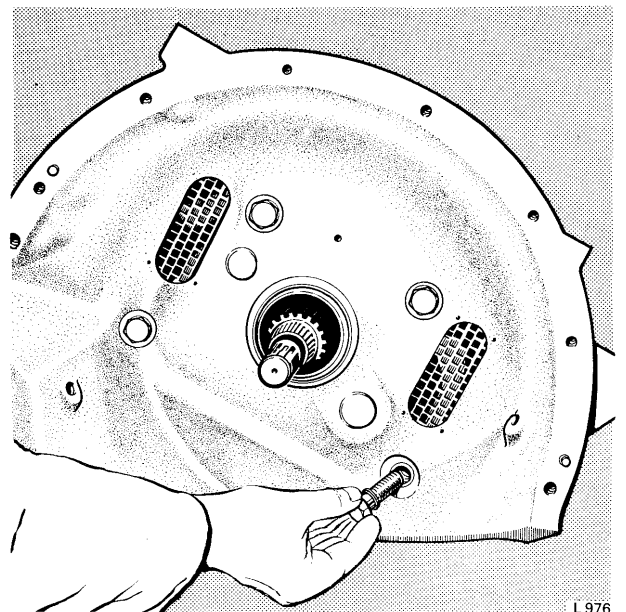


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FIG. T31 REMOVING THE TORUS CHECK VALVE

When fitting the bell housing to the gearbox ensure that the shortest of the four securing setscrews is entered into the bottom hole adjacent to the gearbox side cover as shown in Figure T32.

Ensure that all locking devices, including snap rings, are correctly fitted as the work proceeds.



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FIG. T32 FITTING THE BELL HOUSING SHORT SETSCREW

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If the relief valve retainer has been removed, a new one must be fitted.

Lubricate the neck of the torus cover with clean gearbox oil before fitting and take care not to damage the front pump oil seal and bush.

Fit a new 'O' ring to the torus cover end cover.

When fitting the end cover lubricate the bush, then

ensure that the $\frac{1}{4}$ in. (6,35 mm.) and $\frac{5}{16}$ in. (7,94 mm.) dowel holes are aligned. Fit the fitted bolts first, then the remaining twenty-two bolts.

Note Tighten the bolts evenly; final tightening and torque loading may be left until the remaining bolts are fitted when the gearbox is fitted to the engine.

DIMENSIONAL DATA FOR SECTION T10—FLUID COUPLING

DESCRIPTION	DIMENSION	PERMISSIBLE WORN DIMENSION	REMARKS
Driven torus check valve spring free length.	3.531 in. (89,69 mm.) (approx.)	—	—
Load required to reduce spring length to 0.719 in. (18,26 mm.)	8 lb. 8 oz. to 9 lb. 8 oz. (3,856 kg. to 4,309 kg.)	—	—
Setscrews — bell housing to gearbox casing.	Torque tighten to between 60 lb.ft. and 65 lb.ft. (8,3 kgm. and 8,9 kgm.)	—	—
Setscrews — relief valve retainer to torus hub.	Torque tighten to between 8 lb.ft. and 10 lb.ft. (1,1 kgm. and 1,4 kgm.)	—	—
Torus cover drain plug.	Torque tighten to between 5 lb.ft. and 7 lb.ft. (0,69 kgm. and 0,97 kgm.)	—	—
Clearance between end cover bush and driven torus hub journal.	0.0015 in. to 0.0035 in. (0,037 mm. to 0,087 mm.)	0.0055 in. (0,127 mm.)	—

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Section T11

SIDE COVER, SUMP AND FILTER

The side cover, sump and filter can be removed while the gearbox is in position in the car but this should be necessary only when investigating a defect.

Before removal, the side cover and sump should be examined carefully for signs of oil leakage; if a leak is observed it must be traced and rectified. If the gearbox has been removed from the car, the examination should be carried out before the gearbox is inverted on its stand.

To avoid the risk of dirt entering the gearbox as work proceeds, the gearbox and adjacent underbody areas should be thoroughly cleaned, especially in the vicinity of the side cover and sump.

The following instructions apply when working on the gearbox whilst it is installed in the car. The procedure is generally the same when the gearbox is on the bench except that the control levers will have been removed and the sump will be uppermost.

Side cover — To remove

Place a clean container under the sump drain plug; remove the plug then drain the oil. Fit the plug. It is essential to drain at least some of the sump oil before removing the side cover due to the angle at which the gearbox is inclined.

Slacken the pinch bolt in the T.V. lever, remove the lever from its shaft then tie both lever and rod out of the way.

Remove the split pin and clevis pin from the link rod at the neutral start and height control switch lever end (see Fig. T24).

Remove the two nuts and washers which secure the neutral start and height control switch housing to the

side cover. Remove the housing then tie it to a convenient point out of the way of the side cover.

Slacken the pinch bolt in the gearchange lever.

Remove the two nuts which secure the 'Get-You-Home' lever to the side cover.

Remove the control rods and levers from the side cover then secure them to the rear extension where they will be out of the way.

Place a suitable container beneath the side cover in order to catch the small amount of oil which resides in the lower part of the cover.

Remove the nuts and washers then lift off the side cover. It should be noted that the top left-hand nut is size 2B.A. and not $\frac{7}{16}$ in. A/F as are the others. When removing the side cover it may be necessary to pull down the gearbox slightly, compressing the mounts, so that the side cover clears the corner of the transmission tunnel.

Discard the side cover gasket.

Sump and filter — To remove

Unscrew the flared nut which secures the dipstick and oil filler tube to the front of the sump.

Slacken the setscrew which secures the tube to the rear of 'A' bank cylinder head.

Remove the dipstick tube from the sump (see Fig. T23).

Remove the nuts and plain washers which secure the sump to the gearbox casing.

Lower the sump; discard the gasket.

Before cleaning the interior of the sump examine the oil residue for metallic deposits, also look for particles

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of clutch plate or band lining which may indicate an imminent failure.

Remove the filter by carefully easing it from the rear oil feed pipe then sliding it rearward from the front pipe. Care must be taken not to damage the filter by wrenching the mesh away from the sheet metal base or by stretching the gauze so as to increase the filtration size. Wash the filter in clean paraffin; **do not** use a cloth.

Side cover, sump and filter — To fit

Before fitting the side cover, sump and filter the following precautions must be observed.

Examine the interior of the gearbox for cleanliness and check that all pipes are secure in their sockets. Ensure that all setscrews and nuts are tight, and where lock washers are fitted that they are correctly locked.

Check that the rubber seal and the two steel washers are correctly positioned on the selector shaft as shown in Figure T38—Section T12—Control valve unit.

Ensure that the filter is clean and that new gaskets are fitted to the sump and the side cover.

Fit the components by reversing the procedure given for dismantling.

Replenish the gearbox with oil to the full mark on the dipstick as described in Section T2—'Servicing—To drain and fill'.

**DIMENSIONAL DATA FOR
SECTION T11 — SIDE COVER, SUMP AND FILTER**

DESCRIPTION	DIMENSION	PERMISSIBLE WORN DIMENSION	REMARKS
Nuts — $\frac{7}{16}$ A/F — side cover to gearbox casing.	Torque tighten to between 8 lb.ft. and 10 lb.ft. (1,1 kgm. and 1,4 kgm.)	—	—
Nut — 2B.A. — side cover to gearbox casing.	Torque tighten to between 48 lb.in. and 60 lb.in. (0,553 kgm. and 0,691 kgm.)	—	—
Nuts — Sump to gearbox casing.	Torque tighten to between 16 lb.ft. and 18 lb.ft. (2,1 kgm. and 2,5 kgm.)	—	—
Sump drain plug.	Torque tighten to between 40 lb.ft. and 45 lb.ft. (5,5 kgm. and 6,2 kgm.)	—	—

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Section T12

CONTROL VALVE UNIT

The control valve unit comprises an assembly of valves, springs and plugs which are contained in die cast aluminium bodies. The outer body forms a bearing for the manual control shaft and the throttle control shaft to which the respective control levers are fitted. Pipes convey oil from the governor to the control valve unit. Metered oil is then passed from the control valve unit, through pipes and a series of drillings, to various parts of the gearbox. The whole assembly is secured to a machined face on the left-hand side of the gearbox and enclosed by the side cover.

Operation

The position of the shift valves in Range 4 — first gear and the various oil passages which are used to obtain this gear are shown in Figure T33. The operation of the valves when each gear is selected in each Range is described in the following paragraphs.

RANGE 4

First gear — Part throttle

When the manual selector lever is in Range 4, oil at main line pressure is allowed to flow directly to the front servo to apply the front friction band.

In first gear, road speed would be low, therefore governor pressure would be low.

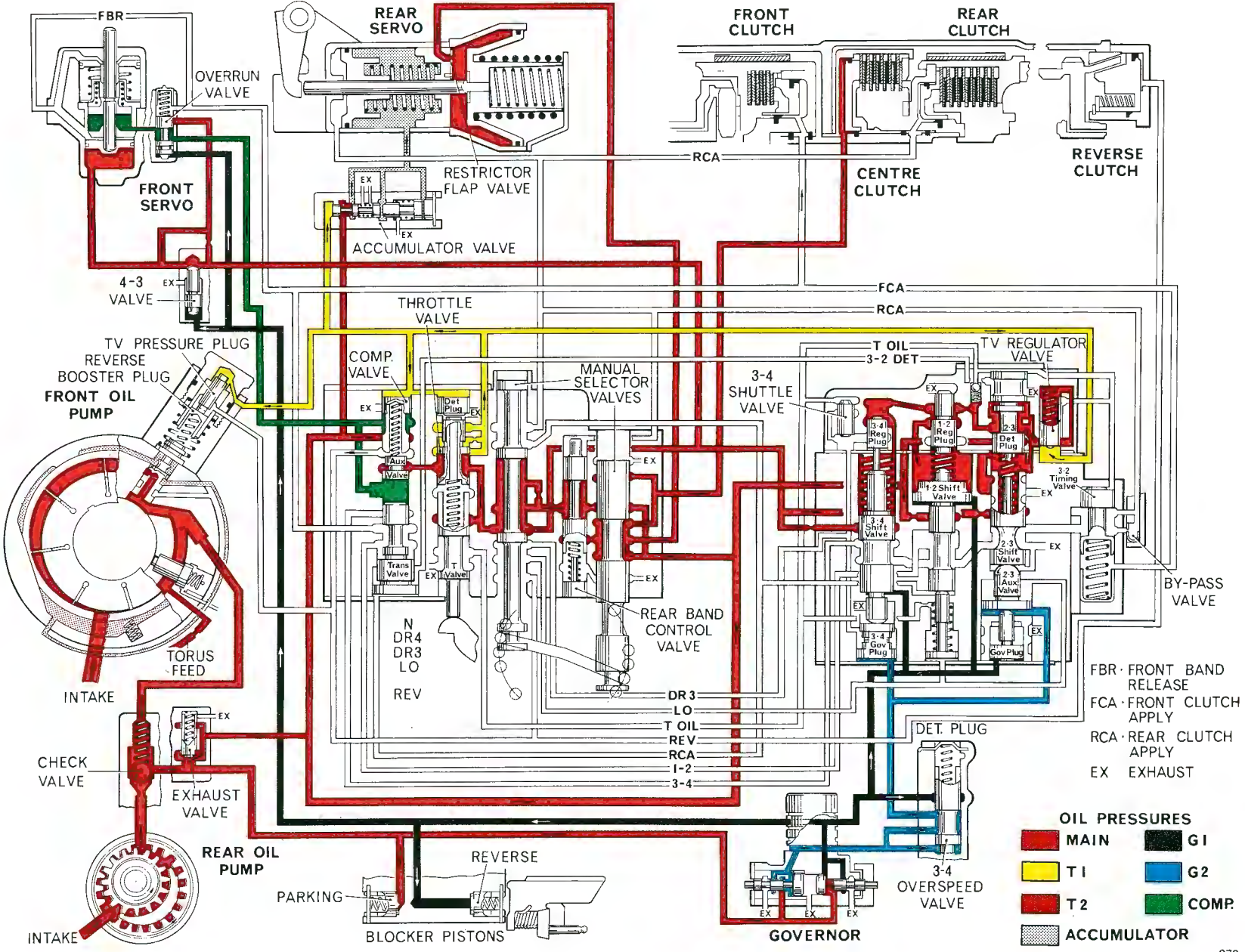
At part throttle, the T valve would be slightly open and consequently the throttle valve also would be slightly open, allowing main line oil to bleed past the throttle valve to form throttle valve (T.V.) pressure. This pressure is then regulated by the T.V. regulator valve.

T.V. pressure moves the T.V. regulator valve against spring pressure, allowing oil to bleed past the valve and become T.V. 2 pressure. This pressure assists the springs which hold the shift valves in their rearmost position.

T.V. pressure, acting on the regulator plug in the pressure control valve, assists the pressure control valve in regulating the front pump capacity (*see Section T17—Pressure control valve*).

T.V. pressure, acting on the compensator valve, moves the valve, against spring pressure, so that main line pressure oil is allowed to bleed past the valve to form compensator pressure. Compensator pressure assists main line pressure in the front servo (*see Section T14—Front servo*). Compensator pressure is also fed to the double transition valve, moving the valve against spring pressure. This is not important in first gear, as front clutch apply oil is fed past the double transition valve and this is not applied until second gear.

Main line oil pressure is fed to the centre clutch and to the rear servo also to release the rear band. The rear drum is held stationary by the action of the sprag clutch so that both gear trains are in reduction, giving a gear ratio of 3.82 : 1.



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Second gear — Part throttle

With the throttle still slightly open, throttle pressure remains low.

As road speed increases, G1 pressure (*see Section T16—Rear pump and governor*) increases and, acting on the 1-2 shift valve, eventually overcomes the springs and T.V. 2 pressure, thus moving the 1-2 shift valve group into the second gear position. T.V. 2 pressure in this group is then cut off by the 1-2 regulator plug and the existing T.V. 2 oil is forced to exhaust. The regulator plug locks the shift valve in gear after an up or down-change and so prevents 'hunting' between gears.

Compensator oil remains high enough to keep the double transition valve open.

The movement of the 1-2 shift valve opens a port which allows main line oil to flow past the open double transition valve, to engage the front clutch and to release the front band.

Main line oil pressure is still fed to the front servo apply chamber, but main line oil, acting on the larger area of the servo 'release' pistons, overcomes the apply oil pressure.

The sprag clutch still holds the rear drum, giving rear train reduction. As the front train is now in direct drive (clutch on, band off) the gearbox gives a reduction of 2.63 : 1.

Down-change

The 2-1 down-change occurs automatically at extremely low road speeds only. When G1 pressure falls below a minimum value, the action of T.V. 2 pressure, plus spring pressure, on the 2-1 shift valve group moves the shift valve back and holds it in the first gear position. Oil pressure to the front clutch is cut off, the front band applied and first gear is obtained.

Third gear — Part throttle

With the throttle still only partially open, throttle pressure remains low.

As road speed increases, G1 pressure will reach its maximum value (at 1 300 r.p.m. output) whilst G2 pressure is still increasing.

When the road speed, and thus governor oil pressures become sufficiently high, the combined G1 and G2 pressures on the 2-3 shift valve group overcome the opposing spring and T.V. 2 pressure and the 2-3 shift valve is forced to move; the 3-2 detent plug is forced back, cutting off T.V. 2 pressure and permitting the displaced oil to exhaust.

As the 2-3 shift valve moves, a port is opened which allows main line pressure oil to flow past the 3-2

timing valve to engage the rear clutch. The sprag clutch allows the rear drum to rotate (*see Section T15—Rear servo and accumulator*).

Main line oil pressure is also tapped from the rear clutch apply line to close the double transition valve against compensator pressure.

When the double transition valve closes, the port which supplied pressure oil for front clutch 'apply' and front band 'release' is sealed. As a result, the front clutch is released by its springs and the front band is applied by the main line oil feed from the selector valve.

The front gear train is then in reduction and the rear train in direct drive, giving a gear ratio of 1.45 : 1.

Down-change

If road speed is allowed to fall, governor pressure will decrease accordingly. When G1 pressure falls below a minimum value, action of the spring will force the 2-3 shift valve into the second gear position.

When this occurs, the main line oil ports to the double transition valve and the rear servo release chambers are sealed. As compensator pressure forces the double transition valve open, main line oil flows past it to engage the front clutch and release the front band. The rear clutch is released, the rear gear train freewheels and the gearbox reverts to second gear.

Fourth gear — Part throttle

Still using a part throttle, the throttle pressure remains low.

Due to the increased road speed in third gear, G1 pressure will reach its maximum and the effect of the increasing G2 pressure will assume a relatively greater importance. When sufficiently high, the combined action of G1 and G2 pressure on the 3-4 governor plug overcomes the opposing spring and T.V. 2 pressure, causing the 3-4 shift valve to move. The 3-4 regulator plug will retain the 3-4 shift valve to prevent 'hunting' in a similar manner to that described for the other two shift valves.

As the 3-4 shift valve moves, a port is opened which allows main line oil pressure to flow past the **closed** double transition valve to engage the front clutch and to release the front band.

The front gear train will then be in direct drive. As the rear train has remained in direct drive from third gear, the gearbox now transmits torque through a 1 : 1 gear ratio.

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Down-change

When road speed in fourth gear is allowed to fall, G2 pressure is reduced accordingly. G1 pressure is not affected until the car speed is considerably reduced.

When G2 pressure is sufficiently low, the combined action of T.V. 2 pressure and spring pressure on the 3-4 shift valve group forces the valve to move into the third gear position.

The flow of main line oil past the 3-4 shift valve is thus cut off, removing the pressure from the front clutch and the front servo release piston. The front clutch is then released by its springs and the front servo is applied by main line oil pressure from the selector valve.

As the rear clutch remains unaffected, the gearbox reverts to third gear.

Forced down-change

A forced down-change can be obtained by fully opening the throttle and applying a slightly greater force on the accelerator pedal, depressing the spring loaded button. This forces the throttle valve assembly to the end of its travel, where the T valve uncovers a port, permitting oil at main line pressure to flow through a non-return valve and bleed past the T.V. regulator valve to increase T.V. pressure to the same value as main line pressure, and to act on the regulator plugs in opposition to governor pressures.

Oil at main line pressure acts on the 3-2 detent plug, the 1-2 regulator plug and the 3-4 shuttle valve. Oil then passes around the shuttle valve to the back of the 3-4 regulator valve, thus applying main line pressure on the 3-4 shift valve.

Subsequent valve operation will depend on the road speed; if this is below 71 m.p.h. (114 k.p.h.) the 3-4 shift valve will move to effect a change to third gear, and maintain third gear until a speed of between 73 m.p.h. and 75 m.p.h. (117 k.p.h. and 121 k.p.h.) is attained, when an upchange will occur.

The up-change is caused by increased G2 pressure acting on the overspeed valve, moving it against spring pressure to uncover a port which allows G1 pressure to substitute for G2 pressure and so increase the pressure on the 3-4 governor plug which moves the 3-4 shift valve assembly.

If the road speed is below 22 m.p.h. (35 k.p.h.) the 3-2 detent plug is moved against its spring pressure towards the 2-3 shift valve and uncovers a port which permits main line oil pressure to act on the double transition valve and the 3-2 timing valve; the 3-2 detent plug and the 2-3 shift valve will then move to change down into second gear.

The 3-2 timing valve, which on earlier Rolls-Royce and Bentley gearboxes delayed the application of the

rear band and disengagement of the rear clutch until the front clutch was applied, is retained. As the rear band is not applied except in Range 2, this feature figures less in importance than hitherto.

Up-change to third gear will not occur until approximately 40 m.p.h. (64 k.p.h.) because of main line pressure acting on the 3-2 lock valve instead of T2 pressure acting on the 2-3 shift valve.

If the road speed is below 8 m.p.h. (13 k.p.h.) the 1-2 shift valve assembly will move to effect the down-change, and the subsequent up-change will occur at a slightly higher speed than normal. This is due to main line oil pressure acting on the front of the 1-2 detent plug and the higher T.V. pressure acting on the 1-2 regulator plug.

SELECTOR POSITIONS

Range 3

When Range 3 is selected, main line oil pressure is directed to the 3-4 shift valve, via the 3-4 shuttle valve and the 3-4 regulator plug, where it holds the 3-4 shift valve in the third gear position. Main line oil pressure is also directed to the 3-4 governor plug, where it resists governor pressure and prevents an up-change to fourth gear except at high speed.

The up-change to fourth gear requires the operation of the overspeed valve. If the car is driven at speeds of between 75 m.p.h. and 77 m.p.h. (121 k.p.h. and 124 k.p.h.) with full throttle, G2 pressure lifts the overspeed valve and substitutes G1 pressure for G2 pressure, thus increasing the thrust on the 3-4 governor plug and forcing the 3-4 shift valve to move to fourth gear position.

The 2-3 shift valve operates in the same way in Range 3 as in Range 4, the up and down-change points being the same in either selector position.

Range 2

When Range 2 is selected, main line oil pressure is directed to the 2-3 auxiliary valve to oppose governor pressure acting on the 2-3 governor plug. This has the effect of locking the 2-3 shift valve group in the second gear position and prevents the gearbox from changing up. Main line oil pressure is also directed to the 1-2 detent plug, which moves the 1-2 shift valve group, against spring and T.V. 2 pressure, to prevent the gearbox changing down to first gear.

A special feature, obtainable in Range 2, is the application of the rear band to assist engine braking.

When Range 2 is selected, the manual valve moves to cut off the supply of main oil line pressure which is

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holding the rear servo in the 'off' position. However, the rear band control valve provides an alternative path as long as rear clutch apply oil holds the rear band control valve back against spring pressure, the oil behind the rear band control valve now being open to exhaust. As rear clutch apply oil pressure falls off, the rear band control valve moves forward, cutting-off rear band release oil and allowing the rear servo to apply the rear band.

Reverse

When the selector lever is moved into the reverse position, main line oil pressure is directed to the rear band release piston, the compensator valve and the reverse cone clutch. It also acts on the reverse booster plug in the pressure control valve (see Section T17—*Pressure control valve*). Main line oil pressure acting on the compensator valve shuts off compensator pressure and this, together with the use of a clutch to engage reverse gear, permits instant change from forward drive to reverse drive and back again when necessary, but a safety blocker piston prevents Reverse from being engaged at speeds in excess of 10 m.p.h. (16 k.p.h.).

Parking

When parking the car, the transmission can be locked by engaging reverse gear with the engine

switched off. This locks the transmission by means of a spring-loaded pawl which engages with teeth around the outer diameter of the reverse annulus gear. The transmission will remain locked, regardless of the position of the steering column mounted selector switch. When the selector lever is moved to Neutral and the ignition is switched on, the pawl will be disengaged by the gearbox electric actuator (see Section T7—*'Gearbox electric actuator'*).

Neutral

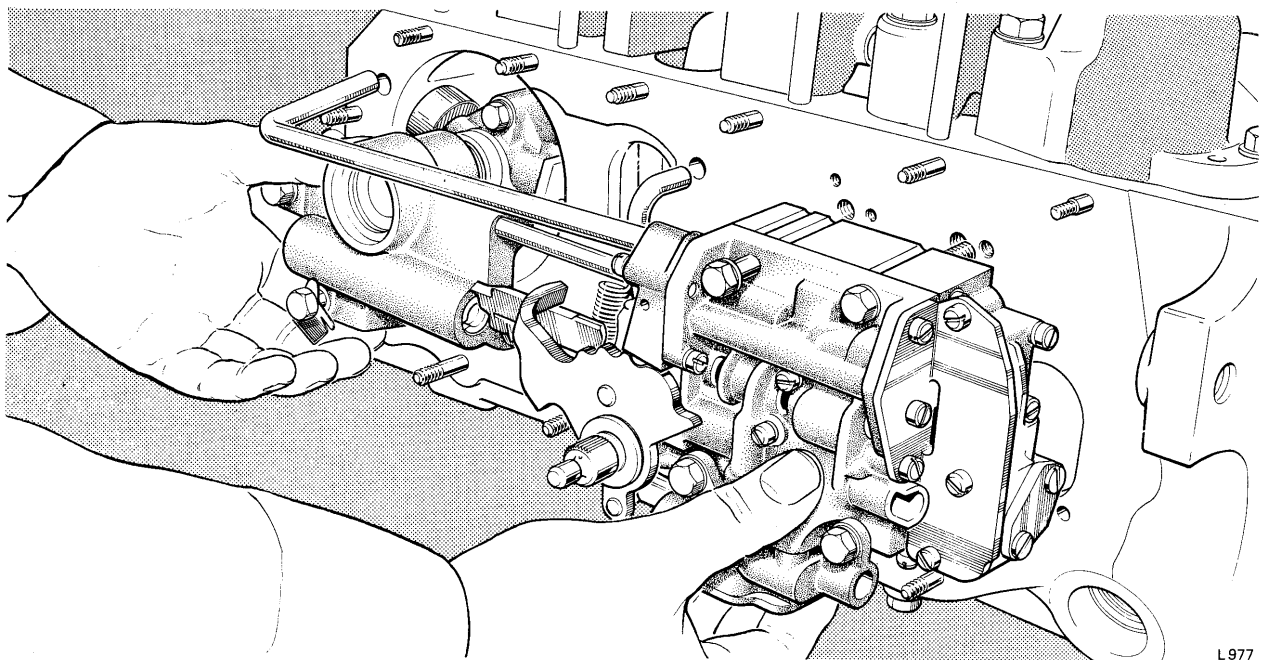
When the engine starts, the front pump immediately builds up oil pressure. The rear band is released by main line oil pressure (rear band release oil), the front servo and front clutch remain released (no oil feed) therefore the drive is disconnected in both front and rear epicyclic units.

OVERHAUL**Control valve unit — To remove**

The control valve unit can be removed from the gearbox, without removing the gearbox from the car.

Remove the gearbox sump drain plug and allow the oil to drain into a clean container.

Remove the gearbox electric actuator as described in Section T 7.



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FIG. T34 REMOVING THE CONTROL VALVE UNIT

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Remove the side cover as described in Section T11.

The control valve unit cannot be removed from the gearbox unless the parking brake bracket is also removed. The rear servo and neutral clutch oil feed pipes locate in both the control valve unit and the gearbox; as a result, the unit must be lifted away from the gearbox instead of being moved forward. Therefore, the following instructions give the procedure to be adopted for the removal of the control valve unit and the parking brake bracket.

Unlock the tab washer, then unscrew and withdraw the parking pawl support screw.

Remove the parking lever roller from the crankpin; the parking pawl will be left loose in the casing as it cannot be withdrawn until the parking brake bracket has been removed.

Unlock the front setscrew tab washer, then remove the two securing setscrews and washers.

Prepare to remove the control valve unit as follows.

Remove the two pressure control valve T.V. oil pipes from the holes in the control valve unit and the gearbox casing.

Check the tightness of the four hexagon-headed setscrews which secure the control valve unit to the gearbox casing; slackness may have caused oil leakage between the mating faces and contributed to faulty operation.

Rotate the selector lever until it is possible to fit a spanner to all four setscrews then remove the setscrews and washers; note that the longest setscrews fit into the top two holes.

Withdraw the control valve unit and the parking brake bracket. Endeavour to withdraw the oil pipes with as little sideways movement as possible, otherwise the holes may be pulled out of shape and could be a possible source of oil leakage.

Remove the parking pawl from the gearbox casing.

Remove the reverse clutch oil pipe, then separate the control valve unit from the parking brake bracket by pulling them apart to disengage the governor oil pipes.

If the gearbox is to remain without a control valve unit whilst the unit is dismantled, precautions must be taken to prevent the ingress of dust and dirt by fitting the side cover.

Control valve unit — To dismantle

If faulty operation of the control valve unit is suspected, it will probably be due to dirt which has found its way into the valve bores; wear of the valves or bores is unlikely. It is recommended that the unit be renewed rather than dismantled, but if this is not convenient, the unit should be dismantled, cleaned, assembled and rig and/or road tested before being put back into Service.

The importance of cleanliness cannot be over-emphasised when handling parts of the control valve unit. Minute particles of fluff from cloth, or even from the hands, if present in the valve bores are sufficient to prevent correct operation. For this reason a brush and filtered cleaning fluid, or compressed air, is recommended for cleaning purposes.

If the unit is to be removed but not dismantled it must be protected from dirt and other foreign matter by wrapping in waxed paper until required for use.

An exploded view of the control valve unit, on which parts are shown in their relative positions is given in Figure T35.

To avoid damage to the valves or bores, extreme care must be taken when dismantling the unit.

A workbench with a clean flat surface should be used, preferably covered with clean greaseproof paper; it is recommended that the control valve unit be left flat on this surface for as much of the dismantling operation as possible.

As valves and springs are removed, they should be washed and lightly oiled with clean gearbox oil and placed in a suitable container until they are required for inspection or assembly.

In order to assist later assembly, all valves, springs, screws and washers should be kept in their original groups, together with the casting from which they were removed.

As an aid to the identification of the various components of the unit, reference is frequently made in parenthesis in the following text to the exploded view of the unit shown in Figure T35.

Control valve outer body — To dismantle

Remove the oil feed pipes then lift the manual valve body (60) from the main control valve unit; withdraw the neutral and rear servo manual valve (62).

Remove the two securing screws and spring washers, then lift the outer body (53) and oil guide plate (48) from the control valve inner body (47).

The compensator plug retaining pin (55) is a sliding fit and may fall out during handling of the outer case; care must be taken to ensure that it is not lost.

Remove the spring steel by-pass valve (28) from the outer body, noting its position to assist in assembly.

Rotate the selector lever (67) as far as possible away from the detent plunger retainer (38) then withdraw the plunger and spring (35 and 36).

Carefully withdraw the manual control valve (37) from the outer body; the valve is slender and may be bent if carelessly handled.

Remove the three securing screws and washers then remove the detent plunger retainer (38) and oil guide

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plate (58) from the outer case. Note the different lengths of the securing screws to ensure correct refitting.

Rotate the throttle valve lever away from the outer body, then withdraw the T valve and throttle valve spring (33 and 34). Care must be taken to ensure that the throttle valve lever is not allowed to contact and damage the empty bore.

Carefully shake the throttle valve (32) and the transition valve (56) from the outer body.

Unscrew the three securing screws and remove the compensator valve plate (49). Withdraw the compensator valve and spring (50 and 51) and the detent plug (52).

The compensator plug (54) need not be removed provided that it moves freely in the bore; its movement should be felt when gently shaking the outer body. If the plug is to be removed, first withdraw the retaining pin (55), then using a soft metal rod in each end of the bore, carefully manoeuvre the plug from the port.

If the selector lever (67) or throttle valve lever are to be removed, withdraw the pin (68) from the outer end of the throttle lever shaft. The selector lever can then be lifted from the throttle valve shaft (30) complete with washer and sealing washer (70 and 69).

Front and inner valve bodies — To dismantle

Place the inner valve body (47) flat on the bench, then firmly holding the front valve body (3) against spring pressure, remove the three securing screws and washers. Slowly release the holding pressure, then remove the front body and oil guide plate (23). Note the position of the three securing screws for correct fitting.

Withdraw from the front body the T.V. regulator valve and spring (6 and 5) the 1-2 regulator plug (4), the 3-4 regulator plug (42) and the 4-3 shuttle valve (43).

Remove from the inner body the 3-4 shift valve and spring (46 and 45), the 1-2 shift valve and spring (11) and (9), and the 2-3 shift valve, spring and guide pin (12, 8 and 10).

Remove the two countersunk screws retaining the 3-2 detent plug plate (1), then remove the plate and the 3-2 detent plug (2).

If access is required to the oil check ball valve, remove the three securing screws and cover plate (44) from the front body. The valve ball and spring (40) and (41) can then be lifted from their seating.

Overspeed valve body — To dismantle

Remove the three screws and washers retaining the overspeed valve body (27), then remove the body and oil guide plate (26); note the position of the three securing screws for correct fitting.

Using the screwdriver, inserted through the slot of the overspeed valve spring retainer (22), compress the spring and extract the retainer. Withdraw the overspeed valve and spring (25 and 23).

Tilt the inner valve body so that the valves protrude. Remove the 3-4 governor plug (29), the 2-3 detent plug and spring (18 and 14) and the 2-3 governor plug (20).

Care must be taken when removing the 2-3 auxiliary valve (16) as its bearing surface is small and it may cant over in the bore. The 2-3 governor plug sleeve (17) should be therefore left in the bore temporarily in order to align the 2-3 auxiliary valve; press out the valve together with the sleeve using a soft rod inserted into the opposite end of the bore.

3-2 timing valve body — To dismantle

Remove the two securing screws and washers then remove the 3-2 timing valve body (13).

Depress the valve spring retaining cap (21) and withdraw the retaining pin (24). Carefully release the retaining cap and withdraw the cap, valve and spring (21, 15 and 19).

Manual valve body — To dismantle

Remove the four screws which secure the cover plate to the valve body; remove the plate (59).

Push the retainer (66) against spring pressure, until the retaining pin (39) can be pushed out.

Remove the retainer, spring and the rear band control valve (66, 55 and 63).

Control valve unit — To inspect

After cleaning, inspect the valves and bores for burrs and scoring, also check that the selector valve is not bent. If scoring in excess of faint lining is found it may cause leakage, in which case the control valve unit must be renewed. Individual parts must not be renewed as valves and valve bores are machined to fine limits when assembled to give the correct clearance between valve and bore. No attempt must be made to polish valves or to scrape bores as the machine marks on these parts are an essential feature and provide the oil pockets in which the valves 'float' for free operation.

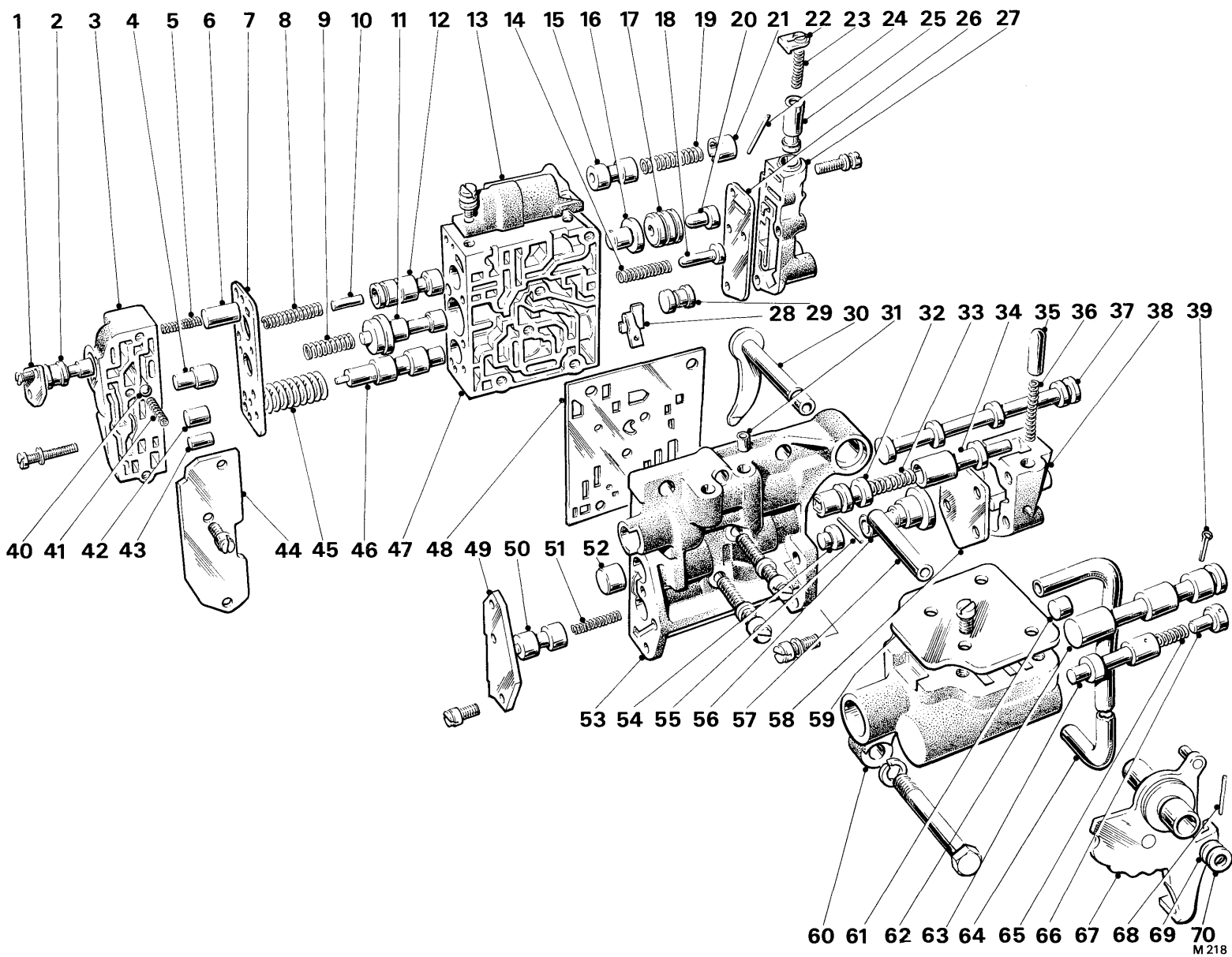


FIG. T35 CONTROL VALVE UNIT

FIG. T35 CONTROL VALVE UNIT

- | | | | | | |
|-----------|------------------------------|-----------|----------------------------|-----------|-------------------------------------|
| 1 | 3-2 Detent plug plate | 25 | Overrun control valve | 48 | Oil guide plate |
| 2 | 3-2 Detent plug | 26 | Oil guide plate | 49 | Compensator valve plate |
| 3 | Front valve body | 27 | Overrun control valve body | 50 | Compensator valve |
| 4 | 1-2 Regulator plug | 28 | By-pass valve | 51 | Compensator valve spring |
| 5 | T.V. Regulator valve spring | 29 | 3-4 Governor plug | 52 | Detent plug |
| 6 | T.V. Regulator valve | 30 | Throttle valve shaft | 53 | Outer valve body |
| 7 | Oil guide plate | 31 | Oil transfer tube | 54 | Compensator plug |
| 8 | 2-3 Shift valve spring | 32 | Throttle valve | 55 | Compensator plug retaining pin |
| 9 | 1-2 Shift valve spring | 33 | Throttle valve spring | 56 | Transition valve |
| 10 | Guide pin | 34 | T valve | 57 | Neutral clutch oil pipe |
| 11 | 1-2 Shift valve | 35 | Detent plunger | 58 | Detent plug retainer plate |
| 12 | 2-3 Shift valve | 36 | Detent plunger spring | 59 | Cover |
| 13 | 3-2 Timing valve body | 37 | Manual control valve | 60 | Manual valve body |
| 14 | 2-1 Detent plug spring | 38 | Detent plunger retainer | 61 | Plug |
| 15 | 3-2 Timing valve | 39 | Retainer pin | 62 | Neutral and rear servo manual valve |
| 16 | 2-3 Auxiliary valve | 40 | Oil check ball | 63 | Rear band control valve |
| 17 | 2-3 Governor plug sleeve | 41 | T oil check ball spring | 64 | Rear servo oil pipe |
| 18 | 2-1 Detent plug | 42 | 3-4 Regulator plug | 65 | Rear band control valve spring |
| 19 | 3-2 Timing valve spring | 43 | 4-3 Shuttle valve | 66 | Retainer |
| 20 | 2-3 Governor plug | 44 | Front body cover plate | 67 | Selector lever |
| 21 | Spring retaining cap | 45 | 3-4 Shift valve spring | 68 | Retaining pin |
| 22 | Spring retainer | 46 | 3-4 Shift valve | 69 | Sealing washer |
| 23 | Overrun control valve spring | 47 | Inner valve body | 70 | Washer |
| 24 | Retaining pin | | | | |

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Using a surface plate, check the inner and outer valve bodies for distortion. If the faces are distorted, renew the control valve unit.

Clean the joint face of the gearbox casing and examine for damage. Under no circumstances must this face be scraped; the machine marks form an oil seal when the control valve unit is bolted down.

Clean the oil pipes and check them for damage and obstruction.

Check the bores in the control valve unit for scoring and burrs.

Check pipes, which should be a push fit in the bores.

Check all springs for loss of tension and for breakage. Check the 3-2 timing valve spring retainer and the 3-4 overspeed valve spring retainer for damage and distortion.

Using a surface plate, ensure that all spacer and retainer plates are not distorted.

Check all tapped screw holes for stripped threads.

Check the throttle valve operating shaft for distortion and damage.

Ensure that the spring steel by-pass valve is not broken or distorted and is still retainable in the outer valve body.

coated with gearbox oil; valves must not be fitted in a dry condition.

As each valve is entered into its bore, check that it slides under its own weight and that it is fully home before another valve is fitted.

If the various control valve unit springs have been separated from their respective assemblies, and difficulty is experienced in identifying them, refer to Figure T36 where they can be seen in comparison to a scale.

Sealing compound must not be used between joint faces.

Overspeed and inner valves bodies — To assemble

Insert the overspeed valve, spring and retainer (25, 23 and 22) into the overspeed valve body (27). Centralise the spring in the retainer recess.

Hold the inner valve body (47) in one hand with the valve bores vertical and the radiused corner lowermost and to the right. Using the free hand, insert together the 2-3 auxiliary valve (16) and 2-3 governor plug sleeve (17) vertically upwards into the 'LO' bore. This method is recommended as the plug sleeve ensures correct alignment of the narrow edged valve, thus effecting a smooth entry into its bore without canting over or picking up on the annular groove. Turn over the valve body and insert the 2-3 governor plug (20)

Control valve unit — To assemble

Before assembling any part of the control valve unit, ensure that the components are perfectly clean and

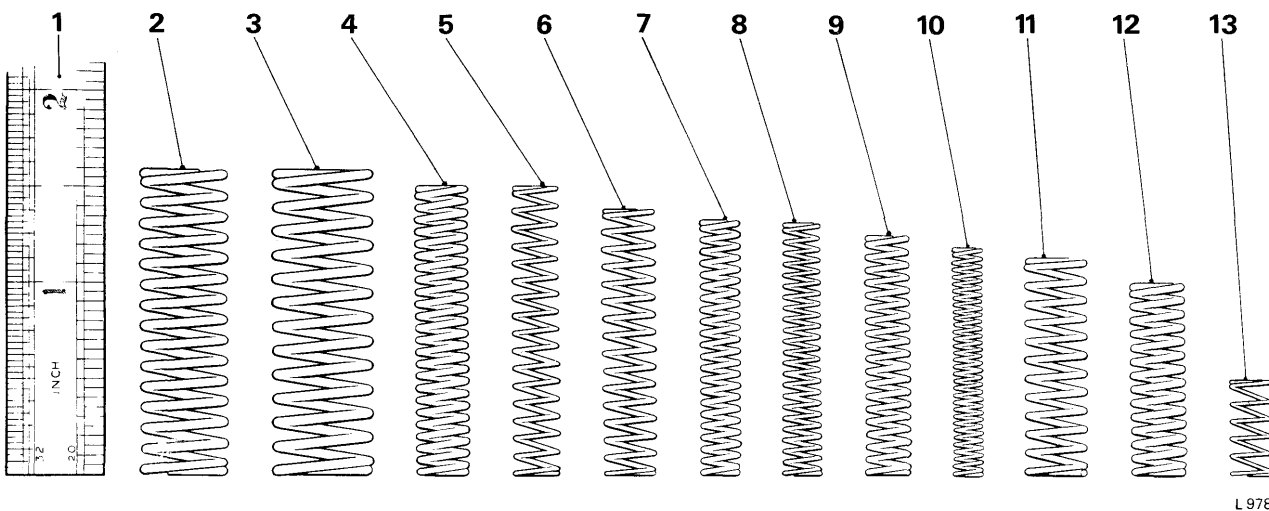


FIG. T36 CONTROL VALVE UNIT SPRINGS

- | | |
|---|--------------------------------------|
| 1 Scale | 7 Detent plunger spring |
| 2 3-2 Timing valve spring | 8 T.V. regulator valve spring |
| 3 3-4 Shift valve spring | 9 Overspeed valve spring |
| 4 2-3 Shift valve spring | 10 Compensator valve spring |
| 5 Rear band control valve spring | 11 1-2 Regulator plug spring |
| 6 2-1 Detent plug spring | 12 Throttle valve spring |
| | 13 T oil ball check spring |

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into its sleeve; the plug should come to rest approximately 0.250 in. (6.35 mm.) below the surface of the sleeve, indicating that the 2-3 auxiliary valve is fully home in the bore.

Fit the 2-1 detent plug and spring (18 and 14) and the 3-4 governor plug (29) into their respective bores, taking particular care when manoeuvring the latter into the larger of the two bores.

Fit the overspeed oil guide plate (26) into position and secure the already assembled overspeed valve unit to the inner body.

Inner and front valve bodies — To assemble

Position the oil check ball valve (40) on its seating in the front valve body (3) then fit the spring (41) and the cover plate (44). The valve seating will be found in the passage adjacent to the centre screw hole (see Fig. T37).

Insert the 3-2 detent plug (2) into its bore in the front body and fit the detent plug retaining plate (1); ensure that the plate covers the adjacent oil ports.

Fit to the front body, the T.V. regulator valve and spring (6 and 5), the 1-2 regulator plug (4), the 3-4 regulator plug (42) and the 4-3 shuttle valve (43).

Hold the inner body (47) with the valve bores vertical and the radiused corner lowermost and to the right. Insert into their respective bores the 3-4 shift valve and spring (46 and 45), the 1-2 shift valve and spring (11 and 9) and the 2-3 shift valve, spring and guide pin (12, 8 and 10); the guide pin fits inside the spring, within the hollow stem of the valve.

Lay the inner and front bodies flat on the bench and position the front oil guide plate (7) against its mating face on the front body. Bring the assemblies together, ensuring that the 2-3 shift valve spring (8) engages with the 3-2 detent plug and that the 1-2 shift valve spring (9) engages with the 1-2 regulator plug (4). Firmly hold the two assemblies together then fit and tighten the three securing screws and washers.

3-2 timing valve body — To assemble

Insert the 3-2 timing valve, spring and retaining cap (15, 19 and 21) into the timing valve body (13). Depress the retaining cap against the tension of the spring and fit the retaining pin (24) into its oblique drilling in the timing valve body; release the cap.

Secure the timing valve body to the lower face of the inner body (47), using the two screws and washers, ensuring that the oil ports are fully covered.

Manual valve body — To assemble

Fit the rear band control valve (63) into the smaller bore in the manual valve body (60), then fit the spring

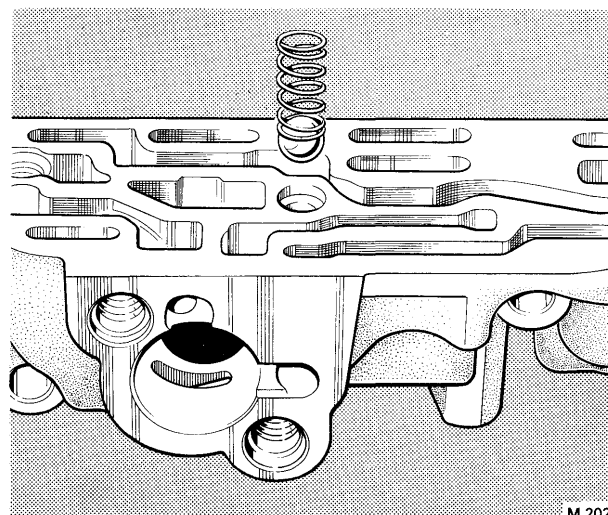


FIG. T37 POSITIONING THE OIL CHECK BALL VALVE

(65) into the bore in the end of the valve.

Fit the retainer (66) so that the small diameter locates the spring and the pin hole aligns a similar hole in the body.

Fit the pin (39) so that the retainer is located in the body and the pin itself is retained when the plate (59) is fitted.

Fit the plate (59) and secure it with the four setscrews.

Fit the neutral and rear servo manual valve.

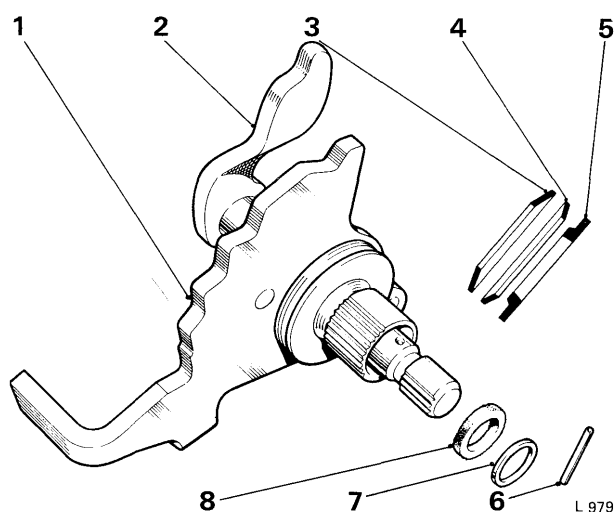


FIG. T38 SELECTOR AND THROTTLE VALVE LEVERS

- | | |
|------------------------|------------------|
| 1 Selector lever | 5 Rubber seal |
| 2 Throttle valve lever | 6 Retaining pin |
| 3 Inner washer | 7 Flat washer |
| 4 Outer washer | 8 Sealing washer |

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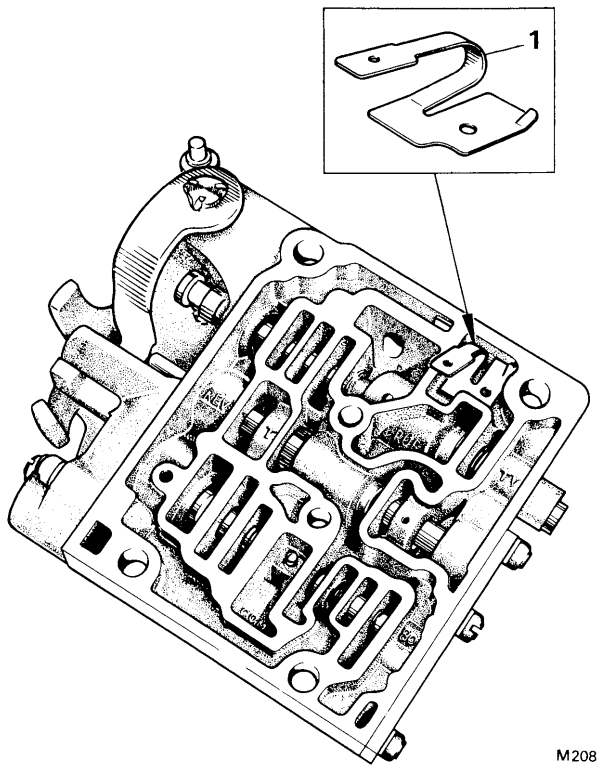


FIG. T39 OUTER BODY AND BY-PASS VALVE

1 By-pass valve

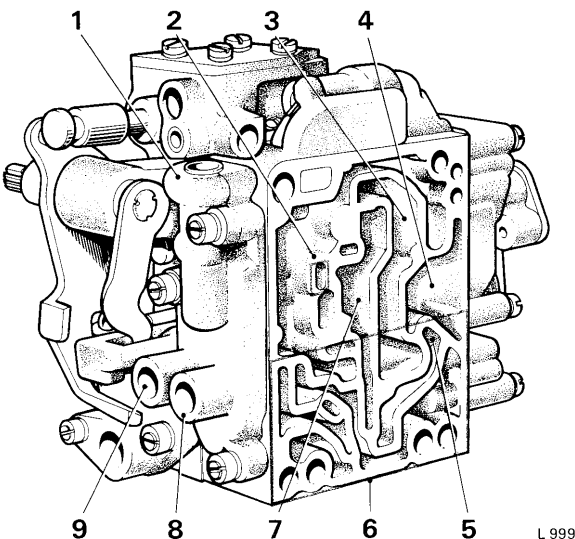


FIG. T40 AIR PRESSURE TEST POINTS—CONTROL VALVE UNIT

- | | |
|---------------------------|-------------------------|
| 1 Overspeed valve housing | 5 G1 Passage |
| 2 Blanking area | 6 Blanking area |
| 3 2-3 Shift valve group | 7 3-4 Shift valve group |
| 4 1-2 Shift valve group | 8 G2 Oil duct |
| | 9 G1 Oil duct |

Outer valve body — To assemble

If the selector lever (67) and throttle valve lever and shaft (30) have been removed from the outer body (53) assemble them as shown in Figure T38; fit a new sealing washer (69) to the throttle lever shaft.

Fit the compensator plug (54) to its bore, if it has been removed, using a rod fitted into the hole in the large end of the plug to assist in manoeuvring it into position. Fit the retainer pin (55) to its drilling in the outer valve body (53), ensuring that it passes across the valve bore, then enters the socket at the far side and does not project above the joint face of the body.

Fit the compensator valve and spring (50 and 51) and the detent plug (52) into their bores in the outer body.

Position the compensator valve plate (49) against its mating face on the outer body (53), then fit and tighten the three securing screws.

Hold the outer body (53) with its valve bores vertical and the selector lever pivot lowermost and to the left. Using the free hand, insert into the centre lower bore as one assembly, the throttle valve (32) and the T valve and throttle valve spring (34 and 33). Move them gently upwards until the throttle valve butts against the detent plug (52). Turn over the outer body and insert the double transition valve (56).

Set the throttle valve lever against the protruding end of the throttle valve stem and hold the selector lever (67) clear of the throttle valve lever. Check that the throttle valve is home in its bore.

Fit the oil guide plate (58) and detent plunger retainer (38), ensuring that the tip of the throttle valve lever is entered into the slot in the plunger retainer body. Secure the assembly with the three setscrews and washers provided; ensure that the shortest screw of the three is fitted through the boss on the outer body (53), otherwise the selector plunger will not enter the retainer during later assembly.

Rotate the selector lever (67) away from the plunger body then fit the detent plunger and spring (35 and 36) into their bore in the retainer body.

Insert the selector valve (37) up to the third land, into its bore in the outer body (53), then rotate the selector lever (67) until the actuating pin on the lever engages between the top lands of the selector valve.

Do not force the pin against the valve, otherwise the valve stem may bend. Depress the selector plunger (35) and further rotate the selector lever until the plunger engages in a notch. Release the plunger and check that the selector lever moves freely into each of the operating positions.

Fit the by-pass valve (28) to the cavity in the outer body as shown in Figure T39.

Check that the compensator plug retaining pin (55) is correctly fitted and does not protrude above the

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joint face of the outer body. Position the oil guide plate (48) on the outer body with its radiused corner towards the selector lever pivot. Align the plate with the aid of the four main setscrews and assemble the outer body and plate to the inner body. Leave the main setscrews in position until the two assembly screws and washers have been tightened. Fit and tighten the two securing screws and washers.

Finally, fit the assembled manual valve body to the top of the outer valve body, ensuring that the two oil transfer tubes (31) are correctly located, and that the groove in the end land of the neutral and rear servo manual valve engages with the top actuating pin on the selector lever.

Control valve unit — To test

The control valve unit can be tested for correct operation using a special test rig, or by fitting it to the gearbox and carrying out a road test as described under 'Change points—To check' in Section T3.

Before fitting the control valve unit to the gearbox, the freedom of the shift valve groups and the over-speed valve in their bores can be checked by means of an air test; this test can also be used, however, as an aid to fault diagnosis.

To check the freedom of the 1-2 shift valve group, apply an air pressure of approximately 70 lb/sq. in. (4.9 kg/sq. cm.) to the G1 passage as shown in Figure T40.

Air pressure applied to the G1 oil duct will move the 2-3 shift group. The lower half of the control valve unit must be suitably blanked off to achieve this.

Movement of the 2-3 and 3-4 shift valve groups and of the overspeed valve can be checked by covering area '2' (see Fig. T40), and applying air pressure to the G2 oil duct. If difficulty is experienced in observing the movement of the overspeed valve, a piece of stiff wire inserted through the centre of the spring and allowed to rest on the valve will indicate when the valve moves.

It should be noted that movement of the 2-3 shift valve group occurs when air is applied to either the G1 or G2 oil duct; in the first case air pressure operates on the 2-3 G1 or governor plug and in the second case on the 2-3 G2 or auxiliary plug.

Control valve unit — To fit

Before fitting the control valve unit, ensure that the mating faces of the unit and the gearbox are perfectly clean.

Fit the parking brake bracket to the control valve unit.

Rotate the selector lever to a position where it will clear the parking brake lever.

Fit the reverse clutch oil pipe to the control valve unit.

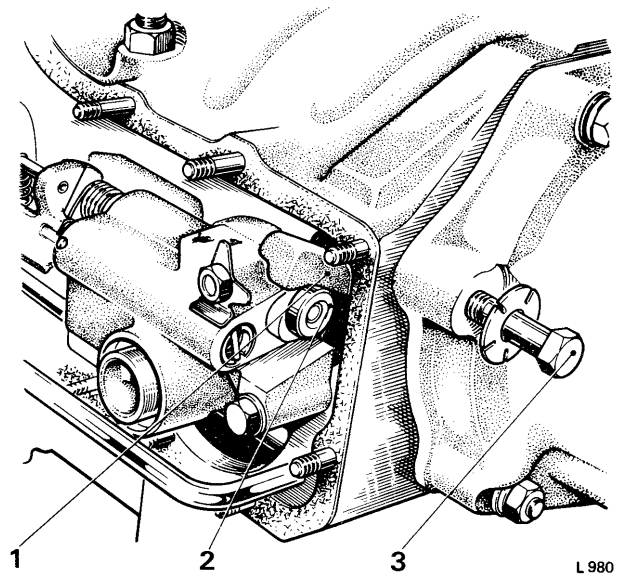


FIG. T41 FITTING THE PARKING PAWL ROLLER

- 1 Parking pawl
- 2 Roller
- 3 Parking pawl locating setscrew

Fit the parking pawl in its approximate working position in the casing.

Ensure that the ends of the sealing rings on the governor tower are locked then slide the governor tower over the rings. As the control valve unit nears the gearbox casing, fit the ends of the two oil pipes into their respective bores in the casing.

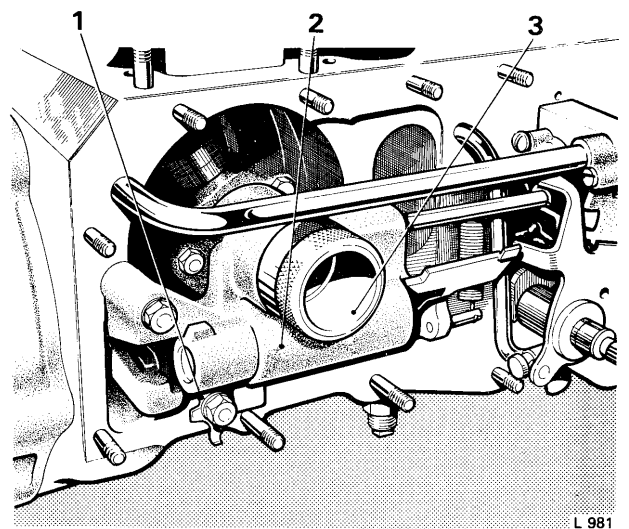


FIG. T42 ALIGNING THE PARKING BRAKE BRACKET

- 1 Lock-washer
- 2 Parking brake bracket
- 3 Guide sleeve

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Fit the two parking brake bracket securing setscrews, taking care to position the special washer on the setscrew adjacent to the parking blocker piston, so that the large tab secures the blocker piston retaining pin. Screw in the setscrews until they are finger tight.

Fit the four setscrews and washers which secure the control valve unit to the gearbox; the two largest setscrews fit into the top holes and also secure the manual valve body to the outer body. Do not tighten the setscrews.

Lubricate and fit the parking pawl roller (see Fig. T41).

Position the parking pawl then fit the supporting setscrew with a new tab washer. Torque tighten the setscrew and secure it with the tab washer, by bending one tab against the hexagon head and two tabs against the rear extension casing.

If the parking lever return spring is still in position, it should be removed whilst the parking brake bracket bore is concentrically positioned around the governor tower.

Insert the alignment gauge RH329 into the annulus formed between the governor tower and the parking brake bracket (see Fig. T42).

Torque tighten the parking brake bracket setscrews and the control valve unit setscrews; the alignment gauge should be free to rotate.

Turn the gearbox output shaft through several revolutions, and at the same time, ensure that the

gauge remains free. If not, slacken the setscrews and reposition the bracket.

If difficulty is experienced in successfully aligning the parking brake bracket, slacken the rear oil pump securing setscrews, then again align the bracket. The slight movement gained by slackening the pump setscrews may just be sufficient to allow the parking brake bracket to be correctly aligned.

When the gauge has remained free through at least one revolution of the governor, with all the pump, parking brake bracket and control valve unit securing screws torque tightened, remove the gauge then lock the special tab washer.

Fit the parking lever return spring.

Move the selector lever to the reverse position to check for parking pawl engagement.

Ensure that the manual valve and the selector valve operate when the lever is moved.

Ensure that the conical steel washers and the oil seal are correctly positioned on the selector shaft.

Fit the pressure control valve oil pipe and T.V. oil pipes; carefully tap home the pipes using a soft-headed mallet.

Fit the side cover as described in Section T11.

After fitting the control levers, the control setting should be checked and, if necessary, adjusted before and during the subsequent road test (see Section T5—'Control linkage').

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DIMENSIONAL DATA FOR SECTION T12— CONTROL VALVE UNIT

DESCRIPTION	DIMENSION	PERMISSIBLE WORN DIMENSION	REMARKS
Check ball spring — T oil — free length.	0.437 in. (approx.) (11,11 mm.) (approx.)	_____	_____
Load required to compress spring to a length of 0.250 in. (6,35 mm.)	1 3/4 oz. to 2 1/4 oz. (50,4 gm. to 64,6 gm.)	_____	_____
Compensator valve spring—free length.	1.1875 in. (approx.) (30,16 mm.) (approx.)	_____	_____
Load required to compress spring to a length of 0.890 in. (22,62 mm.)	6 1/2 oz. to 9 1/2 oz. (184,3 gm. to 269,3 gm.)	_____	_____
1-2 detent plug spring — free length.	1.375 in. (approx.) (34,93 mm.) (approx.)	_____	_____
Load required to compress spring to a length of 0.719 in. (18,26 mm.)	2 lb. 9 oz. to 3 lb. 3 oz. (1,162 kg. to 1,446 kg.)	_____	_____
Detent spring — free length.	1.328 in. (approx.) (33,73 mm.) (approx.)	_____	_____

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DESCRIPTION	DIMENSION	PERMISSIBLE WORN DIMENSION	REMARKS
Dimensional Data—continued			
Load required to compress spring to a length of 0.937 in. (23,81 mm.)	5 lb. 11 oz. to 6 lb. 15 oz. (2,580 kg. to 3,247 kg.)	—	—
Throttle valve spring — free length.	0.947 in. — 0.045 in. (24,07 mm. — 1,14 mm.)	—	—
Load required to compress spring to a length of 0.638 in. (16,20 mm.)	6 lb. 5 oz. to 6 lb. 13 oz. (2,86 kg. to 3,09 kg.)	—	—
Timing valve spring — free length.	1.593 in. (approx.) (40,48 mm.) (approx.)	—	—
Load required to compress spring to a length of 0.796 in. (20,24 mm.)	5 lb. 10 oz. to 6 lb. 6 oz. (2,55 kg. to 2,89 kg.)	—	—
T.V. regulator valve spring — free length.	1.325 in. (approx.) (33,65 mm.) (approx.)	—	—
Load required to compress spring to a length of 0.812 in. (20,4 mm.)	1 lb. 6½ oz. to 1 lb. 9½ oz. (0,637 kg. to 0,722 kg.)	—	—
1-2 regulator plug spring — free length.	1.125 in. (approx.) (28,588 mm.) (approx.)	—	—
Load required to compress spring to a length of 0.469 in. (11,91 mm.)	1 lb. 14 oz. to 2 lb. 2 oz. (0,85 kg. to 0,96 kg.)	—	—
2-3 shift valve spring — free length.	1.531 in. (approx.) (38,89 mm.) (approx.)	—	—
Load required to compress spring to a length of 0.926 in. (23,52 mm.)	3 lb. 2 oz. to 3 lb. 4½ oz. (1,42 kg. to 1,49 kg.)	—	—
Overspeed valve spring — free length.	1.246 in. (approx.) (31,65 mm.) (approx.)	—	—
Load required to compress spring to a length of 0.846 in. (21,48 mm.)	5 lb. 1 oz. to 5 lb. 5 oz. (2,3 kg. to 2,4 kg.)	—	—
3-4 shift valve spring — free length.	1.578 in. (approx.) (40,08 mm.) (approx.)	—	—
Load required to compress spring to a length of 0.883 in. (21,16 mm.)	4 lb. 7 oz. to 4 lb. 13 oz. (2,0 kg. to 2,2 kg.)	—	—
Rear band control valve spring free length.	1.500 in. (38,10 mm.)	—	—
Load required to compress spring to a length of 0.725 in. (18,47 mm.)	1 lb. 2½ oz. to 1 lb. 5½ oz. (0,52 kg. to 0,61 kg.)	—	—
Screws — front body to inner body.	Torque tighten to between 3 lb.ft. and 4 lb.ft. (0,42 kgm. and 0,55 kgm.)	—	—
Screws — outer body to inner body.	Torque tighten to between 3 lb.ft. and 4 lb.ft. (0,42 kgm. and 0,55 kgm.)	—	Tighten with 4 main setscrews in position to align holes.
Screws — 3-2 timing valve body to inner body.	Torque tighten to between 3 lb.ft. and 4 lb.ft. (0,42 kgm. and 0,55 kgm.)	—	—
Screws — overspeed valve body to inner body.	Torque tighten to between 3 lb.ft. and 4 lb.ft. (0,42 kgm. and 0,55 kgm.)	—	—

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DESCRIPTION	DIMENSION	PERMISSIBLE WORN DIMENSION	REMARKS
<i>Dimensional Data—continued</i>			
Screws — compensator valve plate to outer body.	Torque tighten to between 3 lb.ft. and 4 lb.ft. (0,42 kgm. and 0,55 kgm.)	—	—
Screws — cover plate to front body.	Torque tighten to between 3 lb.ft. and 4 lb.ft. (0,42 kgm. and 0,55 kgm.)	—	—
Screws — detent plunger retainer to outer valve body.	Torque tighten to between 3 lb.ft. and 4 lb.ft. (0,42 kgm. and 0,55 kgm.)	—	—
Screws — cover plate to manual valve body.	Torque tighten to between 3 lb.ft. and 4 lb.ft. (0,42 kgm. and 0,55 kgm.)	—	—
Setscrews — control valve unit to gearbox.	Torque tighten to between 6 lb.ft. and 8 lb.ft. (0,83 kgm. and 1,11 kgm.)	—	—

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Section T13 PARKING BRAKE BRACKET

The parking brake bracket is an aluminium alloy casting which is secured to the left-hand side of the gearbox, adjacent to the governor. It forms part of the oil supply passages between the governor and the control valve unit as well as housing the lever and crank assembly which actuates the parking pawl. Also housed in the bracket are two spring-loaded blocker pistons (see Fig. T43); one piston prevents reverse gear from being engaged until the car is almost at a standstill and the other prevents the parking pawl from engaging the transmission locking ring whilst the engine is running.

Operation

The rearmost piston is the parking pawl blocker piston. This piston is dependent upon main line oil pressure for its operation. As long as main line oil pressure holds the piston out, against spring pressure, the parking pawl is prevented from engaging the annular teeth on the reverse annulus gear. When the engine is switched off and oil pressure ceases to act on the piston, the piston is returned by the spring, allowing the pawl to engage when Reverse is selected.

The foremost piston, the reverse blocker piston, prevents the driver from engaging reverse gear whilst travelling in a forward direction above a speed of approximately 8 m.p.h. (12.9 k.p.h.).

This piston is dependent upon governor one (G1) pressure for its operation. When G1 pressure falls below a certain value, the piston return spring pushes back the piston, allowing Reverse to be engaged.

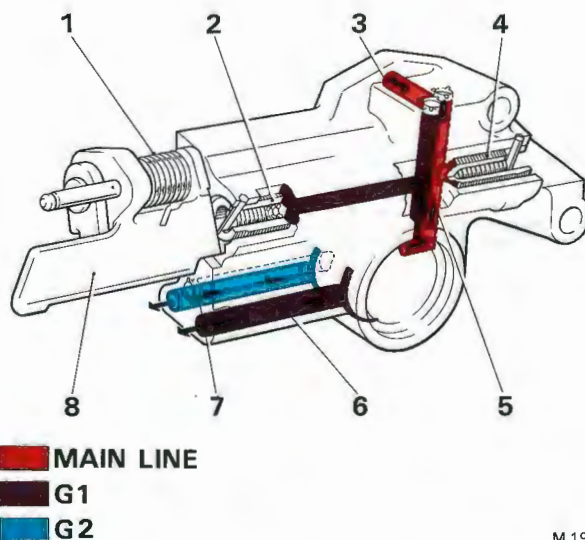


FIG. T43 PARKING BRAKE BRACKET
—OPERATION

- 1 Parking brake lever spring
- 2 Reverse blocker piston
- 3 Main line oil from pump
- 4 Parking blocker piston
- 5 G1 Oil to reverse blocker piston
- 6 G1 Oil to control valve unit
- 7 G2 Oil to control valve unit
- 8 Parking brake lever

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Parking brake bracket—To remove

The parking brake bracket can be removed from the gearbox whilst the gearbox is in position in the car. The side cover and the control valve unit must also be removed.

Remove the sump drain plug then drain the gearbox oil into a suitable clean container.

Remove the side cover (*see Section T11*).

Remove the parking brake bracket together with the control valve unit as described in Section T5.

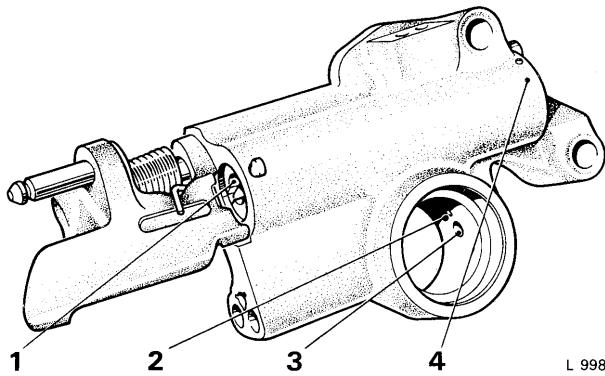


FIG. T44 AIR PRESSURE TEST POINTS

- 1 Reverse blocker piston
- 2 G1 Oil duct
- 3 Main oil pressure duct
- 4 Parking pawl blocker piston

Parking brake bracket—To dismantle

The parking brake bracket assembly need not be dismantled unless the fault diagnosis described in Section T4 indicates faulty operation of the reverse piston or the parking blocker piston and this is confirmed by an air test (*see Section T6*).

To remove the reverse blocker piston, cut off the head of the retaining pin and rotate the parking lever arm to clear the piston. Depress the spring and slide out the pin using thin-nosed pliers. Withdraw the spring and piston from the bore.

Removal of the parking blocker piston is similar except that the retaining pin is free to be removed without cutting off its head. Use snap ring pliers to withdraw the piston if it resists removal.

Parking brake bracket—To inspect

Clean all parts paying particular attention to the oil passages and slots in the main casting; it is not unusual to find a small amount of sludge and metallic dust. Use a compressed air line to clear the oil passages and the reverse clutch oil pipe.

Examine the governor sleeve bore for excessive wear caused by the oil sealing ring or by misalignment of the governor sleeve.

Insert the oil sealing rings into their running position in the governor sleeve bore. Check the ring end clearance with feeler gauges; if the clearance is larger than that given in 'Dimensional Data' at the end of this Section, renew the rings. If the new ring gaps are too wide, fit a new governor bracket.

Examine the casting for cracks and other damage; also examine the piston bores and pistons for scoring and burrs which might restrict free movement. Check that the three oil plugs are secure in their ducts.

Check that the parking lever assembly rotates freely in the bearing, and that the return spring pillar is secure in the parking brake lever.

Examine the roller and the crankpin for damage and for excessive wear.

Examine the parking brake pawl for damage and for excessive wear. Check that the support screw rotates freely in the bore in the pawl.

Examine the teeth of the brake annulus for damage and wear.

Examine the reverse clutch oil pipe for damage and for restriction, particularly at the bend; ensure that it fits snugly in the bore in the gearbox casing.

Parking brake bracket—To assemble

Assemble the parking brake bracket by reversing the procedure given for dismantling, noting the following points.

Lubricate all moving parts with clean gearbox oil during assembly.

When fitting the reverse blocker piston, fit a new retaining pin from the back of the casing and peen the other end of the pin to lock it in position.

Parking brake bracket — To test

The parking and reverse blocker pistons should be tested for freedom of movement in their bores after assembly. Intermittent application of air pressure, at approximately 70 lb/sq. in. (4.9 kg/sq. cm.) to the points shown in Figure T44 should cause the pistons to move to and fro in their bores.

To test the parking blocker piston, cover the main oil pressure port in the bore of the governor sleeve, then apply air pressure to the main oil pressure inlet; the parking blocker piston should then protrude from the parking brake bracket.

To test the reverse piston, rotate the parking lever arm to allow full travel of the piston, then apply air pressure to the G1 oil duct in the governor sleeve bore; the reverse blocker piston should protrude fully from the parking brake bracket.

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Parking brake bracket — To fit

If the parking brake bracket has been renewed due to wear in the governor sleeve bore, the oil sealing rings must be removed from the governor tower and

the gaps checked as described earlier in this Section. The 'run-out' of the governor tower should also be checked as described in Section T16

Fit the parking brake bracket together with the control valve unit as described in Section T12.

**DIMENSIONAL DATA FOR
SECTION T13—PARKING BRAKE BRACKET**

DESCRIPTION	DIMENSION	PERMISSIBLE WORN DIMENSION	REMARKS
Reverse blocker and parking blocker pistons — clearance in bore.	0.0003 in. to 0.0015 in. (0,008 mm. to 0,038 mm.)	0.003 in. (0,08 mm.)	-----
Reverse blocker piston spring —free length.	0.938 in. (approx.) (23,81 mm.) (approx.)	-----	-----
Load required to compress spring length to 0.562 in. (14,29 mm.)	1 lb. 2 oz. to 1 lb. 6 oz. (0,51 kg. to 0,62 kg.)	-----	-----
Parking blocker piston spring —free length.	1.061 in. (approx.) (26,96 mm.) (approx.)	-----	-----
Load required to compress spring length to 0.516 in. (13,1 mm.)	7 lb. 8 oz. to 8 lb. 8 oz. (3,4 kg. to 3,8 kg.)	-----	-----
Governor tower bore diameter	1.1875 in. to 1.1885 in. (30,162 mm. to 30,187 mm.)	-----	Renew parking brake bracket if the governor rings have heavily scored the bore.
Governor sealing rings closed gap (butt clearance).	0.005 in. to 0.015 in. (0,13 mm. to 0,40 mm.)	0.020 in. (0,51 mm.)	Check in 1.1875 in. (30,162 mm.) diameter minimum bore
Setscrews — parking brake bracket to gearbox casing.	Torque tighten to between 16 lb.ft. and 18 lb.ft. (2,21 kg. m. and 2,49 kg. m.)	-----	-----
Parking pawl support screw.	Torque tighten to between 25 lb.ft. and 28 lb.ft. (3,46 kg. m. and 3,87 kg. m.)	-----	-----
Clearance between roller and crankpin.	0.0005 in. to 0.004 in. (0,013 mm. to 0,10 mm.)	0.007 in. (0,18 mm.)	-----

Section T14 FRONT SERVO

The front servo comprises two cast iron casings and an aluminium alloy valve housing.

The two casings form a cylinder which is divided into band apply and band release chambers by the ring seals of three pistons (see Fig. T45). The alloy valve housing contains the overrun control valve and the main line exhaust and non-return valves. A further valve, the 4-3 timing valve is housed in the servo main casing. The servo is secured to the gearbox bottom face and its function is to apply or release the front drum friction band.

Operation

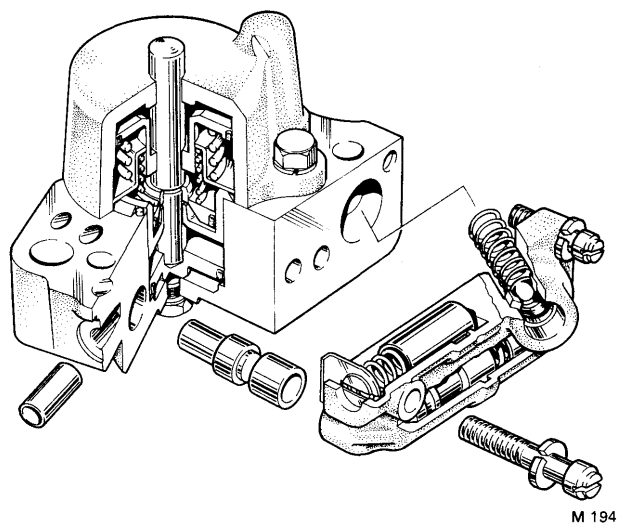
Band apply effort is produced by the action of main line oil pressure in the lower chamber augmented by compensator pressure in the centre chamber. During overrun, when the throttle is closed and compensator pressure is removed, there would be a tendency for the band to slip and cause 'hunting' between two gears. This is avoided as governor (G1) pressure moves the overrun valve into a position whereby main oil pressure is directed into the compensator chamber, thus increasing the piston area over which band apply main pressure is acting (see Fig. T46). As a result the band is held firmly applied until the road speed has dropped low enough to enforce the down-change.

The 4-3 timing valve is provided to delay front band application until the front clutch is released during the down-change. Whenever G1 pressure, acting on the large diameter of the valve, overcomes main line oil pressure, acting on the small diameter, the valve moves to close the direct band apply port. As a result of this, band apply oil is forced to take a by-pass route which includes a 0.055 in. (1.41 mm.) restriction. Thus, band application is retarded and does not take place until the clutch releases.

Band apply main pressure is continuously applied in all forward ranges but band release is obtained, when required for second and fourth gears, by allowing main pressure to act over the larger total area of the band release pistons. Band release pressure thus overcomes band apply pressure and the band is released.

The front servo valve body houses the main line non-return and exhaust valves. The non-return valve is a simple ball and spring arrangement designed to prevent the front pump from discharging oil through the rear pump.

The exhaust valve opens under light spring pressure to reduce quickly the control pressures by allowing oil in the servos and control valves to exhaust when pump delivery ceases.



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FIG. T45 FRONT SERVO

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The front servo can be removed from the gearbox while the gearbox is in the car.

Front and rear servos — To remove

Drain the gearbox sump then remove the sump and filter as described in Section T11.

The front servo cannot be removed without removing the rear servo, therefore, the following instructions cover the removal of both servos; the disconnecting points are shown in Figure T 47.

Slacken the front and rear band adjusting screw

lock-nuts then unscrew the adjusting screws approximately five complete turns to release the pressure on the servo operating rods.

Hook a piece of bent wire into the coils of the rear band release spring then secure it to prevent the spring from falling when the servo is removed.

Remove the governor oil delivery pipe; if necessary use slight leverage near the ends of the pipe.

Slacken the five setscrews which secure both the servo units to the gearbox casing.

Remove the three setscrews which secure the rear servo.

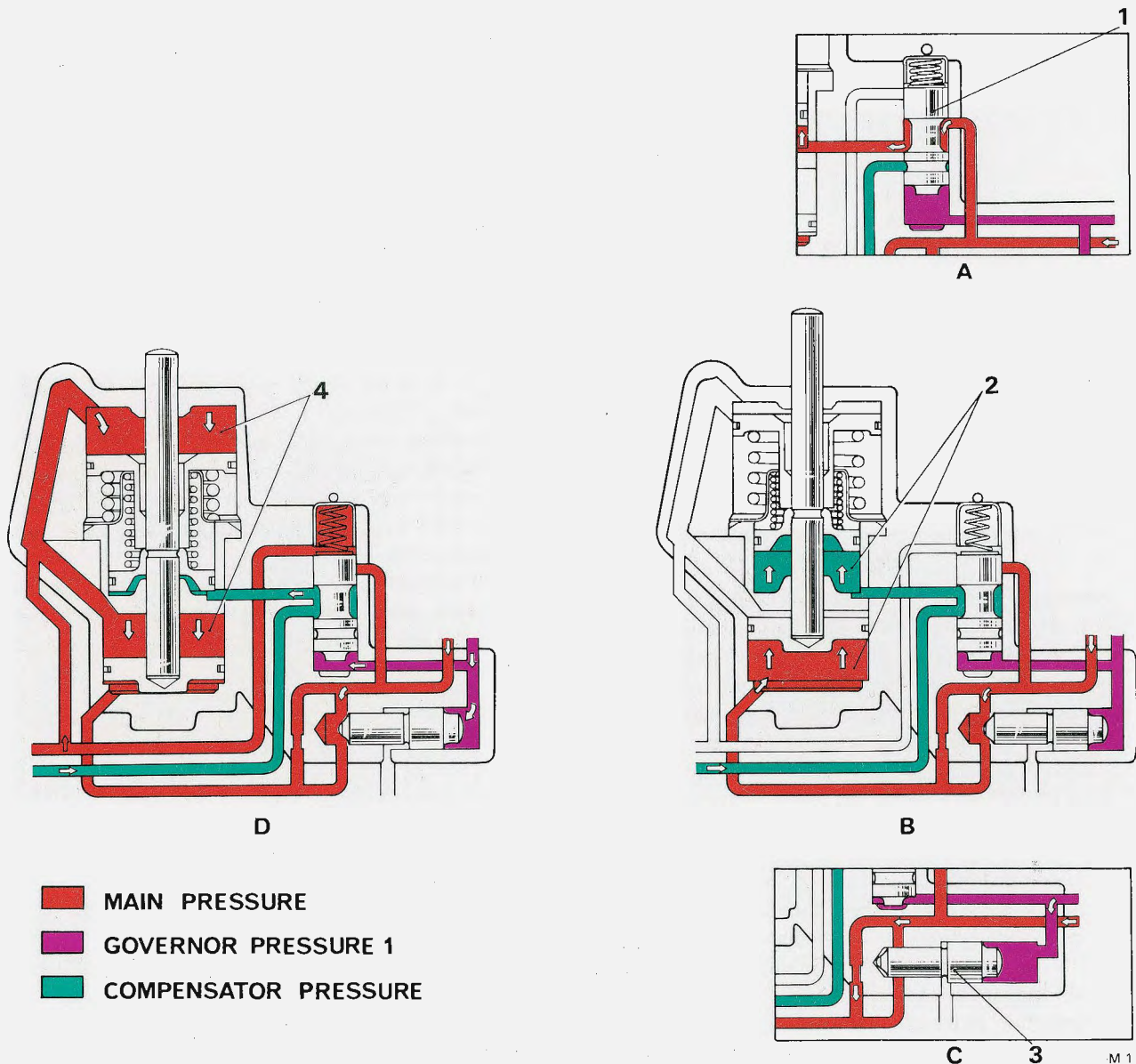


FIG. T46 FRONT SERVO OPERATION

- | | |
|----------------------------|-------------------------|
| A Increased apply pressure | 1 Overrun valve |
| B Band applying | 2 Band apply chambers |
| C Delayed band apply | 3 4-3 Timing valve |
| D Band releasing | 4 Band release chambers |

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Carefully withdraw the rear servo from the front servo, then remove the rear servo from the gearbox. If the gearbox is installed in the car, care must be taken during this operation to support the rear servo, so avoiding damage to the front servo and oil pipes.

Remove the rear band release spring.

Support the front servo then remove the two securing setscrews.

Push the rear oil pump discharge pipe as far as possible into the rear pump, then carefully remove the front servo unit from the gearbox casing. Turn it to disengage the rear oil pump discharge pipe whilst at the same time withdrawing it from the front pump oil delivery pipe.

If difficulty is experienced in disengaging the servo unit from the rear oil pump discharge pipe, slacken, and if necessary, remove the front servo valve body.

If the valve body has to be removed, unscrew the three securing screws then slide the body forward. Lift it from the servo body taking care to retain the non-return ball valve and spring.

When fault diagnosis has indicated that a front

servo unit might be defective, it should be checked as described under 'Front servo — To test'. This will assist in locating the faulty part before the servo is dismantled and inspected.

Front servo unit — To dismantle

When dismantling the front servo, reference should be made to the exploded view of the servo shown in Figure T48.

Hold the servo unit with the aluminium valve body uppermost, thus preventing the 4-3 timing valve from falling out when the valve body is removed.

Hold the valve body against spring pressure then remove the three securing screws.

Slowly release the pressure then, as the bodies move apart, remove the non-return valve and spring.

Tilt the servo body and allow the 4-3 valve to slide from its bore.

Depress the overrun valve retainer and withdraw the pin, retainer, spring and valve. If the retainer sticks in the bore, fit the valve body to the servo body without the non-return valve and spring.

Apply an intermittent blast of compressed air at

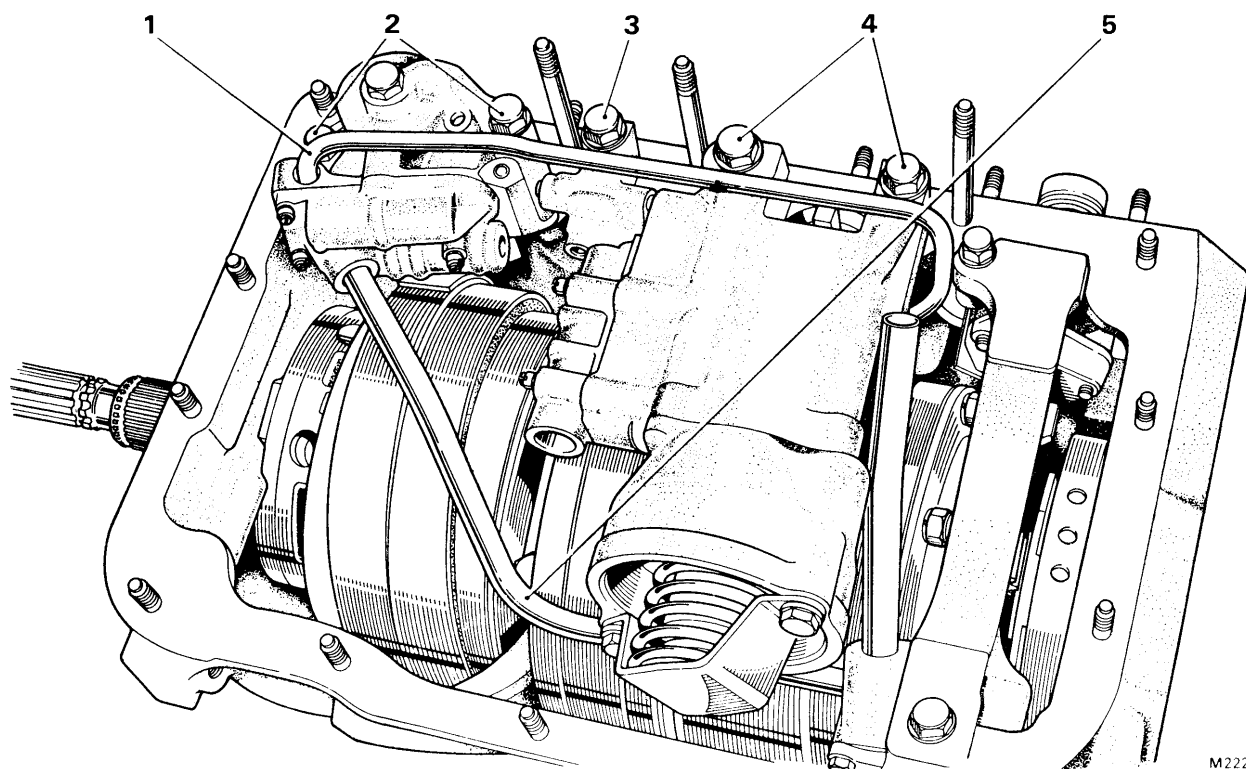


FIG. T47 SERVO DISCONNECTING POINTS

1 Governor oil pipe
2 Front servo securing setscrews

3 Junction body securing setscrew

4 Rear servo securing setscrews

5 Rear pump to servo oil pipe

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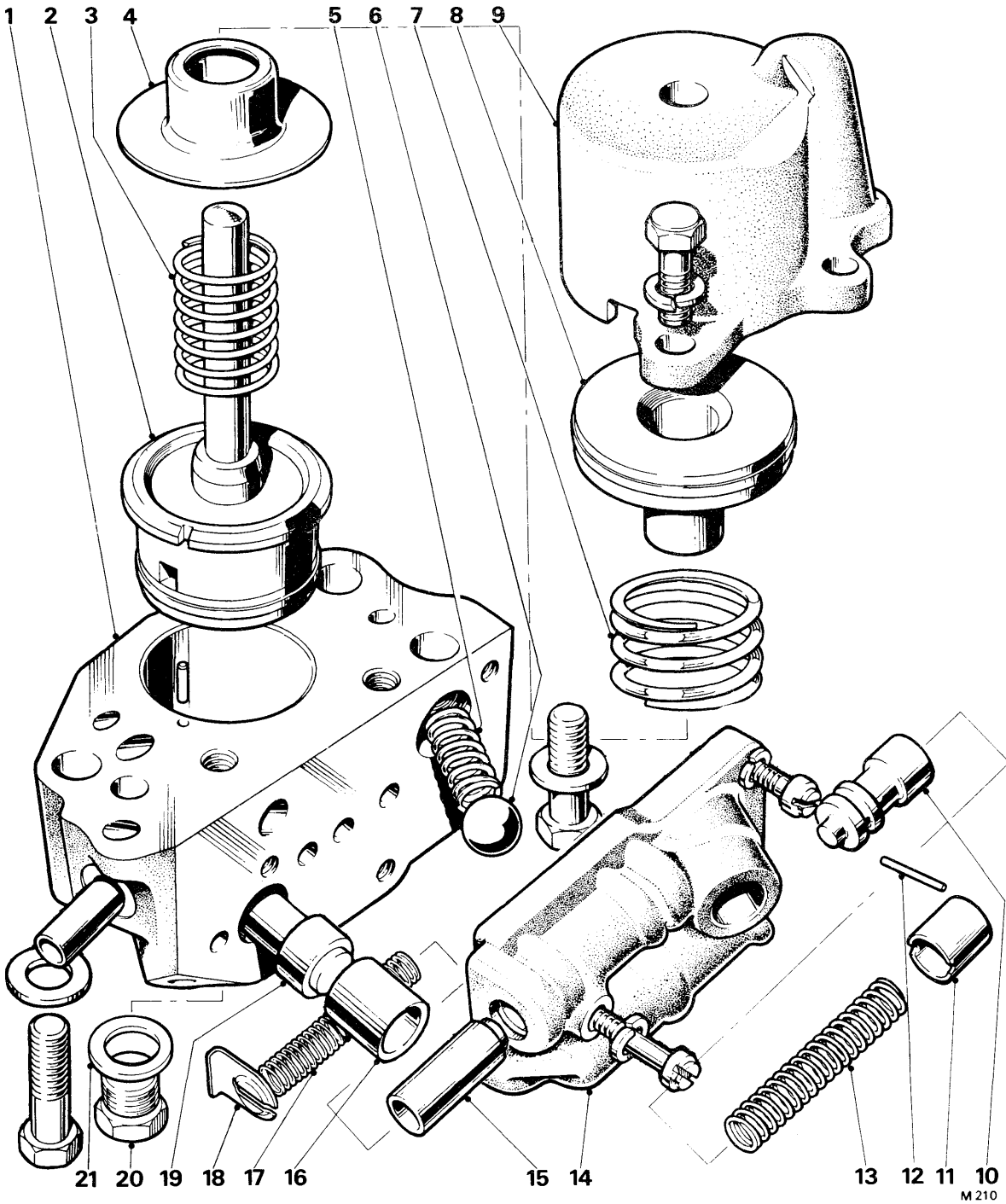


FIG. T48 FRONT SERVO EXPLODED

- | | | |
|------------------------------|--------------------------|----------------------------|
| 1 Front servo main body | 8 Band release piston | 15 Exhaust valve |
| 2 Apply piston assembly | 9 Band release cylinder | 16 4-3 Timing restrictor |
| 3 Apply piston return spring | 10 Overrun control valve | 17 Spring |
| 4 Retainer | 11 Retainer | 18 Retainer |
| 5 Spring | 12 Pin | 19 4-3 Timing valve |
| 6 Non-return ball valve | 13 Spring | 20 Main body blanking plug |
| 7 Spring | 14 Valve body | 21 Blanking plug washer |

approximately 70 lb/sq. in. (4,92 kg/sq. cm.) to the band release oil duct (see Fig. T50). This will have the effect of forcing out the retainer without damage to the component parts. Do not use leverage between the valve and the dividing walls in the face of the valve body casting.

Depress the exhaust valve spring, with the aid of a screwdriver blade through the slot in the retainer then slide out the retainer. Withdraw the spring and valve.

To dismantle the remainder of the servo unit, remove the three screws which secure the band release cylinder then withdraw the cylinder from the servo body.

Remove the two springs and the retainer from the servo operating rod.

Remove the blanking plug and discard the washer.

Withdraw the compensator and band apply piston assembly from the servo body. The assembly is an interference fit in the body and a drift, inserted through the blanking plug orifice, should be used to push out the piston assembly. The compensator and band apply piston assembly cannot be further dismantled.

Front servo — To inspect

Thoroughly clean all parts before inspecting, using a suitable cleaning fluid, brush and compressed air.

Oil ducts and valve bores must be washed and blown through to remove any particles that may eventually reach the control valve unit and cause faulty operation of the gearbox.

Ensure that the leak hole in the non-return valve seating and the restrictor hole in the servo body are free from dirt or sludge.

Do not remove piston rings unless necessary; careless handling will distort the rings. The piston ring inside the compensator piston assembly cannot be removed, but every effort should be made to flush the compensator chamber by introducing cleaning fluid and moving the operating rod backward and forward.

Check that the plug in the servo body is secure.

Examine the springs for breakages or distortion.

Examine the piston bores in the servo body and the front band release cylinder for signs of scoring.

Check that the dowel in the servo body has not become damaged. This dowel is a loose fit in the servo body and is easily removable.

Examine the valves and bores for scoring. Oil the valves then check that they slide freely in the bores under their own weight.

Examine the ball valve seat for damage and security.

Examine the piston ring assembly externally for scores and the piston rings for chipped edges or uneven contact. Hold the outer body of the assembly then move the operating rod backward and forward

to check for freedom of movement; a cushioned effect coupled with the characteristic scraping action of a piston ring should be felt.

Check the face of the alloy valve body for distortion using a surface plate. Any distortion, particularly in the section between the main line oil passage and the overrun valve (see Fig. T49), will mean renewal of the body.

The valve body, complete with valves and springs, can be renewed as a separate assembly, but the ball valve seating cannot be renewed independently.

Unserviceability of the servo body, front band release cylinder, valves or piston assembly will mean renewing the complete servo unit as these items are selectively fitted on initial assembly. Other components such as piston rings can be renewed independently.

Front servo — To assemble

When assembling the front servo ensure that all parts are clean. Lightly oil all moving parts with clean gearbox oil. **Do not** use jointing compound on mating faces.

If necessary, fit a new piston ring on to the band apply piston then fit the assembly into the bore of the servo body. Enter the piston ring squarely to avoid marking the cylinder walls.

Align the dowel slot in the sleeve with the dowel in the servo body, then push the sleeve in by hand as far as possible; the sleeve is an interference fit in the body (see 'Dimensional Data') at the end of this Section and a press tool may be necessary to push the sleeve fully home.

If necessary, fit a new piston ring on to the band release piston, using three 0.0015 in. (0.04 mm.) feeler gauges to enter the piston ring over the steps in the bore.

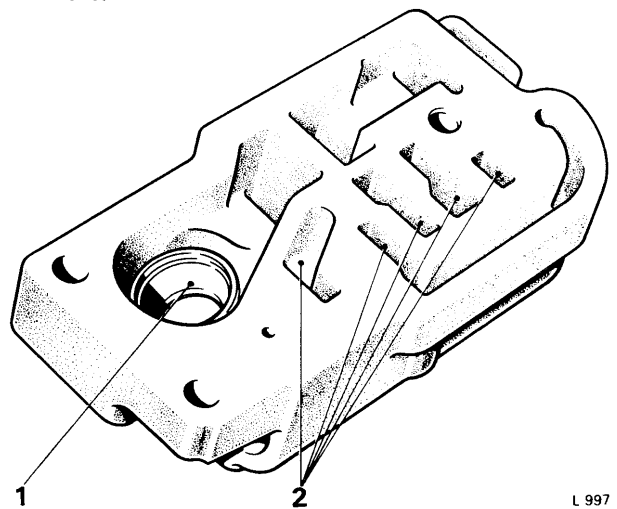


FIG. T49 FRONT SERVO VALVE BODY

- 1 Main line oil
- 2 Overrun control valve oil ports

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Fit, on to the shaft of the band release piston, the compensator piston return spring, retainer and band release piston return spring.

Fit the band release piston to the servo body, then enter, but do not tighten the three securing setscrews. Turn the band release cylinder anti-clockwise to ensure that the flange does not overlap the front pump delivery duct. Torque tighten the screws.

Fit the exhaust valve, spring and retainer, taking care to centralise the exhaust valve spring in the depression in the retainer to obviate side thrust on the valve.

Fit the overrun valve, spring, retainer and pin. Ensure that the end of the overrun valve retainer pin is below the valve body face otherwise it will prevent the two faces meeting, thus permitting oil leakage.

Fit the 4-3 timing valve into its bore in the servo body.

Fit the ball valve and spring, then fit the valve body onto the servo body, securing it with the three screws. Evenly torque tighten the screws to prevent distortion of the body.

Fit the blanking plug together with a new washer.

Front servo — To test

The front servo can be tested functionally only by using a special test rig, or by fitting it to the gearbox

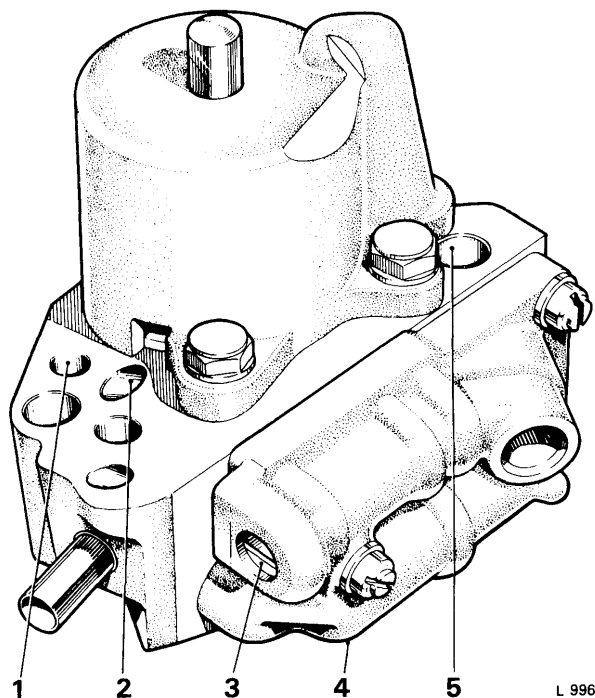


FIG. T50 FRONT SERVO—AIR PRESSURE TEST

- | | |
|--------------------------|---------------------------------|
| 1 Band apply duct | 4 Overrun control valve housing |
| 2 Band release duct | 5 Front pump delivery duct |
| 3 Exhaust valve retainer | |

and carrying out a road test.

Movement of the servo pistons and freedom of the valves in their bores can be tested however by applying an air pressure of approximately 70 lb/sq. in. (4.92 kg/sq. cm.) to specified oil ducts and observing the movement. Internal leaks or sluggish valves, which could cause faulty operation of the gearbox, will not be revealed by these tests.

To test the front servo, proceed as follows.

Apply air pressure to the band apply duct (*see Fig. T50*). The operating rod should move out to its fullest extent, and the 4-3 timing valve should be heard and seen to move through the small hole in the servo body.

If the 4-3 valve does not move, shake the valve to the other end of its bore then repeat the check; this valve is not subject to spring pressure, therefore it will not return once it has moved.

Hold a finger on the overrun valve housing then apply air pressure intermittently to the main line duct; movement of the valve should be felt. If doubt exists, exert a slight pressure on the overrun valve retainer, using a metal rod, then repeat the check; movement of the rod should be felt.

Cover the front pump delivery duct then apply air pressure to the other end of the duct. Oscillation of the valve should be felt and will probably be heard.

Front and rear servos — To fit

As stated earlier the front servo cannot be removed without removing the rear servo, therefore, the following paragraphs describe the fitting of both the front and rear servos.

Fit the rear oil pump discharge pipe into its bore in the rear pump, ensuring that it is fully home.

Check that the front pump oil delivery pipe is fully home in its bore in the front pump.

Rotate the front drum band until the slot for the operating rod is in the correct position and the other end of the band is engaged with the adjusting screw.

Engage the band operating rod in the band slot, then manoeuvre the servo unit into position, engaging the front pump delivery pipe and the rear pump discharge pipe in their respective bores. Do not fit the securing setscrews at this stage.

Fit the rear band release spring in the housing in the end of the rear band, using petroleum jelly to hold it temporarily in position.

Engage the short end of the strut in the spring coil then tie the ends of the band together with a piece of wire; this will hold the spring in position during subsequent operations. The wire should be fixed in such a manner that it can be easily removed at a later stage.

Rotate the band until it engages with the adjusting screw.

Hold the servo operating lever against the operating rod, then move the rear servo unit forward to enter the transfer pipe on the front servo unit into its bore, at the same time engage the socket on the operating lever with the end of the operating strut.

Push both servo units to the face on the gearbox casing, then fit the securing setscrews. Tighten the setscrews evenly, ensuring that the front and rear oil pump pipes engage smoothly and easily; the rear servo must be supported during this operation. Torque load the setscrews to the figure given in 'Dimensional Data' at the end of this Section.

Check that the rear band release spring is in the correct position, then remove the locking wire from the ends of the band, ensuring that none of the wire is left in the gearbox.

Adjust the setting of the front and rear bands as follows.

Bands — To set

Setting of **both** bands must be carried out whenever a servo unit has been removed and may also be necessary to rectify faulty gearbox operation.

The procedure is the same whether the gearbox is on the bench or fitted to the car.

Front band — To set

The tools used when setting the front band are spanner RH 131 and gauge UR 3144 — see 'T.S.D. 2331—Workshop Tools'.

The spanner RH 131 is necessary only if the gearbox is fitted to the car. The outer box spanner fits on to the lock-nut while the inner spanner adjusts the band screw.

Unscrew the blanking plug from the front servo body then screw in the setting tool.

Turn the plunger nut by hand until the plunger makes contact with the servo piston.

Turn the drum by hand in the opposite direction to normal rotation to centralize the band.

Using a spanner, screw in the plunger five complete turns.

Check that the knurled washer cannot be rotated; if it is loose, slacken the band adjusting screw until the washer is gripped.

Hold the knurled washer as shown in Figure T51, then tighten the band adjusting screw until the washer **just slips**.

Hold the adjusting screw to prevent it from turning, then tighten the lock-nut.

Check that the tension on the knurled washer has not changed, indicating that the setting has not altered.

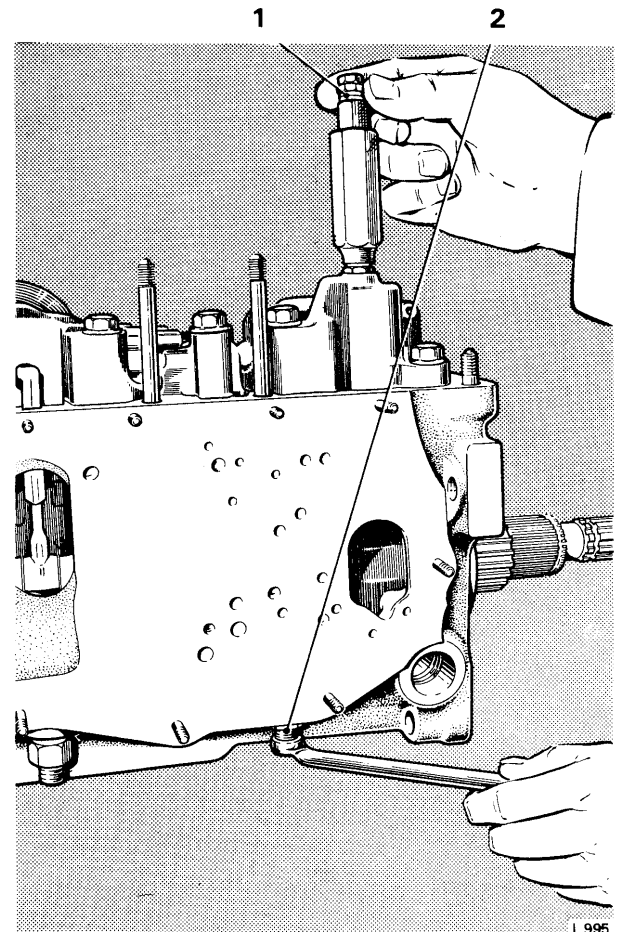


FIG. T51 ADJUSTING THE FRONT BAND

- 1 Band adjusting tool washer
- 2 Band adjusting screw

Slacken the plunger nut at least five turns to relieve the pressure on the screw thread in the servo body.

Unscrew the tool then fit and tighten the blanking plug.

Rear band — To set

The tools required for setting the rear band are spanner RH 131 and gauge RH 7838 — see 'T.S.D.

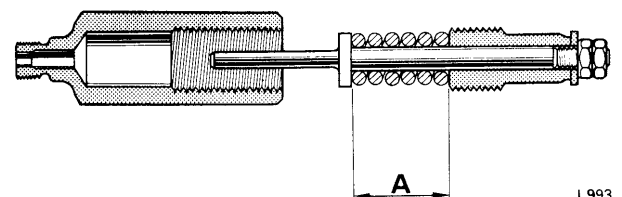


FIG. T52 CHECKING THE FRONT BAND ADJUSTING TOOL

A 1.160 in. \pm 0.003 in (29.46 mm. \pm 0.07 mm)

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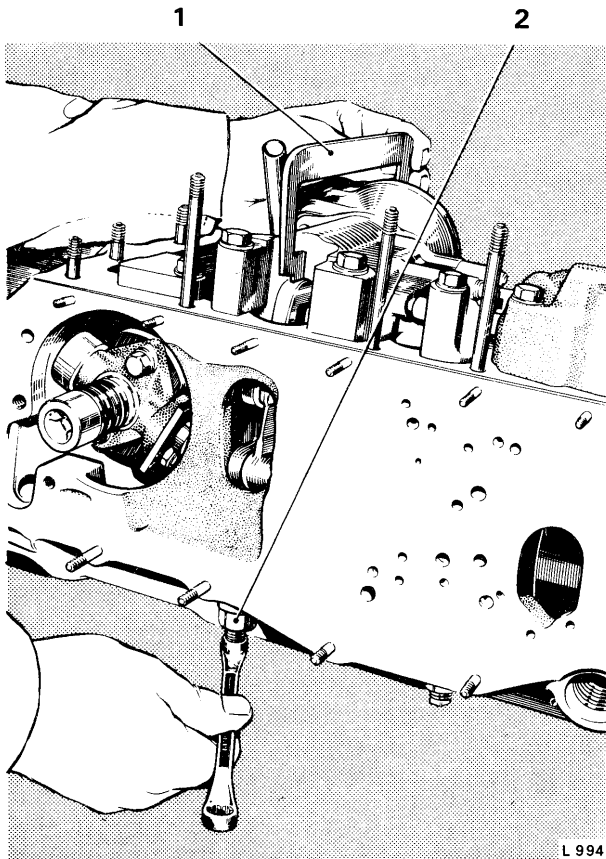


FIG. T53 ADJUSTING THE REAR BAND

- 1 Band adjusting gauge
- 2 Adjusting screw lock-nut

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Check that there is clearance between the end of the operating lever and the rear servo operating rod. If necessary, slacken the band adjusting screw.

Turn the rear drum in the opposite direction to normal rotation to centralize the band. To ensure that the band is properly centralized, hold a screwdriver against the riveted end of the band then shock it into

position on the drum.

Hold the band setting gauge with the cut-away leg firmly against the spring end of the servo, and the other end of the gauge resting on the servo operating rod as shown in Figure T 53.

Screw in the adjusting screw until the face of the operating lever just touches the gauge. Care must be taken not to allow the gauge to be pushed by the operating lever, otherwise an incorrect setting will be obtained.

Should this occur, slacken the adjusting screw then recommence the setting operation, which must always be carried out by adjusting the operating lever so that it moves toward the gauge and not away from it.

Firmly hold the adjusting screw and tighten the lock-nut.

Check that the setting has not altered.

Fit the governor oil delivery pipe.

Fit the filter and sump (see Section T11), then after replenishing the gearbox with oil, carry out a road test as described in Section T3.

Gauge (UR 3144) — To check

Correct setting of the bands, particularly the front band, plays a great part in promoting smooth gear changes. Due to this fact it is recommended that the front band setting gauge be regularly checked for correct adjustment. The tool should be checked approximately every three to six months, depending on how often it is used.

To check the gauge UR 3144, proceed as follows.

Unscrew the plunger assembly from its housing, then check the length of the spring under compression (see Fig. T52); the length of the spring should be 1.160 in. ± 0.003 in. (3.87 mm. ± 0.08 mm.).

If the spring length is incorrect, adjust the nut until the correct length is obtained, then lock together the two nuts and peen over the end of the thread to ensure that they do not work loose.

Screw the plunger assembly back into its housing.

DIMENSIONAL DATA FOR SECTION T14—FRONT SERVO

DESCRIPTION	DIMENSION	PERMISSIBLE WORN DIMENSION	REMARKS
Line exhaust valve return spring —free length.	1.765 in. (approx.) (44.85 mm.) (approx.)	—	—
Load required to reduce spring length to 1.250 in. (31.75 mm.)	2 lb. 9½ oz. to 2 lb. 14½ oz. (1.18 kg. to 1.32 kg.)	—	—
Overrun control valve return spring free length.	2.119 in. (approx.) (53.82 mm.) (approx.)	—	—

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DESCRIPTION	DIMENSION	PERMISSIBLE WORN DIMENSION	REMARKS
Dimensional Data—continued			
Load required to compress spring length to 0.920 in. (23,37 mm.)	6 lb. 14 oz. to 7 lb. 10 oz. (3,12 kg. to 3,46 kg.)	—	—
Check valve spring—free length.	1.437 in. (approx.) (36,51 mm.) (approx.)	—	—
Load required to compress spring length to 0.500 in. (12,70 mm.)	1 lb. 13 oz. to 2 lb. 3 oz. (0,82 kg. to 0,99 kg.)	—	—
Apply piston return spring—free length.	1.515 in. (approx.) (38,50 mm.) (approx.)	—	—
Load required to compress spring length to 0.718 in. (18,26 mm.)	18 lb. to 22 lb. (8,16 kg. to 9,98 kg.)	—	—
Release piston return spring—free length.	0.728 in. (approx.) (18,48 mm.) (approx.)	—	—
Load required to compress spring length to 0.585 in. (14,86 mm.)	54 lb. 3 oz. to 60 lb. 3 oz. (24,57 kg. to 61,04 kg.)	—	—
Release piston ring gap.	0.002 in. to 0.007 in. (0,05 mm. to 0,18 mm.)	0.012 in. (0,30 mm.)	Measure in bore diameter 1.750 in. (44,45 mm.)
Side clearance of release piston ring in piston groove.	0.0005 in. to 0.0025 in. (0,013 mm. to 0,064 mm.)	0.0045 in. (0,115 mm.)	—
Apply piston ring gap.	0.002 in. to 0.014 in. (0,05 mm. to 0,35 mm.) inside diameter of ring.	0.019 in. (0,48 mm.)	—
	0.002 in. to 0.007 in. (0,05 mm. to 0,18 mm.) outside diameter of ring.	0.012 in. (0,30 mm.)	—
Side clearance of apply piston ring in piston groove.	0.0005 in. to 0.0025 in. (0,013 mm. to 0,064 mm.)	0.0045 in. (0,115 mm.)	—
Front servo sleeve fit in servo body.	0.000 in. to 0.001 in. (0,00 mm. to 0,02 mm.) interference.	—	Slackness in bore is not permissible. Renew servo if outside limits.
Line exhaust valve clearance in bore.	0.0007 in. to 0.0015 in. (0,017 mm. to 0,04 mm.)	0.002 in. (0,05 mm.)	} Renew assembly valve body if clearances exceed these limits.
Overrun control valve clearance in bore.	0.0009 in. to 0.0017 in. (0,022 mm. to 0,043 mm.)	0.0022 in. (0,062 mm.)	
4-3 timing valve clearance in bore.	0.0007 in. to 0.00175 in. (0,017 mm. to 0,043 mm.)	0.00225 in. (0,062 mm.)	Renew servo if outside limits.
Setscrews—front servo body to release cylinder.	Torque tighten to between 8 lb.ft. and 10 lb.ft. (1,11 kgm. and 1,38 kgm.)	—	—
Setscrews—front servo to gear-box casing.	Torque tighten to between 29 lb.ft. and 32 lb.ft. (4,0 kgm. and 4,4 kgm.)	—	—
Blanking plug—front servo.	Torque tighten to between 6 lb.ft. and 7 lb.ft. (0,8 kgm. and 0,9 kgm.)	—	Renew aluminium washer whenever plug is refitted.
Setscrews—front servo valve body to servo body.	Torque tighten to between 3 lb.ft. and 4 lb.ft. (0,4 kgm. and 0,5 kgm.)	—	—
Band adjusting screw locknut.	Torque tighten to between 45 lb.ft. and 50 lb.ft. (6,2 kgm. and 6,9 kgm.)	—	—

Section T15

REAR SERVO AND ACCUMULATOR

The rear servo and accumulator (*see Fig. T54*) comprises an assembly of pistons and valves, housed in aluminium alloy castings which are secured to the gearbox bottom face, adjoining the front servo. The rear servo is applied mechanically by a pair of coil springs and released hydraulically by main line oil pressure. A steel strap, bolted to the servo housing, retains the springs.

Operation

The rear servo actuates the rear band which holds the rear clutch drum when the selector lever is in Range 2, and is utilised also to absorb an amount of rear clutch apply oil in Range 3 or 4.

Normally, when driving in Range 3 or 4 a sprag clutch assembly holds the rear drum during first and second gears thus giving the necessary gear reduction as required. When the car is on 'overrun', the rear wheels and propeller shaft attempt to drive the engine but the sprag clutch freewheels and makes this ineffective.

In Range 2 it is desirable to have engine braking, so in order to facilitate this, main line pressure to the rear servo is cut off. The coil springs then apply sufficient pressure to hold the friction band securely around the drum, thus holding it stationary. A small flap valve is fitted to the rear servo, in the hydraulic line. This has the effect of slowing down band application, or conversely speeding up band release.

The rear clutch accumulator (*see Fig. T54*) is a device which assists in the smooth application of the rear clutch under varying throttle conditions in Range 3 and 4. Due to the varying torque loads to which the rear clutch is subjected, some control over the applica-

tion is desirable. For example, with light throttle conditions the rear clutch can be applied with a minimum of pressure, on the other hand, with higher throttle openings, the clutch can be applied with greater oil pressure.

Accumulator pressure is fed to the rear of the accumulator piston. The pressure is controlled by T.V. pressure acting on the primary and secondary valves and springs in the valve body.

When rear clutch apply oil is applied during the 2-3 shift, oil is fed to the clutch piston and to the accumulator. Initially, the clutch piston is forced against the clutch release springs and the accumulator piston remains stationary. During this period the rear clutch apply pressure is lower than the accumulator pressure. When the clutch piston reaches the end of its free travel (clutch plates not yet fully engaged) the rear clutch apply pressure rises until it is the same as the accumulator pressure and the equivalent accumulator spring pressure. This is the pressure required to give a smooth shift at that particular selected throttle opening.

The rear clutch apply pressure which, in attempting to build up above accumulator pressure, forces the accumulator piston back, causing the accumulator oil to exhaust. The rear clutch apply pressure cannot build up until the accumulator piston reaches the end of its travel. In this period the shift will have been completed and until the rear clutch apply pressure builds up to main line pressure it has no effect upon the shift.

Rear servo and accumulator — To remove

The rear servo can be removed independently of the front servo, but as removal necessitates slackening the

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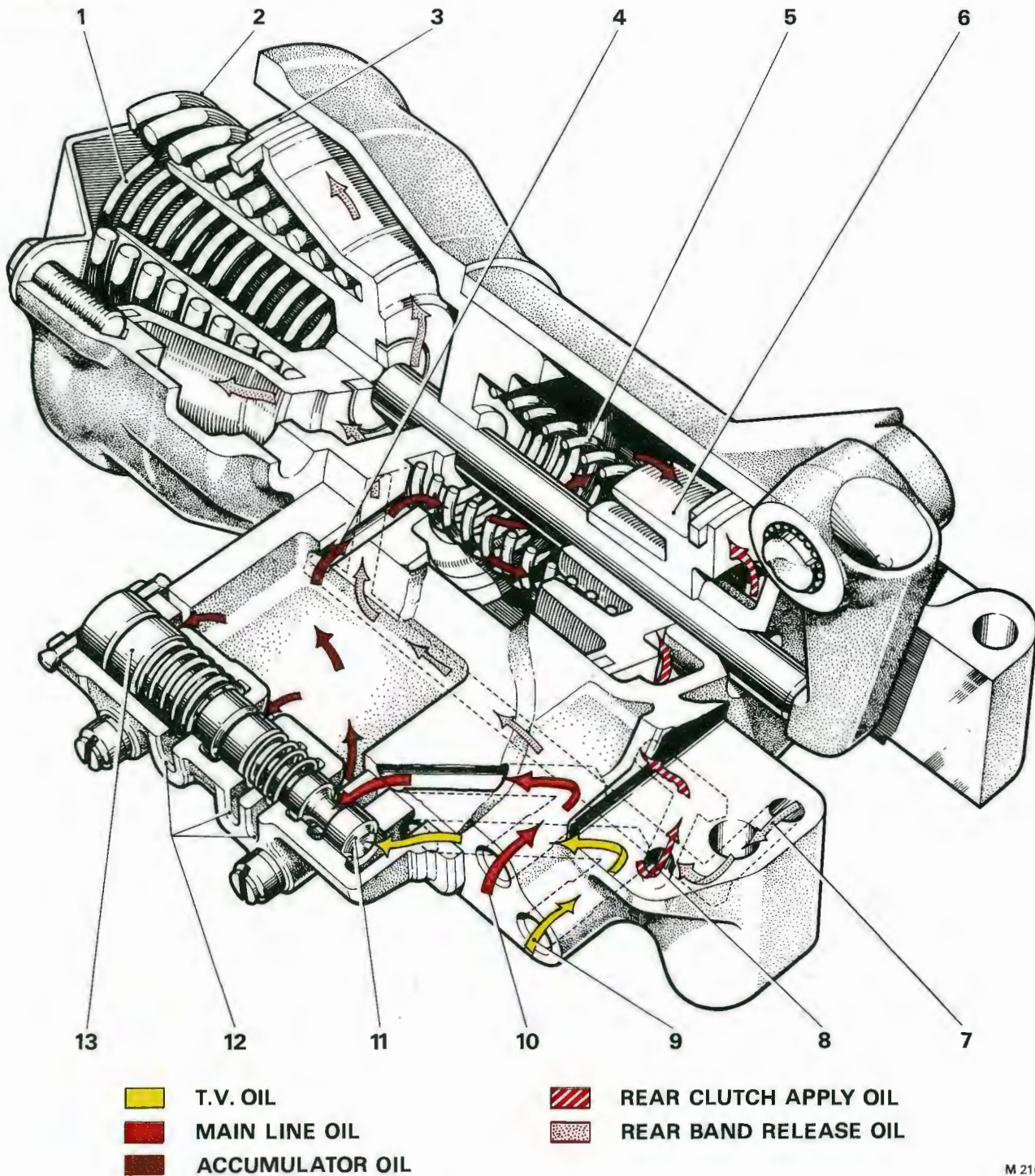


FIG. T54 REAR SERVO AND ACCUMULATOR—OPERATION

- | | | |
|---------------------------|-------------------------------|------------------------|
| 1 Accumulator oil | 5 Accumulator piston spring | 10 Main line oil inlet |
| 2 Rear servo spring | 6 Accumulator piston | 11 Primary valve |
| 3 Rear servo inner spring | 7 Rear band release oil inlet | 12 Exhaust ports |
| 4 Rear servo piston | 8 Rear clutch apply oil inlet | 13 Plug |
| | 9 T.V. oil inlet | |

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front servo securing screws it is advisable to remove both servos together as explained in Section T14—Front servo.

If fault diagnosis has indicated that the rear servo unit may be defective, it should be checked as described under 'Rear servo and accumulator—To test', in order to determine which part is at fault before dismantling and inspecting.

Rear servo and accumulator — To dismantle

Unscrew the four setscrews which secure the valve body to the accumulator body then lift off the valve body. The primary and secondary valves are held in position by a plug which is in turn secured by a crimped-ended pin. It is not necessary to dismantle the valve body.

Dismantling of the servo part of the servo and accumulator assembly is best carried out using special tool RH 7776 to compress and release the inner and outer servo apply springs. **Do not unscrew the two strap retaining setscrews until the springs are held captive by the tool.**

Secure the tool in an upright position in a vice.

Fit the assembled unit on to the base pegs of the tool (see Fig. T55) then screw down the centre screw until it abuts the strap.

Unscrew the strap retaining setscrews then slowly release the centre screw until the two servo springs are no longer under tension.

Remove the strap and springs then lift the assembly off the tool pegs.

If the special tool is not available, the assembly may be positioned upright under a hand press, then the press ram lowered until it just touches the retaining strap.

Note Do not exert any force on the strap, otherwise it may become distorted.

The servo may then be dismantled as previously described.

Push in the band actuating rod until the servo apply piston protrudes from its bore.

Remove the assembly piston and rod.

With the assembly again fitted on to the pegs of the special tool, remove the two setscrews which secure the accumulator body to the servo body; remove the accumulator body from the tool pegs.

Separate the two bodies and discard the gasket.

Note The bodies are a slight interference fit and should be carefully separated using a soft-headed mallet.

Remove the accumulator spring and piston from the accumulator body.

If the operating lever is to be removed, withdraw the split pin, slide out the clevis pin, remove the operating

lever from the lugs then slide out the eighteen needle rollers.

Rear servo and accumulator — To inspect

Thoroughly clean all parts using a clean, filtered cleaning fluid and a brush, then dry off the parts using compressed air.

All oil passages must be washed and blown through with compressed air to ensure that particles of dirt do not remain which may eventually reach the control valve unit.

Do not remove the piston rings except when it is necessary to clean the ring grooves; careless handling of the rings can cause them to distort.

Check the permanent plug for security in the junction body.

Check that the primary and secondary valves are free to move in their bores.

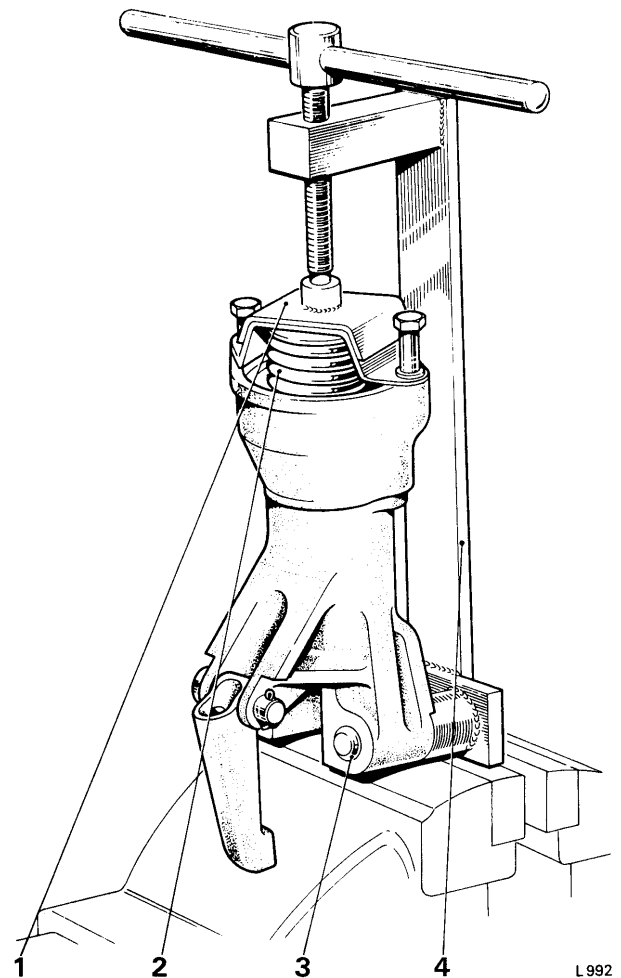


FIG. T55 DISMANTLING THE REAR SERVO

- | | |
|----------------|--------------------|
| 1 Retainer | 3 Tool pin |
| 2 Outer spring | 4 Compressing tool |

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If it is considered necessary to remove the valves and springs, file or saw off the head of the securing pin then withdraw the pin.

Remove the end plug, secondary valve and spring, then the primary valve and spring.

Inspect the valves and valve bores for scoring. Small marks may be removed from the valves with a hard Arkansas stone.

Do not attempt to remove score marks from the valve body bores; if either the valves or body bores are badly scored, a new valve body assembly should be fitted.

Examine all springs for distortion or broken coils.

Examine all tapped holes for damaged threads, particularly the ones which receive the strap securing set-

screws; due consideration should be given to the load imposed on these threads when the servo is acting under oil pressure.

Examine the retaining strap for cracks, particularly at the bends.

Examine the piston rings for wear or breakage, also check for excessive side play in the piston ring grooves (see *Dimensional Data*).

Examine the servo and accumulator body bores for excessive wear or score marks. If either body is considered to be unserviceable, a new servo and accumulator unit assembly should be fitted. Check the fit of the servo body in the accumulator body; if the slight interference fit cannot be maintained a new servo and accumulator unit assembly should be fitted.

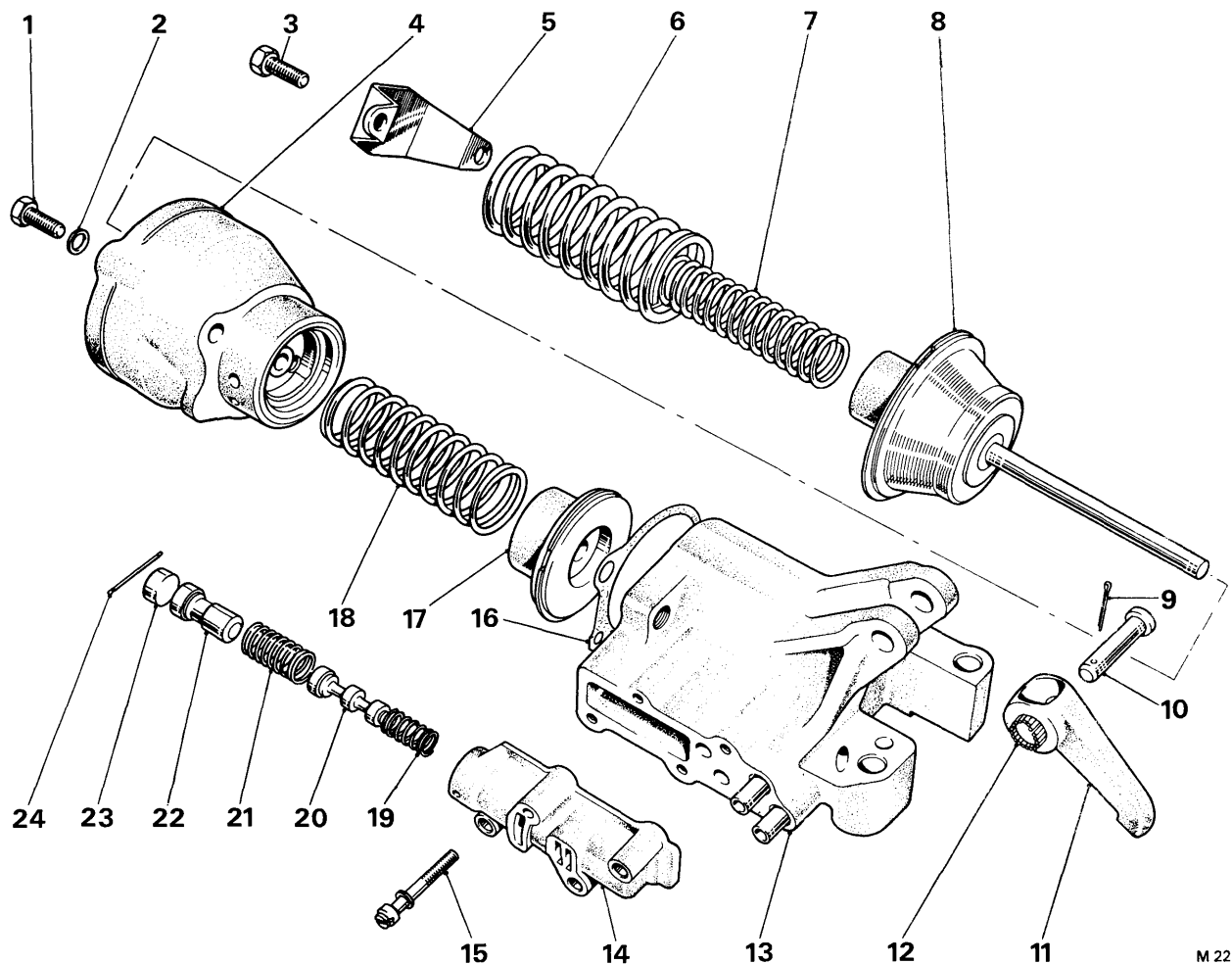


FIG. T56 REAR SERVO AND ACCUMULATOR—EXPLODED

- | | | |
|---------------------------|---------------------------|---------------------------|
| 1 Setscrew | 9 Split pin | 17 Accumulator piston |
| 2 Plain washer | 10 Clevis pin | 18 Accumulator spring |
| 3 Setscrew | 11 Actuating lever | 19 Primary valve spring |
| 4 Rear servo body | 12 Needle roller bearings | 20 Primary valve |
| 5 Spring retainer | 13 Accumulator body | 21 Secondary valve spring |
| 6 Rear servo outer spring | 14 Valve body | 22 Secondary valve |
| 7 Rear servo inner spring | 15 Screw | 23 Plug |
| 8 Rear servo piston | 16 Gasket | 24 Retaining pin |

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Examine the restrictor valve in the bottom of the servo release chamber for security.

Using a surface plate and engineer's blue, examine the mating faces of the accumulator body, valve body and junction body for warping.

Small burrs may be removed, particularly around the setscrew holes. If a component is sufficiently warped to allow excessive oil leaks, it should be renewed.

The clevis pin and the bore of the band operating lever should be examined for excessive wear.

Fit the clevis pin and needle rollers into the bore and check for excessive play. If wear is apparent, renew the parts.

Check the fit of the clevis pin in the lugs on the body.

Rear servo and accumulator — To assemble

Assemble the rear servo and accumulator as follows (see Fig. T56).

Fit the needle rollers into the bore of the operating lever, retaining them in position with petroleum jelly.

Fit the assembly of lever and rollers into the lugs on the body; fit the clevis pin.

Retain the clevis pin with a new split pin.

Lightly oil the accumulator body bore then fit the accumulator piston. Ensure that the piston enters the bore squarely, to avoid damaging the bore with the piston ring; push the piston to the bottom of the bore.

Using the piston rod, align the piston bore with the bore in the accumulator body.

Fit the accumulator piston spring.

Fit a new gasket on to the servo body mating face, ensuring that the gasket is correctly positioned relative to the band release hole.

Fit the servo body to the accumulator body, again positioning the oil hole, then fit the setscrews and the thin plain washers; torque tighten the setscrews (see *Dimensional Data*).

Lightly oil the bore of the servo body and the band actuating rod.

Enter the rod into the bore of the accumulator piston, then, ensuring that the servo release piston ring enters the servo body bore squarely, push the piston and rod assembly into the servo body.

Fit the inner and outer springs.

Fit the assembly onto the base pegs of the special tool.

Fit the strap onto the top of the springs.

Turn the tool centre screw clockwise until the springs are compressed sufficiently to allow the strap retaining setscrews to be fitted. Fit the setscrews and torque tighten them, then remove the assembly from the pegs of the special tool.

Note If the special tool is not available, a press may be used, reversing the procedure adopted when dismantling.

If the primary and secondary valves have been removed, they should be fitted into the valve body together with their return springs. Lightly oil the valves before entering them into the valve body; ensure that they return under spring pressure when pushed from the secondary valve end.

Fit the end plug and a new retaining pin; the end of the pin should be crimped to hold it in position.

Fit the valve body.

Fit the junction body.

Evenly tighten the setscrews then torque load them.

Note Do not use jointing compound between the accumulator body face and the valve housing and junction body faces.

Rear servo and accumulator — To test

The rear servo and accumulator can be tested functionally only by using a special test rig or by fitting the unit to the gearbox and carrying out a road test.

Movement of the pistons and freedom of the valves in their bores can be tested by applying an air pressure of approximately 70 lb/sq. in. (4,9 kg/sq. cm.) to specified oil ducts and observing the movement. However, internal leaks or sluggish valves will not be revealed by these tests.

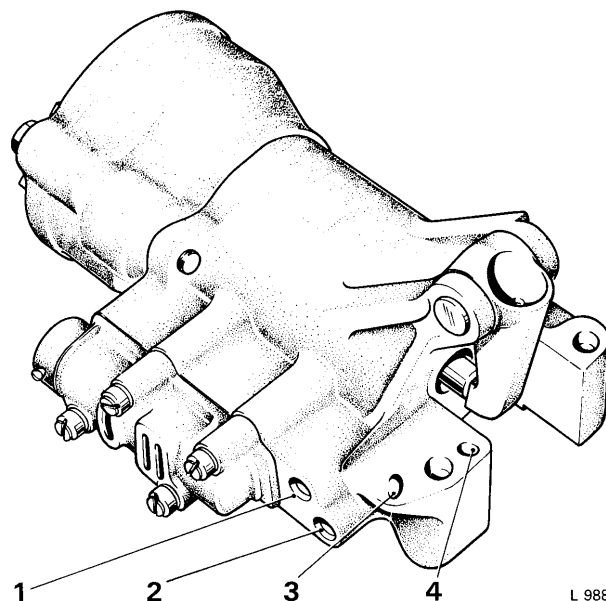


FIG. T57 REAR SERVO AND ACCUMULATOR AIR PRESSURE TEST POINTS

- | | |
|----------------------|------------------------------|
| 1 Main line oil port | 3 Rear clutch apply oil port |
| 2 T.V. oil port | 4 Rear band release oil port |

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Apply air pressure to the band release duct (see Fig. T57); the operating rod should move into the cylinder.

Apply air pressure to the rear clutch apply oil duct; the accumulator piston should be felt to move.

Apply air pressure to the main line oil duct; the primary and secondary valves should be heard to move in the valve body.

Rear servo and accumulator — To fit

If, as suggested under the heading 'Rear servo and

accumulator — To remove', both servos were removed, at this point they should be fitted to the gearbox as described under 'Front and rear servos — To fit' in Section T14.

When the servos have been fitted to the gearbox, set the bands as described in Section T14.

Note If the front servo has been removed from the gearbox, the front band setting must still be checked after the servos have been secured to the gearbox casing.

DIMENSIONAL DATA FOR SECTION T15—REAR SERVO AND ACCUMULATOR

DESCRIPTION	DIMENSION	PERMISSIBLE WORN DIMENSION	REMARKS
Rear servo booster piston ring gap.	0.002 in. to 0.007 in. (0,05 mm. to 0,18 mm.)	—	—
Side clearance of rear servo booster piston ring in piston groove.	0.005 in. to 0.003 in. (0,13 mm. to 0,08 mm.)	0.005 in. (0,13 mm.)	—
Accumulator piston spring—free length.	3.625 in. (96,07 mm.)	—	—
Load required to compress spring length to 2.187 in. (55,56 mm.)	15 lb. (6,8 kg.)	—	—
Accumulator piston ring gap.	0.002 in. to 0.007 in. (0,05 mm. to 0,18 mm.)	—	—
Side clearance of accumulator piston ring in piston groove.	0.0005 in. to 0.0025 in. (0,013 mm. to 0,06 mm.)	0.0045 in. (0,115 mm.)	—
Compensator spring—free length.	3.921 in. (approx.) (99,62 mm.) (approx.)	—	—
Load required to compress spring length to 2.562 in. (65,09 mm.)	40 lb. to 80 lb. (18 kg. to 36 kg.)	—	—
Rear servo spring—free length.	4.343 in. (11,03 cm.)	—	—
Load required to compress spring length to 2.812 in. (71,44 mm.)	116 lb. 11 oz. to 130 lb. 11 oz. (52,9 kg. to 59,3 kg.)	—	—
Lever clevis pin clearance in needle roller bearings.	0.0002 in. to 0.0046 in. (0,005 mm. to 0,117 mm.)	0.006 in. (0,15 mm.)	—
Primary valve spring—free length	0.781 in. (19,84 mm.)	—	—
Load required to reduce spring length to 0.383 in. (9,73 mm.)	1 lb. 10½ oz. to 1 lb. 13½ oz. (0,75 kg. to 0,84 kg.)	—	—
Primary valve clearance in valve body.	0.0010 in. to 0.0018 in. (0,025 mm. to 0,045 mm.)	0.002 in. (0,05 mm.)	Renew assembly valve body if outside limit.
Secondary valve spring—free length.	1.086 in. (27,58 mm.)	—	—
Load required to reduce spring length to 0.620 in. (15,75 mm.)	6 lb. 1½ oz. to 6 lb. 11½ oz. (2,76 kg. to 3,05 kg.)	—	—
Secondary valve clearance in valve body.	0.0010 in. to 0.0018 in. (0,025 mm. to 0,045 mm.)	0.002 in. (0,05 mm.)	Renew assembly valve body if outside limit.

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DESCRIPTION	DIMENSION	PERMISSIBLE WORN DIMENSION	REMARKS
<i>Dimensional Data—continued</i>			
Setscrews — accumulator body to rear servo body.	Torque tighten to between 16 lb.ft. and 18 lb.ft. (2,21 kgm. and 2,49 kgm.)	—	—
Setscrews — retainer to accumulator body.	Torque tighten to between 16 lb.ft. and 18 lb.ft. (2,21 kgm. and 2,49 kgm.)	—	—
Setscrews — valve body to rear servo body.	Torque tighten to between 3 lb.ft. and 4 lb.ft. (0,41 kgm. and 0,55 kgm.)	—	—
Setscrews — rear servo to gearbox case.	Torque tighten to between 29 lb.ft. and 32 lb.ft. (4,01 kgm. and 4,42 kgm.)	—	—
Setscrews — junction body to gearbox case.	Torque tighten to between 29 lb.ft. and 32 lb.ft. (4,01 kgm. and 4,42 kgm.)	—	—

Section T16

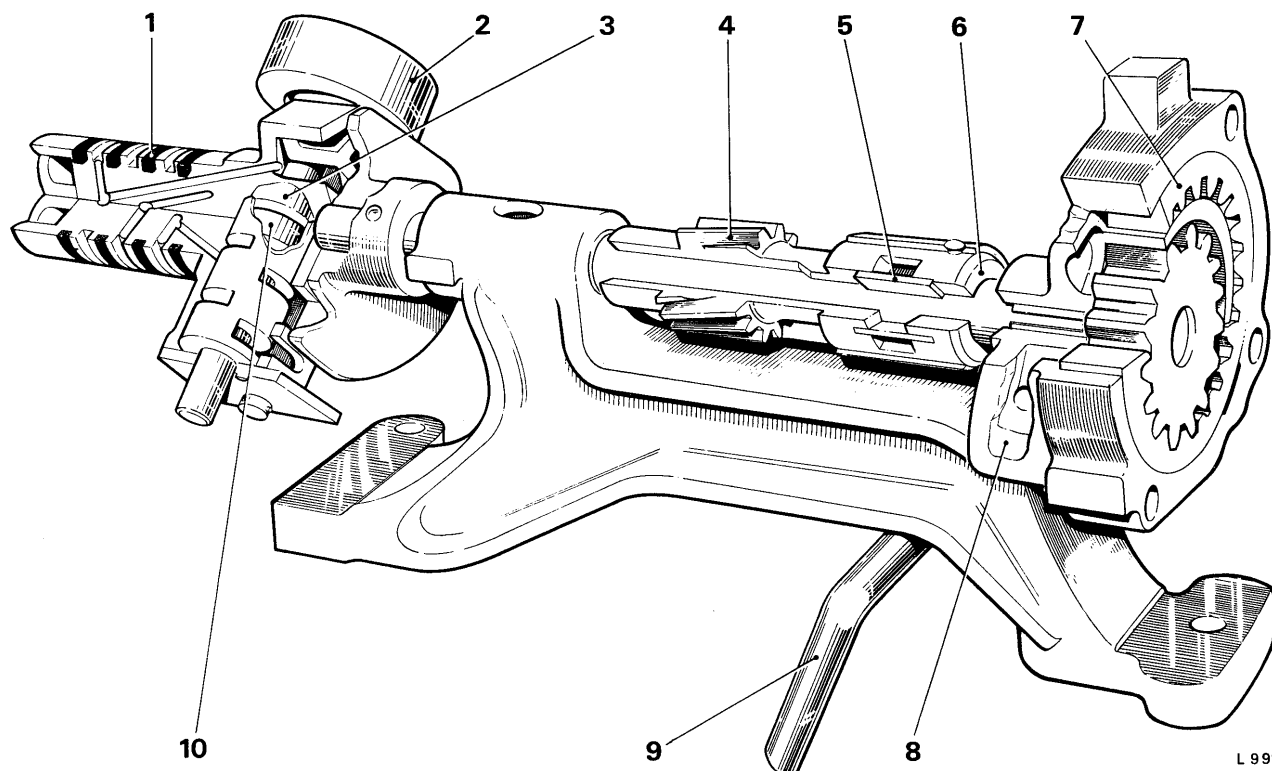
REAR OIL PUMP AND GOVERNOR

Rear pump

The rear pump (see Fig. T58); is a displacement gear type of pump, mounted on the lower face of the gearbox casing and driven by the transmission. The pump driving gear is mounted on a flexibly driven shaft and meshes with a larger annulus gear which itself rotates

in the pump casing. The pump inlet and outlet ports are separated by a crescent shaped projection of the pump casing which also forms a seal between the periphery of both gears. A flat plate secured by four setscrews seals the chamber.

The governor is mounted on a flange which is secured to an extension of the pump driving shaft.



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FIG. T58 REAR PUMP AND GOVERNOR

- | | | | | | |
|---|------------------------|---|--------------|----|---------------|
| 1 | Piston ring type seals | 4 | Driven gear | 8 | Delivery port |
| 2 | G1 Weight | 5 | Driven vane | 9 | Intake pipe |
| 3 | G1 Valve | 6 | Driving dog | 10 | G2 Valve |
| | | 7 | Annulus gear | | |

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Operation — Rear pump

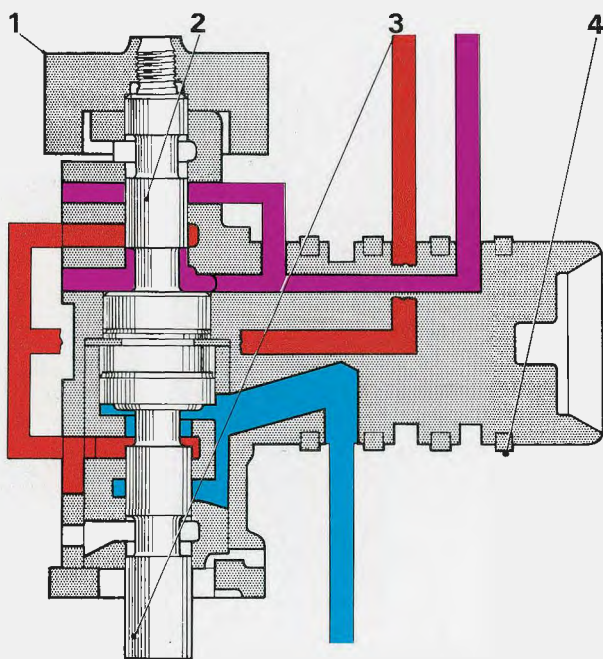
Oil is drawn through an inlet pipe which projects into the sump filter. Upon entering the inlet side of the pump, the oil is carried in sealed pockets between the gear teeth then discharged through the outlet port from where it flows, via a pipe, to the front servo.

Governor

The governor (see Fig. T58); comprises a small iron casting bolted to a flange which in turn is pinned to the oil pump drive-shaft. The casting houses two steel valves, the G1 valve and the G2 valve. The G2 valve works in a sleeve which is retained in the casting by a plate and two setscrews; the G1 valve operates directly in its bore in the casting and has a weight secured to its outer end.

Operation — Governor

Oil is fed to the casting through a stationary sleeve which is a close fit around three annular grooves, these are sealed from each other by four hooked ring seals.



- MAIN LINE PRESSURE
- GOVERNOR PRESSURE 1
- GOVERNOR PRESSURE 2

FIG. T59 GOVERNOR OPERATION

- | | |
|-------------|--------------------|
| 1 G1 Weight | 3 G2 Valve |
| 2 G1 Valve | 4 Oil sealing ring |

From the annular grooves the oil flows through drillings to ports which are controlled by the two valves, (see Fig. T59).

The valves are balanced by metered oil pressure which tends to hold them in, and centrifugal force which tries to move them out. Each valve attains equilibrium when the centrifugal force equals the opposing oil pressure, and as one governor weight is heavier than the other, the governor delivers two pressures, both of which are functions of road speed. Oil at these pressures, termed G1 pressure and G2 pressure, flows through drillings in the sleeve to pipes leading to the control valve unit. G1 pressure builds up quicker than G2 pressure because the G1 governor valve and weight is heavier than the G2 valve.

Rear pump and governor removal

When removing the rear pump and governor, it is unnecessary to remove the gearbox from the car. Drain the oil from the gearbox as described in Section T2—'Servicing' then remove the following units.

- Sump and side cover (see Section T11).
- Control valve unit and parking brake bracket (see Section T12).
- Front servo unit (see Section T14).
- Rear servo and accumulator (see Section T15).

If only the governor is to be removed, it is not necessary to remove the servo units.

Governor — To remove

Scribe correlation marks on the edge of the governor drive flange and the governor body to ensure correct assembly, then unscrew the two retaining setscrews and separate the governor assembly from its driving flange.

If the gearbox has been removed from the car, hold the output flange to prevent the governor from turning whilst the two setscrews are removed.

Rear pump and governor — To remove

Withdraw the pump-to-front servo oil pipe. Rotate the output shaft until the large governor weight faces toward the front of the gearbox. Unscrew the two retaining setscrews then withdraw the pump and governor assembly from the gearbox as shown in Figure T60.

Rear pump and governor — To dismantle

Dismantling of the rear pump, and governor is limited to the procedure described in the following paragraphs. If wear or damage should necessitate the renewal of a part not covered by these dismantling instructions, either the pump or governor must be renewed as a unit.

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When renewing a pump, the bronze driving gear on the output shaft must be examined for wear; if wear is considered excessive or the gears are noisy on a subsequent road test, renew the gear (*see Section T20—Reverse assembly*).

Governor — To dismantle

The only parts which can be removed from the governor assembly are the oil sealing rings, the G2 valve and sleeve and the hardened steel washer which is situated at the bottom of the G2 valve sleeve bore.

The G2 valve can be drawn from its sleeve after removing the retaining plate as shown in Figure T61, but the oil sealing rings need not be removed unless they are worn or damaged.

If the G2 valve is unserviceable, a new G2 valve and sleeve assembly may be fitted, but if a G1 valve is unserviceable a new governor assembly must be fitted as the G1 weight should not be removed.

Rear pump — To dismantle

Unscrew the four setscrews which retain the cover.
Lift off the cover then remove the annulus gear.

Rear pump and governor — To inspect

Thoroughly clean all the components, flush out the oilways with clean paraffin and blow through them with compressed air. Examine all parts for cracks, burrs and other damage.

Governor — To inspect

Check the mating faces of the governor and driving flange with engineer's blue; if either face is distorted, renew the complete assembly as the surfaces must not be scraped or lapped.

Wear of the governor tower is unlikely, but if signs of rubbing are evident, it should be inspected in conjunction with the bore of the parking brake bracket. Wear of this nature is usually caused by the tower running eccentrically. Details of the run-out check and methods of rectification are given under 'Governor — To fit'.

Check the oil sealing rings for freedom or excessive clearance in their grooves.

Ensure that the G1 and G2 valves operate freely; they should be heard to move as the governor assembly is gently shaken from side to side.

Rear pump — To inspect

Check the governor driving flange pin and the flexible drive retaining pin for security.

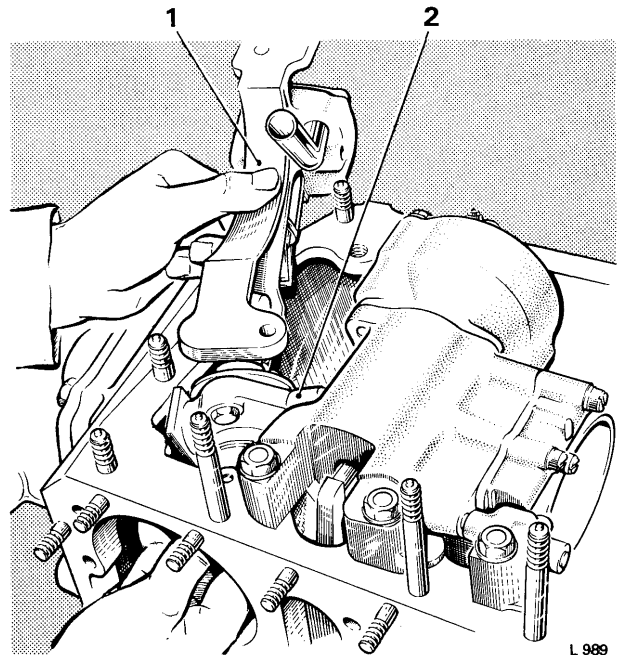


FIG. T60 REMOVING THE REAR PUMP AND GOVERNOR

- 1 Rear pump and governor assembly
- 2 G1 Weight

Failure of the flexible drive is most unlikely, therefore the considerable amount of axial movement and the small radial movement between the steel driven gear and the flexible drive can be considered normal.

Check the mating faces of the pump cover and body

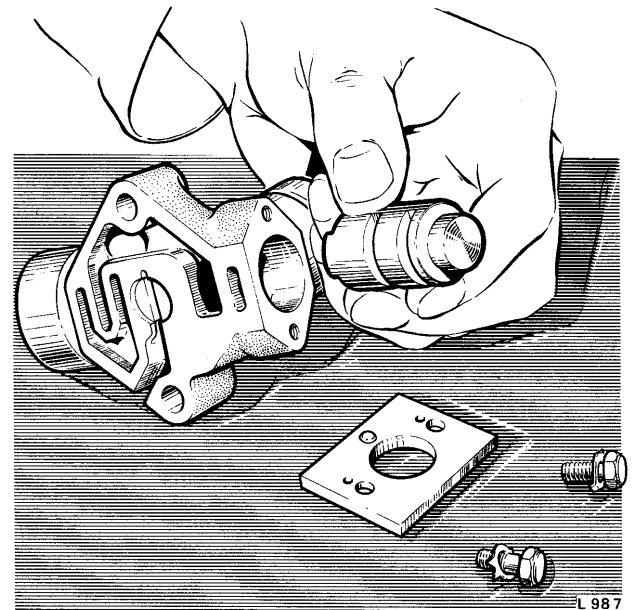


FIG. T61 REMOVING THE G2 VALVE AND SLEEVE

Chapter T

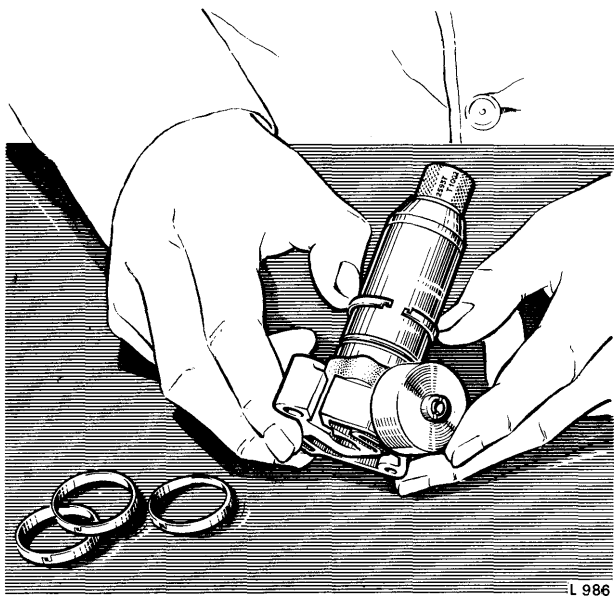


FIG. T62 FITTING THE GOVERNOR OIL SEALING RINGS

with engineer's blue. Small burrs may be removed but the joint faces must not be scraped or lapped otherwise the machining marks, which help to make an oil

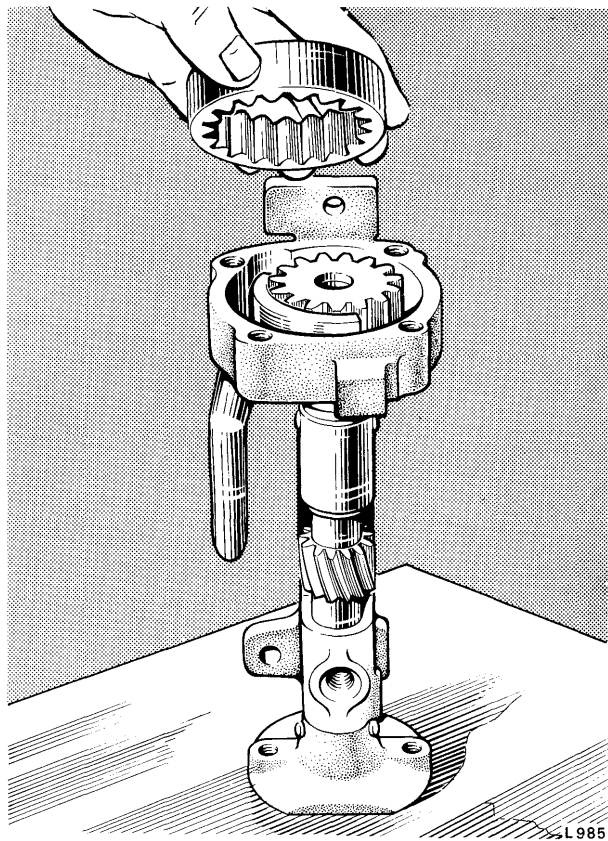


FIG. T63 FITTING THE OIL PUMP ANNULAR GEAR

tight joint, may easily be eliminated.

Examine the annulus gear pocket and pump cover for wear. If the scoring in the pocket is severe and likely to affect the pump performance, renew the pump. If the oil pressure is found to be low during fault diagnosis tests, this should be used as a guide when assessing score damage.

Inspect the gears for worn or damaged teeth and check the oil inlet pipe for security in the pump body.

Check the inside face of the crescent shaped segment for signs of fouling by the inner gear teeth. If scoring is heavy this is an indication of excessive wear in the drive-shaft bushes; in each case the pump should be renewed.

Rear pump and governor — To assemble

Lubricate all working parts with clean gearbox oil prior to assembly.

The importance of cleanliness is emphasized, but cloth should not be used for cleaning purposes owing to the danger of fluff entering the control system and fouling the valves.

When assembling the rear oil pump and governor, attention should be given to the torque tightening figures and fits and clearances given in 'Dimensional Data' at the end of this Section.

Governor — To assemble

Fit the oil sealing rings to the governor tower using the special tool (Part No. 25937/T1002-5) as shown in Figure T62.

Interlock the ends of the rings.

Fit the steel washer into the governor body, then the G2 valve and sleeve. Ensure that the small recess in the sleeve aligns with the slightly larger recess in the governor body.

Fit the retaining plate, ensuring that the dowel in the plate lines up with the two recesses previously described. Fit the two setscrews with new tab washers.

Torque tighten the screws then lock them with the tab washers.

Rear pump — To assemble

Fit the annular gear to the pump body, noting that the chamfered edge of the gear is to be fitted toward the bottom of the annulus gear pocket (see Fig. T63).

Fit the pump cover and four setscrews; torque tighten the screws.

Check that the drive-shaft end float is within the limits given in 'Dimensional Data'.

The pump should be free to rotate smoothly and easily.

If rig testing facilities are available, the pump should

be checked for flow and pressure (see *Dimensional Data*).

Before fitting the governor to the pump flange, the flange face must be checked for swash, using a dial test indicator. Rotate the pump shaft several times and check that the amount of swash, if any, is within the limits given in 'Dimensional Data'. If it is outside these limits, renew the pump.

Governor — To fit

Mount the governor onto the driving flange and if neither of the units have been renewed, ensure that the correlation marks coincide; if a new unit is being fitted, it should be marked after the run-out check described in the following paragraphs. Fit the two setscrews and washers; torque tighten the setscrews.

Using a dial test indicator as shown in Figure T64, check the run-out of the governor tower as follows.

With the stem of the indicator contacting the tower approximately $\frac{1}{4}$ in. (6 mm.) from its outer end, rotate the shaft several times. If the total run-out exceeds the limits given in 'Dimensional Data', remove the governor from the drive flange, turn it through 180 degrees and fit, then again check the run-out. If the run-out is still excessive, fit a new governor. If this does not bring the run-out within the limits, the rear pump and the governor must be renewed.

After satisfactorily completing the check, again scribe the correlation marks on the governor and pump flange.

Fit the remainder of the units by reversing the procedure given for their removal (see *Sections T11, T12 and T14*).

Rear pump and governor — To fit

When both the rear pump and governor have been removed from the gearbox, the assembling and checking procedure is similar to that given under 'Governor — To fit'. It is, however, easier to check for swash and run-out before installing the combined assembly into the gearbox; in such a case the dial test indicator should be mounted onto the pump body (see *Fig. T65*).

After completing the check, ensure that the mating surfaces of the gearbox and oil pump are free from burrs, especially around the setscrew holes, then, with the G1 weight facing the front of the gearbox, fit the assembly, at the same time slightly rotating the governor to mesh the gears.

Fit the two retaining setscrews and flat washers; torque tighten the screws.

Fit the remainder of the units reversing the pro-

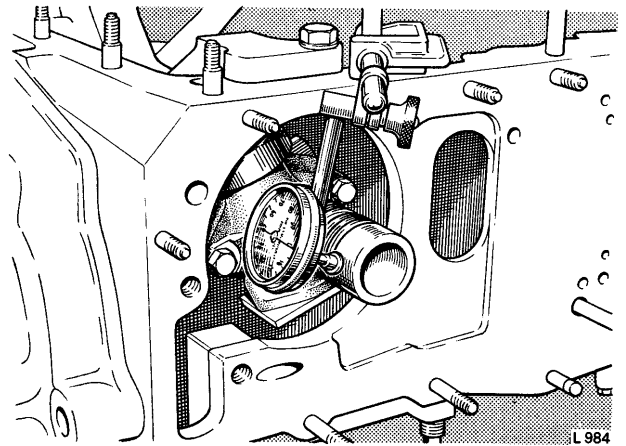
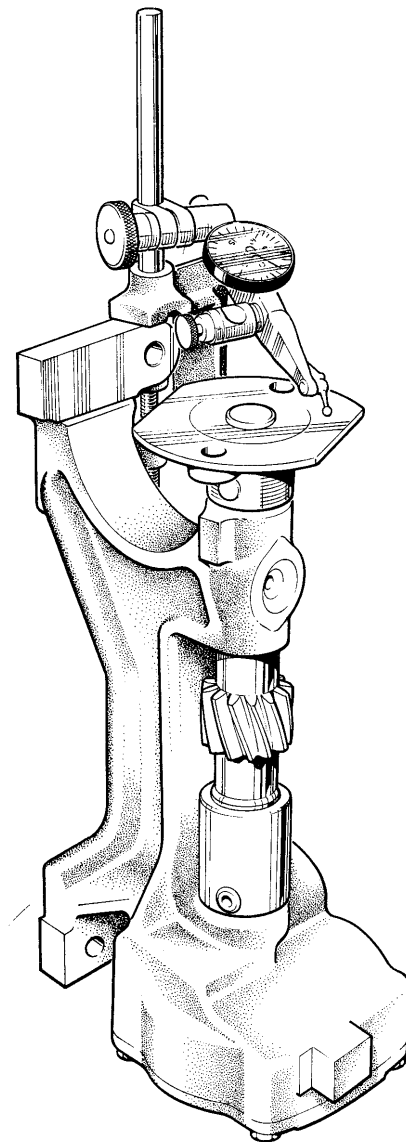


FIG. T64 CHECKING GOVERNOR TOWER RUN-OUT



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FIG. T65 CHECKING THE PUMP FLANGE FOR SWASH

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cedure given for their removal (see Sections T11, T12, T14 and T15).

Serviceability check

After overhaul or fault rectification, replenish the

gearbox with oil then carry out a road test. Pay particular attention to that part of the test which led to the diagnosis of the original fault. Details of the tests are given in Section T2—'Servicing'.

DIMENSIONAL DATA FOR SECTION T16—REAR PUMP AND GOVERNOR

DESCRIPTION	DIMENSION	PERMISSIBLE WORN DIMENSION	REMARKS
Oil sealing rings side clearance in governor tower grooves.	0-0005 in. to 0-0016 in. (0,013 mm. to 0,040 mm.)	0-003 in. (0,08 mm.)	—
Rings closed gap (butt clearance).	0-005 in. to 0-025 in. (0,13 mm. to 0,64 mm.)	0-020 in. (0,51 mm.)	Check in 1-1875 in. (30,16 mm.) diameter minimum bore.
Governor tower run-out.	0-005 in. maximum (0,13 mm. maximum).	—	—
Governor drive flange swash.	0-001 in. maximum (0,025 mm. maximum).	—	Renew pump if outside limit.
Pump drive — shaft end float.	0-0005 in. to 0-0025 in. (0,013 mm. to 0,064 mm.)	0-0045 in. (0,115 mm.)	—
Oil pump gear backlash.	0-004 in. to 0-008 in. (0,10 mm. to 0,20 mm.)	0-012 in. (0,30 mm.)	—
Setscrews — rear pump to gearbox casing.	Torque tighten to between 16 lb.ft. and 18 lb.ft. (2,21 kgm. and 2,49 kgm.)	—	—
Setscrews — rear pump cover to rear pump body.	Torque tighten to between 8 lb.ft. and 10 lb.ft. (1,11 kgm. and 1,38 kgm.)	—	—
Setscrews — governor body to pump drive flange.	Torque tighten to between 8 lb.ft. and 10 lb.ft. (1,11 kgm. and 1,38 kgm.)	—	—
Setscrews — G2 valve retaining plate to governor body.	Torque tighten to between 3 lb.ft. and 4 lb.ft. (0,41 kgm. and 0,55 kgm.)	—	—
Backlash — rear pump driven gear and bronze driving gear.	0-011 in. to 0-015 in. (0,28 mm. to 0,38 mm.)	0-019 in. (0,48 mm.)	—

REAR OIL PUMP RIG TEST PERFORMANCE

PUMP R.P.M.	LINE PRESSURE	LINE FLOW
600	60 lb/sq. in. (4,22 kg/sq.cm.)	½ gallon (2,273 litres) in 70 seconds (minimum)
Use WA —389 oil at 93° C. (199° F.)		

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Section T17

PRESSURE CONTROL VALVE

The pressure control valve comprises an assembly of valve and springs and is located at the front end of the gearbox, adjacent to the front pump.

The valve itself fits into a bore in the front pump body and is attached to the end coil of a return spring. A projection on the hexagon headed plug locates the other end of the spring (*see Fig. T66*).

Operation

The pressure control valve controls the oil delivery from the front pump, according to the demands of the hydraulic system. Pressurized oil is directed, via the control valve, to the outer surface of the front pump slide, thus moving it to the required delivery position.

The controlling forces in the pressure control valve are the pump output (main) pressure and the throttle pressure. Main oil pressure, acting on the spring-loaded valve, tends to reduce pump delivery, whilst throttle valve (T.V.) pressure acting on the T.V. oil regulator plug assists the spring in opposing main pressure and increases pump delivery. T.V. pressure thus causes the pump output to increase with increased throttle opening.

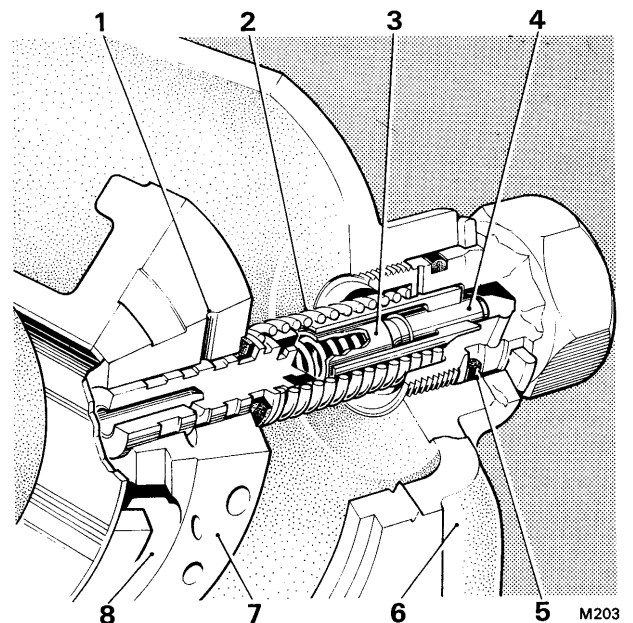
When Reverse is selected, additional oil pressure is required to hold the reverse cone clutch in the engaged position. This pressure is directed to act on the reverse booster plug (*see Fig. T66*) and as this pressure is greater than T.V. pressure, pump delivery is boosted to a pressure sufficient to hold the reverse clutch firmly in engagement.

Pressure control valve — To remove

The pressure control valve can be removed with the gearbox fitted to the car and without disturbing any other parts.

To ensure that the inner parts do not fall out during removal, proceed as follows.

Unscrew the blanking plug, taking care to retain it



**FIG. T66 PRESSURE CONTROL VALVE
IN POSITION**

- | | |
|-----------------------------|---------------------|
| 1 Oil passage to pump slide | 5 Sealing ring |
| 2 Pressure regulator spring | 6 Gearbox casing |
| 3 Reverse booster plug | 7 Pump casing |
| 4 T.V. or regulator plug | 8 Oil delivery duct |

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against the force of the pressure regulator spring. Before lifting out the blanking plug place a finger on the regulator spring and lift out the complete unit.

Separate the spring and valve from the plug; the damper spring, reverse booster plug and T.V. regulator plug can then be shaken from their bores.

Pressure control valve — To inspect

Thoroughly clean all metal parts using a cleaning fluid such as Trichlorethylene.

Examine the condition of the inner and outer rubber cushions and, if they show any signs of deterioration or damage, they should be renewed. Lubricate the new rubber cushions with clean gearbox oil before fitting

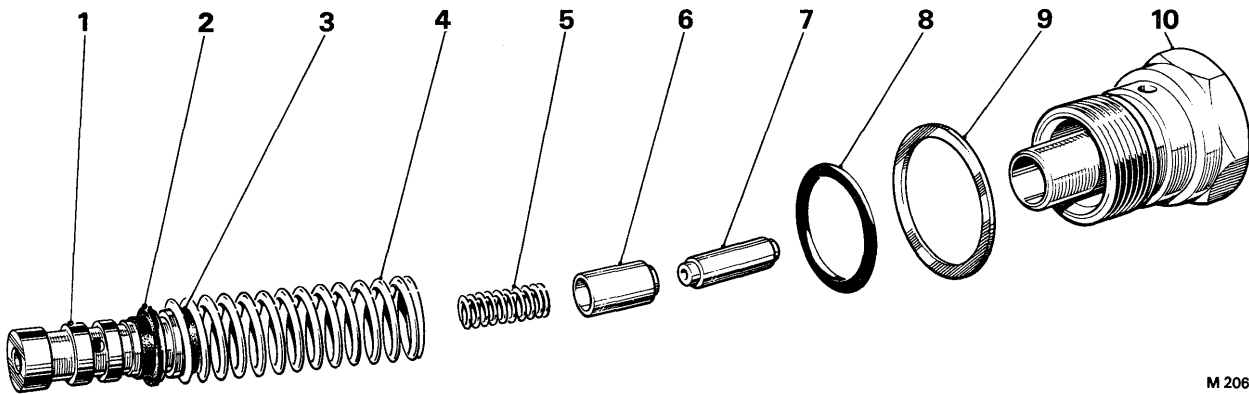
them.

Remove the 'O' ring and joint washer from the blanking plug, then examine the threads for signs of damage; also examine for damage the threads in the aluminium gearbox casing. Screw the blanking plug into the casing to ensure that the plug enters smoothly and easily; remove the plug.

Pressure control valve — To fit

Fit a new 'O' ring and joint washer, then assemble the unit (*see Fig. T67*) using petroleum jelly to retain the plugs and damper spring in position whilst the unit is fitted to the gearbox.

Tighten the plug to the correct torque loading.



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FIG. T67 PRESSURE CONTROL VALVE

- 1 Regulator valve
- 2 Inner cushion
- 3 Outer cushion
- 4 Pressure regulator spring
- 5 Damper spring
- 6 Reverse booster plug
- 7 T.V. regulator plug
- 8 Sealing ring
- 9 Joint washer
- 10 Blanking plug

DIMENSIONAL DATA FOR SECTION T17— PRESSURE CONTROL VALVE

DESCRIPTION	DIMENSION	PERMISSIBLE WORN DIMENSION	REMARKS
Return spring— free length.	2.235 in. (approx). (56,8 mm.) (approx.)	—	—
Load required to compress spring length to 1.328 in. (33,73 mm.)	14 lb. 4 oz. to 14 lb. 12 oz. (6,5 kg. to 6,7 kg.)	14 lb. (6,4 kg.)	—
Damper spring— free length.	0.771 in. (19,57 mm.)	—	—
Load required to compress spring length to 0.609 in. (16,47 mm.)	21 lb. 9 oz. to 24 lb. 7 oz. (9,7 kg. to 11,1 kg.)	21 lb. (9,5 kg.)	—
Blanking plug.	Torque tighten to between 45 lb.ft. and 50 lb.ft. (6,2 kgm. and 6,9 kgm.)	—	—

Section T18

FRONT PUMP AND DRIVE-SHAFT

The gearbox front pump (see Fig. T68) is a variable capacity, engine driven unit which is secured to the front face of the gearbox. A cast iron cover contains a steel slide, a rotor and seven vanes. The vanes are positioned in slots in the rotor, the outer edges running against the inside of the slide and the inner edges against two vane rings. A bronze bush in the cover accepts the neck of the torus cover, and a lip-type seal, pressed into the cover in front of the bush, prevents the escape of oil between the pump and the torus cover. Another iron casting forms the pump body. This body bolts onto the cover and contains a bush which supports the pump drive-shaft; the body also houses the pump relief valve.

Operation

When the engine starts, the pump rotor is caused to rotate and to lift filtered oil from the gearbox sump. The slide can move from a position of maximum tion, to an eccentric position diametrically opposite to the maximum stroke position. This varies the oil displacement space between the rotor and the slide and causes the oil which is carried round between the vanes to be forced out at the position of minimum clearance (see Fig. T69). A position of maximum eccentricity will enable the pump to supply maximum delivery; opposite

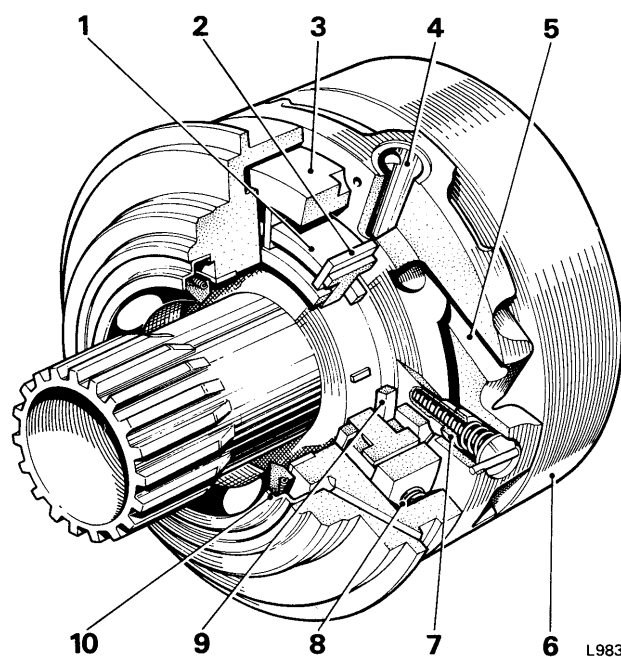


FIG. T68 FRONT PUMP AND DRIVE-SHAFT

- | | |
|-------------------------------|--------------------------------------|
| 1 Rotor | 6 Drive-shaft and front annulus gear |
| 2 Vane | 7 Relief valve |
| 3 Slide | 8 Priming springs |
| 4 Pressure control valve port | 9 Vane rings |
| 5 Outlet | 10 Oil seal |

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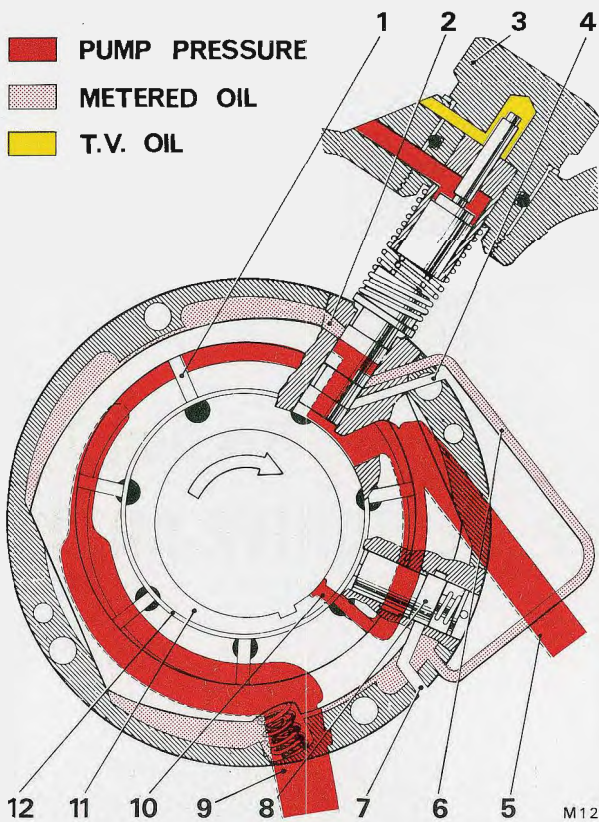


FIG. T69 OIL FLOW DIAGRAM—FRONT PUMP

- | | |
|-------------------------------|---------------------|
| 1 Vane | 7 Exhaust |
| 2 Decreased delivery | 8 Relief valve |
| 3 Pressure control valve | 9 Inlet |
| 4 Exhaust | 10 Feed to coupling |
| 5 Pressure oil to front servo | 11 Rotor |
| 6 Increased delivery | 12 Vane ring |

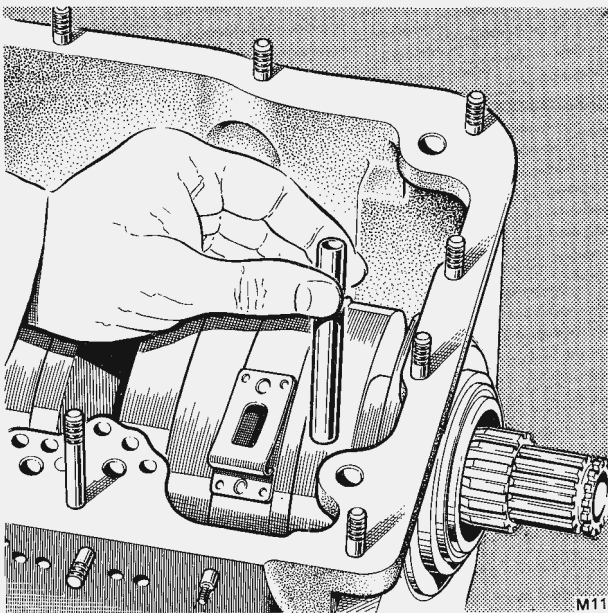


FIG. T70 WITHDRAWING THE PUMP FEED PIPE

eccentricity will enable the pump to return excess oil from the rear pump to the sump. This arrangement enables the front pump to control delivery from both pumps.

A concentric pair of coil springs hold the slide in the maximum delivery position in order to prime the pump rapidly when starting.

The slide position and therefore pump delivery is varied to maintain the required output in accordance with the demands of the gearbox hydraulic system. A pressure control valve (see Section T17) is positioned by pump output pressure to vary oil flow through a port permitting oil pressure to act on the outside of the slide in opposition to the oil pressure on the inside.

Although the front pump absorbs excessive oil from the rear pump, a relief valve is fitted in the front pump body to limit the maximum pressure in the system.

Oil under pressure is delivered by the pump to the front servo unit. At this point it is joined by the supply from the rear pump. Rear pump oil passes through a non-return valve which prevents the front pump from discharging into the rear pump. A small oil bleed is allowed to by-pass the relief valve in order to supply oil to the rear pump when the car is stationary or moving in reverse gear.

Front pump — To remove

To remove the front pump and drive-shaft, it is necessary to remove the gearbox from the car, then remove the following units.

- Fluid coupling (see Section T10).
- Side cover, sump and filter (see Section T11).
- Front servo (see Section T14).
- Rear servo and accumulator (see Section T15).
- Pressure control valve (see Section T17).

If necessary, the front pump may be removed from the gearbox without disturbing the drive-shaft, but, if the gearbox is to be overhauled it is easier to remove the drive-shaft at this stage.

Withdraw the pump-to-front servo oil feed pipe (see Fig. T70), then withdraw the filter-to-pump pipe.

Using snap ring pliers (see T.S.D. 2331—Workshop Tools) remove the snap ring from the intermediate shaft as shown in Figure T71. Remove the steel backing washer and bronze thrust washer; these washers should be kept together and labelled for easy identification on assembly.

Remove the two setscrews which secure the front pump to the gearbox casing then using the snap ring pliers, extract the pump locating washer from its counterbore (see Fig. T72).

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Taking care not to damage the drive-shaft bushes on the intermediate shaft splines, withdraw the pump, together with the drive-shaft, from the gearbox (see Fig. T73). It may be necessary to tap the rear face of the pump to free it initially, in which case a soft drift should be used; discard the pump-to-gearbox 'O' ring seal.

Remove the bronze thrust washer from the intermediate shaft and attach a label to the washer for identification.

The front pump should be dismantled only if it is faulty or requires cleaning. If rig testing facilities are not available, it is recommended that a replacement pump be fitted rather than to attempt rectification.

Front pump — To dismantle

Separate the pump from the drive-shaft by sliding one from the other.

Remove the four setscrews and washers which secure the halves of the pump together, then lift off the pump body (see Fig. T74). If the halves of the pump are held tight by the two dowels, tap the pump cover with a soft-headed mallet. Ensure that the cover is lowermost (i.e. oil seal at the bottom) otherwise the pump internal parts will fall out and may be damaged.

Before lifting out any of the parts, mark the exposed face of the rotor to ensure that it is fitted with the same side up during assembly. Do not use a scribe or punch for marking; an indelible pencil is recommended.

Remove the top inner vane ring, the rotor, the seven vanes and the bottom inner vane ring, then lift out the slide after pushing it toward the priming springs as shown in Figure T75.

Remove the priming springs.

Remove the relief valve from the pump body as follows.

Depress the spring guide then withdraw the retaining pin.

Relax the pressure on the spring guide, then remove the guide and springs; remove the valve (see Fig. T76).

Remove and discard the 'O' ring from the bore of the oil intake pipe in the pump body.

The lip-type seal in the pump cover should not be removed unless it is to be renewed, in which case it should be carefully knocked out with a hammer and chisel; take care not to damage the bore in the pump cover.

Front pump — To inspect

Wash all the parts in clean paraffin, ensuring that all the oil passages and bleed holes are clear, then blow them through with compressed air.

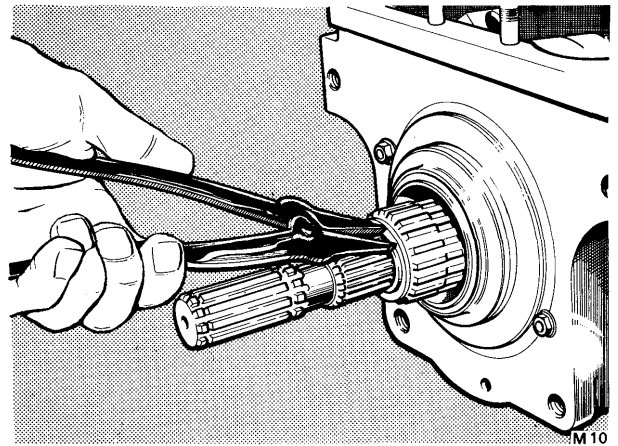


FIG. T71 REMOVING THE SNAP RING

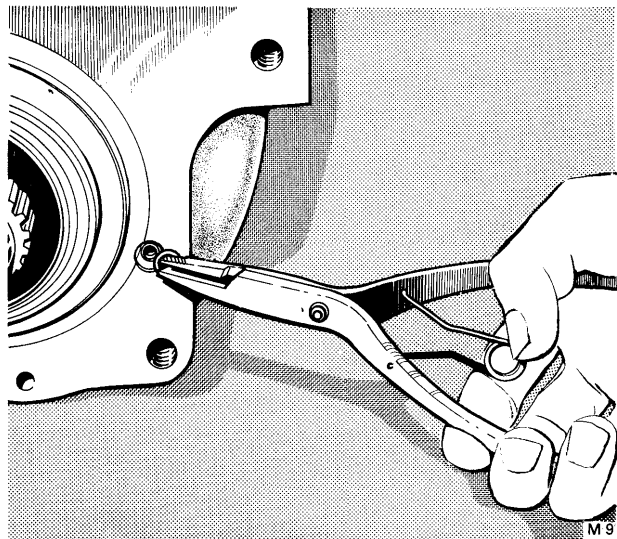


FIG. T72 REMOVING THE PUMP LOCATING WASHER

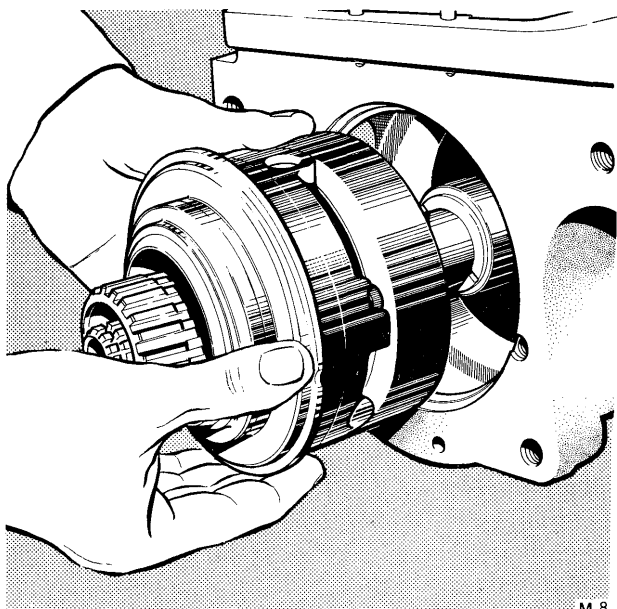


FIG. T73 REMOVING THE PUMP AND DRIVE-SHAFT

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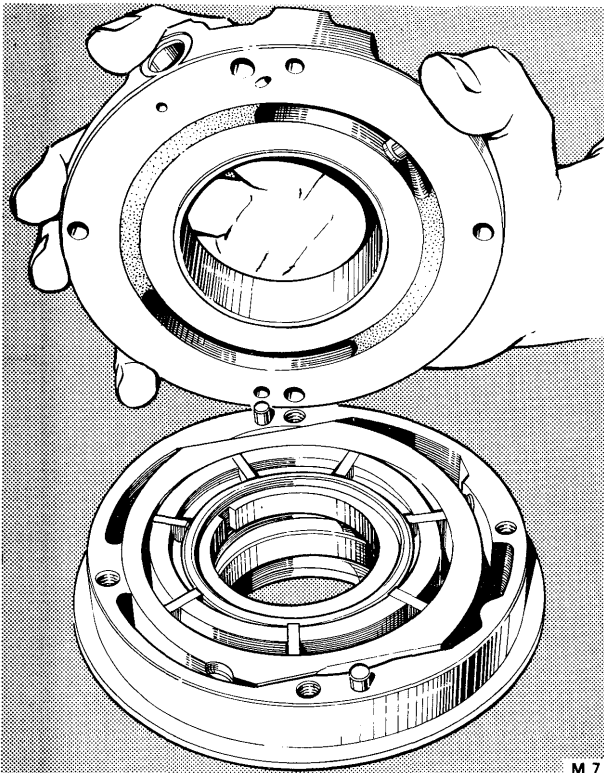


FIG. T74 REMOVING THE PUMP BODY

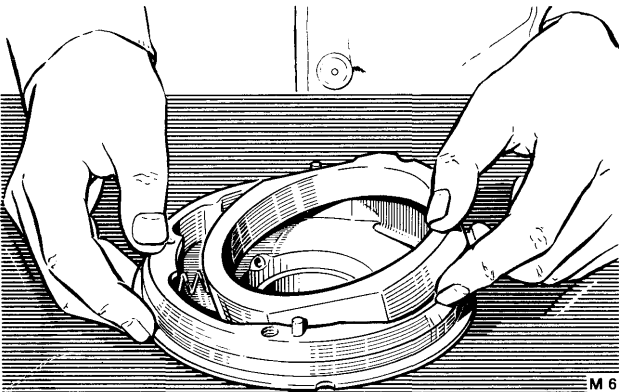


FIG. T75 REMOVING THE PUMP SLIDE

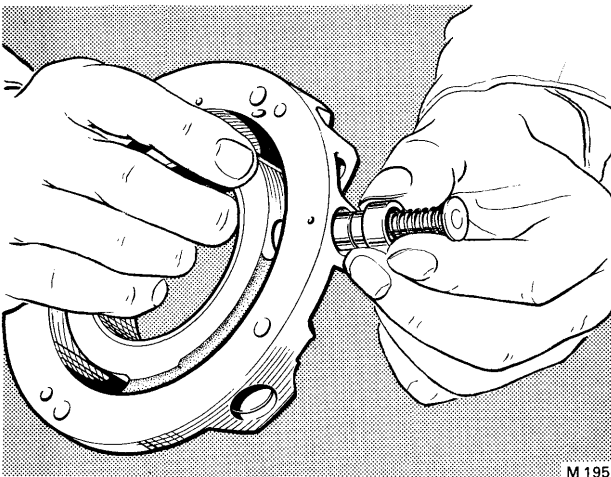


FIG. T76 REMOVING THE RELIEF VALVE

Cloths should not be used for cleaning purposes owing to the danger of fluff entering the control system and fouling the various valves.

Examine all parts for cracks or damage and check all moving parts for scores, burrs and roughness. If the pump cover or body is deeply scored, the pump should be renewed.

Check that the halves of the pump mate without a gap. Small burrs may be stoned off but the joint faces must not be scraped or lapped.

Reference should be made to the Parts List before renewing any parts as many of the components are selectively assembled and must not be renewed separately.

Check that the dowels are secure in the pump cover. Ensure that the pump slide moves freely in the pump cover and that the relief valve and regulator valve are free to move in their respective bores.

Examine the relief valve spring and priming springs for damage and general condition; slight polishing of the coil outer diameter is permissible.

Check that the pump vanes are free in their slots.

Inspect the drive-shaft bush in the pump body and the torus cover bush in the pump cover for scoring or heavy uneven wear. Slight wear of the bushes is normal but, if wear or damage is excessive, the complete pump should be renewed as it is not advisable to fit a separate body or cover.

Ensure that the rotor driving key is a good fit in the drive-shaft; check the rotor keyway for wear and burrs.

Examine the drive-shaft splines and the gear teeth for wear; also the journal surface for scoring.

Check that the two bronze bushes in the shaft are secure; inspect the bushes for scoring and uneven wear.

Examine the steel backing washer and bronze thrust washers for ridges or heavy scoring.

Fit the pump slide into the pump cover without fitting the priming springs.

Using a dial test indicator, as shown in Figure T77, check the end clearance between the slide and cover. The initial reading should be taken from the cover joint face, then the assembly should be moved so that the tip of the indicator moves onto the slide.

The difference between the two readings should comply with the figures given in 'Dimensional Data' at the end of this Section.

Check the end clearance of the rotor in a similar manner; again the difference in indicator readings should comply with the figures given in 'Dimensional Data'.

Remove the slide and rotor.

Front pump — To assemble

When all parts have been carefully inspected, cleaned and dried, lubricate all moving parts with clean gearbox oil then assemble the pump in the following order.

If necessary, fit a new oil seal with the seal lip facing toward the centre of the pump (see Fig. T78). Lightly smear the seal shell with Wellseal before fitting.

Fit a new intake pipe oil seal ring into the bore of the pump body as shown in Figure T79. Ensure that the end of the intake pipe has no sharp edges then lightly smear it with gearbox oil. Check that the ring is correctly fitted by entering and withdrawing the pipe.

Fit the relief valve with its spring guide and retaining pin.

Fit the two priming springs and the slide into the pump cover. Ensure that the outer spring is correctly located in the recesses in the cover and the slide. Check that the slide will move freely through its full stroke and will return under spring pressure.

Fit one of the vane rings, then fit the rotor with its marked face uppermost.

Fit the seven vanes, positioning them according to the wear pattern on the radiused ends; the edge polished along its whole length should contact the inner circumference of the slide, the inside edge being polished only where contact is made with the vane rings.

Fit the second vane ring, ensuring that the vanes are correctly positioned between the vane rings and the slide. Rotate the rotor several times to ensure freedom of movement.

If any one of the vanes appears excessively loose, its diametrical clearance should be checked in the manner illustrated in Figure T81 to ascertain if it is within the limits given in 'Dimensional Data'.

Fit the pump body over the dowels in the cover and secure the body with the four setscrews and washers; tighten the setscrews evenly to the correct torque figure given in 'Dimensional Data'. Turn the rotor several times to check for freedom of movement, then, by pushing against the internal bore of the rotor, ensure that the slide is free and that the priming springs return it to the maximum delivery position.

Pour a little clean gearbox oil into the pump intake bore then rotate the rotor several times to ensure thorough internal lubrication.

If rig testing facilities are available the pump should be checked for flow and pressure (see *Dimensional Data*). If these facilities are not available, fit the pump

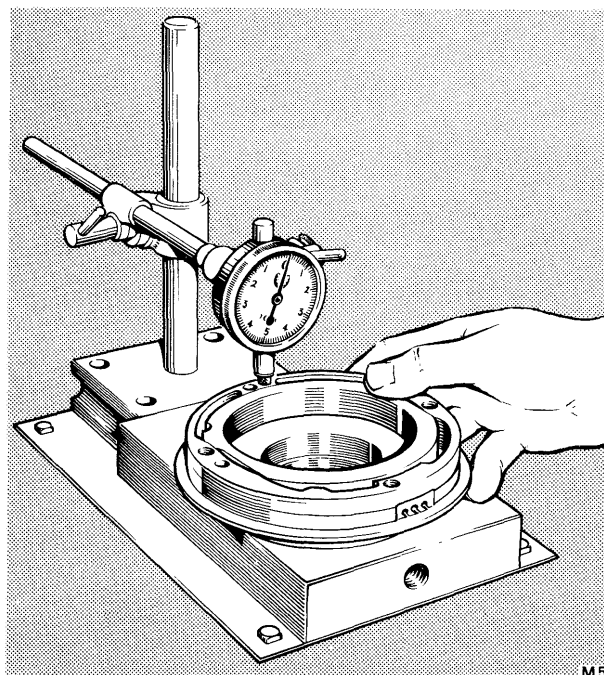


FIG. T77 CHECKING THE SLIDE END CLEARANCE

to the gearbox and check the oil pressure as described under 'Oil pressure—To check' in Section T3—Testing.

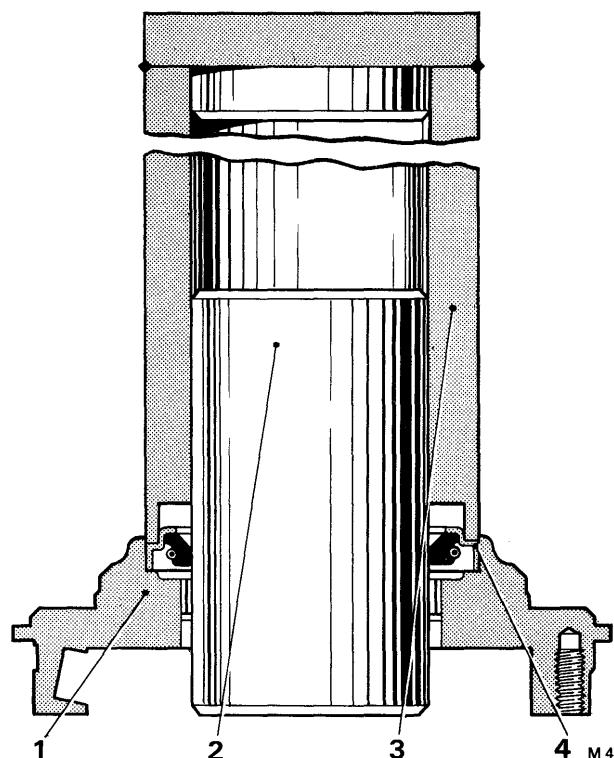


FIG. T78 FITTING THE PUMP OIL SEAL

- | | |
|--------------|--------------|
| 1 Pump cover | 3 Press tool |
| 2 Guide tool | 4 Oil seal |

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FIG. T79 FITTING THE INTAKE PIPE SEALING RING

Front pump — To fit

Fit the bronze thrust washer over the intermediate shaft so that it is in position against the shoulder of the front planet carrier. Apply a liberal amount of

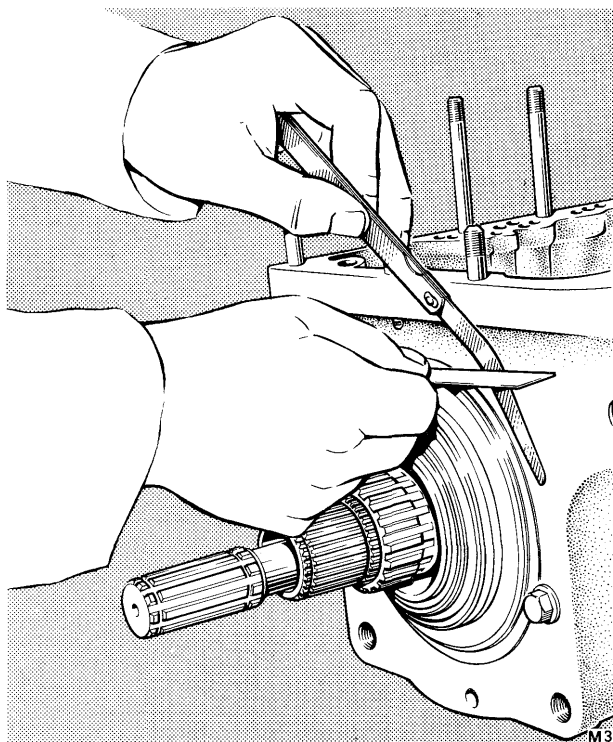


FIG. T80 CHECKING THE FRONT PUMP NIP

clean gearbox oil to the front drive gear then slide it over the intermediate shaft into the main casing, turning it slightly to mesh with the planet gears. During this operation care must be exercised to avoid damaging the bushes on the intermediate shaft splines.

Fit the bronze thrust washer and the steel backing washer over the intermediate shaft, then fit the snap ring.

Using a dial test indicator, or feeler gauges inserted between the thrust washer and the end of the drive-shaft, check the drive-shaft end float in relation to the intermediate shaft. Movement of the drive-shaft should be between 0.002 in. and 0.004 in. (0.05 mm. and 0.10 mm.).

If necessary, adjust the end float by selecting the correct size of backing washer to give the required figure.

Fit a new 'O' ring under the pump cover flange.

Before fitting the pump, lubricate the drive-shaft bush in the pump body with a liberal amount of clean gearbox oil. Align the drive-shaft key with the keyway in the pump then slide the pump into position; the key should enter the keyway smoothly and easily.

Align the pump flange with the dowel washer location in the gearbox front face then insert the dowel washer. Fit the two retaining setscrews and tighten to the correct torque loading (*see Dimensional Data*).

Note The pump must be pushed in until the 'O' ring abuts the counterbore in the gearbox. Do not attempt to push in the pump by tightening the setscrews, except for the latter part when nipping the 'O' ring.

If a replacement pump has been fitted, the following check should be made to ensure the correct nip of the pump flange by the bell housing.

Check that the projection of the pump flange from the front face of the gearbox is within the limits given in 'Dimensional Data'.

This check can be made using a straight-edge and feeler gauges (*see Fig. T80*). If the clearance is incorrect, renew the 'O' ring seal.

Fit the remaining assemblies in the reverse order to that given for their removal.

Oil pressure — To check

If rig testing facilities are available, the front pump should be checked for flow and pressure (*see Dimensional Data*).

If the pump has not been checked in this manner, and the gearbox has been fitted to the car, replenish the

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the gearbox has been fitted to the car, replenish the gearbox with oil and check the oil pressure in the following manner.

Fit an oil pressure gauge as described under 'Oil pressure—To check' in Section T3—Testing, then run the engine at a speed of 1 200 r.p.m. and check the oil pressure when the gearbox is warm. Select Reverse and again note the pressure. If the pump is working satisfactorily the pressure should be approximately 70 lb/sq. in. (4,9 kg/sq.cm.).

Reverse pressure should not be less than that obtained in Neutral; it is normally slightly higher.

Finally, carry out a road test to ensure that all components are functioning correctly. Details of change points and testing procedure are given in Section T3—Testing.

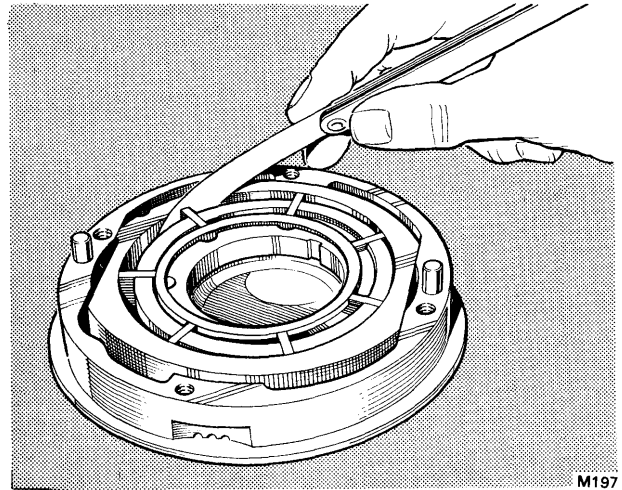


FIG. T81 CHECKING THE VANE DIAMETRICAL CLEARANCE

DIMENSIONAL DATA FOR SECTION T18—FRONT PUMP AND DRIVE-SHAFT

DESCRIPTION	DIMENSION	PERMISSIBLE WORN DIMENSION	REMARKS
Vanes diametrical clearance.	0.0012 in. to 0.0042 in. (0,031 mm. to 0,107 mm.)	0.005 in. (0,13 mm.)	—
Vanes end clearance.	0.0008 in. to 0.0015 in. (0,020 mm. to 0,038 mm.)	0.00175 in. (0,0045 mm.)	Selectively assembled.
Rotor end clearance.	0.0008 in. to 0.0015 in. (0,020 mm. to 0,038 mm.)	0.00175 in. (0,0045 mm.)	Selectively assembled.
Slide end clearance.	0.0008 in. to 0.0015 in. (0,020 mm. to 0,038 mm.)	0.00175 in. (0,0045 mm.)	Selectively assembled.
Vanes clearance in rotor.	0.0012 in. to 0.0042 in. (0,031 mm. to 0,107 mm.)	0.005 in. (0,13 mm.)	A vane with excess clearance will cause oil fluctuation.
Drive-shaft end float.	0.002 in. to 0.004 in. (0,05 mm. to 0,10 mm.)	0.006 in. (0,15 mm.)	Select backing washer to give the correct end float.
Bell housing to gearbox casing nip.	0.003 in. to 0.013 in. (0,08 mm. to 0,33 mm.)	—	Renew 'O' ring to obtain correct nip.
Priming spring — outer — free length.	0.679 in. (17,25 mm.)	—	—
Load required to compress spring length to 0.375 in. (9,53 mm.)	6 lb. 8 oz. to 7 lb. 8 oz. (2,95 kg. to 3,40 kg.)	5 lb. 8 oz. (2,5 kg.)	—
Priming spring — inner — free length.	0.405 in. (10,3 mm.)	—	—
Load required to compress spring length to 0.350 in. (8,89 mm.)	18 lb. to 26 lb. (8,17 kg. to 11,79 kg.)	17 lb. (7,71 kg.)	—
Relief valve spring — free length.	1.718 in. (43,66 mm.)	—	—
Load required to compress spring length to 1.057 in. (26,85 mm.)	13 lb. to 15 lb. (5,90 kg. to 6,80 kg.)	12 lb. (5,44 kg.)	—
Setscrews — pump body to cover.	Torque tighten to between 12 lb.ft. and 15 lb.ft. (1,66 kgm. and 2,07 kgm.)	—	—
Setscrews — pump to gearbox casing.	Torque tighten to between 10 lb.ft. and 13 lb.ft. (1,38 kgm. and 1,80 kgm.)	—	—

Chapter T**FRONT OIL PUMP RIG TEST PERFORMANCE**

PUMP R.P.M	LINE PRESSURE	LINE FLOW	TORUS PRESSURE
350	50 lb/sq. in. (3,5 kg/sq. cm.)	1 gallon (4,55 litres) in 55 seconds (minimum).	10 lb/sq. in. to 40 lb/sq. in. (0,70 kg/sq. cm. to 2,8 kg/sq. cm.)
Use an approved lubricant at 121° C. (250° F)			

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Section T19

SPEEDOMETER DRIVE

The speedometer drive (*see Fig. T82*) is secured by a setscrew and lock plate to the gearbox rear extension; it can be readily removed without disturbing any other gearbox units.

Speedometer drive — To remove

Disconnect the speedometer cable by unscrewing the knurled nut at the gearbox end then withdrawing the cable. If the speedometer drive is to be removed for any length of time, mask the open end of the drive cable to prevent the ingress of dust and dirt.

Remove the retaining setscrew and lock plate then withdraw the speedometer drive.

Discard the rubber 'O' ring.

Speedometer drive — To dismantle

Hold the gear between soft jaws in a vice.

Remove the split pin then unscrew the nut which secures the gear to the drive shaft; remove the nut and washer.

Tap the gear off the shaft using a soft-faced mallet.

Utilizing the two flats on the speedometer drive body, clamp the body between soft jaws in a vice then unscrew the halves of the assembly.

Speedometer drive — To inspect

Wash all dismantled parts in clean paraffin.

Examine the gear teeth for damage and signs of excessive wear.

Examine the squared end of the shaft for cracks.

Examine the threads on the housing for damage.

If the oil seal is to be renewed it should be pressed out of its housing using a suitable dolly.

Examine the shaft for any sharp edges which may damage the oil-seal during assembly.

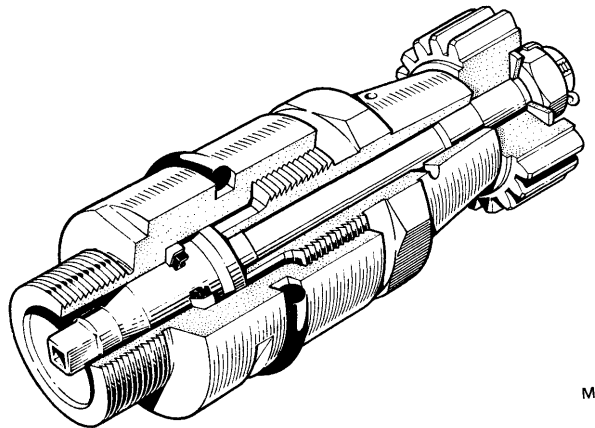
Speedometer drive — To assemble

To assemble the speedometer drive reverse the procedure given for its dismantling noting the following points.

Do not overtighten the castellated nut when fitting the gear to the shaft. A new split pin should be fitted.

Ensure that the halves of the assembly are tight; do not overtighten.

A light application of clean oil on the drive-shaft will assist its passage through the oil seal.



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FIG. T82 SPEEDOMETER DRIVE

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Speedometer drive — To fit

Fit a new rubber 'O' ring to the groove in the speedometer drive housing.

Apply a thin smear of clean oil around the 'O' ring when fitting the speedometer drive into the gearbox rear extension.

Locate the locking plate in its groove, then fit and tighten the setscrew to the correct torque loading.

Ensure that the end float and backlash of the drive-shaft and gear are within the limits given in 'Dimensional Data' at the end of this Chapter.

Connect the speedometer drive cable

**DIMENSIONAL DATA FOR
SECTION T19— SPEEDOMETER DRIVE**

DESCRIPTION	DIMENSION	PERMISSIBLE WORN DIMENSION	REMARKS
Drive-shaft end float.	0.015 in. (0,38 mm.) (minimum).	—	—
Drive gear backlash.	0.002 in. to 0.004 in. (0,05 mm. to 0,10 mm.)	0.006 in. (0,15 mm.)	—
Castellated nut — gear to shaft.	Torque tighten to 8 lb.ft. (1,11 kgm.)	—	Take nut to next split pin hole.
Setscrew — speedometer housing to rear extension.	Torque tighten to between 8 lb.ft. and 10 lb.ft. (1,11 kgm. and 1,38 kgm.)	—	—

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Section T20

REVERSE ASSEMBLY

The reverse assembly (*see Fig. T83*) comprises the reverse epicyclic gears and output shaft, an aluminium rear extension casing and, for dismantling and assembly purposes, the mainshaft.

The reverse planet carrier has three planet gears which rotate on needle roller bearings around hardened steel pins; the carrier is splined to the output shaft.

Also fitted to the reverse planet carrier is the bronze skew gear which drives the rear pump and governor.

The reverse annulus gear, which rotates on the output shaft, is an integral part of the reverse cone clutch. The cone surfaces run between an outer friction cone which is held stationary in the gearbox casing and an inner cone which forms part of the clutch piston; the clutch piston moves axially on four guide pins which prevent its rotation, oil leakage being prevented by annular seals.

Two ball bearings, one at each end of the rear extension carry the output shaft; the front bearing is captive, being retained by a circlip. On the output shaft itself is the gear wheel which drives the speedometer drive-shaft gear. The gear wheel is located by two distance tubes, between the ball bearings, and is secured by the clamping load when the coupling flange is fitted to the output shaft and tightened in position.

Oil sealing is effected by a lip-type seal which fits into a bore in the rear of the extension, the lip of the seal bearing on the coupling flange.

The gearbox electric actuator is conveniently mounted on the rear extension casing. Two tapped bosses on the left-hand side of the casing, and a boss and bracket underneath, accept the actuator securing setscrews.

Operation

When Reverse is selected, reverse oil pressure pushes the reverse clutch piston forward to trap the reverse cone between the inner and outer cones, thus holding the reverse annulus gear stationary. At the same time the rear band and the centre clutch are released, allowing the rear drum to rotate freely.

As driving torque is applied to the rear sun gear, the planet gears are forced to revolve and drive the rear drum and reverse sun gear in the reverse direction to the applied torque. Thus, the reverse planet gears are forced to revolve around the stationary annulus to follow the rotating sun gear, the reverse epicyclic unit is in reduction and the entire assembly of reverse and rear planet carriers is driven in Reverse.

When oil pressure to the reverse clutch is cut off, the reverse cone clutch is released by six coil springs.

Reverse assembly — To remove

Before attempting to remove the reverse assembly,

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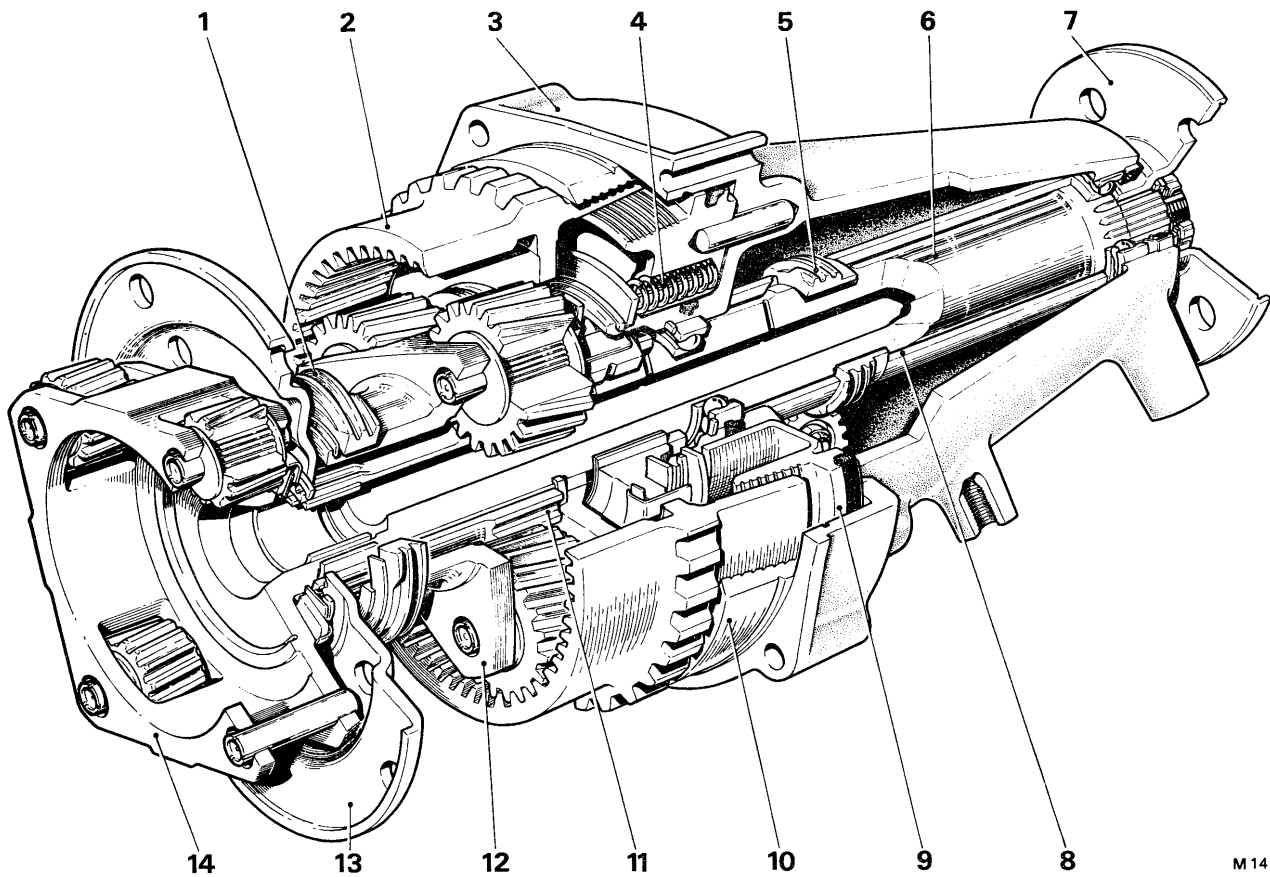


FIG. T83 REVERSE ASSEMBLY — CUTAWAY VIEW

- | | | |
|--------------------------------|-------------------------|-----------------------------|
| 1 Oil pump drive gear | 6 Distance tube | 10 Stationary cone |
| 2 Reverse annulus gear | 7 Coupling flange | 11 Reverse sun gear |
| 3 Rear extension casing | 8 Output shaft | 12 Reverse planet carrier |
| 4 Reverse clutch return spring | 9 Reverse clutch piston | 13 Drive flange |
| 5 Speedometer drive gear wheel | | 14 Rear unit planet carrier |

the gearbox should be taken out of the car (see Section T9) and the following units removed.

Fluid coupling (see Section T10).

Side cover, sump and filter (see Section T11).

Control valve unit and parking brake bracket (see Section T12).

Front servo unit (see Section T14).

Rear servo and accumulator (see Section T15).

Rear pump and governor (see Section T16).

Speedometer drive (see Section T19).

During removal of the reverse assembly from the gearbox and also during subsequent dismantling, all the thrust and adjusting washers should be labelled for easy identification when assembling.

After removal of the units previously mentioned, check the end float of the mainshaft as follows.

Remove the snap ring from the mainshaft.

Fit the centralising tool RH 7771 to the mainshaft and intermediate shaft.

Mount a dial test indicator so that the gauge plunger rests on the end of the mainshaft (see Fig. T84).

Fit the wedge tool (see T.S.D. 2331—Workshop Tools) in position between the forward end of the oil delivery sleeve cap and the front drum, then lightly tap it down to take up front drum assembly end float.

Push the mainshaft in toward the rear extension then set the gauge to zero.

Pull the mainshaft forward and note the gauge reading.

Repeat the operation to ensure that a correct reading has been obtained. If the reading is within the limits given in 'Dimensional Data' the existing thrust washer may be retained, provided that it is otherwise serviceable; remove the wedge tool and the centralising tool.

If the end float is incorrect, measure the thickness of the adjusting washer then select a new one to give the correct end float.

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Unlock the tab washer which secures the coupling flange nut.

Fit a holding bar to the coupling flange then slacken the nut, using serrated spanner No. RH 7772 (see T.S.D. 2331—Workshop Tools). Remove the nut, tab washer, key washer, clamping washer and end nip adjusting washer.

Hold the rear drum by applying the rear band with a suitable lever, then remove the six setscrews and spring washers which secure the driving flange to the rear drum.

Remove the five nuts and plain washers which secure the rear extension to the gearbox casing.

Withdraw the reverse assembly from the gearbox casing, taking care to retain the stationary cone key, then remove the mainshaft and washers (see Fig. T85). If the reverse assembly sticks in the gearbox casing, tap the front of the mainshaft with a soft-headed mallet to initiate movement.

Remove and discard the gasket.

If the gearbox drum assembly is to be removed, fit the rear clutch hub retainer.

Reverse assembly — To dismantle

Remove the output shaft and epicyclic gear train from the rear extension casing as described in the following paragraphs. Refer to the cutaway view shown in Figure T83 when dismantling the reverse assembly.

Place the extension casing on the bed of a press, ensuring that there is sufficient room below the press bed to allow the shaft to emerge fully from the extension casing. Ensure that the bed of the press is clean and will not damage the joint face of the aluminium casing.

Protect the threads on the end of the output shaft then press the shaft out of the bearings.

After approximately 0.750 in. (19.05 mm.) of movement the shaft will fall freely until the land upon which the speedometer drive gear wheel fits encounters the front bearing.

Obtain a bar of suitable length and diameter that will pass through the rear bearing and assist in pushing out the shaft.

Continue pressing the shaft downward until the gear wheel land passes beyond the front bearing inner race.

The shaft should again fall until the third land, upon which the rear bearing fits, encounters the front bearing inner race.

Push the shaft through the front bearing then remove the shaft and the press bar.

Remove the epicyclic gears from the output shaft as follows.

Remove the thrust washer from the reverse annulus gear.

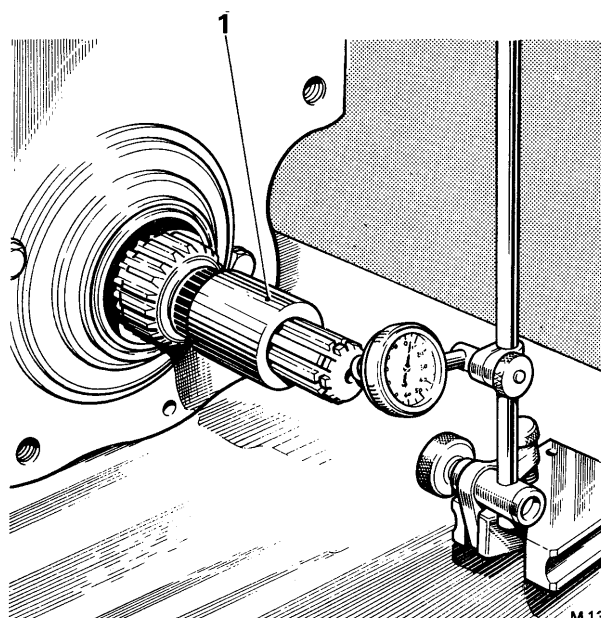


FIG. T84 CHECKING MAINSHAFT END FLOAT

1 Spacer

Remove the annulus gear, spacer and the reverse planet carrier from the output shaft, taking care not to damage the soft metal bush in the annulus gear.

Remove the snap ring from the output shaft then lift off the reverse sun gear and driving flange, thrust washer and backing washer.

To dismantle the reverse clutch, lay the annulus gear on the bench with the stationary cone uppermost.

Expand and remove the stationary cone as shown in Figure T86. Avoid over expanding the cone as this may lead to permanent distortion.

Turn over the annulus gear then remove the retainer and cushioning ring by slightly turning the retainer and withdrawing the lugs from their holes.

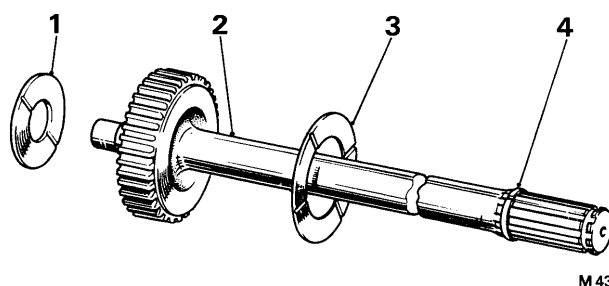


FIG. T85 MAINSHAFT AND WASHERS

- 1 End float adjusting washer
- 2 Mainshaft
- 3 Thrust washer
- 4 Snap ring

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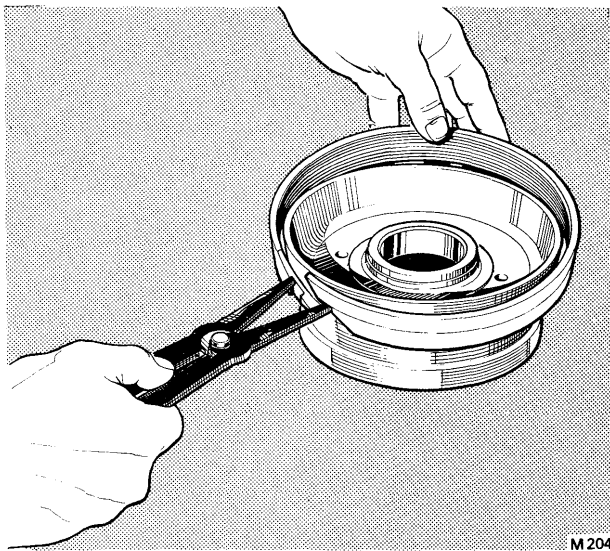


FIG. T86 REMOVING THE STATIONARY CONE

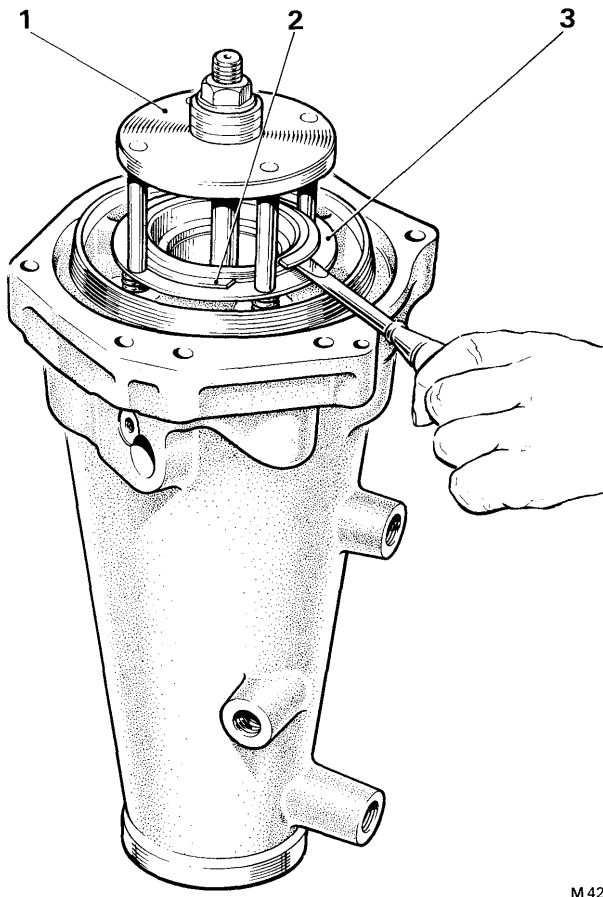


FIG. T87 CLUTCH SPRING COMPRESSING TOOL IN POSITION

- 1 Tool
- 2 Retainer
- 3 Snap ring

Fit the clutch spring compressing tool to the extension as shown in Figure T87, ensuring that the gap in the spring ring is situated between two of the tool legs to facilitate removal.

Centralise the tool in the extension housing. Screw down the tool nut until the clutch spring retaining washer is clear of the spring ring; remove the ring from the groove. Remove the tool and withdraw the retaining plate and six clutch springs.

Withdraw the inner cone clutch from the extension casing.

If difficulty is experienced in removing the clutch cone, place a hand over the extension casing to retain the piston, then intermittently apply air pressure of approximately 70 lb/sq.in. (4,9 kg/sq.cm.) to the clutch apply duct as shown in Figure T88. This will lift the cone sufficiently to allow withdrawal from the casing; do not attempt to rotate the cone as it is located by dowels. Remove the clutch piston sealing rings.

To remove the bearings and speedometer drive gear wheel proceed as follows.

Remove the snap ring which secures the front bearing in position in the extension casing.

Push out the front bearing then remove the short distance tube, speedometer drive gear wheel and the long distance tube.

Push out the rear bearing and the oil seal; the seal may be retained if the shell is undamaged and the rubber lip is in good condition.

Reverse assembly — To inspect

Before inspection, all parts must be cleaned thoroughly using clean paraffin, a brush and compressed air.

Examine the following for residual sludge. Gear teeth, external and internal splines, bores and sealing ring grooves and the mainshaft bearing housing at the front end of the output shaft.

The clutch apply duct in the extension casing and the oil passages at the rear end of the mainshaft must be blown through with compressed air to ensure that they are free from obstruction.

Screw threads — To inspect

Examine all screw threads, particularly any which were tight on removal; if necessary clean the threads.

Gears — To inspect

Examine all gear teeth for damage and wear. Examine the general condition of the end thrust washers of the planet pinions.

Examine the planet pinion carriers around the pin bores for radial cracking, particularly across the

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narrowest sections, also check the pins for tightness in the bores; the pins are initially a press fit and should remain tight.

If any part of a planet pinion assembly is found to be unserviceable the complete assembly concerned must be renewed.

If any part of the reverse planet carrier is unserviceable, the complete assembly, including the rear pump driving gear, must be renewed; the pump driving gear is retained by a ball and snap ring and any attempt to remove it will render it unserviceable. The rear pump must be renewed complete with the reverse planet carrier; a worn gear must not be mated with a new gear in this instance.

The output shaft planet gear assembly, reverse sun gear and the reverse planet gear assembly may be changed independently of their mating gears.

Output shaft — To inspect

Examine the bearing faces of the planet carrier, the shaft and the thrust and backing washers for scoring and for signs of uneven wear.

Examine the mainshaft bronze bearing in the hollow end of the output shaft.

Check the splines for fretting and twisting which may indicate incipient failure.

Check that the plug in the end of the shaft is secure.

If any part of the output shaft is found to be unserviceable, it must be changed as an assembly. The thrust and backing washers can, of course, be renewed independently if any doubt exists as to their serviceability.

Reverse sun gear and driving flange assembly — To inspect

Check the driving flange and the thrust washer retainer for distortion; the retainer should be tight on the splines.

Examine the bronze bearing in the bore of the sun gear for scoring and uneven wear.

Any part which is unserviceable will necessitate renewing the complete assembly.

The thrust washer retainer under the driving flange should not be disturbed as this is a press fit and is jig-assembled.

Reverse planet carrier — To inspect

Check that the rear pump driving gear is tight on its mounting and examine the gear for excessive wear.

Examine the bearing surfaces of the extension and the cushioning ring for scoring and uneven wear.

If any part of the reverse planet carrier is unservice-

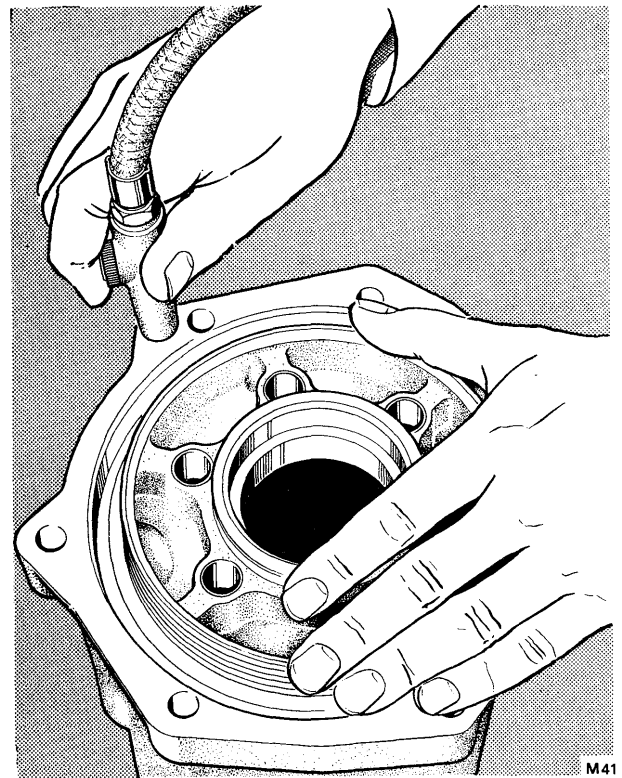


FIG. T88 REMOVING THE REVERSE CLUTCH PISTON

able the complete assembly and the rear pump must be renewed, as described under 'Gears — To inspect'.

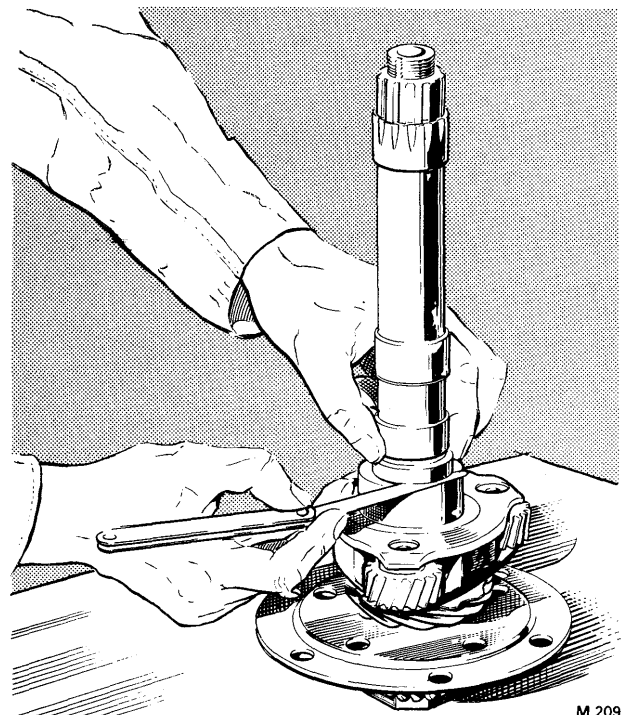


FIG. T89 CHECKING THE REVERSE PLANET CARRIER END FLOAT

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Reverse clutch assembly — To inspect

Examine the following parts for scoring, rough surfaces, signs of overheating and uneven contact. The mating faces of the outer stationary clutch cone, the reverse annulus gear and the inner stationary clutch cone.

Examine the thrust washer and the bearing surface in the reverse annulus gear for scoring and uneven wear; also examine the soft metal lining in the annulus gear bore for scoring, cracking and for poor adhesion to the shell.

Examine the clutch spring retainer for damage or distortion and check the springs for collapsed coils. Check that all the springs are of the same length.

Examine the stationary clutch cone for cracking in the vicinity of the keyway.

Examine the cushioning ring retainer for excessive wear on its bearing surface and for cracking at the bends of the lugs. Check that the cushioning ring has not lost its spring tension and become flattened during service.

Examine the reverse clutch piston seals for loss of resilience and cracking. If any parts of the reverse annulus gear, the stationary clutch cone or the inner clutch cone are unserviceable it will necessitate renewal of these parts as a complete assembly.

Other parts of the assembly can be renewed independently, but clutch springs should be renewed as a set.

Bearings and housing — To inspect

Examine the front and rear ball bearings for wear and the outer races and their housings for signs of spinning; the outer race should be a light, tap fit in the housing.

The bearings can be renewed independently of the shaft or extension casing providing that due regard is given to the condition of the housing and mountings.

Rear extension and coupling — To inspect

Examine the extension for cracks and other damage.

Examine the internal splines of the coupling for signs of fretting or other damage; also examine the bore of the distance sleeves for burrs which might become detached during assembly.

Examine the coupling bolt holes for elongation.

Examine the oil seal rubbing diameter for signs of grooving or burrs.

Examine the oil seal for loss of resilience and any damage to the sealing lip which would account for a leaking seal.

All items in this assembly may be renewed independently.

Reverse assembly — To assemble

Before assembling, all parts must be thoroughly cleaned then lightly oiled with clean gearbox oil.

New gaskets, oil seals and snap rings should be fitted where applicable; jointing compound must not be used.

Stand the output shaft on its end and assemble the thrust washer, the backing washer and the driving flange and reverse sun gear, taking care not to damage the bronze bearing in the sun gear bore as it passes over the shaft splines.

Check that the washers are in the retainer on the underside of the driving flange, then fit the snap ring to the groove in the shaft. Rotate the sun gear assembly to ensure that it is free on the shaft. Fit the reverse planet carrier ensuring that the gears mesh correctly with the sun gear and check that it rotates freely.

Slide the distance piece into position on the shaft; check the end float of the reverse planet carrier by holding the distance piece against the shoulder on the shaft and inserting a feeler gauge between the distance piece and the planet carrier as shown in Figure T89. If the end float is not within the limits quoted in 'Dimensional Data' the output shaft, or the reverse planet carrier, or both, must be renewed by selective fitting.

Mobilgrease M3 and gently expand the seal into its groove with the seal lip facing away from the conical end of the clutch cone. Grease the inner seal and fit it to the groove in the neck of the extension casing with the lip facing the bottom of the apply chamber. Ensure that both seals are fitted snugly into their grooves.

With the extension casing on the bench and the apply chamber uppermost, fit the outer seal guide tool (see *T.S.D. 2331—Workshop Tools*) in position (see *Fig. T90*) ensuring that it is seated on the shoulder in the apply chamber. If a guide tool is not available, a narrow flexible strip of metal approximately 1.00 in. (25.4 mm.) wide, of the correct length and free from burrs and jagged edges, should be inserted in the same manner as the tool.

Lower the inner cone squarely into the guide tool, seal first, then turn it to engage the four dowels. Push the cone into the chamber until it reaches the bottom, then remove the guide tool.

Do not try to force the piston into its chamber without the aid of a suitable guide, otherwise the piston outer seal will almost certainly be damaged.

Fit the extension casing in position over the base of the clutch spring compressing tool and fit the six clutch springs into the sockets. Lay the clutch spring retainer plate and the spring ring in position on top of the springs and assemble the top portion of the tool ensuring that it is in a central position. Depress the

retainer until the spring ring can be fitted into the groove. When the spring ring is in position, tap it into the groove to make sure it will not fly out when under spring pressure. Release the pressure and remove the tool.

Check the freedom of the piston in the apply chamber by applying an air pressure of approximately 70 lb/sq. in. (4,9 kg/sq. cm.) to the clutch apply duct.

Hold the cone out by air pressure and check the seal for leakage which will be indicated by the presence of grease bubbles. If a leakage occurs fit a new seal.

Lubricate the stationary clutch cone and expand it into position on the reverse annulus gear, using snap ring pliers.

Care must be taken to ensure the inner face on the edge of the annulus gear is not damaged during this operation. Do not over expand the cone due to the risk of distortion and the subsequent loss of contact area.

Turn the reverse annulus gear over and fit the cushioning ring and retainer; rotate the retainer to lock the lugs in their holes.

Rear extension — To assemble

The reverse assembly can be completely assembled before being fitted to the gearbox if a bench fixture is available to hold the assembly. If a fixture is not available, assessment of the thickness of the coupling flange end nip washer and the final tightening and locking of the securing nut should be left until the assembly is secured to the gearbox casing.

With the output shaft standing on its gear end, lower the reverse annulus gear over the shaft (cushioning ring retainer downward), until it meshes with the reverse planet carrier. Spin the reverse annulus gear several times to check for freedom of rotation.

Position the thrust washer in the reverse annulus gear and retain it with a smear of petroleum jelly.

Press the front bearing into its bore in the rear extension; fit the snap ring.

Lower the bearing and casing over the output shaft then press down the bearing, using a suitable tube on the bearing inner race, until the race abuts the collar. During this operation the stationary cone must be guided into its spigot in the rear extension casing, at the same time align the keyway so that it is between the bottom two stud holes in the casing.

Fit the short distance tube with the oil supply slots uppermost.

Fit the speedometer drive gear with the shoulder uppermost then fit the long distance tube.

Fit the rear bearing, pushing it down the rear extension bore until the inner race abuts the long distance tube.

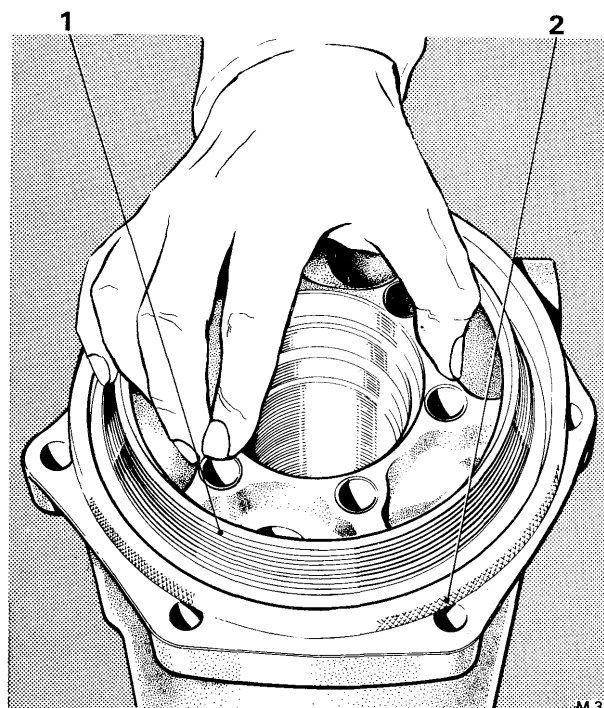


FIG. T90 FITTING THE REVERSE CLUTCH PISTON

- 1 Piston
- 2 Guide tool

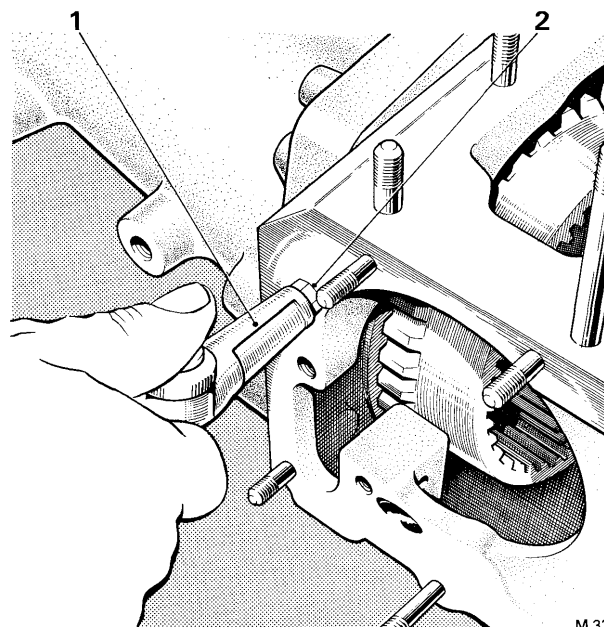


FIG. T91 CENTRALISING THE REVERSE CLUTCH CONE

- 1 Air line adaptor
- 2 Reverse clutch apply port

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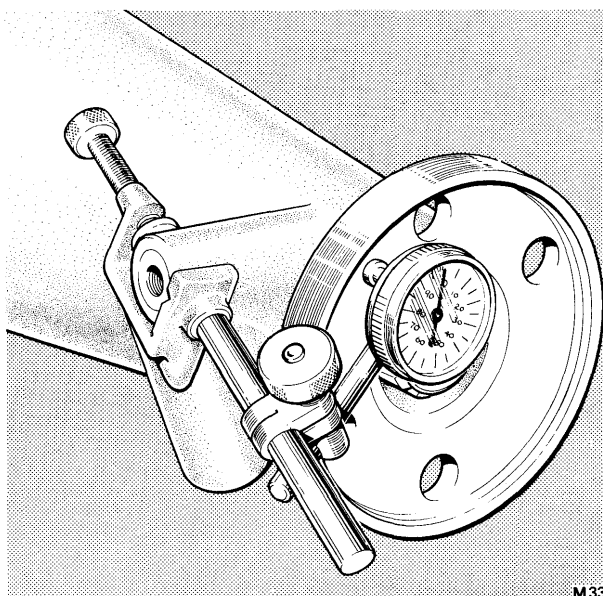


FIG. T92 ASSESSING THICKNESS OF END NIP WASHER

Fit the oil seal with the lip of the seal facing toward the bearing. The seal casing should lie flush with the end of the rear extension.

Apply a smear of clean gearbox oil to the seal lip then fit the coupling flange, nip washer, abutment washer, key washer, tab washer and nut; do not tighten the nut yet unless a bench fixture is available to hold the rear extension assembly.

Reverse assembly — To fit

Remove the clutch hub retainer; ensure that the hub is correctly engaged in all the driving plates as described in Section T21.

Fit a new gasket to the gearbox rear face and retain it with a smear of petroleum jelly.

Fit the bronze adjusting washer to the recess in the front face of the output shaft and retain it with a smear of petroleum jelly.

Fit the mainshaft into the bearing in the output shaft. Ensure that the bronze thrust washer is in position in the rear clutch hub, then fit the mainshaft and reverse assembly to the gearbox. Check that the stationary cone keyway is aligned with the keyway in the gearbox casing.

Fit the key then push the reverse assembly firmly against the rear face of the gearbox.

Fit the parking pawl setscrews to align the rear extension then fit the plain washers and nuts; finger tighten the nuts.

Apply air pressure of approximately 70 lb/sq.in. (4.9 kg/sq.cm.) to the reverse clutch apply port in the gearbox side (see Fig. T91). This will apply and cen-

tralise the reverse clutch assembly.

With the air pressure still applied, evenly tighten the nuts. Cut off the air supply then torque tighten the nuts to the correct torque figure; remove the parking pawl setscrew.

Align the driving flange holes with the rear drum holes then fit the setscrews and washers; check the output shaft for freedom of rotation and the mainshaft for freedom of movement whilst the setscrews are being progressively tightened.

If the output shaft becomes stiff to turn, or locks, or the mainshaft cannot be moved, remove the rear extension and ensure that the rear clutch hub is home in the rear drum; also ensure that the mainshaft adjusting and thrust washers have not slipped from their respective recesses. If either of these washers has slipped and become trapped, it must be checked for damage or distortion and, if necessary, renewed.

If new clutch plates have been fitted to any of the drums, a certain amount of stiffness may be encountered but it should still be possible to rotate the output shaft by hand.

Check the end float of the mainshaft as described under 'Reverse assembly — To remove'. This is a routine assembly operation but it may have to be carried out during investigations of stiffness as described in the previous paragraphs.

Fit the rearmost snap ring to the mainshaft.

Output shaft end nip — To adjust

The output shaft end nip is set to ensure that certain components which are fitted to the output shaft are locked in position.

Output shaft end nip should be adjusted as follows.

Remove the nut, lock tab, key washer, clamping washer and adjusting washer from the output shaft.

Select a thick adjusting washer; washer range 0.090 in. to 0.125 in. (2.29 mm. to 3.18 mm.), fit the washer to the output shaft; the washer should stand proud of the shaft shoulder.

Fit the clamping washer, key washer and nut, then tighten the nut until all end clearance between the bearing, gear and spacers has been taken up.

Remove the nut and washers then fit a slave adjusting washer, between 0.040 in. and 0.060 in. (1.02 mm. and 1.52 mm.) thick, onto the output shaft; the shaft shoulder should stand proud of the washer.

Fit the clamping washer, key washer and nut; tighten the nut.

Mount a dial test indicator to read off the coupling flange as shown in Figure T92.

Push the coupling flange along the output shaft then set the dial to zero. Pull back the coupling flange and note the reading. The thickness of the required adjust-

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ing washer is: the thickness of the slave (thin) adjusting washer, plus the dial test indicator reading, plus between 0.004 in. and 0.010 in. (0,10 mm. and 0,25 mm.). 0.008 in. (0,20 mm.) is obtained on initial build).

Measure the thickness of the existing washer and, if suitable, and otherwise serviceable, it may be fitted. If it is unsuitable, select another washer to give the required end nip.

Remove the nut and washers then fit the selected adjusting washer, clamping washer, key washer, new

Fit a holding tool to the coupling flange, tighten the

tab washer and the nut.

nut to the correct torque figure then bend over the tabs on the washer.

Remove the holding tool and build up the gearbox as described in the Sections which are listed at the commencement of this Section.

The reverse unit can be tested for correct functioning, apart from reverse clutch operation, only by fitting the gearbox to the car and carrying out reverse and forward selection of the gears as explained in Section T6—'Air pressure check and investigation'.

DIMENSIONAL DATA FOR SECTION T20—REVERSE ASSEMBLY

DESCRIPTION	DIMENSION	PERMISSIBLE WORN DIMENSION	REMARKS
Output shaft bush i/d.	0.687 in. to 0.689 in. (17,46 mm. to 17,51 mm.)	—	—
Mainshaft — bearing diameter.	0.685 in. to 0.684 in. (17,39 mm. to 17,37 mm.)	—	—
Clearance.	0.002 in. to 0.005 in. (0,05 mm. to 0,13 mm.)	—	—
Reverse sun gear bush i/d.	1.4995 in. to 1.5005 in. (38,08 mm. to 38,113 mm.)	—	—
Output shaft diameter.	1.498 in. to 1.497 in. (38,05 mm. to 38,02 mm.)	—	—
Clearance.	0.0015 in. to 0.0035 in. (0,038 mm. to 0,089 mm.)	—	—
Reverse planet carrier end float.	0.004 in. to 0.015 in. (0,10 mm. to 0,40 mm.)	—	—
Mainshaft end float.	0.004 in. to 0.015 in. (0,10 mm. to 0,40 mm.)	—	—
Reverse annulus gear bush i/d.	1.9995 in. to 2.0005 in. (50,799 mm. to 50,801 mm.)	—	—
Reverse planet carrier bearing diameter.	1.9965 in. to 1.9955 in. (50,711 mm. to 50,686 mm.)	—	—
Clearance.	0.003 in. to 0.005 in. (0,08 mm. to 0,13 mm.)	—	—
Output shaft front bearing inner race i/d.	1.3775 in. to 1.3780 in. (34,99 mm. to 35,00 mm.)	—	—
Output shaft bearing diameter.	1.3782 in. to 1.3777 in. (35,006 mm. to 34,994 mm.)	—	—
Interference.	0.0002 in. to 0.0007 in. (0,005 mm. to 0,018 mm.)	—	—
Speedometer drive gear wheel i/d.	1.3782 in. to 1.3792 in. (35,006 mm. to 35,057 mm.)	—	—
Output shaft—bearing diameter.	1.3782 in. to 1.3777 in. (35,006 mm. to 34,994 mm.)	—	—
Clearance.	0.0000 in. to 0.0015 in. (0,000 mm. to 0,038 mm.)	—	—
Output shaft rear bearing inner race i/d.	1.37795 in. (34,977 mm.)	—	—
Output shaft—bearing diameter.	1.3782 in. to 1.3777 in. (35,006 mm. to 34,994 mm.)	—	—

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DESCRIPTION	DIMENSION	PERMISSIBLE WORN DIMENSION	REMARKS
<i>Dimensional Data—continued</i>			
Interference or clearance.	+ or — 0.00025 in. (+ or — 0,0063 mm.)	—	—
Rear extension front bearing bore i/d.	2.4408 in. to 2.4416 in. (61,996 mm. to 62,016 mm.)	—	—
Front bearing outer race o/d.	2.4409 in. to 2.4404 in. (62,018 mm. to 61,986 mm.)	—	—
Interference or clearance.	—0.0001 in. tight to +0.0012 in. clear (— 0,0025 mm. to + 0,030 mm.)	—	—
Rear extension rear bearing bore i/d.	2.8343 in. to 2.8348 in. (71,992 mm. to 72,004 mm.)	—	—
Rear bearing outer race o/d.	2.8346 in. (71,999 mm.)	—	—
Interference or clearance.	—0.003 in. tight to +0.0002 in. clear (— 0,008 mm. to + 0,005 mm.)	—	—
Output shaft end nip.	0.004 in. to 0.010 in. (0,10 mm. to 0,25mm.)	—	—
End nip adjusting washer range.	0.090 in. to 0.125 in. (2,29 mm. to 3,18 mm.)	—	Select adjusting washer to give correct end nip.
Output shaft pinions end clearance.	0.005 in. to 0.026 in. (0,13 mm. to 0,66 mm.)	—	—
Nuts — rear extension to gear-box casing.	Torque tighten to between 29 lb.ft. and 32 lb.ft. (4,01 kgm. and 4,42 kgm.)	—	—
Nut — coupling flange.	Torque tighten to between 150 lb.ft. and 180 lb.ft. (20,74 kgm. and 24,89 kgm.)	—	—
Setscrews — driving flange to rear drum.	Torque tighten to between 16 lb.ft. and 18 lb.ft. (2,21 kgm. and 2,49 kgm.)	—	—
Reverse clutch release spring—free length.	1.344 in. (approx.) (33,12 mm.) (approx.)	—	—
Load required to compress spring length to 1.031 in. (26,19 mm.)	30 lb. 1 oz. to 35 lb. 1 oz. (13,64 kg. to 15,90 kg.)	—	—

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Section T21

DRUM ASSEMBLIES

The drum assemblies (see Fig. T93) comprise three drums, referred to as front drum, centre drum and rear drum. Both the front and rear drums contain clutch plates, as well as an epicyclic gear train and are free to rotate. The centre drum contains a clutch pack and a sprag clutch; this drum is an interference fit on the oil delivery sleeve. It is also located in the gearbox casing by means of a steel key. The drum and oil delivery sleeve are held captive in the gearbox casing. The inner race of the sprag clutch is splined to the rear drum. When the centre clutch is applied, the sprag outer race is held and the rear drum will be held stationary by the action of the sprag. The sprag takes the torque reaction of the rear train as soon as the rear drum is released by the rear clutch and the rear epicyclic unit goes into reduction.

The four forward gears are obtained by using the two epicyclic gear trains which are of different ratios. The reverse gear idles when the forward Ranges are selected, but when engaged, it revolves in a reverse direction and provides a further slight gear reduction (see Section T20—Reverse assembly).

Four forward gears are obtained as follows.

First gear — both front and rear epicyclic units are in reduction.

Second gear — the front unit is in direct drive and the rear unit is in reduction.

Third gear — the front unit is in reduction and the

rear unit is in direct drive.

Fourth gear — both units are in direct drive.

The centre clutch is applied during all forward Ranges but is not applied in Reverse.

Operation

The line of drive through each epicyclic unit is dependent upon a hydraulically controlled friction band (two bands in Range 2) and three clutches. When the friction bands, or sprag clutch, hold the drums stationary, the front and rear clutches are in the disengaged state and the units are in reduction. When the front band is released, and the front clutch engaged, locking together two elements of the gear train, a direct drive is provided through the unit. As soon as the rear clutch is applied, the action of the sprag clutch is such that it allows this drum also to rotate.

The clutch in the front unit locks together the sun gear and the planet gear carrier, thus preventing rotation of the planet gears and locking the unit in direct drive.

The clutch in the rear unit locks the annulus gear to the intermediate shaft. If there were no slip in the fluid coupling this would be equivalent to locking the annulus and sun gears together, so preventing rotation of the planet gears and enforcing direct drive through the unit. However, slight slip is always present in the

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fluid coupling, therefore, the planet gears revolve slowly around the annulus to accommodate it, the action being similar in principle to that of a differential. The subsequent result nevertheless, is direct drive through the unit with slight loss in the fluid coupling.

In Reverse, both the rear clutch and the centre clutch are released, permitting all the gears in the rear unit to rotate. The rear unit annulus and the reverse unit sun gear are splined together, and rotate in the opposite direction to that of the input torque. The reverse unit annulus gear is held by the reverse cone clutch (see Section T20—Reverse assembly) and the reverse unit planet gears therefore revolve inside it, transmitting the reverse torque through the planet gear carrier to the output shaft.

A point of interest in gear arrangement is the fact that the fluid coupling is not directly driven by the engine drive-plate; the torus cover is secured to the crankshaft driven drive-plate and drives the rear torus member at a reduced speed, in first gear, through the gear train of the front epicyclic unit. This speed reduction allows the fluid coupling to rotate at a lower speed than if it were directly connected to the engine. Since

the coupling is inefficient at very low speeds this reduces the tendency for the car to creep forward when a forward Range is selected at idle.

Gear ratios

The line of drive through from the engine crankshaft, follows.

First gear

The drive is transferred from the engine crankshaft, via the torus cover to the front gear train which is in reduction. From the front gear train the drive passes to the fluid coupling by way of the intermediate shaft. The fluid coupling drives the mainshaft which in turn transfers the drive through the rear train, which is in reduction, to the output shaft. With both gear trains in reduction the gearbox will be in bottom or first gear, ratio 3.82 : 1 (see Fig. T94).

Second gear

The drive is transferred from the engine crankshaft, via the torus cover, to the front gear train which is in

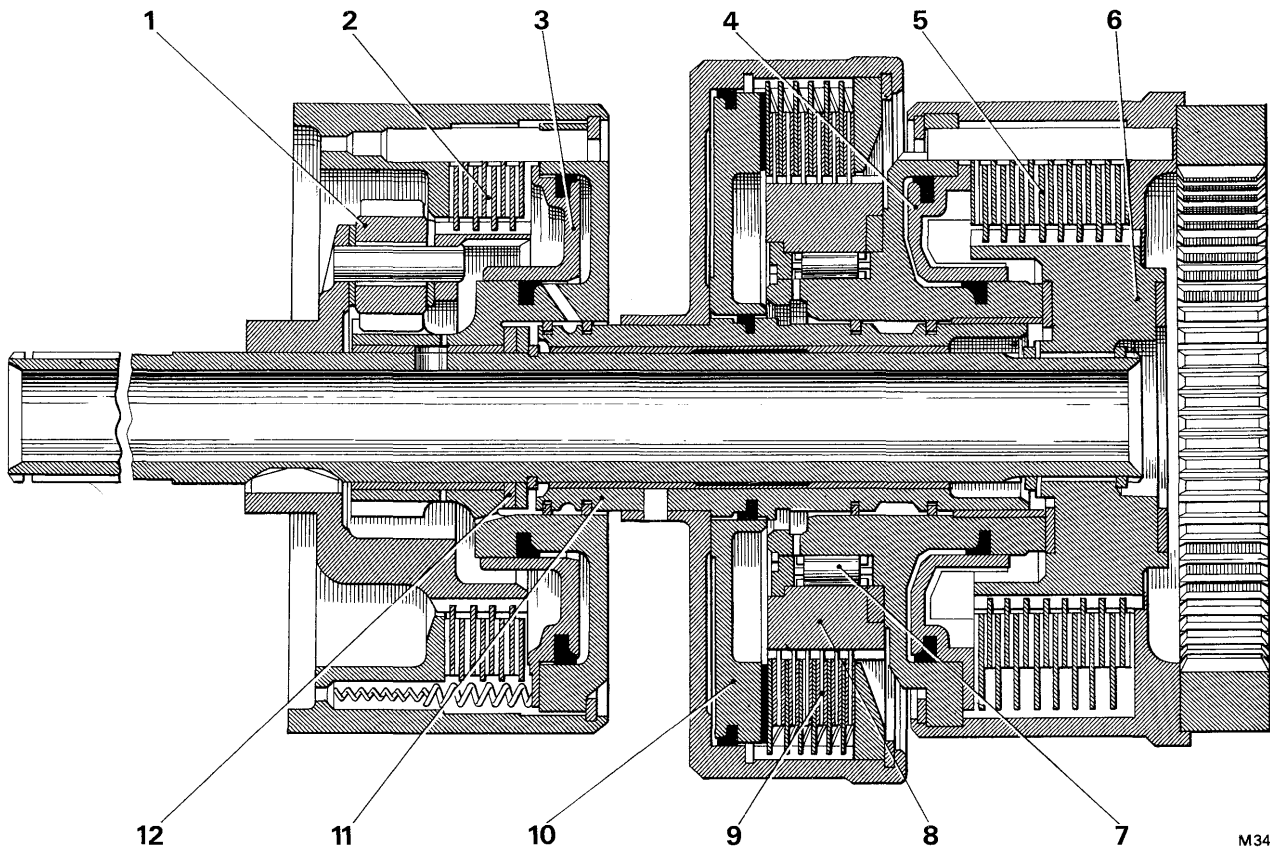


FIG. T93 DRUM ASSEMBLIES—SECTIONED VIEW

- | | | |
|-----------------------|--------------------|-------------------------|
| 1 Front planet gear | 5 Rear clutch | 9 Centre clutch |
| 2 Front clutch | 6 Rear clutch hub | 10 Centre clutch piston |
| 3 Front clutch piston | 7 Sprag race | 11 Oil delivery sleeve |
| 4 Rear clutch piston | 8 Sprag outer race | 12 Thrust washer |

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direct drive. From the front gear train the drive passes to the fluid coupling by way of the intermediate shaft. The fluid coupling drives the mainshaft which in turn transfers the drive through the rear train, which is in reduction, to the output shaft. Only the rear train is in reduction so the gearbox will be in second gear, ratio 2.63 : 1 (see Fig. T95).

Third gear

The drive is transferred from the engine crankshaft, via the torus cover, to the front gear train which is in reduction. Here the drive is divided, passing to the fluid coupling via the intermediate shaft, also passing directly to the rear train, again by way of the intermediate shaft. The rear train is in direct drive; hence, torque is applied to the output shaft from the fluid coupling, via the mainshaft, also from the intermediate shaft. As only the front train is in reduction the gearbox will be in third gear, ratio 1.45 : 1 (see Fig. T96).

Fourth gear

The drive is transferred from the engine crankshaft, via the torus cover, to the front gear train which is in direct drive. Here again the drive is divided, passing forward to the fluid coupling and rearward to the rear gear train. The rear gear train is in direct drive also, therefore the gearbox transmits torque through a 1 : 1 ratio and is in top gear (see Fig. T97).

Reverse

The drive is transferred from the engine crankshaft, via the torus cover, to the front gear train which is in reduction. From the front gear train the drive passes to the fluid coupling by way of the intermediate shaft. The fluid coupling drives the mainshaft and rear unit sun gear. The rear unit sun gear transmits the drive, via the output shaft planet gears, to the rear unit annulus gear which is splined to the reverse unit sun gear. The reverse unit is in reduction and drive is transmitted by the reverse unit planet carrier to the output shaft in a reverse direction (see Section T20—Reverse assembly). With the front, rear and reverse trains in reduction, the ratio is 4.30 : 1 (see Fig. T98).

Neutral

The drive is transferred from the engine crankshaft, via the torus cover to the front train. The front band and clutch are off, the gears idle therefore no torque is transmitted to the output shaft (see Fig. T99).

Drum assemblies — To overhaul

The following paragraphs describe the procedure to be adopted when overhauling the drum assembly. This assembly comprises the front, centre and rear clutch units, the intermediate shaft, the oil delivery sleeve, the sprag clutch and the front and rear bands. Before the assembly can be removed from the gearbox, the gearbox must be taken out of the car and the following units removed.

Fluid coupling (see Section T10).

Side cover, sump and filter (see Section T11).

Control valve unit and parking brake bracket (see Sections T12 and T13).

Servo units (see Sections T14 and T15).

Rear pump and governor (see Section T16).

Pressure control valve (see Section T17).

Front pump and drive-shaft (see Section T18).

Reverse assembly (see Section T20).

Drum assemblies — To remove

Unscrew the two setscrews which secure the centre drum locating key plate to the gearbox casing; remove the plate, run a 5/16 in. dia. U.N.F. setscrew into the tapped hole in the key then lift out the key (see Fig. T100).

Turn back the tabs of the centre bearing cap lock plate, unscrew the two retaining setscrews then lift off the cap. Remove the oil feed pipe from the centre drum and casing.

Rotate both bands so that they are clear of their respective anchor pins.

Lift the rear end of the intermediate shaft and support the front of the shaft with the other hand; gently ease the oil delivery sleeve out of its support.

Hold the rear band on the rear drum then lift the assembly out of the gearbox casing, leaving the front band in the casing.

Fit the assembled drums and shaft into the holding stand (see T.S.D. 2331—Workshop Tools), then remove the front band from the casing.

Drum assemblies — To dismantle

Remove the snap ring which retains the rear drum hub to the intermediate shaft (see Fig. T101). Remove the hub.

Lift the rear drum assembly off the shaft. As the sprag clutch inner race is retained by a snap ring to the rear drum, the inner race will be removed as well as the sprag race and the outer race.

Remove the thin steel thrust washer from above the snap ring. Remove the snap ring which locates the rear

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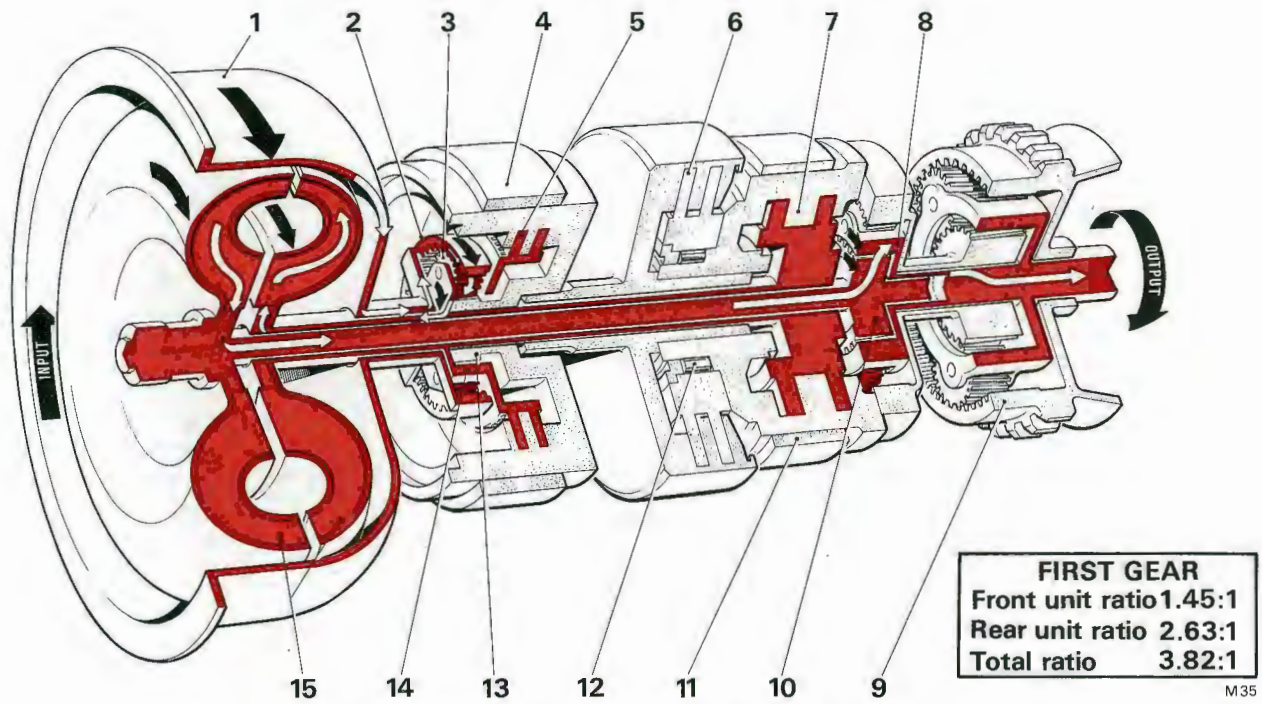


FIG. T94 LINE OF DRIVE IN 1st GEAR

- | | | |
|--------------------------------|---------------------------------|-----------------------------------|
| 1 Torus cover <i>driving</i> | 6 Centre clutch <i>holding</i> | 11 Rear band <i>released</i> |
| 2 Annulus gear <i>driving</i> | 7 Rear clutch <i>released</i> | 12 Sprag clutch <i>holding</i> |
| 3 Planet gears <i>rotating</i> | 8 Planet carrier <i>driving</i> | 13 Sun gear <i>stationary</i> |
| 4 Front band <i>holding</i> | 9 Reverse unit <i>idling</i> | 14 Planet carrier <i>rotating</i> |
| 5 Front clutch <i>released</i> | 10 Sun gear <i>driving</i> | 15 Tori <i>driving</i> |

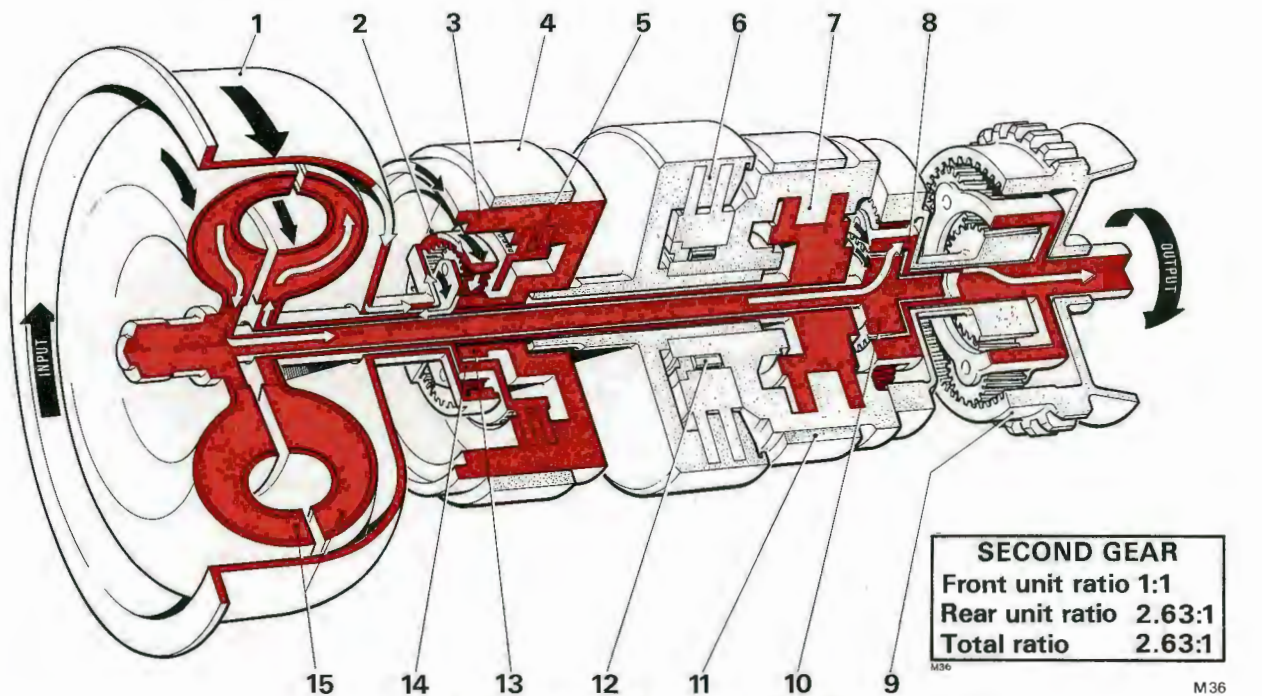


FIG. T95 LINE OF DRIVE IN 2nd GEAR

- | | | |
|-------------------------------|---------------------------------|-----------------------------------|
| 1 Torus cover <i>driving</i> | 6 Centre clutch <i>applied</i> | 11 Rear band <i>released</i> |
| 2 Annulus gear <i>driving</i> | 7 Rear clutch <i>released</i> | 12 Sprag clutch <i>holding</i> |
| 3 Front drum <i>rotating</i> | 8 Planet carrier <i>driving</i> | 13 Sun gear <i>rotating</i> |
| 4 Front band <i>released</i> | 9 Reverse unit <i>idling</i> | 14 Planet carrier <i>rotating</i> |
| 5 Front clutch <i>applied</i> | 10 Sun gear <i>driving</i> | 15 Tori <i>driving</i> |

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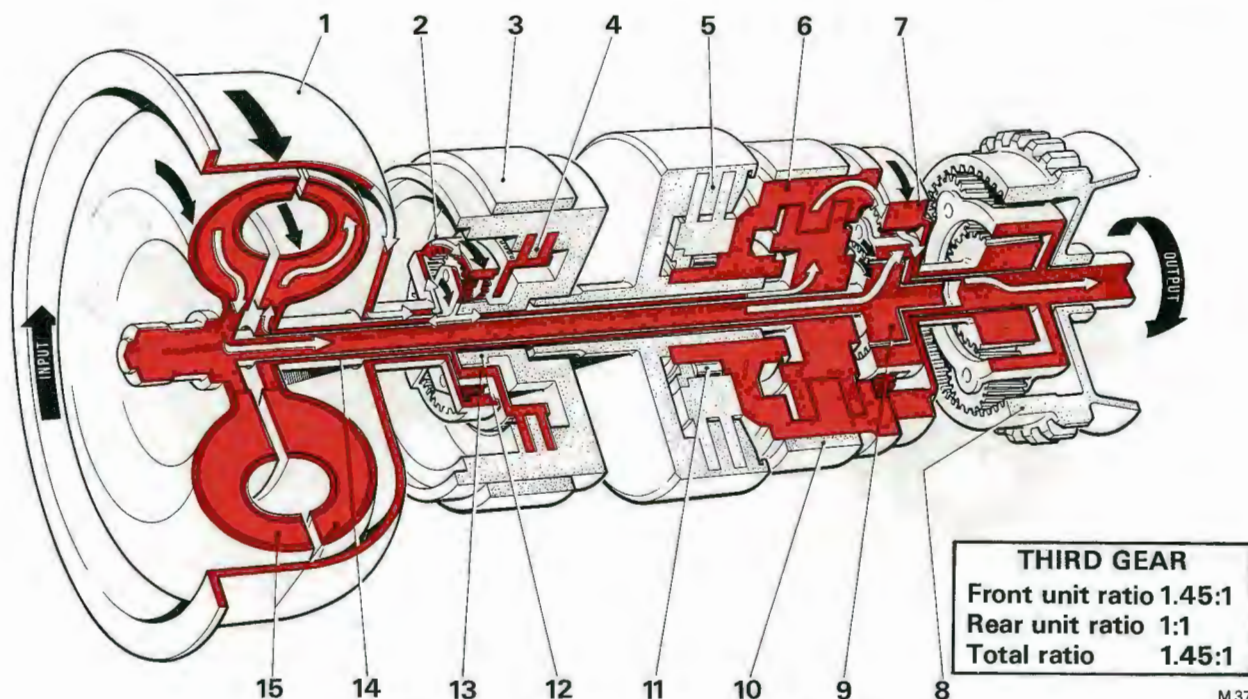


FIG. T96 LINE OF DRIVE IN 3rd GEAR

- | | | |
|-------------------------|--------------------------|----------------------------|
| 1 Torus cover driving | 6 Centre clutch holding | 11 Rear band released |
| 2 Annulus gear driving | 7 Rear clutch released | 12 Sprag clutch holding |
| 3 Planet gears rotating | 8 Planet carrier driving | 13 Sun gear stationary |
| 4 Front band holding | 9 Reverse unit idling | 14 Planet carrier rotating |
| 5 Front clutch released | 10 Sun gear driving | 15 Tori driving |

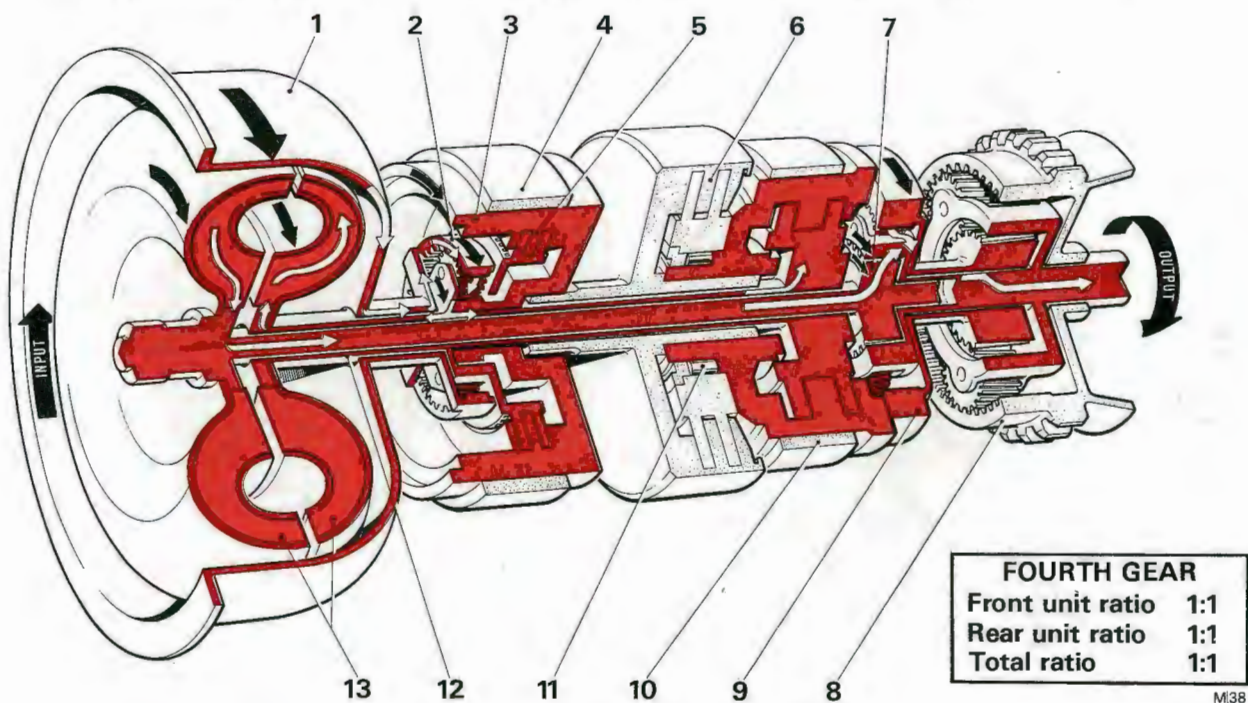


FIG. T97 LINE OF DRIVE IN 4th GEAR

- | | | |
|------------------------|-------------------------|-------------------------------|
| 1 Torus cover driving | 6 Centre clutch applied | 10 Rear band releasing |
| 2 Annulus gear driving | 7 Sun gear driving | 11 Sprag clutch freewheeling |
| 3 Front drum rotating | 8 Reverse unit idling | 12 Intermediate shaft driving |
| 4 Front band released | 9 Annulus gear driving | 13 Tori driving |
| 5 Front clutch applied | | |

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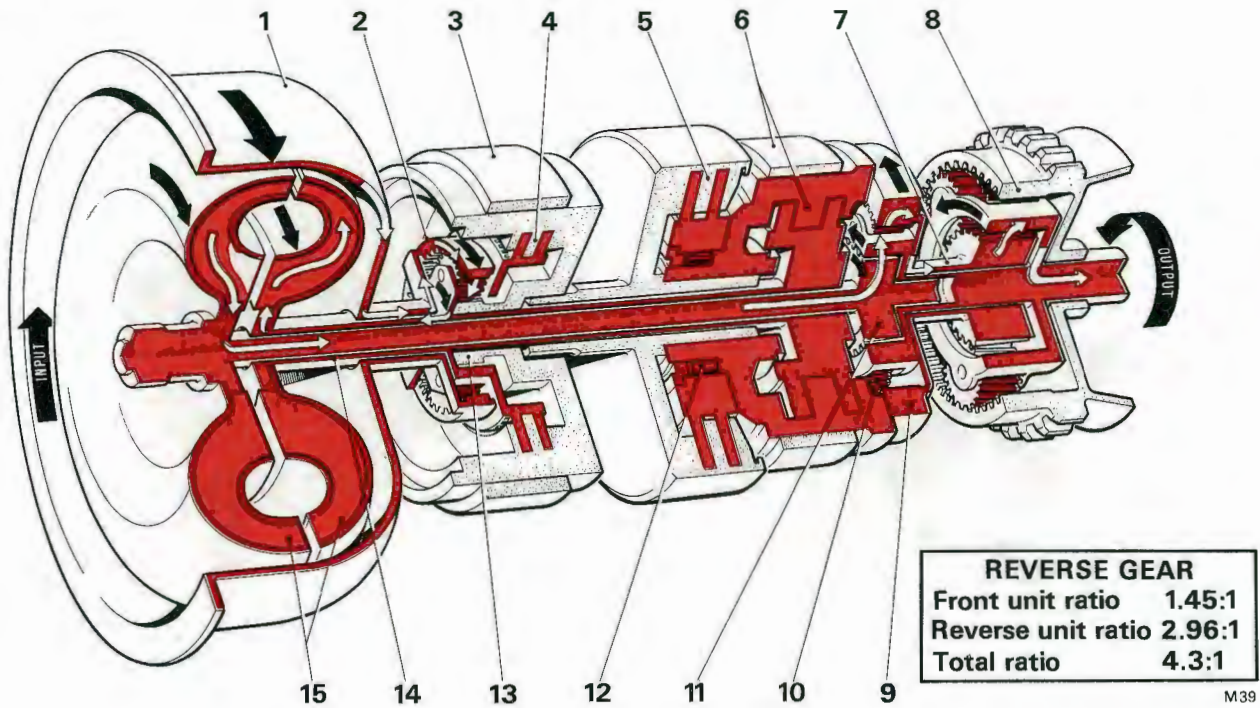


FIG. T98 LINE OF DRIVE IN REVERSE GEAR

- | | | |
|---------------------------------|---|--------------------------------------|
| 1 Torus cover <i>driving</i> | 6 Band and clutch <i>released</i> | 11 Sun gear <i>driving</i> |
| 2 Annulus gear <i>driving</i> | 7 Sun gear <i>driving</i> | 12 Sprag clutch <i>rotating</i> |
| 3 Front band <i>holding</i> | 8 Annulus gear <i>stationary</i> | 13 Sun gear <i>stationary</i> |
| 4 Front clutch <i>released</i> | 9 Annulus gear <i>opposite rotation</i> | 14 Intermediate shaft <i>driving</i> |
| 5 Centre clutch <i>released</i> | 10 Planet gears <i>rotating</i> | 15 Tori <i>driving</i> |

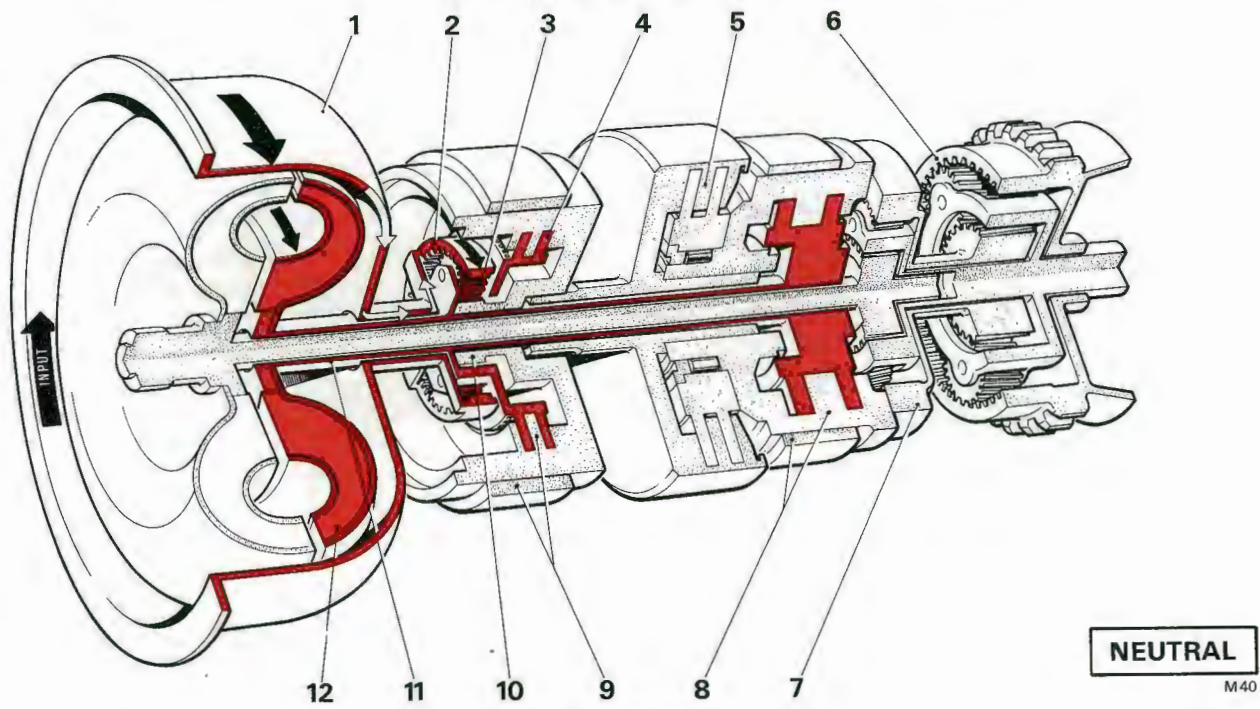


FIG. T99 NEUTRAL

- | | | |
|---------------------------------|--|---|
| 1 Torus cover <i>driving</i> | 6 Reverse unit <i>idle</i> | 9 Front clutch and band <i>released</i> |
| 2 Annulus gear <i>driving</i> | 7 Annulus gear <i>idle</i> | 10 Sun gear <i>idling</i> |
| 3 Planet gears <i>rotating</i> | 8 Rear clutch and band <i>released</i> | 11 Intermediate shaft <i>idling</i> |
| 4 Planet carrier <i>idling</i> | | 12 Rear torus <i>idling</i> |
| 5 Centre clutch <i>released</i> | | |

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clutch hub and which now prevents the removal of the oil delivery sleeve (see Fig. T102).

Lift the assembled delivery sleeve and centre drum from the intermediate shaft.

Remove the front drum retaining snap ring (see Fig. T103), taking care not to scratch the surface of the intermediate shaft, then lift off the drum assembly.

Withdraw the steel and the bronze thrust washers from the recess in the front drum and label them for identification.

Front drum — To dismantle

Position the front drum assembly in a suitable press then apply sufficient pressure on the clutch cover to enable the large snap ring to be prised from its groove.

Remove the drum assembly from the press and separate the clutch cover from the drum by tapping the end of the sun gear with a soft-headed mallet.

Remove the six inner and six outer clutch return springs, then lift out the complete pack of clutch plates and spacer plate(s). It is important that the clutch plates are not separated prior to examination.

Remove the clutch apply piston from its annular housing in the clutch cover by sharply tapping the sun gear with a soft-headed mallet to shock it out of position.

Using a blunt screwdriver or similar tool, prise the oil seal rings and expanders from their respective grooves in the clutch piston and clutch cover, discard the seals and expanders.

Centre drum — To dismantle

Place the centre drum on a suitable press so that the drum, and not the oil delivery sleeve, rests on the press.

Press down the clutch retaining ring just sufficiently to enable the snap ring to be removed; remove the snap ring then remove the drum from the press.

Lift out the pack of clutch plates, clutch release springs and spacer plate(s); do not separate the plates prior to examination.

Remove the clutch apply piston then remove the rubber oil sealing rings from the piston and the oil delivery sleeve; discard the seals.

Rear drum — To dismantle

Remove the rear clutch hub retainer (if fitted) then withdraw the hub and bronze thrust washer.

Place the drum on the bench with the sprag clutch uppermost. Remove the Spirolox snap ring by winding it out of its groove in the sprag inner race (see Fig. T104).

Pull the sprag outer race until the bronze retainer, outer race and thrust washer can be removed; remove

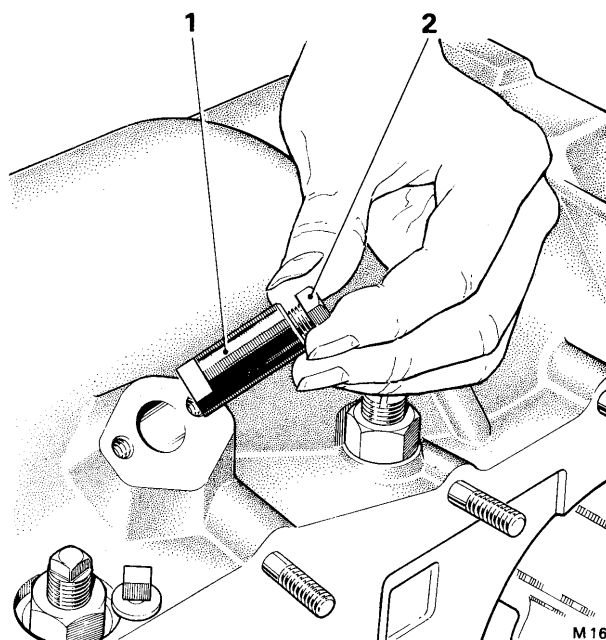


FIG. T100 REMOVING THE CENTRE CLUTCH KEY

1 Key 2 Setscrew

the assembled retainer and the outer race then remove the sprag race.

Note The sprag race and the outer race should be removed smoothly and easily. **Do not** attempt to force either one when removing them from or fitting them to the inner race.

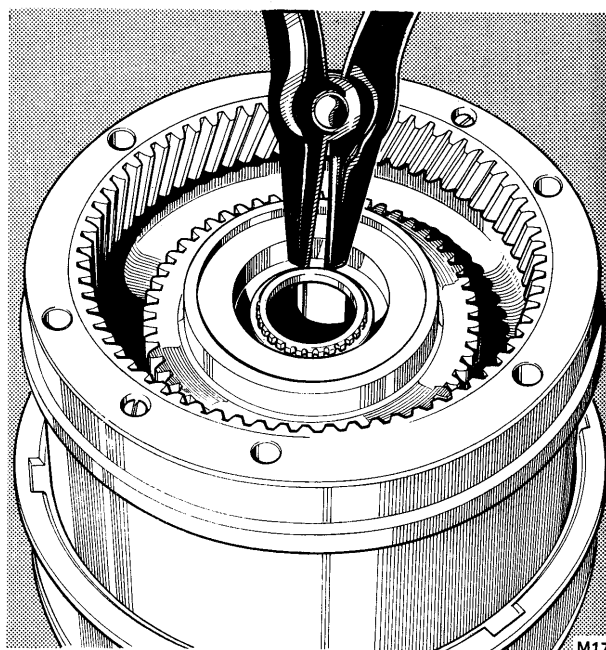


FIG. T101 REMOVING THE REAR DRUM RETAINING RING

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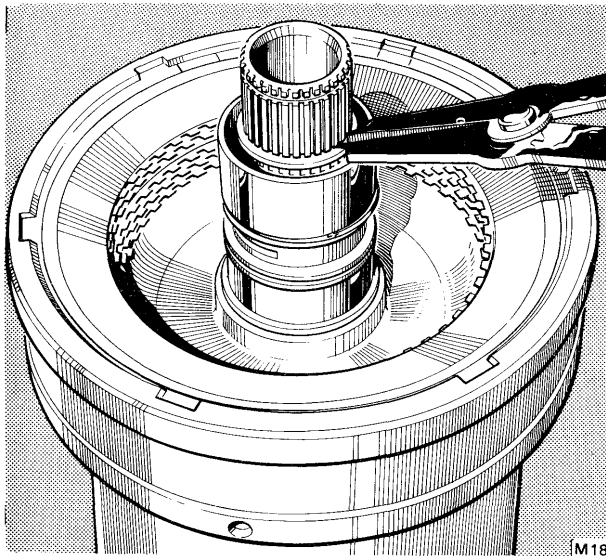


FIG. T102 REMOVING THE DELIVERY SLEEVE RETAINING RING

Place the rear drum on the bed of a press with the sprag inner race uppermost.

Press down the inner race just sufficiently to enable the large snap ring to be removed.

Place the rear drum of the bench then remove the inner race, which is part of the rear clutch drum.

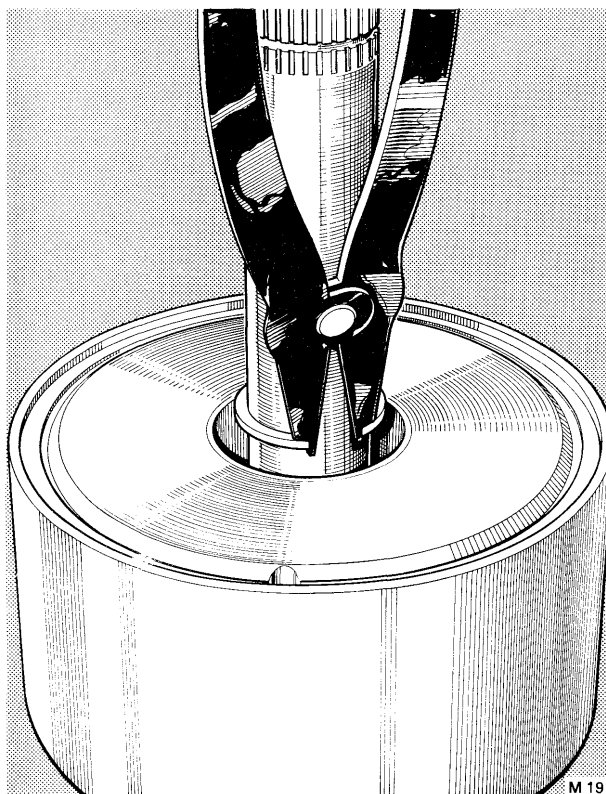


FIG. T103 REMOVING THE FRONT DRUM RETAINING RING

Remove the rear clutch piston, then remove and discard the inner and outer seals and expanders.

Remove the clutch pack and return springs in a similar manner to that described for the front drum.

Note The clutch release springs are fitted with guide pins which should be removed with the springs.

The annulus gear is secured to the rear drum by two setscrews and should be removed only for renewal purposes.

Drum assemblies — To inspect

With the exception of the three clutch packs, thoroughly wash all parts in clean paraffin. The clutch plates must first be examined as explained later in this Section.

Examine all surfaces of the clutch drums for scoring and grooves; only slight damage, which should be removed by stoning, is permissible. Check the front and rear clutch driving pins for security; if loose, renew the drums.

Examine the gear teeth of the rear drum annulus gear and the intermediate shaft pinions. If damaged, check the gears with which they mesh and, if they are unserviceable, renew the particular unit or assembly.

Examine the internal and external splines of the clutch hubs and the intermediate shaft for damage marks, burrs and excessive uneven wear; only damage which can be rectified by light stoning should be accepted. If any splines are chipped, that particular unit should be renewed.

Examine the snap ring grooves in the intermediate shaft for burrs and ridges. Examine the bearing surfaces for scores and scratches; if necessary, remove with a stone. Examine the planet carrier and the outer diameter of the pinion thrust washer for cracks. Spin each planet gear to check for smooth running; also check for side play which may indicate worn needle rollers or loose planet gear retaining pins. The front planet and intermediate shaft assembly must be renewed as a unit should any of the components become unserviceable; dismantling of the unit is not permitted.

Examine the clutch return springs for distortion and collapsed coils.

The springs should be of the same height (*see Dimensional Data*). If one spring is weak, it is recommended that all the springs be changed, as a reduction in spring length, or distortion, indicates that the clutch has, at some stage, been overheated. This will have weakened all the springs and will cause the clutch to slip under heavy loading. Slight wear indicated by brightness of the outer coil diameter is acceptable. Examine the centre clutch return springs for cracks or distortion; polishing of the tops of the spring 'waves'

is acceptable (see *Dimensional Data for approximate spring height*). Examine the guide pins of the rear clutch springs for distortion and burred ends; ensure that they are all of equal length.

Examine the clutch pistons for scores, cracks or distortion and ensure that the seal grooves are perfectly clean.

Examine the piston bore in the front clutch cover for scores and the bushes for security, signs of picking up or heavy wear. Check the seal groove for cleanliness.

Examine the rear clutch drum for scoring of the piston bore; examine the bush for scores and grooves. Ensure that the seal groove is clean. Examine the delivery sleeve ring bores in the clutch drums for grooving; the bores will have a clean finish where the rings have run, but should not be scored or grooved. If signs of scoring or grooving is evident, renew the drums. Examine the sprag inner race diameter for scores and indentations; ensure that the oil holes are clean. Examine the sprag race to ensure that there are no cracks in the sprag cage and that the sprags are free to move in the cage. Examine the sprag outer race for scores and indentations. Examine the thrust washer in the outer race for scores; this washer is an integral part of the outer race and no attempt should be made to remove it. Examine the sprag retainer for scores; the retainer is initially a light interference fit — 0.000 in. to 0.001 in. (0,00 mm. to 0,025 mm.) — in the outer race, but slackness is permissible, providing that the retainer is otherwise serviceable. The tracks on which the sprag operates may appear — owing to its normal wear pattern — to be slightly worn or indented. In such a case, polish the tracks with Crocus paper then inspect the surfaces for irregularities, using a dial test indicator, in order to prevent possible rejection of a serviceable component (see *Dimensional Data for sprag clutch inner and outer race diameters*).

Examine the assembled oil delivery sleeve and centre drum for scores; damage which can be removed by light stoning only is acceptable. Check that the drum is secure on its sleeve.

Note On early models, check that the three guide pins are secure in the drum and that the centre clutch piston will move freely on the pins.

Examine the bush in the oil delivery sleeve for heavy scoring.

Ensure that the oil delivery sleeve sealing rings are free in their grooves and that the grooves are clean. It is not necessary to remove the rings unless damage necessitates renewal.

Examine the centre bearing cap and dowel pin for burrs; light damage may be removed by stoning or polishing. If the dowel pin is loose or damaged it should be renewed.



FIG. T104 REMOVING THE SPRAG RETAINING RING

Clutch plates — To inspect

Having retained the clutch plates in the order in which they were fitted, it is now possible to examine the surfaces of each plate in relation to that with which it mates. This is important, as a rough surface on a driven plate may easily be the cause of excessive wear on the mating face of the composition drive plate.

It is possible that at the clutch cover end of the front and rear clutch packs, and at the piston end of the centre clutch pack, one or two extra steel plates may be found. These 'spacing' plates should be labelled and

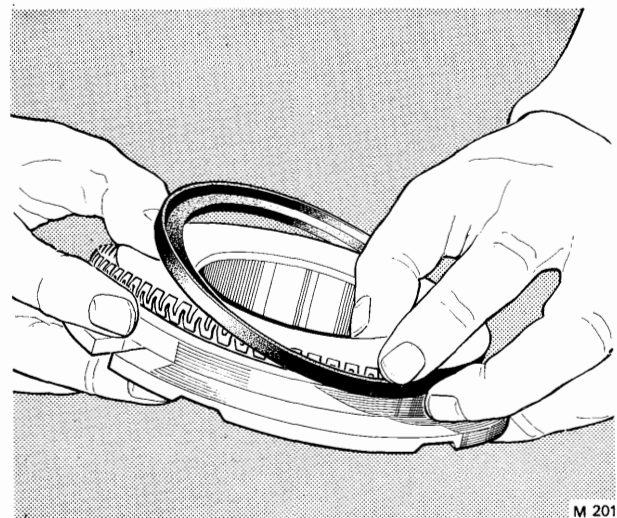


FIG. T105 FITTING EXPANDER AND SEAL TO CLUTCH PISTON

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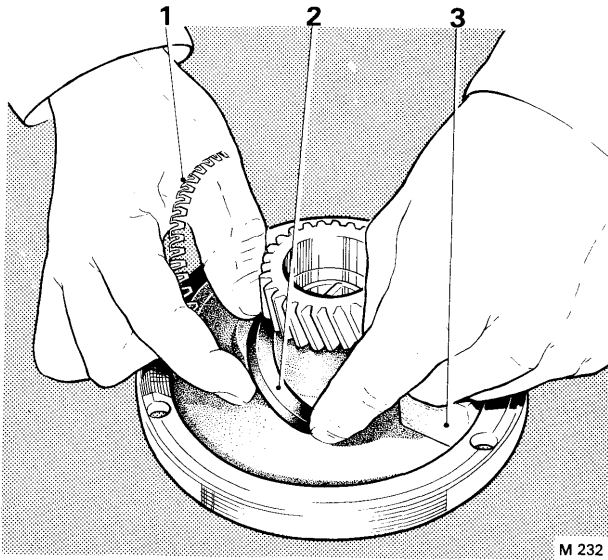


FIG. T106 FITTING EXPANDER AND SEAL TO CLUTCH COVER

- 1 Expander
- 2 Seal
- 3 Spacing block

kept separate from the other plates, as they are not hardened and vary in thickness.

Slight discolouration of the steel plates is acceptable, but heavy discolouration caused by overheating may have affected the heat treatment of the plates and they should be discarded. Check the driven plates in the front and rear clutches for distortion, using a surface plate; also ensure that the surface finish is smooth and polished. The centre clutch outer plates (steel plates) should also have a smooth polished finish but instead of being flat, should be slightly waved — between 0.008

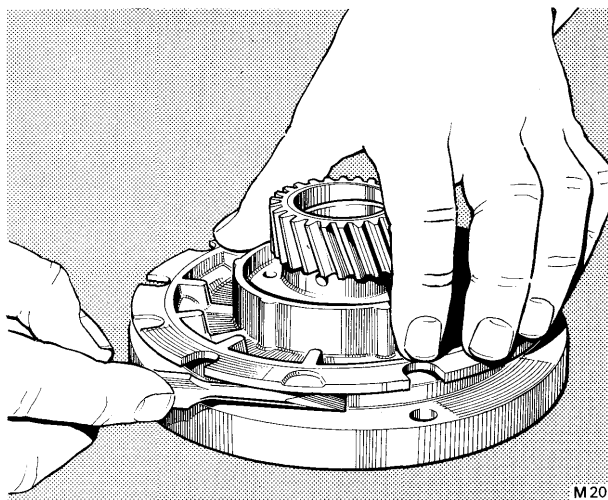


FIG. T107 FITTING THE PISTON TO THE CLUTCH COVER

in. and 0.012 in. (0.20 mm. and 0.31 mm.).

The composition surfaces of the drive plates should be carefully inspected for lifting, flaking or excessive wear. The thickness of the composition plates should not be less than 0.090 in. (2.29 mm.). A plate will normally darken with use, but should it be almost black, or have a glazed look, indicating signs of burning, it must be renewed. If more than one plate is badly burnt, the complete set of plates must be renewed.

The surface contour of the front and rear clutch drive plates is undulated; each plate should have six 'waves' which should not be less than 0.015 in. (0.40 mm) deep. This can be checked on a surface table by sliding a feeler gauge into the spaces so formed; if there is evidence of any other distortion the plate must be renewed.

Examine the drive plate serrations and the driven plate slots for burrs or signs of excessive wear; ensure that the plates slide smoothly over their respective splines or driving pins.

Oil delivery sleeve — To check

It is possible to check for oil leakage between the oil delivery sleeve and gearbox casing as follows.

Pour clean gearbox oil over the portion of the centre drum that contains the dowel and oil feed holes.

Fit the drum and oil delivery sleeve to the gearbox casing, locating the cap dowel pin in one of the two holes in the sleeve instead of its correct location; this blanks off the casing oilways.

The cap must be fitted with the machined chamfer toward the front of the case and the setscrews evenly tightened to the correct torque loading.

Note If the sleeve and drum assembly can be rocked they should be renewed.

Apply air pressure to the front and rear clutch passages, as shown for clutch testing in Figure T116; there should be no leakage between the drum, the case and the cap. When a new oil delivery sleeve and drum assembly has been fitted, slight leakage may be rectified by carefully dressing the cap where it abuts the casing. Should this prove unsuccessful, the cap and casing must be renewed.

When the foregoing checks are satisfactory, remove the sleeve in readiness for gearbox assembly.

Bands — To inspect

Examine the band for loose or worn linings. If the face of a lining is worn to the bottom of the grooves, or has started to lift from the steel band, the particular band assembly must be renewed. When inspecting bands, care must be taken not to distort them in any way which might destroy the good circumferential fit which

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exists between drum and band. If a lining is found to be badly impregnated with foreign matter such as bronze, caused by a bush failure, it should be renewed.

Check the steel bands for distortion and cracks and check the anchor ends for broken welds and worn sockets.

Check the rear band operating strut locating pin for security and the strut for play on the pin. If play is excessive or the pin is loose, renew the complete band assembly.

Thrust washers and snap rings — To inspect

Examine all thrust washers for cracks; if any washer is cracked, badly scored or excessively worn, it should be renewed. Examine the washer mating faces for burrs, scoring and sharp edges. Check the snap rings for correct fitting in their grooves. If they are loose when in position on the intermediate shaft they should be renewed.

Checking the fittings of the large snap rings in the clutch drums. The rings must be a snug fit in their grooves; slight distortion necessitates the renewal of the rings.

Front clutch — To assemble

Fit a new seal and expander to the piston in the manner illustrated in Figure T105. Take care to ensure that the rubber is well bedded into its groove and that the expander does not protrude beyond the bottom edge of the rubber seal.

In a similar manner fit a new seal and expander to the clutch cover. After initially inserting the expander and seal into the groove, a small wooden block should be fitted between the seal and the inner circumference of the cover (see Fig. T106). This will prevent the tendency for the seal and the expander to creep out of the groove during fitting. Remove the wooden block then check that the expander does not protrude below the seal.

The direction in which the protruding lip of the seal faces is important and must be fitted as shown in the respective illustrations (see Fig. T105 and Fig. T106).

With the seal correctly in position the piston may then be inserted into the cover after first smearing the rubber with 'Mobilgrease MP'. The lip of the outer seal should be initially introduced into the cover using the side of a blunt screwdriver drawn over the seal edge as shown in Figure T107. The two components can then be pressed together manually.

Line up the square notches in the piston with the three holes in the cover.

Fit the intermediate shaft into the holding fixture, clutch hub uppermost.

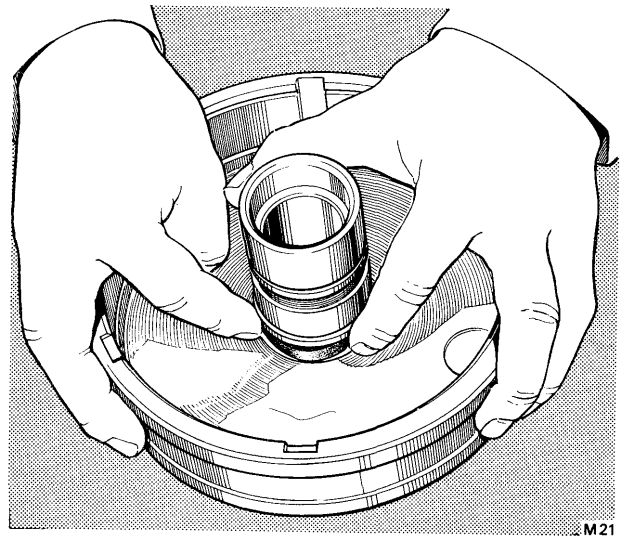


FIG. T108 FITTING THE OIL SEAL TO THE CENTRE CLUTCH DRUM ASSEMBLY

Fit the front drum over the shaft so that it rests on the planet gears with its driving pins pointing upward.

Lubricate the surfaces of the clutch plates with clean gearbox fluid, then fit them alternately commencing with a composition drive plate, then a steel driven plate, until the complete pack is fitted. New composition plates should be thoroughly soaked in hot gearbox oil before fitting. Ensure that each composition plate slides freely over the clutch hub splines and that the steel plates are fitted with the square notches over the driving pins.

It should be noted that previously labelled spacing plates must be fitted last, but the thickness may have to be re-assessed as described later.

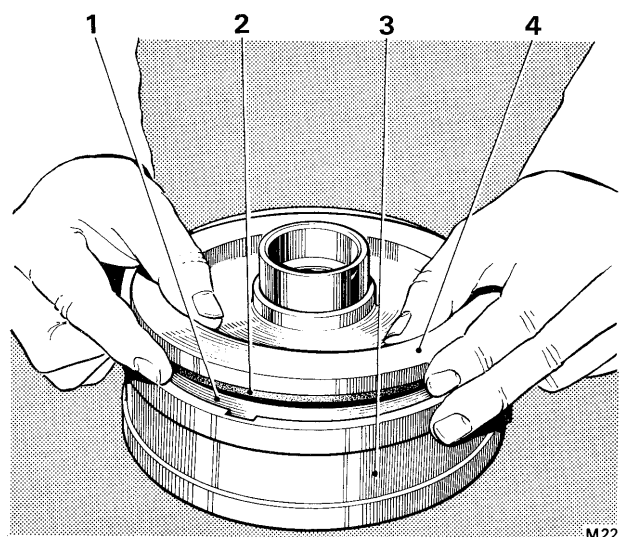


FIG. T109 FITTING THE CENTRE CLUTCH PISTON

- | | |
|--------------|---------------|
| 1 Guide tool | 3 Centre drum |
| 2 Seal | 4 Piston |

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Fit the size pairs of clutch release springs into the locating holes formed by the plates, then fit the cover into the drum, sun gear first, making sure that the springs engage with the pockets in the clutch piston.

Remove the complete assembly from the intermediate shaft.

Using a suitable press, apply sufficient pressure to the clutch cover to enable the snap ring to be fitted into its groove. Ensure that the ring snaps firmly into its groove then release the pressure.

After removing the drum assembly from the press, ensure that the outer shoulder of the clutch cover protrudes evenly through the inner circumference of the snap ring; if necessary, lightly tap the cover into its correct position, using a soft-headed mallet.

The assembly of the clutch plates should now be checked. This is best accomplished by placing the fingers on the teeth of the drive plates then lifting and turning the plates. When correct, the clearance should be just sufficient to allow free rotation of the plates without binding.

If the clutch plates are too free and end float can be felt, or if the plates are binding or are solid, it will be necessary to alter the thickness of the spacing plates accordingly.

These plates are supplied in various thicknesses (*see Parts List*) and can be fitted singly or paired in any combination to give the correct clearance. The total number of spacing plates fitted must not exceed two and they must not be fitted in any position other than

between the clutch cover and the first steel driven plate.

Centre clutch — To assemble

Fit a new seal to the piston.

In a similar manner, fit a new seal to the oil delivery sleeve; the seal lip should point toward the base of the drum (*see Fig. T108*). If the oil sealing rings have not been removed take care not to damage the seal. Ensure that the seals are well bedded in their grooves.

Smear the seals with 'Mobilgrease MP'.

Fit the piston guide tool RH 7777 (*see T.S.D. 2331 —Workshop Tools*) into the drum then fit the piston as shown in Figure T109.

Note On early models, turn the piston to align the holes with the guide pins.

Push the piston to the bottom of the bore; remove the guide tool.

Fit the existing spacer plate(s) next to the piston then lubricate the faces of the clutch plates with clean gearbox oil. New plates should be thoroughly soaked in hot gearbox oil before fitting.

Fit alternately a steel outer plate, a composition inner plate and a 'waved' spring (*see Fig. T110*) until six steel plates and five composition plates and springs have been fitted. Ensure that the open ends of the springs face toward the piston and that the gaps in the springs are aligned.

Fit the retaining plate next to the upper steel plate

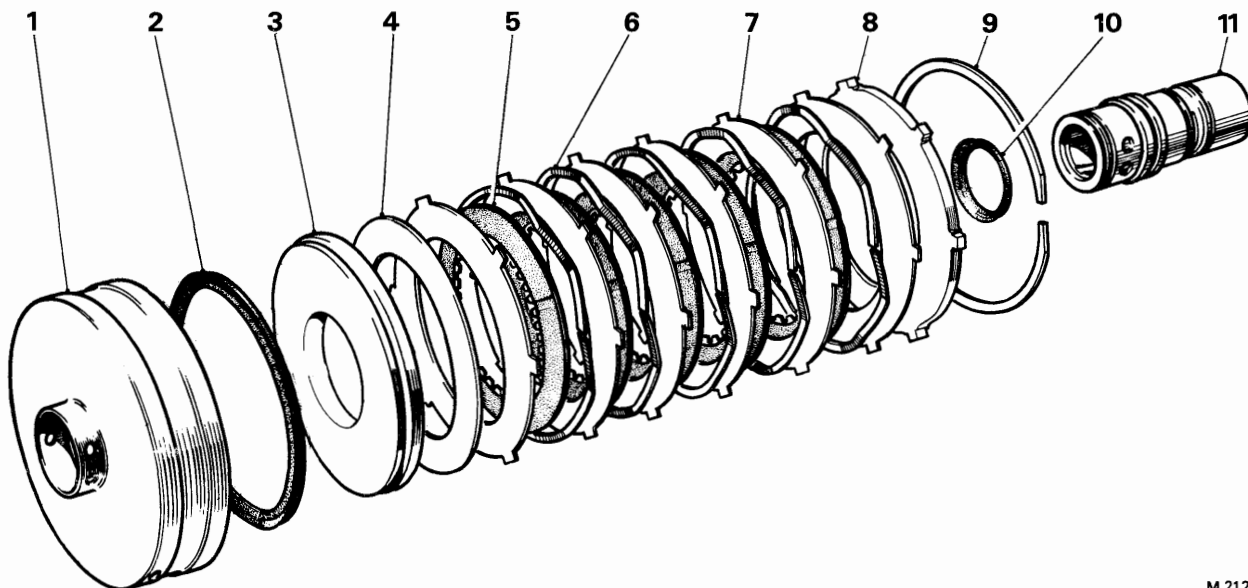


FIG. T110 CENTRE CLUTCH

- | | | |
|----------------|------------------------------------|------------------------|
| 1 Drum | 5 Inner clutch plate (composition) | 8 Retainer |
| 2 Outer seal | 6 Clutch release spring | 9 Snap ring |
| 3 Piston | 7 Outer clutch plate (waved) | 10 Inner seal |
| 4 Spacer plate | | 11 Oil delivery sleeve |

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Fit the retaining plate next to the upper steel plate with the chamfered side uppermost.

Place the drum under a press with the drum itself resting on the press.

Press down the retainer until it is possible to fit the snap ring; fit the snap ring then remove the drum assembly from the press.

It is necessary to check the piston movement before proceeding further; this should be done as follows.

Measure the depth from the top of the drum to the top of the piston.

Apply an air pressure of approximately 70 lb/sq.in. (4,9 kg/sq.cm.) to the clutch apply port in the drum periphery (see Fig. T111).

When the clutch has moved through its full travel and compressed the plates, again measure the depth from drum top to piston top with the air pressure still applied. By subtracting one from the other, the amount of piston travel can be obtained. Piston travel should be between 0.100 in. and 0.120 in. (2,54 mm. and 3,048 mm.).

If the piston travel is greater or less than the figures quoted, dismantle the drum assembly then adjust the spacer plate(s) to obtain the correct piston travel.

The spacer plates are supplied in various thicknesses (see *Parts List*) and can be fitted singly or paired in any combination to give the correct travel. The total number of spacing plates fitted must not exceed two and they must not be fitted in any position other than between the piston and the first steel plate.

Rear clutch — To assemble

If previously removed, fit the annulus gear and evenly tighten the screws. Before final tightening, tap the end face of the gear with a soft-headed mallet to ensure correct location.

Fit new oil seals and expanders to the piston and the rear clutch drum in a similar manner to that described for the front clutch.

Lubricate the clutch plates with clean gearbox oil (thoroughly soak new plates) then fit the eight composition plates and eight steel plates to the drum, commencing with a composition plate and ending with a steel plate; note that the squared holes in the driven plates fit over the driving pins. It is advisable to fit temporarily the clutch hub to ensure that the drive plates slide freely on the splines.

Fit the clutch return springs and guide pins.

Fit the spacer plate(s) between the top steel plate and the piston then fit the rear clutch drum; fit the snap ring.

plate and the piston then fit the rear clutch drum; fit the snap ring.

Check and adjust the rear clutch clearance in a similar manner to that described for the front clutch.

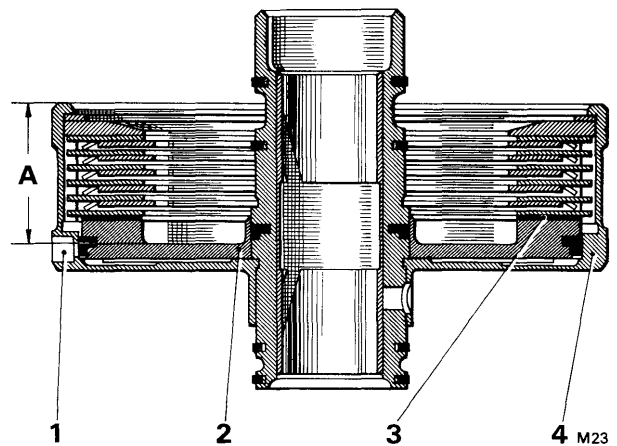


FIG. T111 CHECKING CENTRE CLUTCH PISTON TRAVEL

A Piston travel 0.100 in. to 0.120 in. (2,54 mm to 3,048 mm)

1 Clutch apply port

2 Clutch piston

3 Spacer plate

4 Clutch drum

Remove the hub.

Fit the large bronze thrust washer to the hub, retaining the washer on the hub with petroleum jelly.

Fit the hub and washer, rotating the hub to engage the drive plate splines. When correctly fitted the hub should be flush or just slightly below the counterbore of the drum.

Fit and secure the hub retaining bracket.

Stand the drum assembly on the bench, clutch drum uppermost.

Lubricate the sprag race with clean gearbox oil then fit the sprag race to the outer race with the flanged end of the sprag race uppermost (see Fig. T112). The

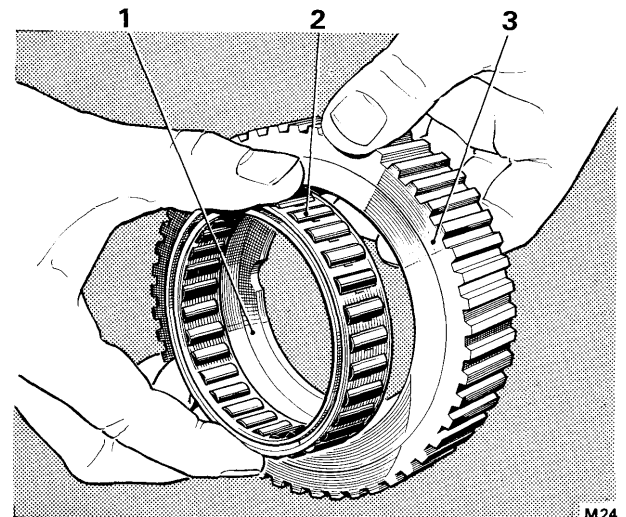


FIG. T112 FITTING THE SPRAG

1 Retainer

2 Sprag

3 Outer race

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FIG. T113 FITTING THE SPRAG CLUTCH ASSEMBLY

- 1 Retainer 2 Sprag 3 Outer race

sprag race should slide into the outer race smoothly and easily whilst being pushed in.

Note It is essential that the outer race and sprag is fitted so that it 'freewheels' when turned anti-clockwise and locks when turned clockwise.

Lubricate the thrust washer and the retainer on the outer race then fit the assembly to the clutch drum turning it in a similar manner to that previously described (see Fig. T113).

Fit the Spirolox snap ring.

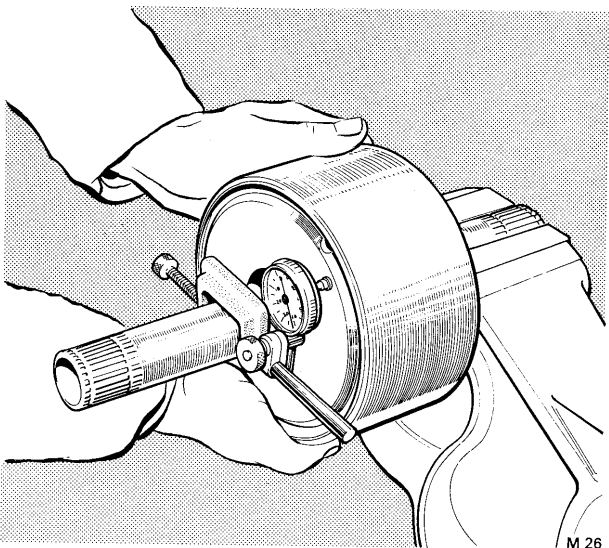


FIG. T114 CHECKING FRONT DRUM END FLOAT

Drum assemblies — To assemble

Fit the drum assemblies to the intermediate shaft in the following manner, using liberal quantities of clean gearbox oil during the procedure.

Fit the front drum onto the shaft, over the hub, rotating the drum so as to locate all the drive plates on the hub.

Fit the bronze thrust washer, steel (by selection) backing washer and the snap ring. The steel washer may have to be changed if, as a result of the following end float check, the end clearance is found to be outside the limits.

Hold the shaft in soft jaws in a vice.

Mount a dial test indicator on the shaft as shown in Figure T114 then measure the drum end float. If the end float reading is outside the limits given in 'Dimensional Data', replace the steel washer with one of suitable thickness, details of which are given in the Parts List.

Remove the assembly from the vice then fit the assembly to a holding fixture.

Ensure that the oil sealing rings on the oil delivery sleeve are locked, then carefully lower the assembled sleeve and centre drum over the intermediate shaft. Carefully enter the two sealing rings into the front drum cover, lowering the sleeve and drum until it comes to rest against the lower snap ring on the shaft.

Fit the snap ring above the sleeve then fit the thin steel washer.

Align the splines of the five drive plates in the centre clutch. This is best accomplished using a slave sprag outer race.

Ensure that the oil sealing rings on the intermediate shaft are locked.

Fit the rear drum assembly onto the oil delivery sleeve. Ease the drum carefully over the sealing rings, at the same time slightly turning the assembly to enable the splines on the sprag outer race to engage the clutch teeth. Also position the rear clutch hub so that the internal splines will engage with the mating splines on the end of the intermediate shaft. It may be necessary to remove the hub, fit the drum assembly and then fit the hub again. In such a case, ensure that the large bronze thrust washer is retained in its recess in the hub, otherwise, damage will occur and end float will be unobtainable.

Fit the hub retaining snap ring and the hub retaining bracket.

Drum assemblies — To fit

Fit the bearing cap in position on the centre drum — chamfer to the front — making sure that the dowel locates positively in its correct hole.

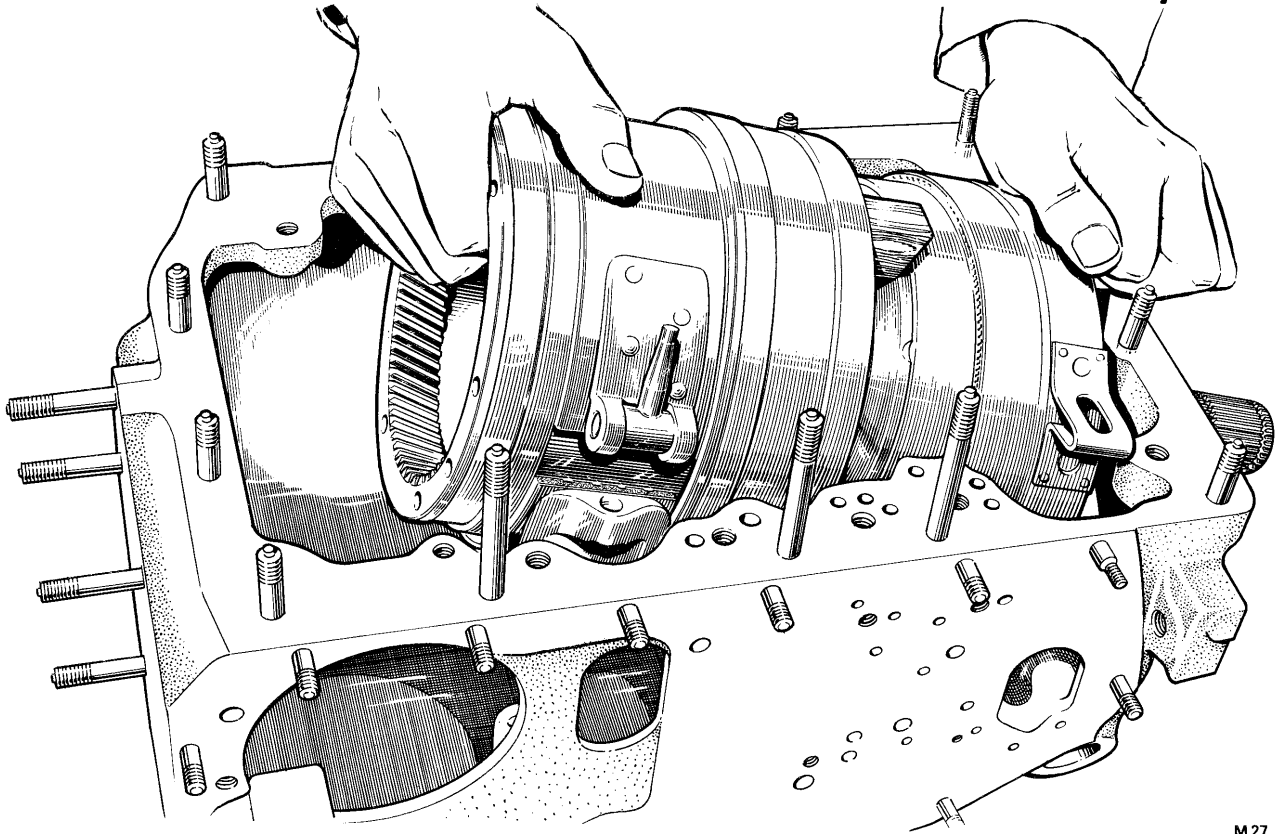


FIG. T115 FITTING THE DRUM ASSEMBLIES

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Fit the front band into position in the gearbox casing.

Place a small block of wood approximately 1.00 in. (25.4 mm.) wide between the front and centre drums. This will hold them apart as the drum assemblies are lowered into the gearbox casing and onto the bearing.

Insert the front of the intermediate shaft through the front band then, while the assembly is tilted, fit the rear band to the rear drum. Lower the complete assembly into position in the gearbox casing (see Fig. T115).

Remove the wooden spacer block.

Ensure that the anchor point on each band is located on its respective adjusting screw.

Fit the bearing cap setscrews together with a new lock-plate; do not tighten the screws.

Ensure that the key locating hole in the centre drum aligns with the corresponding hole in the case; similarly ensure that the centre clutch oil feed pipe holes align.

Fit the key.

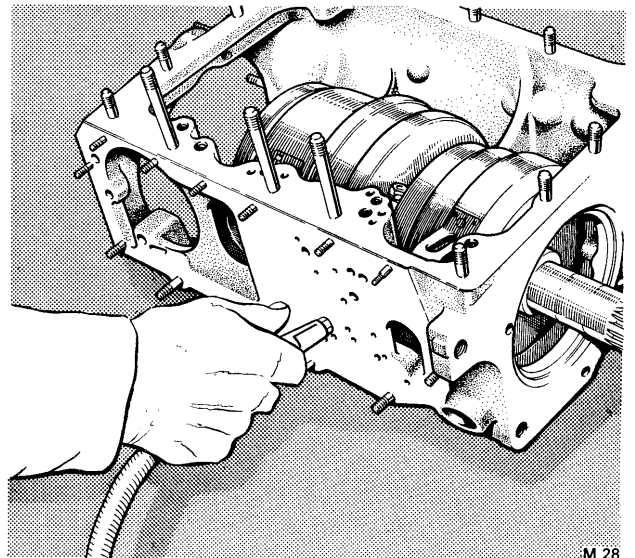
Note Ensure that the flats on the key align with the slot in the drum. Do not use force to fit the key.

Fit the key retaining plate and setscrews; tighten the screws.

Torque tighten the bearing cap setscrews then lock them with locking plate tabs.

Ensure that the front and rear drums revolve smoothly on the intermediate shaft.

Check the action of the clutches by means of compressed air applied through the passages shown in Figure T116. Correct operation can be both heard and



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FIG. T116 CHECKING CLUTCH OPERATION

felt. Thoroughly check for air leaks during this test.

Assemble the gearbox, fitting the remaining assemblies as explained in their relevant Sections.

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DIMENSIONAL DATA FOR SECTION T21—DRUM ASSEMBLIES

DESCRIPTION	DIMENSION	PERMISSIBLE WORN DIMENSION	REMARKS
Front drum end float on intermediate shaft.	0.002 in. to 0.004 in. (0,05 mm. to 0,10 mm.)	0.006 in. (0,15 mm.)	Correct by changing the steel adjusting washer.
Intermediate shaft planet gears end float.	0.002 in. to 0.004 in. (0,05 mm. to 0,10 mm.)	—	Renew assembly shaft if gear pins or rollers are badly worn.
Front drum bush i/d.	1.3750 in. to 1.3755 in. (34,93 mm. to 34,943 mm.)	—	—
Intermediate shaft bearing diameter.	1.372 in. to 1.373 in. (34,80 mm. to 34,81 mm.)	—	—
Clearance.	0.002 in. to 0.0035 in. (0,05 mm. to 0,089 mm.)	—	—
Oil delivery sleeve bush i/d.	1.330 in. to 1.331 in. (33,78 mm. to 33,81 mm.)	—	—
Intermediate shaft bearing diameter.	1.3265 in. to 1.3275 in. (33,693 mm. to 33,718 mm.)	—	—
Clearance.	0.0025 in. to 0.0045 in. (0,064 mm. to 0,115 mm.)	—	—
Centre clutch piston travel.	0.100 in. to 0.130 in. (2,54 mm. to 3,30 mm.)	—	Apply air pressure of 70 lb/sq.in. (4,92 kg/sq.cm.) to clutch apply port.
Sprag outer race i/d.	3.4990 in. to 3.4995 in. (88,875 mm. to 88,888 mm.)	—	—
Sprag inner race o/d.	2.84325 in. to 2.8435 in. (72,218 mm. to 72,225 mm.)	—	—
Rear clutch drum bush i/d.	1.9705 in. to 1.9715 in. (50,05 mm. to 50,08 mm.)	—	—
Oil delivery sleeve o/d.	1.967 in. to 1.968 in. (49,96 mm. to 50,12 mm.)	—	—
Clearance.	0.0025 in. to 0.0045 in. (0,063 mm. to 0,114 mm.)	—	—
Clutch inner release spring—free length.	2.234 in. (approx.) (56,74 mm.) (approx.)	—	—
Load required to compress spring length to 1.812 in. (46,03 mm.)	14 lb. to 16 lb. (6,35 kg. to 7,26 kg.)	—	—
Clutch outer release spring—free length.	2.484 in. (approx.) (63,09 mm.) (approx.)	—	—
Load required to compress spring length to 1.812 in. (43,03 mm.)	22 lb. 8 oz. to 25 lb. 8 oz. (10,21 kg. to 11,57 kg.)	—	—
Centre clutch release spring—free height.	0.162 in. (approx.) (4,12 mm.) (approx.)	—	—
Setscrews — centre bearing cap to gearbox casing.	Torque tighten to between 29 lb.ft. and 32 lb.ft. (4,01 kgm. and 4,42 kgm.)	—	—
Setscrews — rear planet pinion annulus gear to rear drum.	Torque tighten to between 3 lb.ft. and 4 lb.ft. (0,41 kgm. and 0,55 kgm.)	—	—
Setscrews — centre drum key plate to gearbox casing.	Torque tighten to between 8 lb.ft. and 10 lb.ft. (1,11 kgm. and 1,38 kgm.)	—	—
Oil delivery sleeve sealing ring gap.	0.005 in. to 0.015 in. (0,13 mm. to 0,40 mm.)	—	Check ring gaps in unworn part of relevant bores.

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Section T22

GEARBOX CASING

When all the units have been removed from the gearbox, as described in the foregoing Sections, the only removable parts which remain are the two band adjusting screws, the oil pressure test point blanking plug, the breather filter and, if necessary, the studs.

Removal of the adjusting screws and the blanking plug is straightforward. The filter should be carefully removed to prevent altering its shape and consequently its fit in the gearbox casing.

Thoroughly wash the casing in clean paraffin then dry off with compressed air. Ensure that all the oilways are clear.

Gearbox casing — To inspect

Check all joint faces for burrs; slight damage can be removed by careful scraping.

Note Extreme care should be taken when removing burrs or damage marks from the control valve unit face on the casing. The surface finish on this face is the only sealing medium between the two units and should not be marked.

Similarly examine the spigot bores in the front and rear ends of the casing.

Inspect the screw threads of all tapped holes, making sure that the top threads have not been pulled or

damaged to an extent which might upset a joint face.

Heli-Coil inserts are fitted to the gearbox casing in the following holes.

- Parking brake bracket securing setscrew holes.
- Control valve unit securing setscrew holes.
- Band anchor screw holes.

If a Heli-Coil insert becomes damaged, it should be removed and discarded, then a new one fitted.

Section A3—General Information—gives a detailed description of the procedure to be followed, and the tools required when removing or fitting a Heli-Coil insert.

Examine the gearbox casing for cracks and other damage.

Check the fit of the centre bearing cap together with the centre drum and oil delivery sleeve as explained in Section T21.

Check the continuity and interconnection of the oil passages using compressed air, and referring to Figure T13 as a guide.

Strong wire may be used to clear a blocked passage but care must be taken not to damage the mouth of the holes.

Screw the band adjusting screws into the casing, fit the oil pressure blanking plug; torque tighten the plug.

Fit the breather filter.

Chapter T**DIMENSIONAL DATA FOR
SECTION T22—GEARBOX CASING**

DESCRIPTION	DIMENSION	PERMISSIBLE WORN DIMENSION	REMARKS
Oil pressure check point plug.	Torque tighten to between 16 lb.ft. and 18 lb.ft. (2,21 kgm. and 2,49 kgm.)	—	—

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Section T23

WORKSHOP TOOLS

The following is a list of special tools to be used when servicing or overhauling the Automatic Gearbox. General tools are not included as it is felt that these will be available locally. For a complete list of all the necessary tools refer to T.S.D. 2331 — Workshop Tools Manual.

Tool No.	Title	Description
R 5244 ..	Oil pressure gauge	The gauge adaptor fits into the main line oil pressure take-off orifice to enable main line pressure to be checked.
RH 412 ..	Square holed spanner – blanking plug ..	This spanner can be used to remove and fit the oil pressure orifice blanking plug.
R 5280 ..	Adaptor – air checking	This is a rubber nosed adaptor for applying air pressure to the various oil holes in the gearbox so that components can be tested for correct operation.
RH 7843 ..	Compressor – actuating lever spring ..	This tool fits onto the actuator output shaft and will compress the actuating lever spring to facilitate removal of the retaining pin.
RH 7841 ..	Insertion and extraction tool – roll pin ..	The roll pin can be easily fitted to and removed from the brake drum and worm shaft with the aid of this tool.
RH 7674 ..	Circlip and snap ring pliers	By utilising the various nose pieces, this tool can be used for the removal and fitting of circlips and snap rings in the gearbox.
RH 329 ..	Alignment gauge – governor sleeve ..	The bore of the parking brake bracket must fit concentrically over the governor tower. The gauge is essential for correct alignment.
UR 3144 ..	Tool – front band adjusting	The tool screws into the blanking plug orifice in the bottom of the front servo and is used to accurately adjust the front friction band.
RH 7838 ..	Gauge – rear band adjusting	The gauge is used in conjunction with spanner RH 131 to correctly adjust the rear friction band.
RH 131 ..	Spanner – band adjusting screw	This spanner enables both bands to be adjusted whilst the gearbox is in the car.
RH 7776 ..	Compressor – rear servo springs	Before dismantling the rear servo, the springs must be held captive by the compressor until the spring retaining setscrews have been removed.
25937/ T 1002-5 ..	Assembly sleeve – oil sealing rings ..	The four sleeves of the tool are designed to assist in the fitting of the oil sealing rings to the governor tower.
STD 6007 ..	Holding tool – front oil pump	This tool, designed to fit over a lug cast on the body of the front pump, enables the pump to be held secure whilst the body securing screws are slackened or tightened.

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Workshop Tools—continued

Tool No.	Title	Description
26225/ T 1002 ..	Adaptor – torque spanner	The adaptor has been designed to enable a standard torque spanner to be used to tighten the front oil pump socket head screws.
RH 7770 ..	Oil seal insertion tool	This tool has been designed to facilitate the fitting of the front pump oil seal, whether the pump is fitted to the gearbox or has been removed.
RH 7771 ..	Centralising sleeve – mainshaft end float check	This sleeve fits over the mainshaft and the intermediate shaft, centralising the mainshaft, to enable the existing end float to be checked.
STD 6010 ..	Spacing wedge – front drum	This tool is used when checking mainshaft end float.
RH 7772 ..	Serrated spanner	This spanner is designed to remove and fit the coupling flange securing nut.
RH 7773 ..	Compressing tool – reverse clutch springs	The reverse clutch return springs are compressed by this tool to facilitate fitting of the reverse piston retaining ring.
23789/ F 1002 ..	Installing tool – reverse piston	This tool ensures that the lip of the piston oil seal is not damaged during fitting.
RH 584 ..	Holding fixture – intermediate shaft ..	The task of assembling the clutches to the intermediate shaft is made considerably easier if the shaft is held in this fixture.
RH 7777 ..	Installing tool – centre clutch piston ..	This tool facilitates the fitting of the centre clutch piston to the centre drum.
RH 7853 ..	Compressing tool – oil delivery sleeve rings	The piston ring type seals on the oil delivery sleeve have inter-locking ends, but they may be compressed further by using this tool before the rings enter the front drum.
23789/ T 1001 ..	Hub retainer	The rear clutch hub is held in position by this retainer to facilitate assembly to the intermediate shaft.

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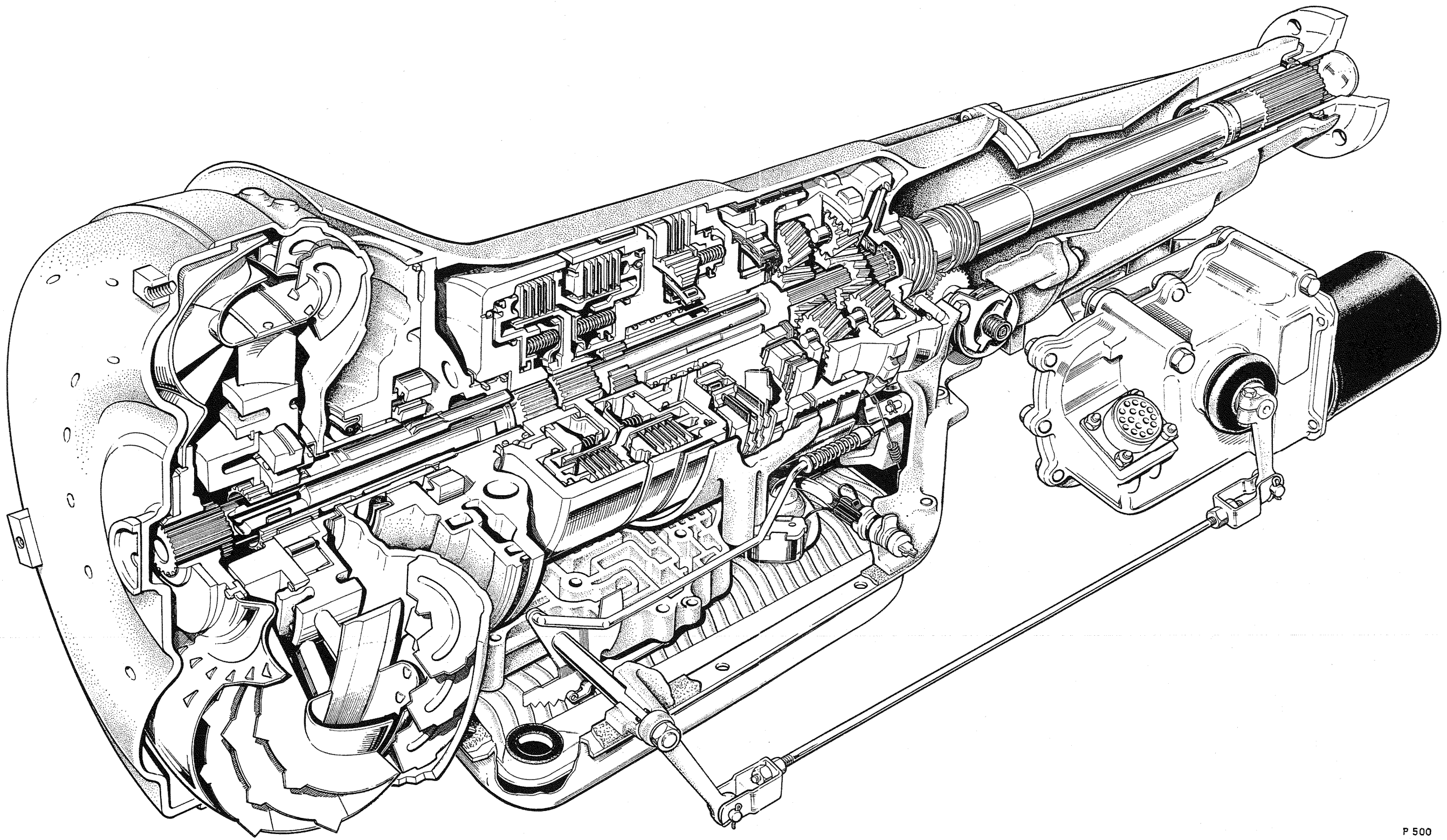
Chapter T

TRANSMISSION - PART 2

TORQUE CONVERTER TRANSMISSION

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**FIG. T117 THE TORQUE CONVERTER
TRANSMISSION AND GEARCHANGE ACTUATOR—
CUT-AWAY VIEW**



**FIG. T117 THE TORQUE CONVERTER
TRANSMISSION AND GEARCHANGE ACTUATOR—
CUT-AWAY VIEW**

Chapter T

TRANSMISSION — PART 2

Section T1

INTRODUCTION

All left-hand drive Rolls-Royce Silver Shadow and Bentley T series motor cars are fitted with the Torque Converter Transmission.

Late right-hand drive Rolls-Royce Silver Shadow and Bentley T series motor cars are fitted with the Torque Converter Transmission as follows:

Car Serial Number SRH 4033 and onwards produced for export.

All right-hand drive from Car Serial Number SBH 4478 and SRH 4487 (except SRH 4488).

The Torque Converter Transmission (*see Fig. T117*) is a fully automatic unit, consisting primarily of a three-element hydraulic torque converter and a compound planetary gear train. On current cars three multiple-disc clutches, a sprag unit, two roller clutch units and two friction bands provide the elements which are required to obtain the desired functions of the gear train.

Note On **early** cars the gear train consists of two sprag units and on **intermediate** cars a sprag unit and roller clutch unit, in place of the **current** two roller clutch units.

The Torque Converter Transmission can be identified by a name plate, fitted to the right-hand side of the transmission, toward the centre of the case. The serial number is prefixed by the letters RR and the year in numerals.

Note On cars produced after 1972, destined for countries where full emission control systems are required (i.e. U.S.A., Canada and Japan), the transmission prefix letters are changed from RR to RS. The reason for this change in the prefix lettering is that a different transmission modulator is fitted.

The torque converter, clutches and rollers connect the engine to the planetary gears with the aid of pressurised transmission fluid. Three forward gears and Reverse are provided. When necessary, the torque converter will supplement the gears by multiplying engine torque.

The torque converter is of welded steel construction and cannot be dismantled. The unit is made up of two vaned sections which face each other across a fluid filled housing. The pump half of the converter is connected to the engine and the turbine half is connected to the transmission.

When the engine is running the converter pump rotates and throws fluid against the turbine, causing the turbine to rotate. The fluid then returns to the pump in a circular flow and continues this cycle as long as the engine is running.

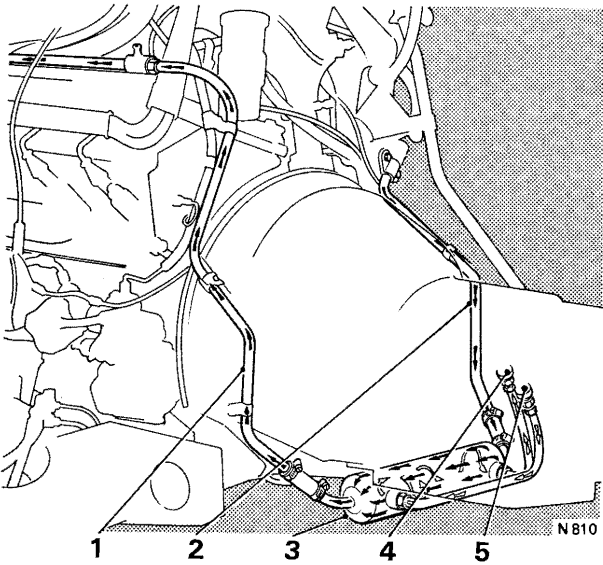
The converter also has a smaller vaned section, called a stator, which directs the fluid back to the pump through smaller openings at greater speed. The speeded-up fluid imparts additional force to the engine driven converter pump, thus multiplying engine torque.

A hydraulic system pressurised by an internal-external gear type of pump provides the working pressure required to operate the friction elements and automatic controls.

The external control connections to the transmission are:

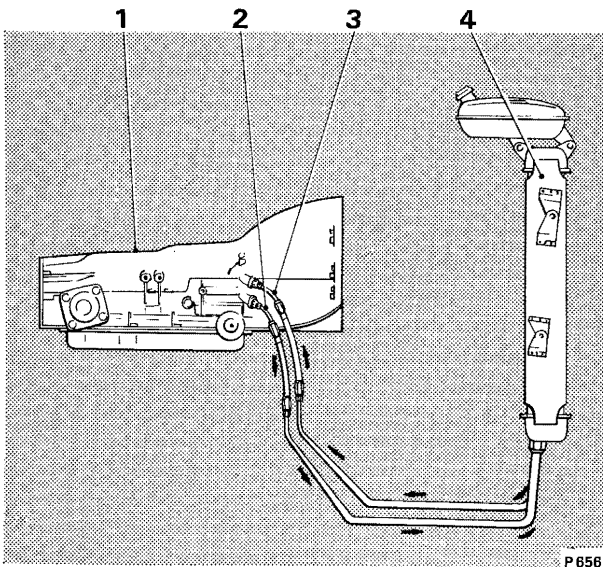
An electric gearchange actuator and a system of rods and levers. The actuator responds to an electrical signal from a switch on the steering column, then moves the gearchange lever on the transmission to the required position.

Chapter T



**FIG. T118 HEAT EXCHANGER SYSTEM
(EARLY CARS)**

- 1 Coolant from heat exchanger to coolant pump
- 2 Coolant from cylinder head to heat exchanger
- 3 Heat exchanger
- 4 Transmission fluid to heat exchanger
- 5 Transmission fluid from heat exchanger



**FIG. T119 HEAT EXCHANGER SYSTEM
(LATER CARS)**

- 1 Transmission
- 2 Transmission fluid to heat exchanger
- 3 Transmission from heat exchanger
- 4 Coolant radiator with heat exchanger in bottom tank

Engine vacuum — to operate a vacuum modulator unit.

12 volt electrical signals — to operate electrical detent solenoid.

Gear or torque ratios of the transmission are as follows:

First	—	2.5 : 1 gear ratio
Second	—	1.5 : 1 gear ratio
Third	—	1.0 : 1 gear ratio
Reverse	—	2.0 : 1 gear ratio

Each gear ratio can be multiplied by as much as two, depending upon the slip speed of the converter pump and turbine.

A vacuum modulator is used to automatically sense engine torque input to the transmission. The vacuum modulator transmits this signal to the pressure regulator which controls main line pressure, so that all the torque requirements of the transmission are met and the correct gearchange spacing is obtained at all throttle openings.

Early cars the detent solenoid is activated by a micro-switch adjacent to the carburettors. When the engine throttle is opened sufficiently a micro-switch is closed by the throttle controls, the solenoid in the transmission is activated and a down-change will occur at speeds below 70 m.p.h. (113 k.p.h.). At lower speeds a down-change will occur at smaller throttle openings without the aid of the micro-switch or the solenoid.

Current cars do not have the micro-switch situated adjacent to the carburettors, instead a micro-switch and plunger assembly are fitted to the toe board beneath the accelerator pedal. Service instructions for this later assembly are given in Chapter U — Part 2.

On **early cars** a transmission fluid heat exchanger is situated beneath the bell housing bottom cover, at the front of the transmission sump (see Fig. T118). The transmission is cooled by directing fluid from the converter to the heat exchanger, the cooled fluid then returns to the transmission to feed the lubricating system.

Engine coolant is directed to and from the heat exchanger by connections either at the rear of 'A' bank cylinder head and the radiator bottom tank (**early cars**) or on the inlet side of the coolant pump and the outlet side of the thermostat elbow (**intermediate cars**).

The fluid system incorporates an intake pipe and strainer assembly. An internal by-pass permits increased flow during cold operation when the oil is heavier.

On **current cars** the heat exchanger for the transmission fluid is situated in the bottom of the radiator matrix.

The transmission quadrant has six selector positions which enable the driver to control the operation of the

transmission under varying driving conditions. The six selector positions appear on the quadrant in the following sequence, from left to right; 'P' - Park, 'R' - Reverse, 'N' - Neutral, 'D' - Drive, 'I' - Intermediate and 'L' - Low. The engine can be started in the Park and Neutral positions only.

'P' - Park position positively locks the output shaft to the transmission case by means of a locking pawl and prevents the car from rolling either backward or forward when parked on a steep incline.

'R' - Reverse enables the car to operate in a reverse direction.

'N' - Neutral enables the engine to be started and run without the car moving.

'D' - Drive is used for all normal driving conditions and maximum economy. Drive range has three gear ratios from starting to direct drive. Forced down-changes are available for safe and rapid overtaking, by fully depressing the accelerator pedal.

'I' - Intermediate adds new performance for congested traffic conditions or hilly terrain. This range has the same starting ratio as 'D', but prevents the transmission from changing above second gear; acceleration is retained when extra performance is required.

The engine can be used to assist braking in this Range.

'L' - Low range permits operation at a lower gear ratio and should be used when maximum torque multiplication is required or, when descending a steep gradient. When the selector lever is moved from Drive to Low at normal road speeds, the transmission will change to second gear and remain in second gear until the speed of the car is reduced to the normal 2-1 down-change speed. The transmission will then change down to first gear and remain in first gear regardless of car speed or engine revolutions, until the selector lever is moved into either the Drive or the Intermediate position.

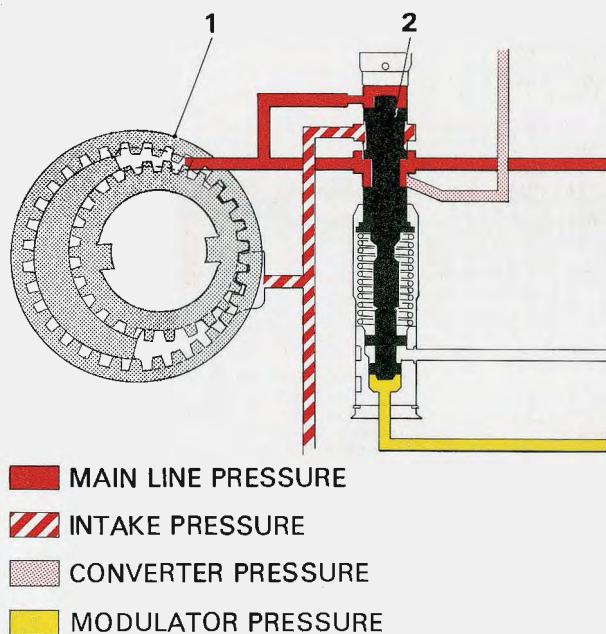
HYDRAULIC SYSTEM

Pressure control

The transmission is controlled automatically by a hydraulic system (see Fig. T120). Hydraulic pressure is supplied by the transmission oil pump, which is engine driven.

Main line oil pressure is controlled by a pressure regulator valve train which is located in the pump and by the vacuum modulator which is connected to engine vacuum.

The pressure regulator controls main line oil pressure automatically, in response to a pressure signal from a modulator valve, in such a manner, that the torque requirements of the transmission clutches are met and correct gearchange spacing is obtained at all throttle openings.



N600

FIG. T120 PRESSURE CONTROL

- 1 Transmission oil pump
- 2 Pressure regulator valve train

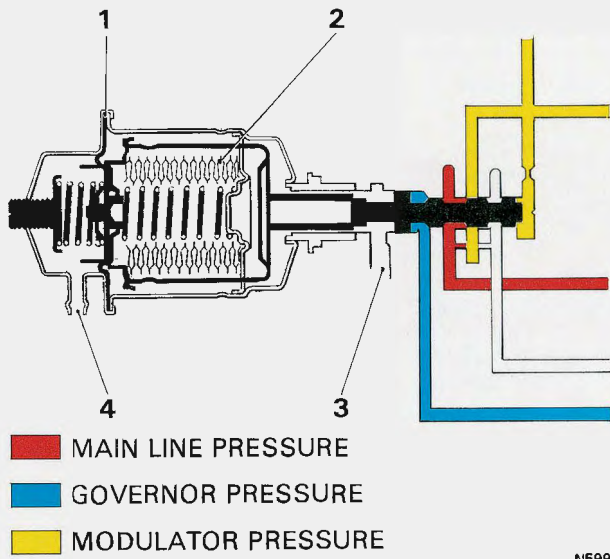
To control line pressure, a modulator pressure is used. This pressure varies in the same manner as torque input to the transmission. Since the torque input to the clutches is the product of engine torque and converter ratio, modulator pressure must compensate for changes in either or both of these.

To meet these requirements, modulator pressure is regulated by engine vacuum, which is an indicator of engine torque and carburetter throttle opening. It will decrease as the car speed increases to compensate for the changing converter torque ratio.

Vacuum modulator assembly

The engine vacuum signal is received by the vacuum modulator (see Fig. T121), which comprises an evacuated metal bellows, a diaphragm and two springs. The assembly is so arranged that the bellows and external spring apply a force that acts on the modulator valve so that it increases modulator pressure. Engine vacuum and an internal spring oppose the bellows and external spring to control modulator pressure.

To reduce the effect of altitude on change points, the effective area of the diaphragm is different than that of the bellows. Atmospheric pressure acts on the resulting differential area to reduce modulator pressure.



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FIG. T121 VACUUM MODULATOR ASSEMBLY

- 1 Diaphragm
- 2 Aneroid bellows
- 3 Exhaust
- 4 Engine vacuum

Governor assembly

The speed of the car is signalled to the transmission by a governor (see Fig. T177) which is driven by the transmission output shaft. The governor is comprised basically of a valve body, a regulator valve and flyweights.

Centrifugal force causes the flyweights to act on the regulator valve. The valve then regulates a pressure signal which increases with road speed.

Governor pressure acts on the modulator valve to cause modulator pressure to decrease as the speed of the car increases.

Operation of valves and hydraulic Control units

Line pressure regulator

The line pressure regulator valve regulates line pressure according to pump speed and engine torque.

Manual valve

The manual valve establishes the range in which the transmission is to operate as selected by the driver through the selector switch and the gear change actuator.

Governor assembly

The governor assembly generates an oil pressure that is sensitive to the speed of the car and which increases as the car speed increases.

Governor pressure is used to control the change points and to regulate modulator pressure.

Vacuum modulator valve

The vacuum modulator valve provides modulator pressure which senses engine torque and car speed. It is used to vary the change points, according to throttle opening, by opposing governor oil on the shift valves and also to raise line pressure proportional to engine torque.

1-2 shift valve

This valve controls the speeds at which the 1-2 and 2-1 changes occur.

1-2 regulator valve

The 1-2 regulator valve regulates modulator pressure to a proportional pressure and tends to hold the 1-2 shift valve in the down-change position.

1-2 detent valve

The 1-2 detent valve senses regulated modulator pressure which tends to hold the 1-2 shift valve in the down-changed position and provides an area for detent pressure for 2-1 detent changes.

2-3 shift valve

This valve controls the speeds at which the 2-3 and 3-2 changes occur.

2-3 modulator valve

The 2-3 modulator valve is sensitive to modulator pressure and applies a variable force on the 2-3 shift valve which tends to hold the 2-3 shift valve in the down-changed position.

3-2 valve

The 3-2 valve prevents modulator pressure from acting on the shift valves after the direct clutch has been applied. This allows fairly heavy throttle operation in third gear without effecting a down-change. In third gear, detent pressure or modulator pressure above 87 lb/sq.in. (6,1 kg/sq.cm.) can be directed to the shift valves to provide the necessary force to effect the down-change.

1-2 accumulator valve

The 1-2 accumulator valve is sensitive to modulator oil and regulates drive oil to a proportionally smaller value. The pressure increases as modulator pressure increases and is used to control the engagement of the intermediate clutch.

Detent valve

The detent valve moves when line oil is exhausted from the end of the valve when the detent solenoid is energised. As a result, detent oil is directed to the 1-2 and 2-3 modulator valves and allows the detent regulator valve to regulate.

Detent regulator valve

When the detent valve moves, the detent regulator is freed and allows drive oil to enter the detent passage at a regulated pressure of 70 lb/sq.in. (4.9 kg/sq.cm.). Detent oil will also flow into the modulator passages which lead to the shift valves. Low oil moves the detent regulator to accept drive oil, allowing drive oil to enter the modulator and detent passages.

Rear servo and accumulator assembly

The rear servo applies the rear band for engine braking in Low range 1st. gear. It also applies the rear band in Reverse to hold the reaction carrier to provide the reverse gear ratio.

During the 1-2 up-change in Drive and Intermediate ranges the servo acts as an accumulator for the intermediate clutch oil to provide a smooth up-change.

Front servo

The front servo applies the front band to provide engine braking in 2nd. gear in Low and Intermediate ranges. It is used also as an accumulator for direct clutch oil during the application of the direct clutch and in conjunction with a series of check balls which control orifices, is part of the timing for the release of the direct clutch.

To prevent the application of the front band in Neutral, Drive or Reverse ranges, oil is directed from the manual valve to the release side of the servo piston.

In 'D' range, the servo release oil from the manual valve is used to charge the servo in preparation for the application of the direct clutch.

Direct clutch oil is directed to the front servo accumulator piston where spring force, plus direct clutch pressure, stroke the piston up against the force of servo release oil. This lowers the clutch apply pressure for a smooth engagement.

The release of the direct clutch and the exhausting of the front servo accumulator is slowed down by three check balls and three orifices. This permits a smooth return of the drive load to the intermediate roller clutch and also allows the engine r.p.m. to increase during a detent 3-2 down-change in preparation for the lower gear ratio, which results in a smooth change and better acceleration.

The position of the shift valves in each range and gear, and the various oil passages which are used are shown in Figures T122 to T130. The operation of the valves when each gear is selected is described in the following paragraphs.

Drive and Intermediate—First gear

Power flow

Forward clutch – applied. Direct clutch – released. Intermediate clutch – released. Roller clutch – effective. Front band – released. Intermediate roller clutch – ineffective. Rear band – released.

With the selector lever in either Drive or Intermediate range, the forward clutch is applied. This delivers turbine torque to the mainshaft and turns the rear internal gear clockwise. (Converter torque ratio is approximately 2 : 1 at stall).

Clockwise motion of the rear internal gear causes the rear pinions to turn clockwise to drive the sun gear anti-clockwise. In turn, the sun gear drives the front pinions clockwise, thus turning the front internal gear, output carrier, and output shaft clockwise in a reduction ratio of approximately 2.5 : 1. Reaction of the front pinions against the front internal gear is taken by reaction carrier and roller clutch assembly to the transmission case. (Approximate stall ratio – 5 : 1).

Oil flow

When the selector lever is moved to either Drive or Intermediate position, the manual valve is repositioned to allow line pressure to enter the drive circuit. Drive oil then flows to the following (*see Fig. T122*):

- Forward clutch
- 1-2 Shift valve
- Governor assembly
- 1-2 Accumulator valve
- Detent regulator valve

Basic control

Drive oil is directed to the forward clutch where it acts on two areas of the clutch piston to apply the forward clutch. The first, or inner area, is fed through an unrestricted passage. The outer area is fed through an orifice to ensure a smooth change into Drive.

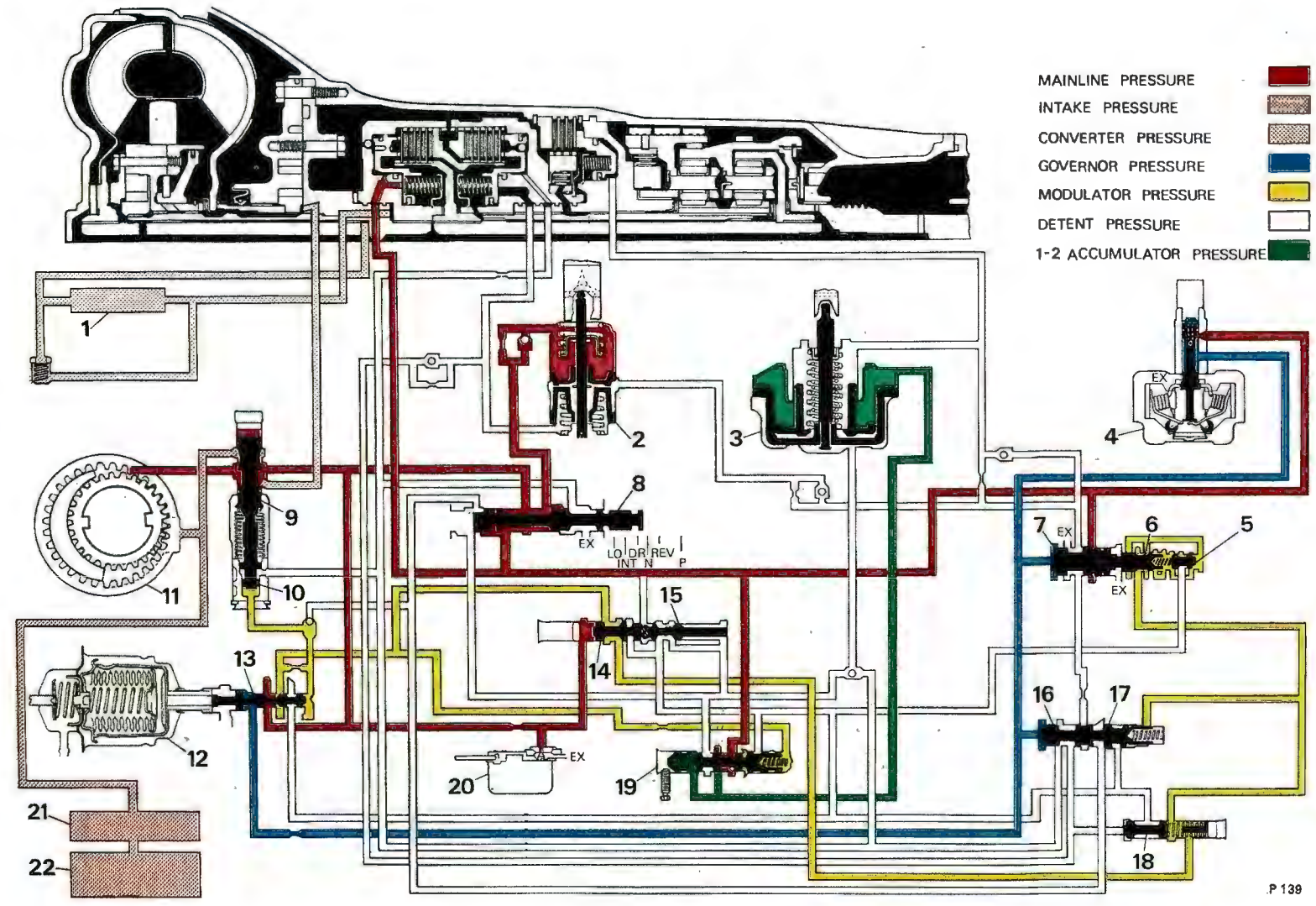
Drive oil at the governor assembly is regulated to a variable pressure. This pressure increases with car speed and acts against the ends of the 1-2 and 2-3 shift valves and an area on the modulator valve.

Drive oil is regulated also to another variable pressure at the 1-2 accumulator valve. This pressure is controlled by modulator oil and is directed to the rear servo. 1-2 accumulator oil at the rear servo acts on the accumulator piston.

In addition, to maintain the lower pressure in the 1-2 accumulator passage, the 1-2 accumulator valve intermittently uncovers the Low oil passage and oil is exhausted at the manual valve.

Summary

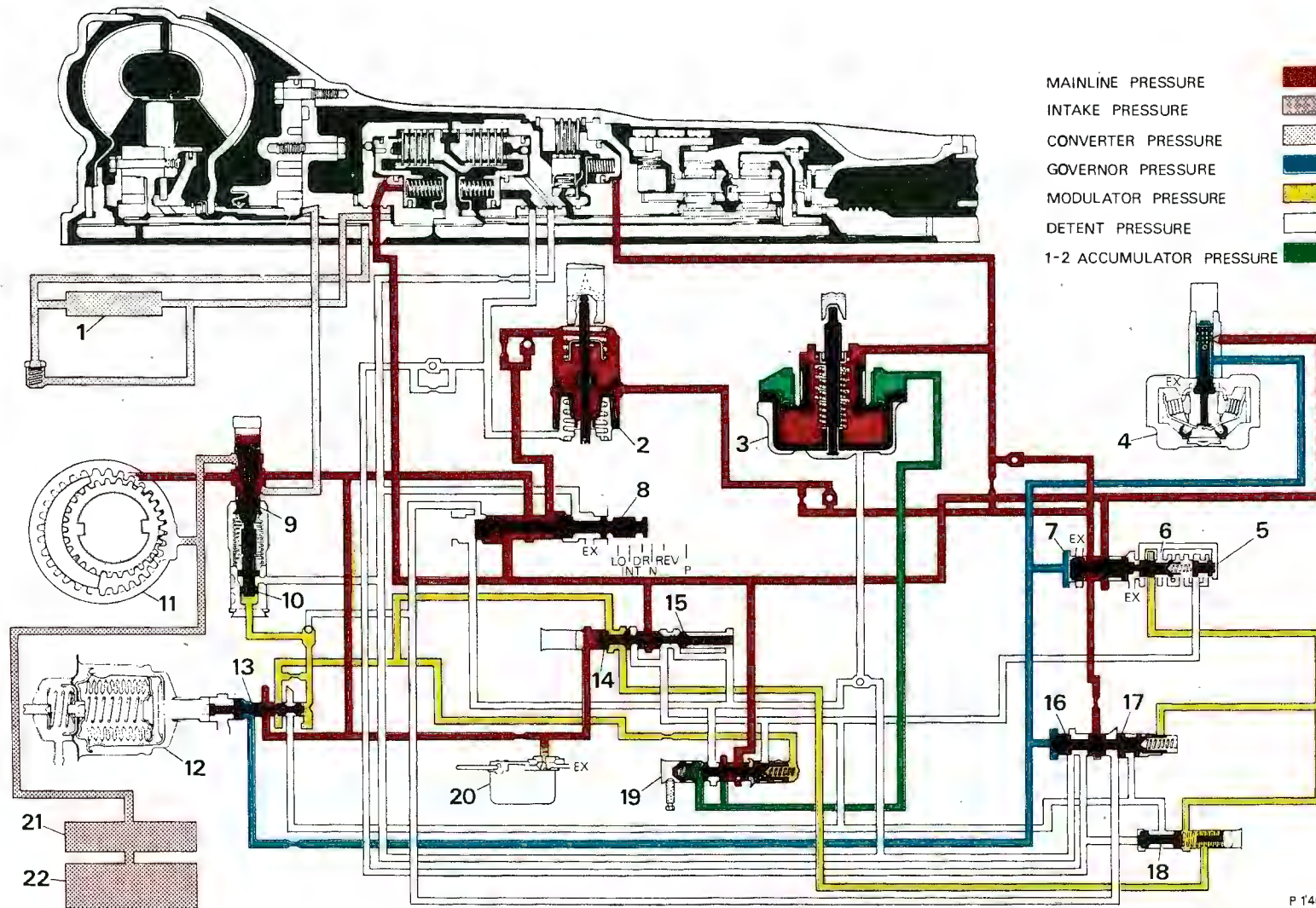
The converter is filled. The forward clutch is applied. The transmission is in first gear.



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FIG. T122 DRIVE RANGE-1ST GEAR

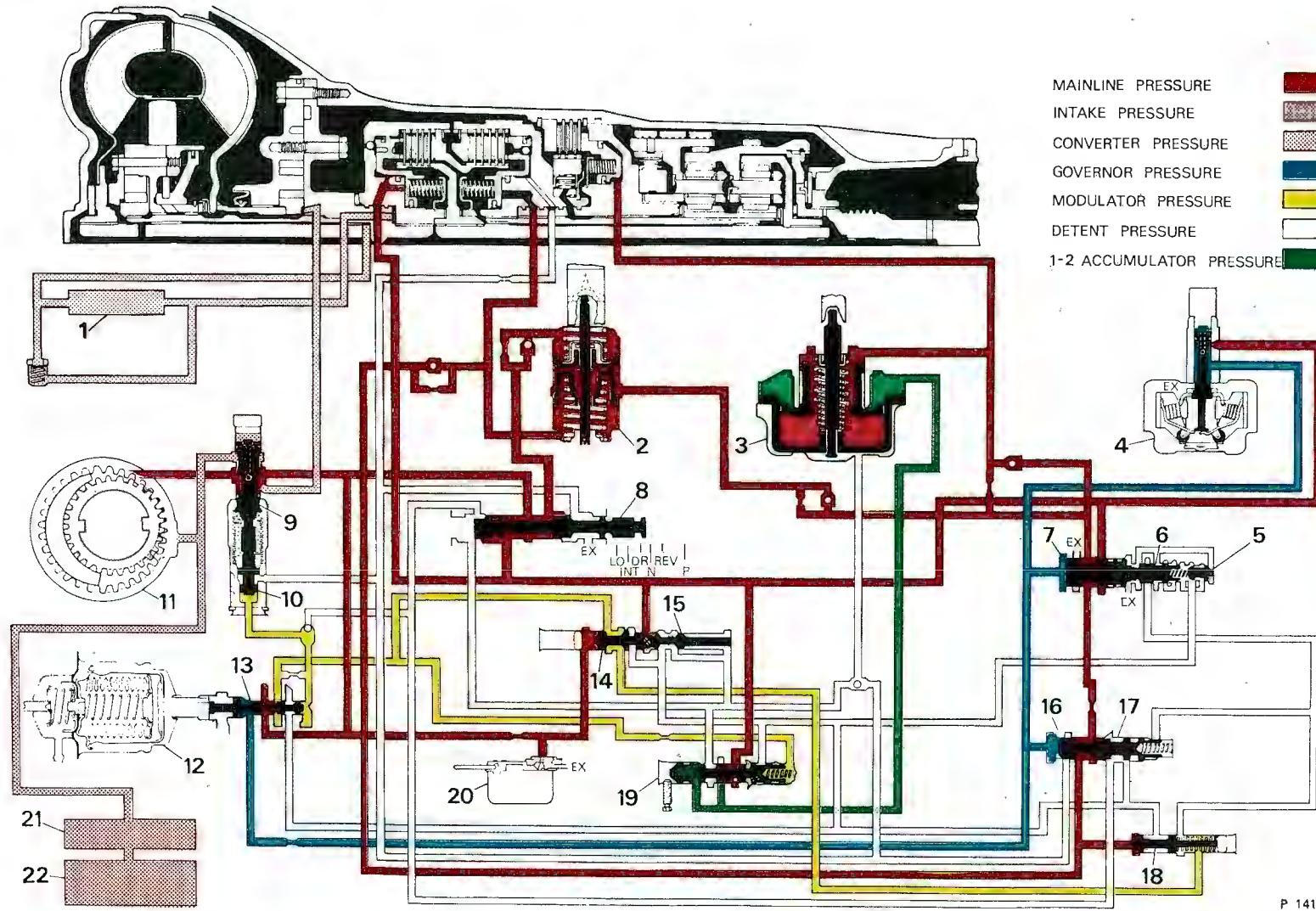
- | | | | | | |
|---------------------|--------------------|----------------------|--------------------|--------------------------|-----------------|
| 1 Heat exchanger | 5 Regulator plug | 9 Pressure regulator | 13 Modulator valve | 17 2-3 modulator valve | 21 Oil strainer |
| 2 Front servo | 6 1-2 detent valve | 10 Boost valve | 14 Detent valve | 18 3-2 valve | 22 Sump |
| 3 Rear servo | 7 1-2 valve | 11 Pump | 15 Regulator valve | 19 1-2 accumulator valve | |
| 4 Governor assembly | 8 Manual valve | 12 Vacuum modulator | 16 2-3 valve | 20 Detent solenoid | |



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FIG. T123 DRIVE RANGE—2ND GEAR

- | | | | | | |
|---------------------|--------------------|----------------------|--------------------|--------------------------|-----------------|
| 1 Heat exchanger | 5 Regulator plug | 9 Pressure regulator | 13 Modulator valve | 17 2-3 modulator valve | 21 Oil strainer |
| 2 Front servo | 6 1-2 detent valve | 10 Boost valve | 14 Detent valve | 18 3-2 valve | 22 Sump |
| 3 Rear servo | 7 1-2 valve | 11 Pump | 15 Regulator valve | 19 1-2 accumulator valve | |
| 4 Governor assembly | 8 Manual valve | 12 Vacuum modulator | 16 2-3 valve | 20 Detent solenoid | |



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FIG. T124 DRIVE RANGE—3RD GEAR

- | | | | | | |
|---------------------|--------------------|----------------------|--------------------|--------------------------|-----------------|
| 1 Heat exchanger | 5 Regulator plug | 9 Pressure regulator | 13 Modulator valve | 17 2-3 modulator valve | 21 Oil strainer |
| 2 Front servo | 6 1-2 detent valve | 10 Boost valve | 14 Detent valve | 18 3-2 valve | 22 Sump |
| 3 Rear servo | 7 1-2 valve | 11 Pump | 15 Regulator valve | 19 1-2 accumulator valve | |
| 4 Governor assembly | 8 Manual valve | 12 Vacuum modulator | 16 2-3 valve | 20 Detent solenoid | |

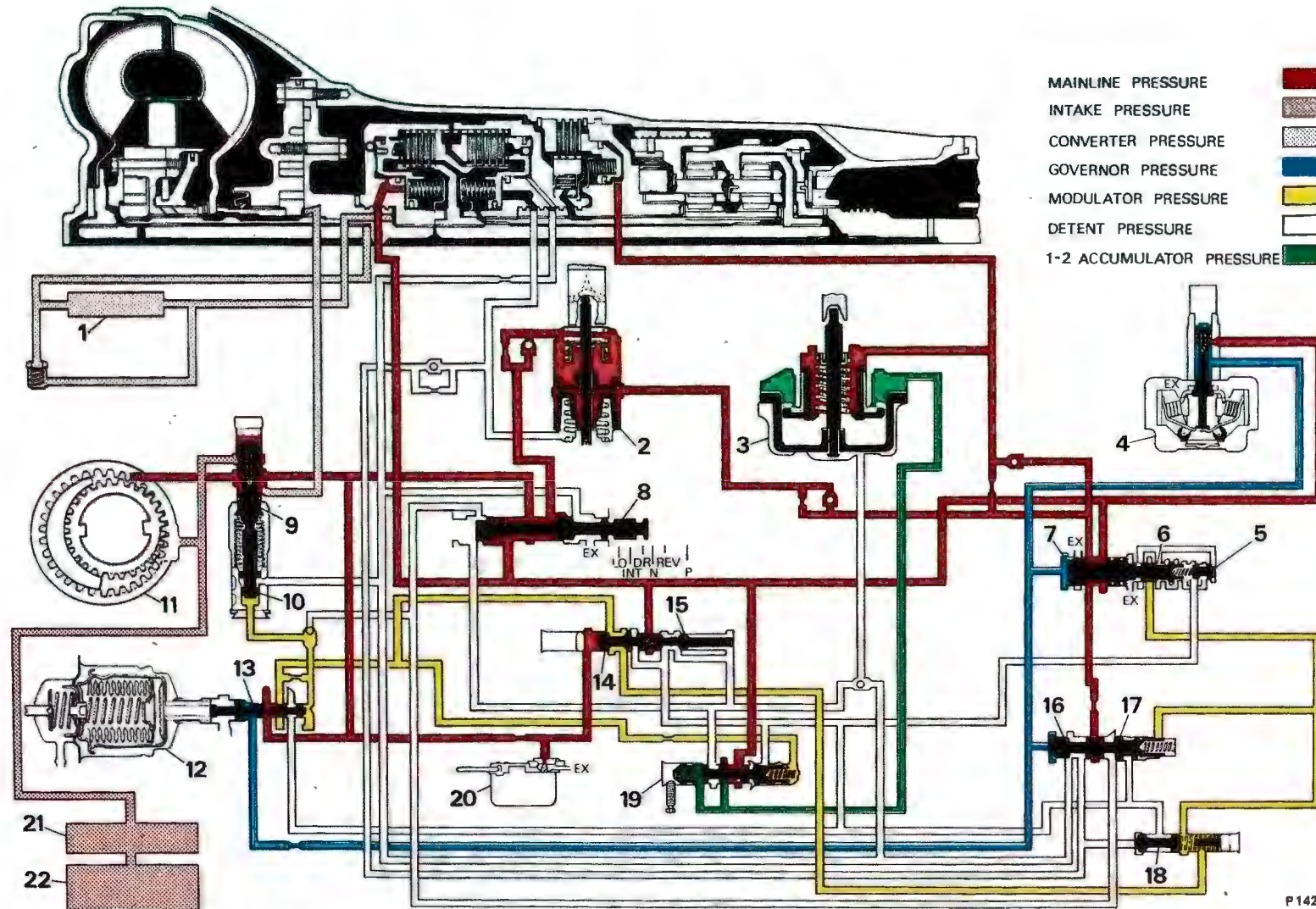


FIG. T125 PART THROTTLE DOWN-CHANGES

- | | | | | | |
|---------------------|--------------------|----------------------|--------------------|--------------------------|-----------------|
| 1 Heat exchanger | 5 Regulator plug | 9 Pressure regulator | 13 Modulator valve | 17 2-3 modulator valve | 21 Oil strainer |
| 2 Front servo | 6 1-2 detent valve | 10 Boost valve | 14 Detent valve | 18 3-2 valve | 22 Sump |
| 3 Rear servo | 7 1-2 valve | 11 Pump | 15 Regulator valve | 19 1-2 accumulator valve | |
| 4 Governor assembly | 8 Manual valve | 12 Vacuum modulator | 16 2-3 valve | 20 Detent solenoid | |

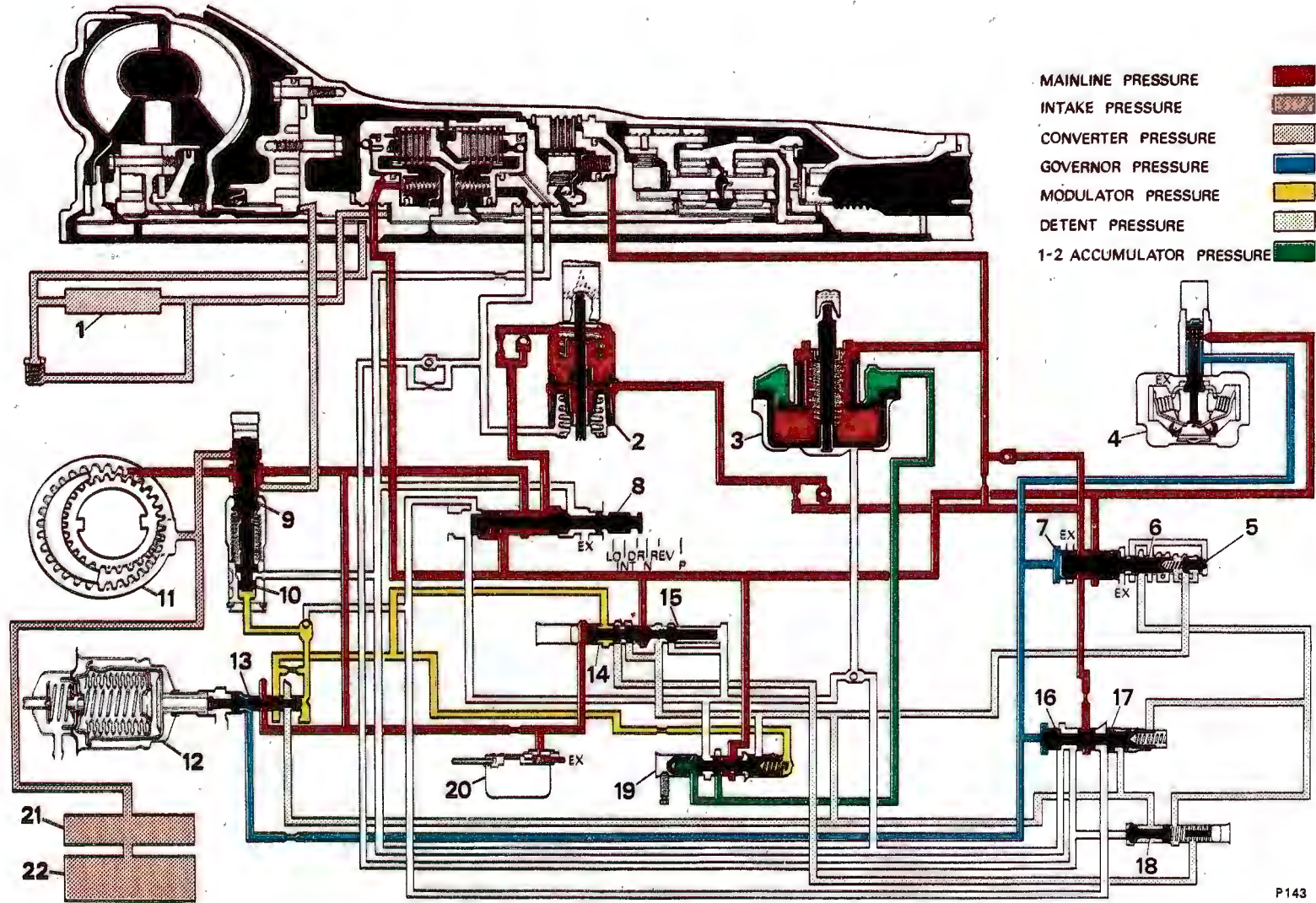
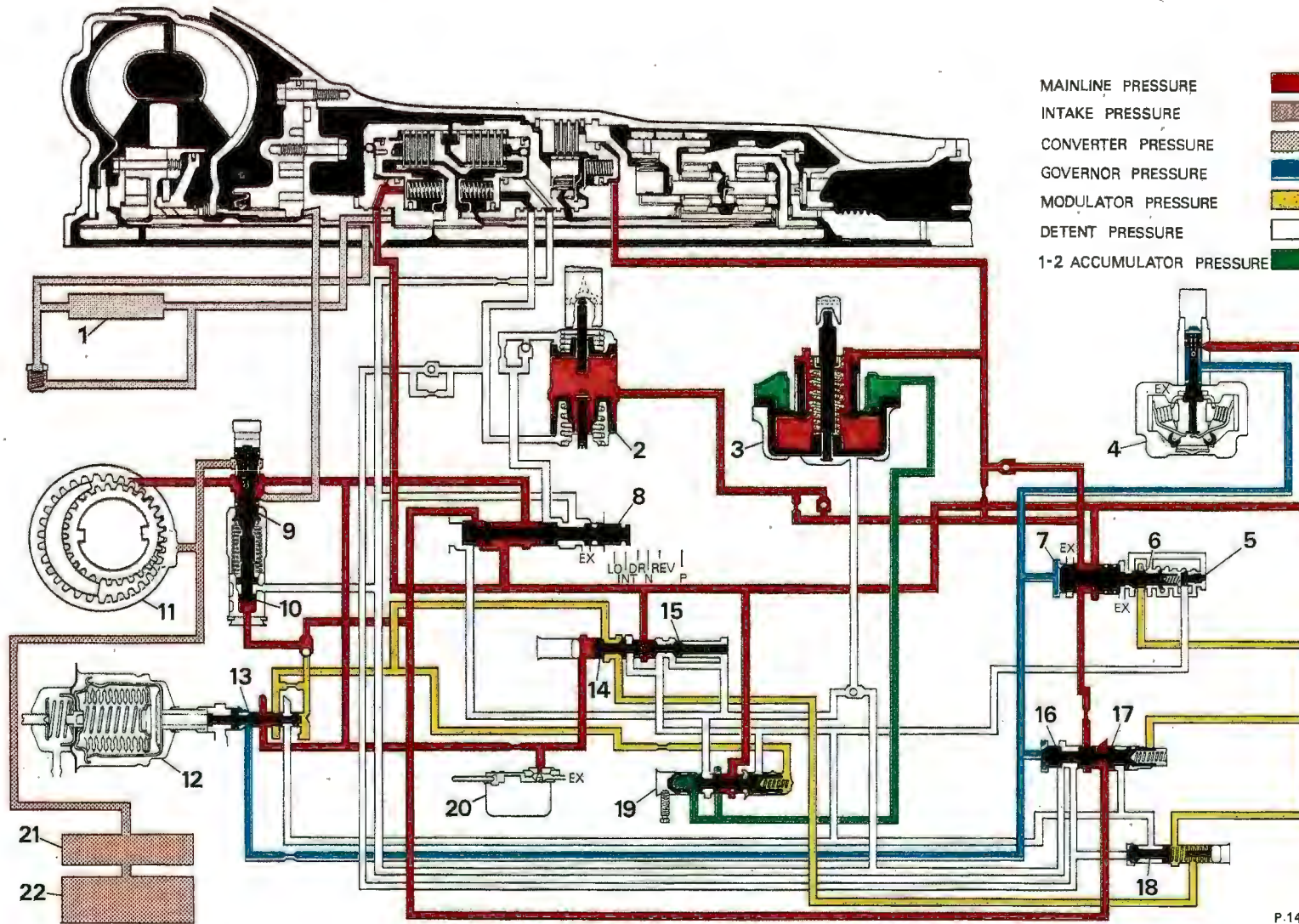


FIG. T126 DETENT DOWN-CHANGE

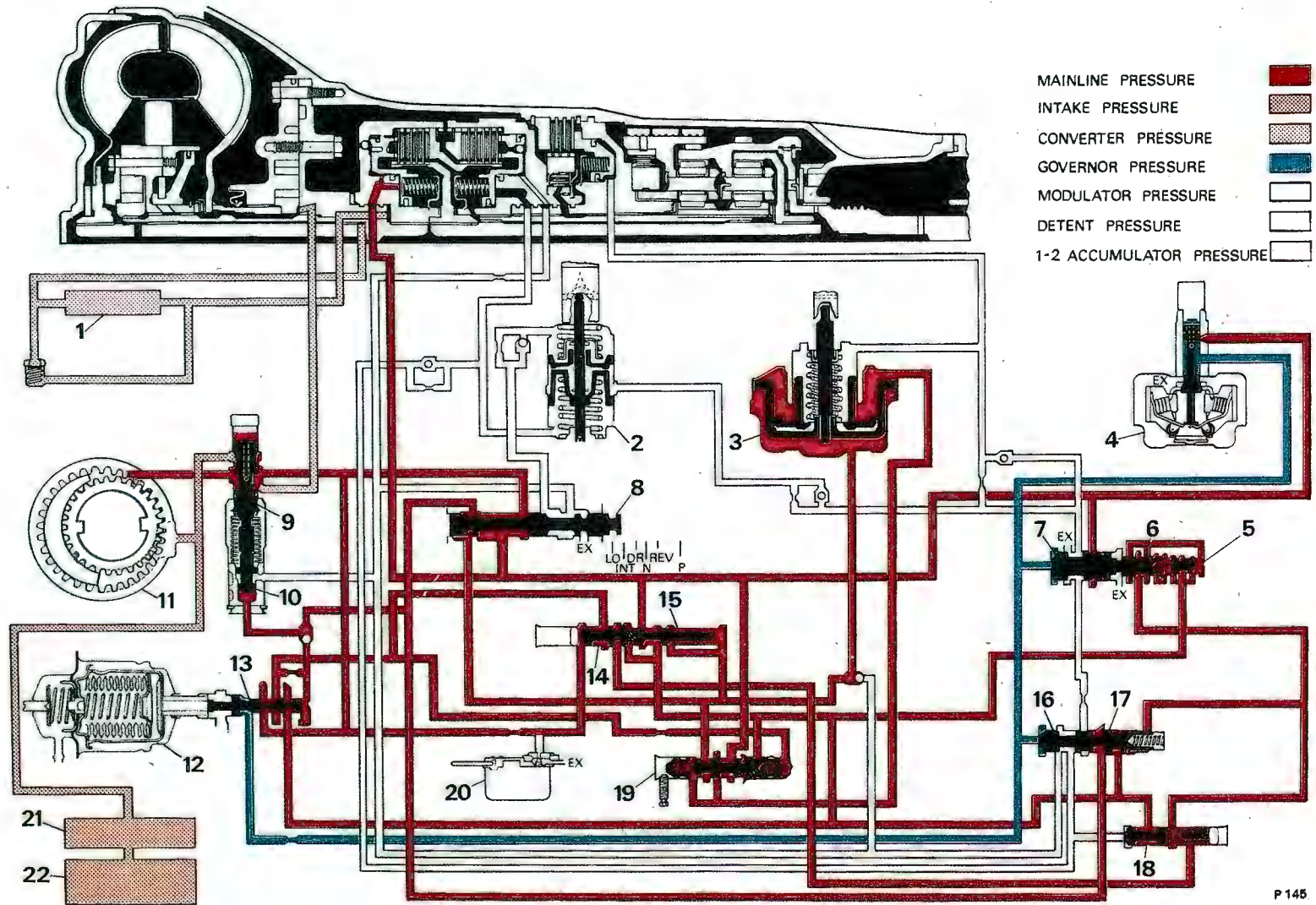
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|---------------------|--------------------|----------------------|--------------------|--------------------------|-----------------|
| 1 Heat exchanger | 5 Regulator plug | 9 Pressure regulator | 13 Modulator valve | 17 2-3 modulator valve | 21 Oil strainer |
| 2 Front servo | 6 1-2 detent valve | 10 Boost valve | 14 Detent valve | 18 3-2 valve | 22 Sump |
| 3 Rear servo | 7 1-2 valve | 11 Pump | 15 Regulator valve | 19 1-2 accumulator valve | |
| 4 Governor assembly | 8 Manual valve | 12 Vacuum modulator | 16 2-3 valve | 20 Detent solenoid | |



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FIG. T127 INTERMEDIATE RANGE 2ND GEAR

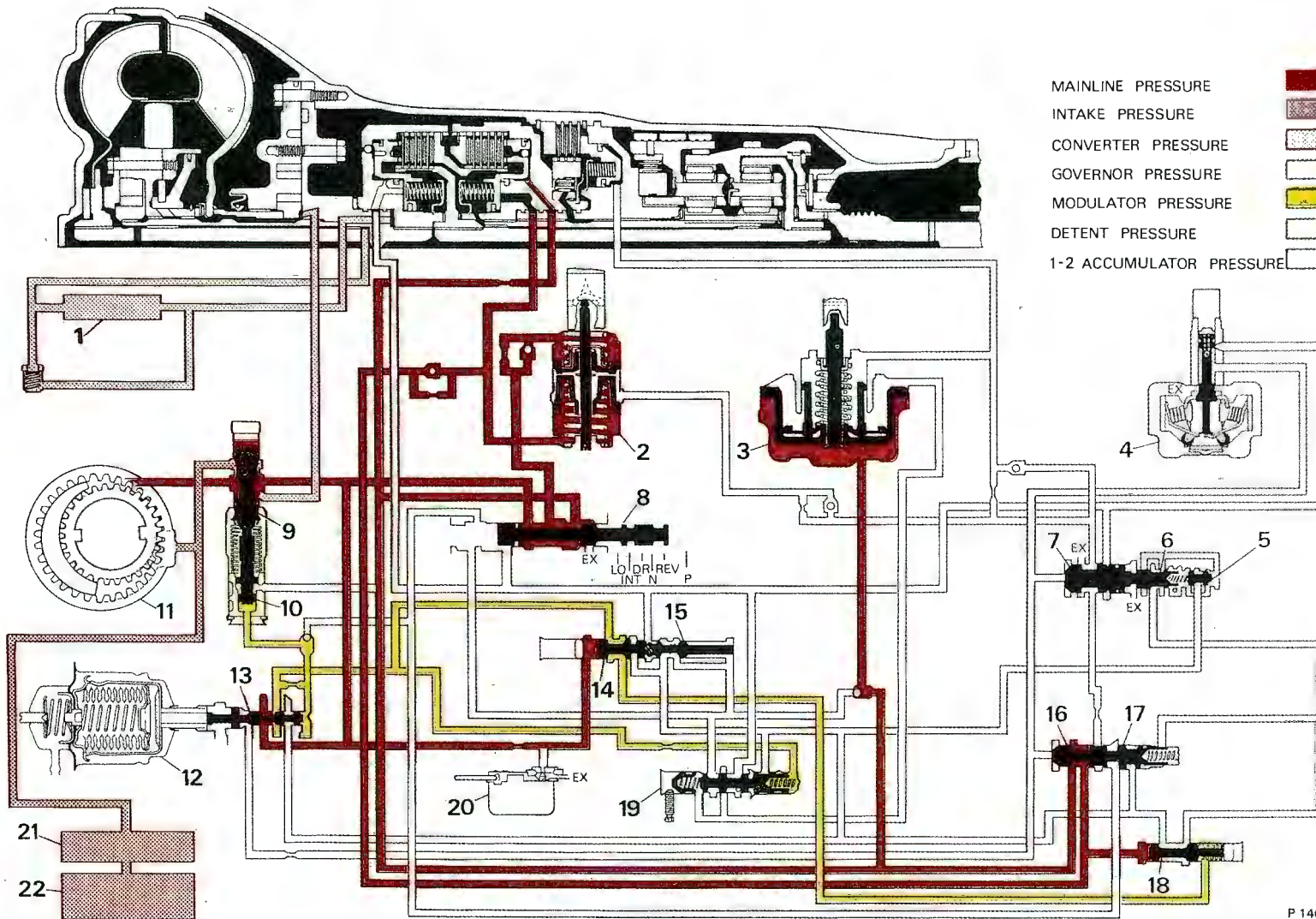
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|---------------------|--------------------|----------------------|--------------------|--------------------------|-----------------|
| 1 Heat exchanger | 5 Regulator plug | 9 Pressure regulator | 13 Modulator valve | 17 2-3 modulator valve | 21 Oil strainer |
| 2 Front servo | 6 1-2 detent valve | 10 Boost valve | 14 Detent valve | 18 3-2 valve | 22 Sump |
| 3 Rear servo | 7 1-2 valve | 11 Pump | 15 Regulator valve | 19 1-2 accumulator valve | |
| 4 Governor assembly | 8 Manual valve | 12 Vacuum modulator | 16 2-3 valve | 20 Detent solenoid | |



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FIG. T128 LOW RANGE—1ST GEAR

- | | | | | | |
|---------------------|--------------------|----------------------|--------------------|--------------------------|-----------------|
| 1 Heat exchanger | 5 Regulator plug | 9 Pressure regulator | 13 Modulator valve | 17 2-3 modulator valve | 21 Oil strainer |
| 2 Front servo | 6 1-2 detent valve | 10 Boost valve | 14 Detent valve | 18 3-2 valve | 22 Sump |
| 3 Rear servo | 7 1-2 valve | 11 Pump | 15 Regulator valve | 19 1-2 accumulator valve | |
| 4 Governor assembly | 8 Manual valve | 12 Vacuum modulator | 16 2-3 valve | 20 Detent solenoid | |



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FIG. T129 REVERSE

- | | | | | | |
|---------------------|--------------------|----------------------|--------------------|--------------------------|-----------------|
| 1 Heat exchanger | 5 Regulator plug | 9 Pressure regulator | 13 Modulator valve | 17 2-3 modulator valve | 21 Oil strainer |
| 2 Front servo | 6 1-2 detent valve | 10 Boost valve | 14 Detent valve | 18 3-2 valve | 22 Sump |
| 3 Rear servo | 7 1-2 valve | 11 Pump | 15 Regulator valve | 19 1-2 accumulator valve | |
| 4 Governor assembly | 8 Manual valve | 12 Vacuum modulator | 16 2-3 valve | 20 Detent solenoid | |

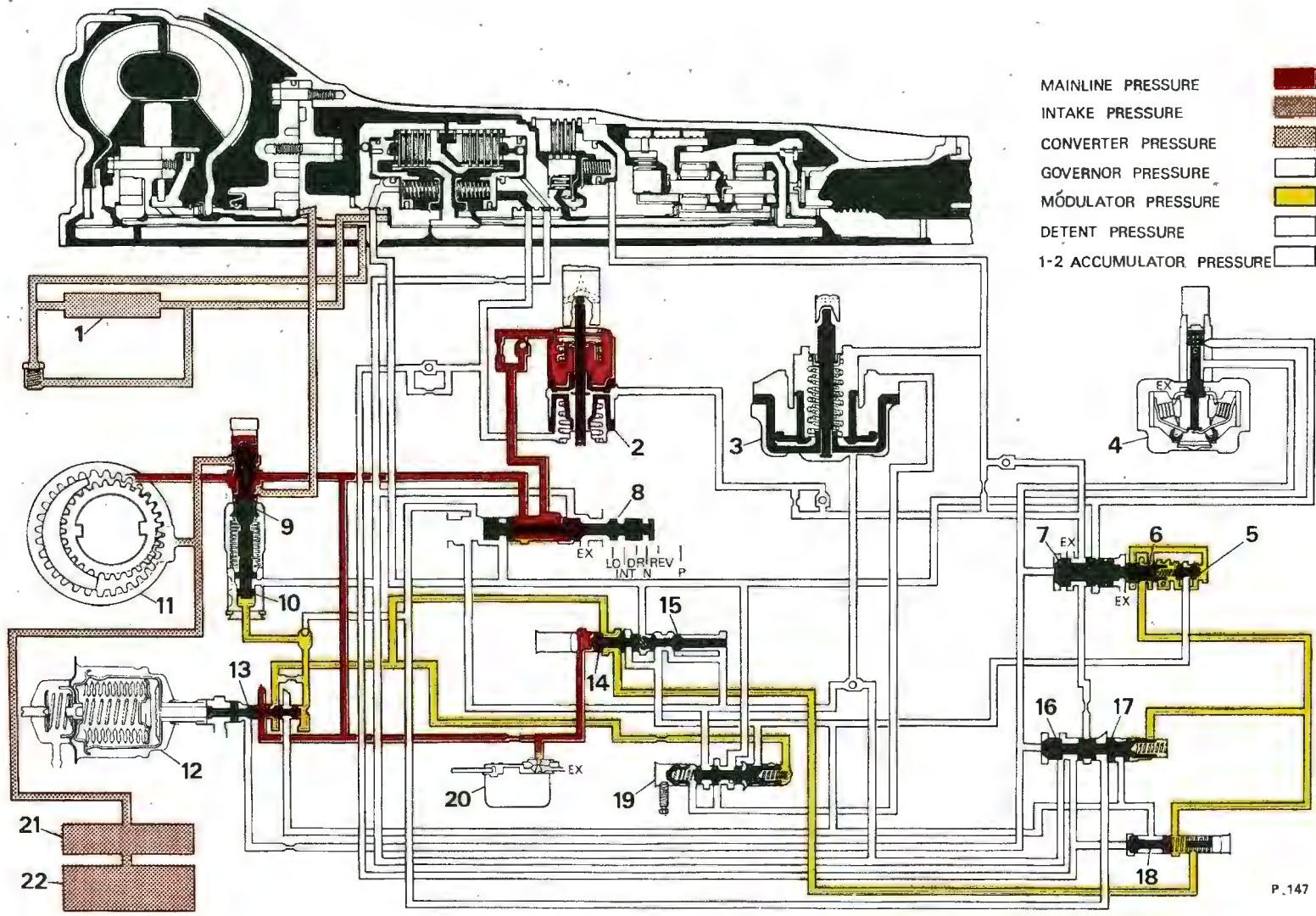


FIG. T130 NEUTRAL-ENGINE RUNNING

- | | | | | | |
|---------------------|--------------------|----------------------|--------------------|--------------------------|-----------------|
| 1 Heat exchanger | 5 Regulator plug | 9 Pressure regulator | 13 Modulator valve | 17 2-3 modulator valve | 21 Oil strainer |
| 2 Front servo | 6 1-2 detent valve | 10 Boost valve | 14 Detent valve | 18 3-2 valve | 22 Sump |
| 3 Rear servo | 7 1-2 valve | 11 Pump | 15 Regulator valve | 19 1-2 accumulator valve | |
| 4 Governor assembly | 8 Manual valve | 12 Vacuum modulator | 16 2-3 valve | 20 Detent solenoid | |

Drive—Second gear**Power flow**

Forward clutch – applied. Direct clutch – released. Intermediate clutch – applied. Roller clutch – ineffective. Front band – released. Intermediate roller clutch – effective. Rear band – released.

In second gear the intermediate clutch is applied to allow the intermediate roller clutch to hold the sun gear against anti-clockwise rotation. Turbine torque through the forward clutch is then applied clockwise through the mainshaft to the rear internal gear.

Clockwise rotation of the rear internal gear turns the rear pinions clockwise against the stationary sun gear. This causes the output carrier and output shaft to turn clockwise in a reduction ratio of approximately 1.5 : 1.

Note Further reduction is possible at low speeds, due to the torque multiplication provided by the converter.

Oil flow

As the car speed and the governor pressure increases, the force of governor oil acting on the 1–2 shift valve will overcome the force of regulated modulator oil pressure. This allows the 1–2 shift valve to open, permitting drive oil to enter the intermediate clutch passage.

Intermediate clutch oil from the 1–2 shift valve is directed to the following (see Fig. T123):

- Intermediate clutch
- Rear servo
- Front servo and accumulator pistons
- 2–3 Shift valve

Basic control

Intermediate clutch oil from the 1–2 shift valve seats a one-way check ball and flows through an orifice to the intermediate clutch piston to apply the intermediate clutch. At the same time, intermediate clutch oil moves the accumulator piston against the 1–2 accumulator oil and accumulator spring to maintain lower pressure in the clutch during a 1–2 shift for a smooth clutch application. Intermediate clutch oil seats a second one-way check ball and flows to the front servo and accumulator pistons. Intermediate clutch oil is also directed to a land of the 2–3 shift valve.

Summary

The forward and intermediate clutches are applied. The transmission is in second gear.

Drive—Third gear**Power flow**

Forward clutch – applied. Direct clutch – applied.

Intermediate clutch – applied. Roller clutch – ineffective. Front band – released. Intermediate roller clutch – ineffective. Rear band – released.

In direct drive, engine torque is transmitted from the converter, through the forward clutch to the mainshaft and rear internal gear. Because the direct clutch is applied, equal power is also transmitted to the sun gear shaft and the sun gear. Since both sun gear and internal gears are now turning at the same speed, the planetary gear set is essentially locked and turns as one unit in direct drive or a ratio of 1 : 1.

Oil flow

As car speed and governor pressure increase, the force of governor oil acting on the 2–3 shift valve overcomes the force of 2–3 shift valve spring and modulator oil. This allows the 2–3 shift valve to move, feeding intermediate clutch oil to the direct clutch passage.

Direct clutch oil from the 2–3 shift valve is directed to the following (see Fig. T124):

- Direct clutch
- Front accumulator piston
- 3–2 Valve

Basic control

Direct clutch oil from the 2–3 shift valve flows past a one-way check valve to the inner area of the direct clutch piston to apply the direct clutch. Simultaneously, direct clutch oil is fed to the front accumulator piston. Pressure of the direct clutch oil, combined with the accumulator spring, moves the accumulator and servo pistons against servo oil. This acts as an accumulator for a smooth direct clutch application.

Direct clutch oil is supplied also to the 3–2 valve to move the valve against modulator pressure. This cuts off modulator oil to the 1–2 regulator and 2–3 modulator valves and allows the transmission to utilize the torque multiplying characteristics of the converter during medium throttle operation without down-changing.

Summary

The forward, intermediate and direct clutches are applied. The transmission is in third gear (direct drive).

Part throttle down-change**Power flow**

Forward clutch – applied. Direct clutch – released in second. Direct clutch – applied in third. Intermediate clutch – applied. Roller clutch – ineffective. Front band – released. Intermediate roller clutch – effective in second. Intermediate roller clutch – ineffective in third. Rear band – released.

In second gear, the intermediate clutch is applied to allow the intermediate roller clutch to hold the sun

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gear against anti-clockwise rotation. Turbine torque through the forward clutch is then applied clockwise through the mainshaft to the rear internal gear.

Clockwise rotation of the rear internal gear turns the rear pinions clockwise against the stationary sun gear. This causes the output carrier and output shaft to turn clockwise in a reduction ratio of approximately 1.5 : 1.

Oil flow

A part throttle 3-2 down-change can be accomplished below approximately 33 m.p.h. (53 k.p.h.) by depressing the accelerator far enough to raise modulator pressure to approximately 87 lb/sq.in. (6,1 kg/sq.cm.). Modulator pressure and the 3-2 valve spring will move the 3-2 valve against direct clutch oil and allow modulator oil to act on the 2-3 modulator valve. This moves the 2-3 valve train against governor oil and changes the transmission to second gear (*see Fig. T125*).

Detent down-change

Power flow

Forward clutch – applied. Direct clutch – released in second. Direct clutch – applied in third. Intermediate clutch – applied. Roller clutch – ineffective. Front band – released. Intermediate roller clutch – effective in second. Intermediate roller clutch – ineffective in third. Rear band – released.

In second gear, the intermediate clutch is applied to allow the intermediate roller clutch to hold the sun gear against anti-clockwise rotation. Turbine torque through the forward clutch is then applied clockwise through the mainshaft to the rear internal gear.

Clockwise rotation of the rear internal gear turns the rear pinions clockwise against the stationary sun gear. This causes the output carrier and output shaft to turn clockwise in a reduction ratio of approximately 1.5 : 1.

Oil flow

While operating at speeds below approximately 70 m.p.h. (113 k.p.h.) a forced or detent 3-2 down-change is possible. The down-change is effected by depressing the accelerator pedal so that the kick-down button is depressed and the kick-down switch actuates the detent solenoid. The detent solenoid opens an orifice that allows line oil at the detent valve to be exhausted, thus permitting the detent regulator valve to operate. Line oil acting on the detent valve and solenoid is supplied by a small orifice.

Drive oil on the detent regulator valve is then regulated to a pressure of approximately 70 lb/sq.in. (4,9 kg/sq.cm.) and called detent oil. Detent oil is then routed to the following (*see Fig. T126*):

Modulator passage

1-2 Regulator valve

2-3 Modulator valve

3-2 Valve

1-2 Primary accumulator valve

Vacuum modulator valve

Detent oil in the modulator passage and at the 2-3 modulator valve will close the 2-3 shift valve, changing the transmission to second gear.

A detent 2-1 down-change can also be accomplished below approximately 20 m.p.h. (32 k.p.h.) because detent oil is directed to the 1-2 regulator valve. This allows detent oil to act on the 1-2 regulator, and 1-2 detent valve to close the 1-2 shift valve, changing the transmission to first gear.

Detent oil is directed also to the modulator valve to prevent modulator pressure from regulating below 70 lb/sq.in. (4,9 kg/sq.cm.) at high speeds or at high altitudes.

Intermediate—Second gear

Power flow

Forward clutch – applied. Direct clutch – released. Intermediate clutch – applied. Roller clutch – ineffective. Front band – applied. Intermediate roller clutch – effective. Rear band – released.

In second gear, the intermediate clutch is applied to allow the intermediate roller clutch to hold the sun gear against anti-clockwise rotation. Turbine torque through the forward clutch is now applied clockwise through the mainshaft to the rear internal gear.

Clockwise rotation of the rear internal gear turns the rear pinions clockwise against the stationary sun gear. This causes the output carrier and output shaft to turn clockwise in a reduction ratio of approximately 1.5 : 1.

In second gear, engine braking is provided by the front band as it holds the sun gear fixed. Without the band applied, the sun gear would overrun the intermediate roller clutch.

Oil flow

When the selector lever is in Intermediate range, intermediate oil from the manual valve is directed to the following: (*see Fig. T127*).

Pressure boost valve

2-3 Shift valve

Intermediate oil at the boost valve will increase line pressure to 150 lb/sq.in. (10,5 kg/sq.cm.). This increased intermediate oil pressure at the 2-3 shift valve will close the 2-3 shift valve, regardless of car speed.

For engine braking the front band is applied by exhausting servo oil at the manual valve. This allows intermediate clutch oil, acting on the servo piston, to move the piston and apply the front band. Once the

transmission is in second gear – Intermediate range, it cannot change to third gear regardless of car speed.

Summary

The forward and intermediate clutches and front band are applied. The transmission is in second gear – Intermediate range.

Low range—First gear

Power flow

Forward clutch – applied. Direct clutch – released. Intermediate clutch – released. Roller clutch – effective. Front band – released. Intermediate roller clutch – ineffective. Rear band – applied.

With the selector lever in Low range, the forward clutch is applied. This delivers turbine torque to the mainshaft and turns the rear internal gear clockwise. (Converter torque ratio is approximately 2.0 : 1 at stall).

Clockwise motion of the rear internal gear causes the rear pinions to turn clockwise to drive the sun gear anti-clockwise. In turn, the sun gear drives the front pinions clockwise, thus turning the front internal gear, output carrier and output shaft clockwise in a reduction ratio of approximately 2.5 : 1. The reaction of the front pinions against the front internal gear is taken by the reaction carrier and roller clutch assembly to the transmission case. (Total stall ratio is approximately 5 : 1).

Downhill or overrun braking is provided in Low range by applying the rear band as this prevents the reaction carrier from overrunning the roller clutch.

Oil flow

Maximum downhill braking can be attained at speeds below 40 m.p.h. (64 k.p.h.) with the selector lever in Low position as this directs Low oil from the manual valve to the following: (*see Fig. T128*).

- Rear servo
- 1–2 Accumulator valve
- Detent regulator valve
- 1–2 Shift valve

Basic control

Low oil flows past a ball check to the apply side of the rear servo piston and to the 1–2 accumulator valve to raise the 1–2 accumulator oil to line pressure for a smooth band application.

Low oil acts on the detent regulator valve. Combined with the detent spring, Low oil holds the detent valve against line oil acting on the detent valve, causing drive oil to flow through the detent regulator valve into the detent and modulator passages. Modulator and detent oil at line pressure acting on the 1–2 regulator and 1–2 detent valve overcomes governor oil and Low oil on the 1–2 shift valve at any vehicle speed

below approximately 40 m.p.h. (64 k.p.h.) and the transmission will change to first gear.

In first gear – Low range, the transmission cannot up-change to second gear regardless of car or engine speed.

Summary

The forward clutch and rear band are applied. The transmission is in first gear – Low range.

Reverse

Power flow

Forward clutch – released. Direct clutch – applied. Intermediate clutch – released. Roller clutch – ineffective. Front band – released. Intermediate roller clutch – ineffective. Rear band – applied.

In Reverse, the direct clutch is applied to direct turbine torque to the sun gear shaft and sun gear. The rear band is also applied, holding the reaction carrier.

Clockwise torque to the sun gear causes the front pinions and front internal gear to turn anti-clockwise in reduction. The front internal gear is connected directly to the output shaft, thus providing the reverse output gear ratio approximately 2 : 1. The reverse torque multiplication at stall (converter and gear ratios) is approximately 4 : 1.

Oil flow

When the selector lever is moved to the Reverse position, the manual valve is repositioned to allow oil at line pressure to enter the reverse circuit. Reverse oil then flows to the following (*see Fig. T129*):

- Direct clutch
- 2–3 Shift valve
- Rear servo piston
- Pressure boost valve

Basic control

Reverse oil from the manual valve flows to the large area of the direct clutch piston and to the 2–3 shift valve. From the 2–3 shift valve, it enters the direct clutch passage and is directed to the small area of the direct clutch piston to apply the direct clutch.

Reverse oil flows to the rear servo and acts on the servo piston to apply the rear band. Reverse oil acts also on the pressure boost valve to boost line pressure.

Summary

The direct clutch and the rear band are applied. The transmission is in Reverse.

Park or Neutral—Engine running

Power flow

Forward clutch – released. Direct clutch – released. Intermediate clutch – released. Roller clutch – ineffec-

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tive. Front band – released. Intermediate roller clutch—ineffective. Rear band – released.

In Neutral or Park no bands or clutches are applied, therefore no power is transmitted.

Oil flow

Whenever the engine is running at idle with the selector lever in 'P' or 'N', oil from the pump is directed to the following (*see Fig. T130*):

Pressure regulator valve	Manual valve
Torque converter	Detent valve
Oil cooler	Detent solenoid
Oil cooler by-pass valve	Vacuum modulator valve
Lubrication system	Front servo (Neutral only)
Stator valve (early cars only)	Stator solenoid and valve (early cars only)

Cooling and lubrication

Oil flows from the pump to the pressure regulator valve which regulates pump pressure. When the pump output exceeds the demand of line pressure, oil from the pressure regulator is directed to the converter feed passage to fill the converter. Oil from the converter is directed to the transmission heat exchanger by-pass valve. Oil from the heat exchanger is directed to the transmission lubrication system.

The heat exchanger by-pass valve permits oil to be fed directly from the converter to the lubrication circuits if the heat exchanger becomes restricted.

Note On early cars fitted with a stator valve and solenoid, when the pump output exceeds the demand of line pressure, oil from the pressure regulator is directed to the transmission heat exchanger by-pass valve. Oil from the heat exchanger is directed to the transmission lubrication system.

Line pressure acts on the following:

- Manual valve
- Detent valve
- Detent solenoid
- Modulator valve
- Stator valve (early cars only)
- Stator solenoid (early cars only)

Line pressure at the modulator valve is regulated to a pressure called modulator oil, which acts on the pressure boost valve, 1-2 accumulator and primary valves, and passes through the detent valve and the 3-2 valve to the 1-2 and 2-3 valve trains.

Summary

The torque converter is filled, (early cars—stator blades are at high angle) and all clutches and bands are released. The transmission is in Neutral.

Section T2 SERVICING

Careful and regular maintenance of the Transmission is necessary to ensure maximum reliability; the following table gives the recommended servicing periods.

SERVICING PERIODS

ESSENTIAL MAINTENANCE	PERIOD
Check oil level	After first 3 000 miles (5 000 km.) then every 6 000 miles (10 000 km.)
Drain transmission and fill with new fluid	Every 12 000 miles (20 000 km.)
Fit new intake strainer	After first 24 000 miles (40 000 km.)
ADDITIONAL MAINTENANCE	PERIOD
Lubricate control linkage Road test for satisfactory performance	Every 6 000 miles (10 000 km.)

It is absolutely essential that great attention be paid to cleanliness whenever the interior of the transmission is exposed and when work is being carried out on a particular unit belonging to the transmission. The smallest particle of dirt in the oil may interfere with the correct operation of the valves, particularly in the control valve unit.

Fluid level—To check

Car attitude and fluid temperature are particularly important when checking the fluid level on a Torque Converter Transmission. Careful attention to the following procedures is necessary in order to determine the actual fluid level.

Fluid recommendations

Whenever fluid is added, use only a **Dexron** fluid. For a complete list of the **Dexron** lubricants currently approved for use in this transmission refer to Chapter D of this Workshop Manual T.S.D. 2476 or the latest Service Bulletin.

Transmission dipstick and filler tube

The transmission dipstick and filler tube are situated on the right-hand side of the engine and are easily accessible when the bonnet is raised (*see Fig. T131*).

To check and add fluid

The level of the transmission fluid should be checked at every engine oil change. The full 'MAX' and low 'MIN' marks on the dipstick are approximately $\frac{7}{8}$ pint (Imp.), 1 pint (U.S.), 0,45 litre apart and should be used to determine the correct fluid level at the normal operating temperature of 76.7°C., (170°F.). Careful attention to transmission fluid temperature is necessary because the correct fluid level at low operating temperatures will be below the 'MIN' mark on the dipstick (*see Fig. T131*), and the correct fluid level at higher operating temperatures will rise above the 'MAX' mark. Fluid level must always be checked when the car is on an even, level surface and with the engine running to ensure that the converter is full. To determine the correct fluid level proceed as follows.

1. Run the car on the road for approximately 20 miles. This will ensure that the transmission has reached normal operating temperature.

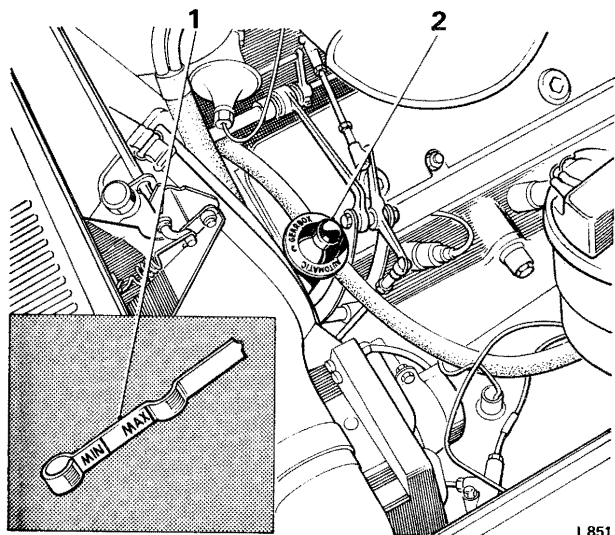
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2. Position the car on a level surface and firmly apply the handbrake.

3. Allow the engine to idle slowly, move the gear range selector lever through each range, return to the **Park** position and immediately check the fluid level.

4. With the engine running, add fluid as required to bring it to the correct level (see Fig. T131).

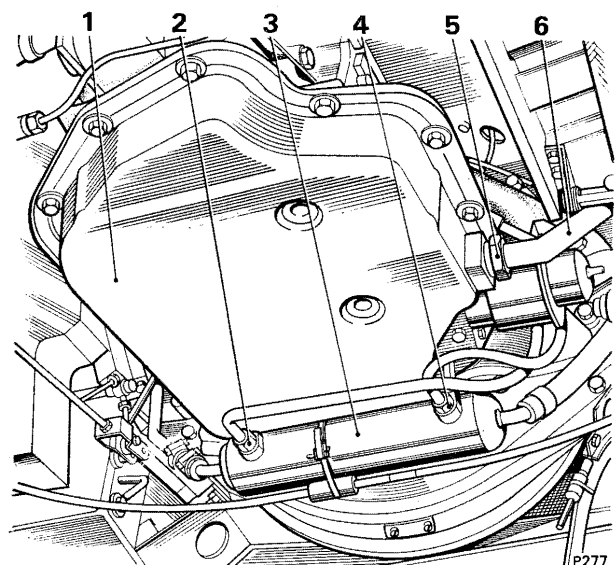
Note Do not overfill.



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FIG. T131 CHECKING THE OIL LEVEL

- 1 Minimum and Maximum oil level marks
- 2 Transmission oil dipstick



P277

FIG. T132 TRANSMISSION SUMP

- 1 Transmission sump
- 2 Fluid inlet from transmission
- 3 Fluid heat exchanger
- 4 Fluid outlet to transmission
- 5 Fluid drain point
- 6 Dipstick filler tube

To drain the sump and renew the intake pipe and strainer assembly

1. Position the car on a ramp or over an inspection pit.
2. Place a clean container, minimum capacity 5 pints (Imp.) 6 pints (U.S.) 2,8 litres under the sleeve nut which secures the filler tube to the side of the sump.
3. Slacken the clips which secure the filler tube. Slacken the sleeve nut at the base of the tube and allow the fluid to drain into the container.
4. Remove the dipstick and filler tube from the sump.

Early Cars Only

5. Unscrew the two unions securing the transmission fluid inlet and outlet pipes to the heat exchanger (see Fig. T132), withdraw the pipes and collect any fluid in a container. Remove the four setscrews (two at each end) securing the heat exchanger to the bell housing bottom cover. Lower the heat exchanger on the flexible coolant pipes to gain access to the two forward sump retaining setscrews.

Note It should not be necessary to release the flexible coolant pipes.

All Cars

6. Remove the thirteen setscrews securing the sump.
7. Remove the sump; discard the gasket.
8. Drain the remainder of the fluid from the sump.
9. Examine the residue of the sump for signs of wear in the transmission then wash the sump in clean paraffin (kerosene). Thoroughly dry the sump with clean compressed air.
10. Remove the intake pipe and strainer; discard the 'O' ring.
11. Fit a new 'O' ring into the intake pipe bore in the transmission case then fit the new intake pipe and strainer. Fit the strainer retaining bolt.

Important There is more than one combination of strainer and sump fitted to the Torque Converter Transmission. If an incorrect combination is fitted, a transmission failure will result.

12. Fit the sump, using a new gasket. Torque tighten the setscrews (refer to Chapter P of this Workshop Manual T.S.D. 2476).
13. Fit the oil filler tube, positioning the clips before tightening the sleeve nut.
14. Add 8 pints (Imp.) 9 2/3 pints (U.S.) 4,5 litres of fresh clean transmission fluid through the filler tube.

Note When draining the sump and **not** renewing the intake pipe and strainer, add only 5 pints (Imp.) 6 pints (U.S.) 2,8 litres of fluid.

15. Run the engine at a fast idle for approximately 90 seconds with the selector lever in 'P' position.

16. Reduce the engine speed to slow idle, move the gear range selector lever through each range, return to the **Park** position. Immediately, check the fluid level with the engine running and the car on level surface. This should be approximately 0.0625in. (1.59 mm.) **below** the 'MIN' mark when the transmission is cold 20°C. (68°F).

Caution Do not overfill as foaming may occur when the fluid warms up. If the fluid level is too low, especially when cold, complete loss of drive may result after quick stops. Extremely low fluid levels will result in damage to the transmission.

17. Finally check that the transmission fluid level is correct (see **To check and add fluid — operations 1-4 inclusive**).

To fill a dry transmission unit

The fluid capacity of a Torque Converter Transmission, including the torque converter, is approximately 18 $\frac{3}{8}$ pints (Imp.) 22 $\frac{1}{2}$ pints (U.S.) 10.6 litres, but the correct level is determined by the marks on the dipstick rather than by the quantity of fluid added. It is important that the correct level be maintained. When the transmission has been overhauled and a complete fill is required, including the torque converter, proceed as follows.

1. Pour approximately 11 $\frac{1}{2}$ pints (Imp.) 14 pints (U.S.) 6.5 litres through the filler tube.
2. Run the engine at a fast idle for approximately 90 seconds with the selector lever in 'P' position.
3. Reduce the engine speed to slow idle, move the gear range selector lever through each range, return to the **Park** position. Immediately, check the fluid level with the engine running and the car on level surface. This should be approximately 0.0625in. (1.59 mm.) **below** the 'MIN' mark when the transmission is cold 20°C. (68°F).

The transmission sump should be drained every 12 000 miles (20 000 km.) or 12 months, whichever occurs first. Fresh fluid should be added to maintain the correct level on the dipstick (see *Fig. T131*).

The fluid intake system incorporates an intake pipe and strainer assembly. This assembly should be renewed after the first 24 000 miles (40 000 km.) or two years, whichever occurs first. In the event of a major failure in the transmission, the strainer must be renewed.

Important There is more than one combination of strainer and sump fitted to the Torque Converter Transmission. If an incorrect combination is fitted, a transmission failure will result.

To check for leaks

Whenever the transmission has been dismantled, completely or partially, the following procedure must be observed to minimise the possibility of fluid leakage.

1. Always fit new gaskets and 'O' ring seals.
2. Use a small amount of petroleum jelly to hold a gasket in position during assembly.
3. Do not use a sealing compound (e.g. Wellseal) with a gasket.
4. Ensure that the composition cork and paper gaskets are not wrinkled or creased when fitted. Ensure that gaskets have not shrunk or stretched during storage.
5. Ensure that square-sectioned 'O' rings are correctly fitted and are not twisted.
6. Ensure that all mating faces are clean and free from burrs and damage.
7. Torque tighten bolts, setscrews etc., to the torque figures given in Chapter P of this Workshop Manual T.S.D. 2476.

Possible leakage points

When examining the transmission for leaks, determine whether the fluid originates from the transmission or the engine. The original factory fill fluid in the transmission is formulated with a red aniline dye to assist in locating the source of leakage. If the colour of the dye cannot be detected in the transmission fluid, add a red aniline dye preparation to the fluid. Red dye appearing in the leaking fluid will positively identify the source of the leak.

If the fluid is known to be leaking from the transmission, examine the following areas.

Front end

It will be necessary to remove the bell housing bottom cover and the lower front cover plate in order to examine the transmission for leakage at the front end.

To correct a leak at the front end, the transmission will have to be removed from the car.

1. If the **pump oil seal** is suspected of leaking fluid, ensure that the seal has been correctly fitted and is not damaged.

When fitting a new seal (see *Section T19*) ensure that the seal bore in the case is clean and that the seal garter spring is fitted. Examine the finish on the converter neck and the bearing surface in the pump body.

2. Examine the **pump square-sectioned 'O' ring** and the **gasket for damage**, renew if necessary.
3. Ensure that the **rubber coated washers** on the pump securing setscrews are correctly fitted and are not damaged.
4. Examine the **torque converter** for leakage (see *Section T10*).

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Rear extension

1. Examine for damage the **rear extension lip-type seal**.
2. Examine the finish on the **sliding coupling**.
3. Ensure that the **square-sectioned 'O' ring** at the front of the rear extension has been correctly fitted and is not damaged.

Note On later transmissions, the 'O' ring is superseded by a **gasket**, fitted between the joint faces.

4. Check the **securing setscrews** for correct torque tightness.
5. Examine the **housing** for cracks or porosity.

Transmission case

1. Examine the speedometer drive **'O' ring and lip-type seal**. Ensure that the securing **setscrew** is torque tightened.
2. Examine the **governor cover gasket**. Ensure that the **setscrews** are torque tightened.
3. Examine for damage the **detent and stator (if fitted) connector 'O' ring**.
4. Examine for damage the **parking pawl shaft 'O' ring**.
5. Examine for damage the **manual shaft 'O' ring**.
6. Examine for damage the **vacuum modulator 'O' ring**. Ensure that the retaining **setscrew** is torque tightened.
7. Examine the **vacuum modulator** for possible damage to the **diaphragm**.

Note If the transmission is found to be consistently low on fluid, check the modulator to make certain that there is no split in the diaphragm. Apply suction to the vacuum tube and check for leaks. A split diaphragm would allow transmission fluid to be drawn into the engine induction manifold and vacuum line. This condition can usually be detected because the exhaust will be excessively smokey due to the transmission fluid being added to the combustion mixture.

8. Examine the **sump gasket**. Check the torque tightness of the securing setscrews.
9. Check the torque tightness of the **main line pressure tapping plug**.
10. Examine the **breather pipe** for damage.
11. Ensure that the transmission has not been overfilled.
12. Check for coolant in the transmission fluid.
13. Examine the **case** for cracks or porosity.
14. Ensure that the **pump to case gasket** is not incorrectly positioned.
15. Ensure that foreign material is not between the **pump and case**, or between the **pump cover and body**.

16. Ensure that the breather hole in the **pump cover** is not obstructed.
17. Ensure that the **'O' ring** on the filter assembly is not cut.

Heat exchanger connections

Ensure that the heat exchanger transmission **fluid pipes** are correctly fitted and are not damaged. Ensure that the nuts are tight.

Dipstick and filler tube

Examine the **flared end** of the dipstick and filler tube for cracks or damage. Examine the **spherical seat** in the sump. Ensure that the **sleeve nut** is tightened sufficiently to nip the tube securely to the sump.

Internal leaks

It will be necessary to remove the sump in order to determine the source of internal leaks.

1. Check the **governor pipes** for security and damage.
2. Examine the **rear servo cover gasket** for damage. Ensure that the **square-sectioned 'O' ring** is fitted correctly and is not damaged. Torque tighten the cover securing setscrews.
3. Examine the **control valve unit assembly and oil guide plate gaskets**. Check the torque tightness of the unit securing setscrews.
4. Examine the **solenoid gaskets** for damage. Check the torque tightness of the solenoid securing setscrews.
5. Examine the **intake pipe 'O' ring** for damage.
6. Check that the **case valve body mounting face** is not distorted.

Control joints—To lubricate

During initial assembly, the clevis pins in the manual control linkage are lubricated with Rocol MTS 1000 grease and should be similarly treated whenever they are removed.

The emergency (Get-You-Home) lever (fitted to early cars) pivots on an Oilite bush and should not require lubrication.

When a car is being serviced, the opportunity should be taken to check the controls for correct operation and to lubricate all the control joints with a few drops of light oil.

Manual shaft—To lubricate

As part of the normal controls maintenance procedure, it is recommended that the manual shaft be lubricated with a few drops of oil at the point where it enters the transmission case.

If a manual shaft shield is fitted, the shaft should not require lubrication.

Section T3 TESTING

Before road testing the car to check the functioning of the transmission, carry out the following checks.

1. Check the fluid level and top-up, if necessary.
2. Ensure that the engine and transmission are at normal operating temperature 76·7°C. (170°F.).
3. Ensure that the gearchange actuator is operating satisfactorily.
4. Check the manual linkage and adjust, if necessary (*see Section T5*).
5. Check the operation of the detent switch and adjust, if necessary (*see Section T17*).
6. If the oil pressure is to be checked, fit a gauge. The car can then be road tested, using all the selector ranges. Note when any operating faults occur. Check the gearchange pattern as follows.

Gearchange pattern check

Drive range

1. Select 'D' range, then accelerate the car from standstill.
2. A 1-2 and a 2-3 up-change should occur at all throttle openings.

Note The change points will vary according to throttle opening.

3. As the speed of the car decreases to a stop, the 3-2 and the 2-1 down-changes should occur.

Intermediate range

1. Select 'I' range.
2. Accelerate the car from standstill.
3. A 1-2 up-change should occur at all throttle openings.

4. A 2-3 up-change cannot be obtained in this Range.

5. The 1-2 up-change point will vary according to throttle opening.

6. As the speed of the car decreases to a stop, the 2-1 down-change should occur.

Low range

1. Select 'L' range.
2. No up-change should occur in this Range, regardless of throttle opening.

2nd. gear overrun braking

1. Select 'D' range.
2. When a speed of approximately 35 m.p.h. (56 k.p.h.) has been reached, move the selector lever to the 'I' range position.
3. The transmission should change down to 2nd. gear.
4. An increase in the speed of the engine as well as an engine braking effect should be observed.
5. Line pressure should change from 70 lb/sq.in. (4,9 kg/sq.cm.) to approximately 150 lb/sq.in. (10,5 kg/sq.cm.).

1st. gear—downhill or overrun engine braking

1. Select 'I' range.
2. When the speed of the car is approximately 30 m.p.h. (48 k.p.h.) – not exceeding 40 m.p.h. (64 k.p.h.) – and at constant throttle, move the selector to 'L' range.

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3. An increase in engine r.p.m. and a braking effect should be noticed as the down-change occurs.

Oil pressure—To check

Before attempting to check oil pressure or to road test the car, always ensure that the level of fluid in the transmission is correct (*see Section T2 – Servicing*).

The pressure can be checked with the transmission in the car by using an oil pressure gauge coupled to the main line tapping in the left-hand side of the transmission case.

1. Clean any dirt from around the line pressure plug; remove the plug.

2. Fit adapter RH 7914 into the main line tapping; tighten the adapter.

3. Screw a pressure gauge, 0 lb/sq.in. to 300 lb/sq.in. (0 kg/sq.cm. to 21,1 kg/sq.cm.) onto the adapter then position the gauge so that it can be seen from the driver's seat. This can be achieved by removing the carpet from the driver's side then removing the rubber plug from the side of the transmission tunnel. Run the gauge pipe through the hole then couple it to the adapter (*see Fig. T133*). Ensure that the gauge pipe does not interfere with the gear-change linkage.

4. Connect a tachometer to the engine; this will enable the gear change points to be positively identified.

5. Drive the car until the transmission has reached normal operating temperature 76·7°C. (170°F.).

6. Check the fluid level and correct, if necessary.

The following checks may be carried out during road test.

Engine idle pressure check

1. Select 'D' range then drive the car at approximately 30 m.p.h. (48 k.p.h.) with the throttle eased back. The line pressure should be 70 lb/sq.in. (4,9 kg/sq.cm.).

2. Select 'I' range then drive the car to obtain a steady road load, speed 25 m.p.h. (40 k.p.h.). Line pressure should be 150 lb/sq.in. plus or minus 5 lb/sq.in. (10,5 kg/sq.cm. plus or minus 0,35 kg/sq.cm.).

Full throttle pressure check

1. Jack up the rear of the car and suitably position blocks so that the rear wheels are clear of the ground.

2. Disconnect the vacuum line at the induction manifold.

3. Blank off the orifice in the manifold.

4. Run the engine at a fast idle (700 r.p.m. to 1 000 r.p.m.) in Neutral. The oil pressure should be 145 lb/sq.in. (10,2 kg/sq.cm.).

5. Repeat the procedure in Reverse. Reverse pressure should be 150 lb/sq.in. plus or minus 5 lb/sq.in. (10,5 kg/sq.cm. plus or minus 0,35 kg/sq.cm.).

6. Connect the vacuum pipe.

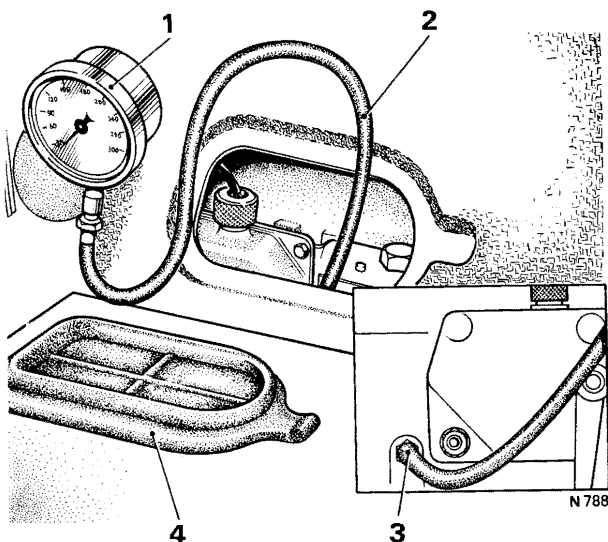


FIG. T133 CHECKING THE OIL PRESSURE

- 1 Oil pressure gauge
- 2 Gauge pipe
- 3 Pipe adapter (RH 7914)
- 4 Rubber cover

Towing

Cars which are fitted with the Torque Converter Transmission cannot be started by pushing the car.

If the engine cannot be started by the starter motor, the car should be towed to the nearest service station.

If the transmission, propeller shaft, final drive unit and drive-shafts are serviceable, the car may be towed, in Neutral (N) at speeds of up to 35 m.p.h. (56 k.p.h.) for distances of up to 50 miles (80 kilometres).

When higher towing speeds, or extended mileage is necessary, it is recommended that the propeller shaft be disconnected or the rear wheels raised clear of the road.

Before towing, check the fluid level in the transmission. The level must be **above** the 'MAX' mark on the dipstick when the engine is **not running**. The car must always be towed with the transmission in Neutral.

If it is necessary to raise either the front or the rear part of the car when towing, the wheels should be raised so that they just clear the ground. When towing with the rear wheels raised, secure the steering wheel with the front road wheels in the 'straight ahead' position.

Section T4 FAULT DIAGNOSIS

Accurate diagnosis of transmission problems begins with a thorough understanding of normal transmission operation. In particular, knowing which units are involved in the various speeds and gears is essential so that the specific unit or fluid flow path can be isolated and investigated further.

The following diagnosis table lists the various diagnosis operations in the sequence in which they are to be performed.

Following the chart will, in most cases, correct the condition without having to remove the transmission from the car.

The instructions must be followed in exact sequence

as any deviation will result in incorrect diagnosis.

The following sequence of tests may help to simplify the diagnosis of defects and should be performed first.

1. Check fluid level.
2. Warm up engine and transmission.
3. Check manual controls.
4. Check detent switch.
5. Road test car.

Note If possible, test the car with the Customer as a passenger. It is possible that the condition which the Customer requires correcting is a normal function of the transmission, thus, unnecessary work can be avoided.

DIAGNOSIS

SYMPTOM	POSSIBLE CAUSE	ACTION
1 No drive in Drive range.	<ol style="list-style-type: none"> 1 Insufficient fluid in transmission. 2 Car battery flat — actuator inoperative. 3 Manual linkage 4 Incorrect line pressure. 5 (a) Low line oil pressure. (b) Normal line oil pressure. 6 Pump assembly. 7 Forward clutch. 8 Roller clutch (late cars) Sprag clutch (early cars) 	<ol style="list-style-type: none"> 1 Top-up as described on Page T163. 2 Fit new fully charged battery. Also check thermal cut-out in Fusebox. 3 Check and adjust the manual linkage as described on Page T183. 4 With brakes applied, check line oil pressure (see Fig. T133). 5 (a) Check items as listed under 'Low line pressure — Page T177'. (b) Check items 6-8 inclusive. 6 Check forward clutch feed passage for restriction. 7 Check items as listed under 'Burned forward clutch — Page T178'. 8 Check clutch assembly for damage or incorrect installation.
2 (a) No drive in Reverse range. (b) Slips in Reverse range.	<ol style="list-style-type: none"> 1 Insufficient fluid in transmission. 2 Actuator inoperative. 3 Manual linkage. 4 Incorrect line oil pressure. 	<ol style="list-style-type: none"> 1 Top-up as described on Page T163. 2 (a) Check operation of actuator as described in Section T7. (b) Check charge condition of battery. 3 Check and adjust the manual linkage as described on Page T183. 4 With brakes applied, check line oil pressure (see Fig. T133).

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SYMPTOM	POSSIBLE CAUSE	ACTION
<p>2 (a) No drive in Reverse range. (b) Slips in Reverse range <i>—continued.</i></p>	<p>5 (a) Low line oil pressure. (b) Normal line oil pressure. 6 Control valve assembly. 7 Rear servo and accumulator. 8 Forward clutch. 9 Direct clutch. 10 Rear band. 11 Centre support.</p>	<p>5 (a) Check items as listed under 'Low line oil pressure — Page T177'. (b) Check items 6-11 inclusive. 6 (a) Check valve body gaskets are not damaged or incorrectly fitted. (b) Check 2-3 valve train is not sticking open (this condition will also cause a 1-3 up-change in Drive range). 7 (a) Check for damaged rear piston seal. (b) Check for short band apply pin (this condition may also cause no overrun braking or slipping in overrun braking — Low range). (c) Check rear servo piston and bore. 8 Check clutch unit will release (if unit does not release this will also cause drive in Neutral). 9 Check items listed under 'Burned direct clutch — Page T178'. 10 Check the band for burned or loose linings, damaged anchor or apply pins, broken band. 11 Check to ensure oil seal rings or grooves are not damaged or worn.</p>
<p>3 Drive in Neutral.</p>	<p>1 Manual linkage. 2 Internal linkage. 3 Pump assembly. 4 Forward clutch.</p>	<p>1 Check and adjust manual linkage as described on Page T183. 2 (a) Manual valve disconnected or broken end. (b) Inside detent lever pin broken. 3 Transmission fluid pressure leaking into forward clutch apply passage. 4 (a) Check items listed under 'Burned forward clutch — Page T178'. (b) Incorrect assembly of forward clutch.</p>
<p>4 (a) Will not hold in Park. (b) Will not release from Park.</p>	<p>1 Manual linkage. 2 Internal linkage.</p>	<p>1 Check and adjust manual linkage as described on Page T183. 2 (a) Check parking brake lever. (b) Check actuator assembly (check the chamfer on the actuator sleeve rod). (c) Parking pawl broken, chamfer omitted. (d) Parking pawl return spring broken, missing or incorrectly hooked.</p>
<p>5 No engine braking in Low range — 1st. gear.</p>	<p>1 Transmission case assembly. 2 Rear servo. 3 Rear band.</p>	<p>1 (a) Low — Reverse check ball mispositioned or missing. (b) Transmission case damaged in area surrounding Low — Reverse check ball. 2 (a) Check servo for damaged oil seal ring, ring bore or piston. (b) Rear band apply pin short. (c) Incorrect assembly of parts. 3 (a) Broken or burned (check for cause). (b) Check assembly engages correctly on anchor pins and/or servo pin.</p>
<p>6 No engine braking in Intermediate Range — 2nd. gear.</p>	<p>1 Front servo and accumulator. 2 Front band.</p>	<p>1 (a) Check for leaking or broken oil seal rings. (b) Check for scored bores. (c) Check for sticking servo piston. 2 (a) Check to ensure front band is not burned or broken. (b) Check to ensure front band is engaging correctly on anchor pin and/or servo pin.</p>

SYMPTOM	POSSIBLE CAUSE	ACTION
<p>7 No detent down-changes. Note Position car on a suitable ramp. Switch-on ignition but do not start engine.</p>	<p>1 Transmission case electrical plug.</p> <p>2 (a) Light off.</p> <p>(b) Light on.</p>	<p>1 (a) Disconnect electrical plug. (b) Connect test-lamp to 'detent terminal' of disconnected wiring harness. (c) Depress accelerator 'fully'.</p> <p>2 (a) Incorrectly adjusted or faulty micro-switch. Faulty electrical circuit. (b) Check operation of detent solenoid. If solenoid cannot be heard to operate this may be due to (i) Faulty electrical connection. (ii) Sticking detent valve train. (iii) Restricted oil passage.</p>
<p>8 Noisy transmission. Note Before checking transmission, ensure that noise is not from coolant pump alternator, air conditioning unit, power steering, etc.</p>	<p>1 Noise in Park, Neutral and all Drive ranges.</p> <p>2 First, Second and Reverse.</p> <p>3 During acceleration any gear.</p> <p>4 Squeak at low vehicle speeds.</p> <p>5 Clutch application during Neutral-to-Drive and/or Park-to-Drive.</p> <p>6 1-2 up-change in Intermediate and Drive ranges.</p> <p>7 2-3 up-change in Drive range, Neutral-to-Reverse and Park-to-Reverse.</p>	<p>1 (a) Pump cavitation. (i) Transmission fluid level low top-up as described on Page T163. (ii) Restricted or incorrect filter assembly. (iii) Intake 'O' ring damaged or intake pipe split. (iv) Transmission case — porosity at pump face intake port. (v) Pump to transmission case gasket not correctly fitted. (vi) Coolant in transmission fluid. (b) Pump assembly. (i) Defective or damaged gears. (ii) Drive gear incorrectly assembled. (iii) Crescent interference. (iv) Orifice cup plug in pressure regulator damaged or missing (buzzing noise). (v) Seal rings damaged or worn. (c) Converter. (i) Damaged converter. (ii) Loose bolts converter to flywheel.</p> <p>2 (a) Planetary gear train. (i) Gears or thrust bearings damaged. Thoroughly clean thrust bearings and thrust races. Closely inspect needles and surfaces for pitting and roughness. (ii) Front internal gear ring damaged.</p> <p>3 (a) Check coolant or transmission fluid lines to and from cooler are not fouling. (b) Check engine mounts are not loose or broken.</p> <p>4 Check speedometer driven gear shaft seal (lubricate or replace).</p> <p>5 Check condition of forward clutch assembly.</p> <p>6 Check condition of intermediate clutch plates.</p> <p>7 Check condition of direct clutch plates.</p>
<p>9 1st and 2nd speeds only (no 2-3 up-change).</p>	<p>1 Control valve assembly.</p>	<p>1 (a) Check for sticking 2-3 shift valve train (valves should fall under their own weight). (b) Check for damaged or incorrectly fitted gaskets between the control valve unit, oil guide plate and case.</p>

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SYMPTOM	POSSIBLE CAUSE	ACTION
<p>9 1st and 2nd speeds only (no 2-3 up-change) — continued</p>	<p>2 Direct clutch. 3 Incorrect vacuum.</p>	<p>2 Check items listed under 'Burned direct clutch — Page T178'. 3 Check items listed under 'Incorrect vacuum at modulator — Page T177'.</p>
<p>10 (a) No 1-2 up-change (b) Delayed up-change.</p>	<p>1 Insufficient fluid in transmission. 2 Transmission case electrical plug.</p> <p>3 (a) Normal up-change occurs. (b) No up-change occurs.</p> <p>4 (a) Pressure 60 to 90 lb/sq.in. (4,2 to 6,3 kg/sq.cm.) see test 3(b). 4 (b) Pressure 90 to 150 lb/sq.in. (6,3 to 10,5 kg/sq.cm.) see test 3(b). 5 (a) Pressure 55 to 70 lb/sq.in. (3,8 to 4,9 kg/sq.cm.) see test 4(b). (b) Pressure 70 to 160 lb/sq.in. (4,9 to 11,2 kg/sq.cm.) see test 4(b).</p> <p>6 Intermediate clutch.</p>	<p>1 Top-up as described on Page T163. 2 Disconnect electrical plug and road test car.</p> <p>3 (a) (i) Check for short circuit, correct detent switch and wiring. (ii) Check for solenoid click. (b) Check line pressure at 1 000 r.p.m. in Drive range.</p> <p>4 (a) Control valve assembly. (i) Check for sticking 2-3 shift valve train (valves should fall under their own weight). (ii) Check for damaged or incorrectly fitted gaskets between control valve unit, oil guide plate and case. 4 (b) Check line pressure at 1 000 r.p.m. in Neutral.</p> <p>5 (a) (i) Check detent system. (ii) Check solenoid for operation and damage. (iii) Check 'line - to - detent' orifice in spacer plate. (iv) Check detent valve train. (b) (i) Check for vacuum leaks or no vacuum as described on Page T177. (ii) Check vacuum modulator for leaking diaphragm or bent neck see Page T179. (iii) Check vacuum modulator valve is free to operate. (iv) Check transmission case for damage or porosity at modulator valve.</p> <p>6 Ensure intermediate clutch seals are sealing correctly (if transmission is dismantled for complaint of 'no 2nd gear' or 'transmission changes 1-3', always fit new inner and outer clutch piston seals).</p>
<p>11 Rough 1-2 up-change.</p>	<p>1 Insufficient fluid in transmission. 2 Check condition of engine. 3 Vacuum line and components.</p> <p>4 Line oil pressure.</p> <p>5 (a) High line pressure.</p>	<p>1 Top-up fluid as described on Page T163. 2 Tune engine.</p> <p>3 (i) Check vacuum as described on Page T177. (ii) Check vacuum modulator for leaking diaphragm or bent neck see Page T179. (iii) Check vacuum modulator valve is free to operate. (iv) Check 'feel' of up-change.</p> <p>4 Check line pressure in 'Drive' at 1 000 r.p.m.</p> <p>5 (a) Check causes of high line pressure (see Page T176).</p>

SYMPTOM	POSSIBLE CAUSE	ACTION
<p>11 Rough 1-2 up-change — <i>continued.</i></p>	<p>5 (b) Normal line pressure.</p> <p>6 Intermediate clutch.</p>	<p>5 (b) (i) Remove control valve assembly and solenoid. Check 1-2 accumulator system in control valve assembly.</p> <p>(ii) Check rear accumulator for sticking piston or leaks.</p> <p>(iii) Check rear accumulator feed restricted in transmission case.</p> <p>(iv) Check for correct number and location of check balls (<i>see Fig. T216</i>).</p> <p>6 (i) Check intermediate clutch, if 'burnt' check cause (<i>see Page T178</i>).</p> <p>(ii) Check correct number and type of plates.</p>
<p>12 Slipping 1-2 up-change.</p>	<p>1 Insufficient fluid in transmission.</p> <p>2 Check condition of engine.</p> <p>3 Vacuum line and components.</p> <p>4 (a) Poor response at modulator.</p> <p>(b) Normal response at modulator.</p> <p>5 (a) Low line oil pressure.</p> <p>(b) Normal line oil pressure.</p> <p>6 Intermediate clutch.</p> <p>7 (a) Excessive leakage.</p> <p>(b) Normal leakage.</p>	<p>1 Top-up fluid as described on Page T163.</p> <p>2 Tune engine.</p> <p>3 Check vacuum system for response at modulator. Oil pressure should vary and respond rapidly to quick changes in throttle openings.</p> <p>4 (a) (i) Check vacuum feed, including carburetter for restriction.</p> <p>(ii) Check modulator assembly (<i>see Page T179</i>).</p> <p>(b) Check line pressure in 'Drive' at 1 000 r.p.m.</p> <p>5 (a) Check causes of Low line pressure (<i>see Page T177</i>).</p> <p>(b) (i) Check control valve assembly bolt torque.</p> <p>(ii) Remove control valve assembly and detent solenoid.</p> <p>(iii) Check spacer plate for blocked orifice.</p> <p>(iv) Check for damaged rear servo piston or oil seal ring.</p> <p>(v) Check rear accumulator piston, rings and case bore.</p> <p>(vi) Check 1-2 accumulator valve system. Check front accumulator piston and oil rings.</p> <p>(vii) Check centre support bolt torque and support for looseness.</p> <p>6 Air check intermediate clutch for leakage at seals.</p> <p>7 (a) Remove and inspect intermediate clutch and centre support — check case to support face. If plates are 'burnt' check cause (<i>see Page T178</i>).</p> <p>(b) Check intermediate clutch for correct components, correct number of release springs or 'cocked' release spring. Check intermediate clutch piston for flatness.</p>
<p>13 Rough 2-3 up-change.</p>	<p>1 Insufficient fluid in transmission.</p> <p>2 Check condition of engine.</p> <p>3 Check line pressure.</p> <p>4 (a) High line oil pressure.</p>	<p>1 Top-up fluid as described on Page T163.</p> <p>2 Tune engine.</p> <p>3 With brakes applied check line pressure in 'Drive' at 1 000 r.p.m.</p> <p>4 (a) Check cause of high line oil pressure (<i>see Page T176</i>).</p>

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SYMPTOM	POSSIBLE CAUSE	ACTION
<p>13 Rough 2-3 up-change — <i>continued.</i></p>	<p>4 (b) Normal line oil pressure.</p> <p>5 Direct clutch.</p>	<p>4 (b) Remove control valve assembly.</p> <p>(i) Check front accumulator for sticking piston, also for broken or missing spring.</p> <p>(ii) Check control valve assembly for drilling to accumulator.</p> <p>5 (a) Check direct clutch for leakage to outer area of clutch piston (leak could be at centre piston seal — 2nd ring on centre support).</p> <p>(b) Damaged centre support.</p>
<p>14 Slipping 2-3 up-change.</p>	<p>1 Insufficient fluid in transmission.</p> <p>2 Check condition of engine.</p> <p>3 Check line oil pressure.</p> <p>4 (a) Low line oil pressure. (b) Normal line oil pressure.</p> <p>5 Front Servo.</p> <p>6 Direct clutch.</p>	<p>1 Top-up fluid as described on Page T00.</p> <p>2 Tune engine.</p> <p>3 With brakes applied check line oil pressure in Drive at 1 000 r.p.m.</p> <p>4 (a) Check cause of Low line oil pressure (<i>see Page T177</i>).</p> <p>(b) Remove control valve assembly.</p> <p>(i) Check spacer plate for damage, blocked direct clutch feed orifice or mispositioned gasket.</p> <p>(ii) Check for damaged or leaking oil passages.</p> <p>(iii) Check for sticking valves.</p> <p>5 (a) Check for broken or missing front servo spring.</p> <p>(b) Check for leak at servo pin.</p> <p>6 (a) (i) Air check direct clutch for excessive leak. (ii) Remove transmission, inspect for case to centre support leak. (iii) Broken or undersize oil rings. (iv) Damaged or missing piston seals.</p> <p>(b) Remove transmission and inspect direct clutch for correct number and type of clutch plates.</p>
<p>15 (a) Delayed up-changes. (b) No up-changes.</p>	<p>1 Detent system (full throttle) micro-switch.</p> <p>2 Incorrect modulator vacuum.</p> <p>3 Incorrect line pressure.</p>	<p>1 Disconnect the Green/White wire from connection on side of transmission. Test up-changes.</p> <p>(a) If up-changes occur, problem is in micro-switch or wiring.</p> <p>(b) If fault persists continue to Operation 2.</p> <p>2 Connect gauge to lower end of vacuum modulator pipe. Check for normal vacuum.</p> <p>(a) If vacuum is low or not present, check for leaks and restrictions.</p> <p>(b) If fault persists continue to Operation 3.</p> <p>3 Connect gauge to transmission and check 'Line pressure' in 'Drive' range with engine speed of 1 000 r.p.m. Normal pressure is between 65 lb/sq.in. and 75 lb/sq.in. (4,57 kg/sq.cm. and 5,27 kg/sq.cm.)</p> <p>Note Normal Line pressure in 'Drive' range with car stationary should vary from approx. 65 lb/sq.in. (4,57 kg/sq.cm.) at idle speed to 150 lb/sq.in. (10,55 kg/sq.cm.) at full throttle. The pressure increases as engine vacuum decreases.</p>

SYMPTOM	POSSIBLE CAUSE	ACTION
15 (a) Delayed up-change. (b) No up-changes — <i>continued.</i>	4 Line pressure 95 lb/sq.in. to 110 lb/sq.in. (6,68 kg/sq.cm. to 7,73 kg/sq.cm.). 5 Line pressure 135 lb/sq.in. to 150 lb/sq.in. (9,49 kg/sq.cm. to 10,55 kg/sq.cm.). 6 Normal Line pressure 65 lb/sq.in. to 75 lb/sq.in. (4,57 kg/sq.cm. to 5,27 kg/sq.cm.). 7 Detent system.	4 Check complete detent system. 5 With good vacuum at modulator check. (a) Modulator valve. (b) Pressure regulator components. 6 Remove governor assembly; check for freedom of operation and presence of dirt. Clean if necessary. Check bleed orifice in centre of governor valve is not blocked. 7 (a) Detent solenoid loose or defective. (b) Solenoid feed orifice blocked. This is the 0.034 in. (0,86 mm.) dia. hole in the valve body spacer plate, nearest to the detent solenoid. (An incorrectly fitted gasket could block the hole). (c) Detent valve spacer pin either short or missing. The pin should be 1.221 in. to 1.215 in. (31,01 mm. to 30,86 mm.) in length. (d) Detent valve bore plug pushed too far and tilted. The plug should be seated against the retaining pin. (e) Detent valve bore plug under-size or eccentric, causing an excessive leak at the detent valve.
16 Torque Converter Leaks.	1 Converter welding. 2 Damaged or worn converter hub.	1 (a) Carry out converter leak check (<i>see Page T229 — Torque Converter — To Leak test</i>). (b) Fit new converter if unit is leaking. 2 (a) Closely inspect converter hub for wear and scoring that can damage seal. (b) Repair converter hub with crocus cloth if practical, or fit new components.
17 Torque Converter Vibrations	1 Converter/Flex-plate out of balance. 2 Converter balance weight. 3 Crankshaft pilot.	1 (a) Isolate cause of vibration. (b) Change position of converter on flex-plate 120° at a time to cancel out engine/converter out of balance condition. 2 (a) Check converter for loss of balance weight. (b) Change converter if balance weight is lost. 3 (a) Check to ensure converter to crankshaft pilot is not broken. (b) Change converter if pilot is broken.
18 Torque Converter Noisy or Slips. (Most converter noise occurs under light throttle in 'Drive' with brakes applied).	1 Loose flex-plate to converter bolts. 2 Cracked flex-plate. 3 Items listed under Operation 17 — Torque Converter Vibrations. 4 Internal damage to converter.	1 (a) Check flex-plate and converter for damage. (b) If no damage is apparent, tighten bolts. (c) If damage is apparent replace components. 2 (a) Check for cracked flex-plate (engine to case dowel pins missing can result in cracked flex-plate). (b) Replace damaged components. 3 Items lists under Operation 17 — Torque Converter Vibrations. 4 (a) Check thrust roller bearing, thrust races and roller clutch for damage. (i) Thrust roller bearing and thrust races can be checked by viewing them when looking into the converter neck or feeling through the opening to

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SYMPTOM	POSSIBLE CAUSE	ACTION
<p>18 Torque Converter Noisy or Slips — <i>continued.</i></p>	<p>5 Excessive Torque Converter end clearance.</p> <p>6 Converter Fluid.</p> <p>Note Do not change the converter if a failure in some other part of transmission has resulted in converter containing dark discoloured fluid. The full flow filters used in the transmission will remove all harmful residue from failures (other than converter or pump failures) before oil is pumped into converter. Full flow filter fitted to this transmission from late 1967.</p>	<p>make sure they are not cracked, broken or incorrectly positioned (see Fig. T171). Fit a new converter if damage is apparent.</p> <p>(ii) Roller clutch function can be checked by placing a finger into the converter neck and with side pressure against the spline, turn the stator race. The race should turn fairly free in a clockwise direction and not turn in an anti-clockwise direction. Fit a new converter if damage is apparent.</p> <p>5 (a) Check Torque Converter end clearance (see Page T229). (b) Fit a new converter if end clearance is excessive.</p> <p>6 (a) Check colour of fluid, if this appears as 'aluminium paint' converter is internally damaged. (b) Check anti-freeze has not contaminated converter fluid. (c) Fit new converter.</p> <p>Correct transmission problem, change fluid and filter.</p>

High line pressure

If either the idle or full throttle pressure checks is high, the cause may be as follows.

1. Vacuum leak

- a Full leak (vacuum line disconnected).
- b Partial leak in line from engine modulator.
- c Incorrect engine vacuum.
- d Leak in vacuum operated accessories.

2. Damaged Modulator

- a Sticking valve.
- b Water in modulator.
- c Incorrect operation of modulator
(See Page T231 — Section T11).

3. Detent System

- a Detent switch actuated (plunger sticking) or shorted.
- b Detent wiring shorted.

c Detent solenoid stuck open.

d Detent feed orifice in spacer plate blocked.

e Detent solenoid loose.

f Detent valve bore plug damaged.

g Detent regulator valve pin short.

4. Pump

- a Pressure regulator and/or boost valve stuck.
- b Incorrect pressure regulator spring.
- c Excessive number of pressure regulator valve spacers.
- d Faulty pump casting.
- e Pressure boost valve installed incorrectly or otherwise defective.
- f Aluminium bore plug defective.
- g Pressure boost bush defective.

5. Control valve assembly

- a Spacer plate-to-case gasket incorrectly fitted.
- b Incorrect plate-to-case gasket.

Low line pressure

If either the idle or full throttle pressure checks is low, the cause may be as follows.

1. **Transmission oil level low.**
2. **Modulator assembly** (*see Fig. T174*).
3. **Filter**
 - a Blocked or restricted.
 - b 'O' ring on intake pipe omitted or damaged.
4. **Split or leaking intake pipe**
5. **Incorrect filter assembly**
6. **Pump**
 - a Pressure regulator or boost valve sticking.
 - b Gear clearance, damaged or worn (pump will become damaged if the drive gear is installed the wrong way or if the converter pilot does not enter the crankshaft freely).
 - c Pressure regulator spring weak.
 - d Insufficient spacers in pressure regulator.
 - e Pump to case gasket incorrectly positioned.
 - f Defective pump body and/or cover.
7. **Leaks in the internal circuit**
 - a Forward clutch leak (pressure normal in Neutral and Reverse — pressure low in Drive).
 - (i) Check pump rings.
 - (ii) Check forward clutch seals.
 - b Direct clutch leak (pressure normal in Neutral), Low, Intermediate and Drive — pressure low in Reverse).
 - (i) Check centre support oil seal rings.
 - (ii) Check direct clutch outer seal for damage.
 - (iii) Check rear servo and front accumulator pistons and rings for damage or missing.
8. **Case assembly**
 - a Porosity in intake bore area.
 - b Check case for intermediate clutch plug leak or blown out.
 - c Low - Reverse check ball incorrectly positioned or missing (this condition will cause no Reverse and no overrun braking in Low range).

Note When checking item 3 — Filter it should be noted that there is no approved method for either checking or cleaning the filter. If the performance of the filter is suspect a **new** filter must be fitted.

Improper vacuum at modulator

1. **Engine**
 - a Requires tune-up.
 - b Loose vacuum fittings.
 - c Vacuum operated accessory leak.
2. **Vacuum line to modulator**
 - a Leak.
 - b Loose fitting.
 - c Restricted orifice, or incorrect orifice size.
 - d Carbon build-up at modulator vacuum fitting.
 - e Pinched line.
 - f Grease or varnish material in pipe (no or delayed upchange — cold).

Oil leaks

1. **Transmission oil sump leaks**
 - a Securing bolts not correctly torque tightened.
 - b Improperly installed or damaged sump gasket.
 - c Oil sump gasket mounting face not flat.
2. **Case extension leak**
 - a Securing bolts not correctly torque tightened.
 - b Rear seal assembly damaged or incorrectly installed.
 - c Gasket (extension to case) damaged or incorrectly installed.
 - d Porous casting.
 - e Output shaft 'O' ring damaged.
3. **Case leak**
 - a Filler pipe 'O' ring damaged or missing; mispositioned filler pipe bracket to engine 'loading' one side of the 'O' ring.
 - b Modulator assembly 'O' ring damaged or incorrectly installed.
 - c Connector 'O' ring damaged or incorrectly installed.
 - d Governor cover, gasket and bolts damaged or loose; case face leak.
 - e Damaged or porosity. Leak at speedometer driven gear housing or seal. Leak at speedometer hole plug.
 - f Manual shaft seal damaged or incorrectly installed.
 - g Line pressure tap plug stripped.
 - h Vent pipe (*refer to Item 5*).
 - i Porous case or crack at pressure plug boss.
4. **Front end leak**
 - a Front seal damaged (check converter neck for nicks, etc., also for pump bushing moved forward), garter spring missing.

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- b Pump securing bolts and seals damaged; bolts missing or loose.
 - c Converter (leak in weld).
 - d Pump 'O' ring seal damaged (Also check pump oil ring groove and case bore).
 - e Porous casting (pump or case).
 - f Pump drain back hole not open.
5. **Oil comes out vent pipe**
- a Transmission over-filled.
 - b Water in oil.
 - c Filter 'O' ring damaged or incorrectly assembled causing oil to foam.
 - d Foreign material between pump and case or between pump cover and body.
 - e Case porous, pump face incorrectly machined.
 - f Pump porous.
 - g Pump to case gasket mispositioned.
 - h Pump breather hole blocked or missing.
 - i Hole in intake pipe.
6. **Modulator Assembly**
- a Diaphragm defective.

Control valve assembly—Governor line pressure check

1. Install line pressure gauge.
2. Disconnect vacuum line to modulator.
3. With car on hoist (rear wheels off ground), foot off brake, in Drive, check line pressure at 1 000 r.p.m.
4. Slowly increase engine revolutions to 3 000 r.p.m. and determine if a line drop occurs of 7 lb/sq. in. (0,49 kg/sq. cm.) or more.
5. If pressure drop occurs, dismantle, clean and inspect control valve assembly.
6. If no pressure drop occurs:
 - a Inspect governor.
 - (i) Sticking valve.
 - (ii) Weight freeness.
 - (iii) Restricted orifice in governor valve.
 - b Governor feed system.
 - (i) Check screen in governor feed pipe hole in case assembly.
 - (ii) Check for restrictions in governor pipe.

Burned clutch plates

Note Burned clutch plates can be caused by incorrect usage of clutch plates. Also, anti-freeze in transmission fluid can cause severe damage, such as large pieces of composition clutch plate material peeling off.

1. **Forward clutch**
 - a Check ball in clutch housing for damage, sticking or missing.
 - b Clutch piston cracked, seals damaged or missing.
 - c Low line pressure.
 - d Manual valve mispositioned.
 - e Restricted oil feed to forward clutch. (Clutch housing to inner and outer areas not drilled, restricted or porosity in pump).
 - f Pump cover oil seal rings missing, broken or undersize; ring groove oversize.
 - g Case valve body face not flat or porosity between channels.
 - h Manual valve bent and centre land not ground properly.
2. **Intermediate clutch**
 - a Rear accumulator piston oil ring, damaged or missing.
 - b 1-2 accumulator valve sticking in control valve assembly.
 - c Intermediate clutch piston seals damaged or missing.
 - d Centre support bolt loose.
 - e Low line pressure.
 - f Intermediate clutch plug in case missing.
 - g Case valve body face not flat or porosity between channels.
 - h Manual valve bent and centre land not ground properly.
3. **Direct clutch**
 - a Restricted orifice in vacuum line to modulator (poor vacuum response).
 - b Check ball in direct clutch piston damaged, sticking or missing.
 - c Defective modulator bellows.
 - d Centre support bolt loose (Bolt may be tight in support but not holding support tight to case).
 - e Centre support oil rings or grooves damaged or missing.
 - f Clutch piston seals damaged or missing.
 - g Front and rear servo pistons and seals damaged.
 - h Manual valve bent and centre land not cleaned up.
 - i Case valve body face not flat or porosity between channels.
 - j Intermediate roller clutch installed backwards.
 - k 3-2 valve, 3-2 spring or 3-2 spacer pin installed in wrong location in 3-2 valve bore.

Note If direct clutch plates and front band are burned, check manual linkage.

Vacuum modulator assembly

The following procedure is recommended for checking modulator assemblies in service before replacement is undertaken.

1. **Vacuum Diaphragm Leak Check.** Insert a pipe cleaner into the vacuum connector pipe as far as possible and check for the presence of transmission oil. If oil is found, replace the modulator.

Note Petrol or water vapour may settle in the vacuum side of the modulator. If this is found **without** the presence of oil, the modulator should **not** be changed.

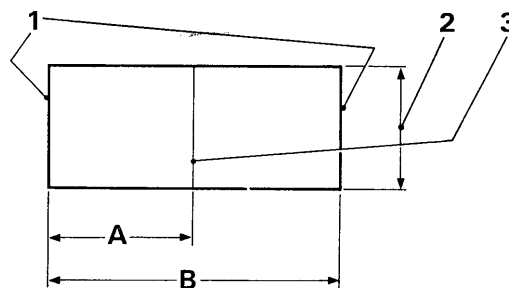
2. **Atmospheric Leak Check.** Apply a liberal coating of soap bubble solution to the vacuum connector pipe seam, the crimped upper to lower housing seam, and the threaded screw seal. Using a short piece of rubber tubing, apply air pressure to the vacuum pipe by blowing into the tube and observe for leak bubbles. If bubbles appear, replace the modulator.

Note Do not use any method other than human lung power for applying air pressure, as pressures over 6 lb/sq. in. (0,42 kg/sq. cm.) may damage the modulator.

3. **Bellows Comparison Check.** Make a comparison gauge (see Fig. T134), and compare the load of a known good modulator with the assembly in question.

- a Install the modulator that is known to be acceptable on either end of the gauge.
- b Install the modulator in question on the opposite end of the gauge.
- c Holding the modulators in a horizontal position, bring them together under pressure until either modulator sleeve end just touches the line in the centre of the gauge. The gap between the opposite modulator sleeve end and the gauge line should then be 0.0625 in. (1,59 mm.) or less. If the distance is greater than this amount the modulator in question should be replaced.

4. **Sleeve Alignment Check.** Roll the main body of the modulator on a flat surface and observe the sleeve for concentricity to the body. If the sleeve is concentric and the plunger is free, the modulator is acceptable. Once the modulator assembly passes all of the above tests, it is an acceptable part and should be fitted again.



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FIG. T134 COMPARISON GAUGE

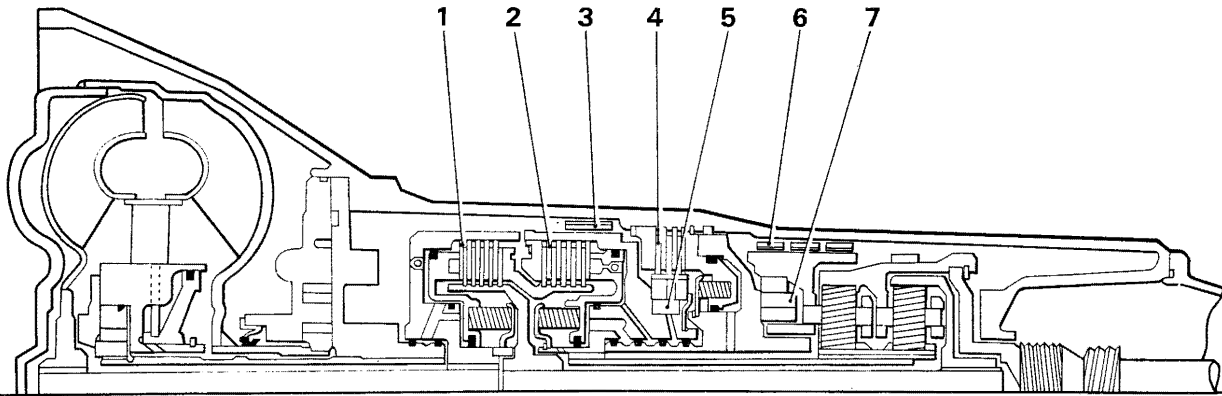
- 1 Ends to be square within 1/64 in. (0,397 mm.)
- 2 Round or flat bar between 13/32 in. (10,32 mm.) and 3/8 in. (9,5 mm.) in width
- 3 Scribed centre line
- A 1/2 in. (12,7 mm.)
- B 1.0 in. (25,4 mm.)

Down-change solenoid circuit—To check

Note Before checking the down-change solenoid circuit, make certain that the transmission down-change switch is properly adjusted as described in Operation 5.

1. With the transmission gear range selector lever in Park, turn the ignition switch to the 'ON' position but do not start the engine. Leave the ignition switch 'ON' throughout the checking procedure.
2. Working under the bonnet slowly advance the throttle linkage to the full throttle position. One click should be heard from the transmission.
3. Allow the throttle to return to the closed position. One click should be heard from the transmission.
4. If the system performed as described above, the down-change circuit is operating properly. If the system does not perform as described above, proceed to Operation 5.
5. Disconnect the Green/White wire from the connection on the side of the transmission case, fit a test lamp into the circuit between the Green/White wire and the connection on the side of the transmission case, ensure that the test lamp bulb lights when the throttle linkage is in the full throttle position. The bulb should extinguish when the throttle is released.

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SELECTOR POSITION	Park - Neut:	Drive			Intermediate		Lo		Reverse
		1	2	3	1	2	1	2	
PUMP PRESSURE	70-160	70-160	70-160	70-160	175 - 175		175 - 175		100 - 230
FORWARD CLUTCH	OFF	ON	ON	ON	ON - ON		ON - ON		OFF
DIRECT CLUTCH	OFF	OFF	OFF	ON	OFF - OFF		OFF - OFF		ON
2 nd OVERRUN BAND	OFF	OFF	OFF	OFF	OFF - ON		OFF - ON		OFF
INT: CLUTCH	OFF	OFF	ON	ON	OFF - ON		OFF - ON		OFF
INT: SPRAG	OFF	OFF	ON	OFF	OFF - ON		OFF - ON		OFF
REAR SPRAG	OFF	ON	OFF	OFF	ON - OFF		ON - OFF		OFF
REVERSE BAND	OFF	OFF	OFF	OFF	OFF - OFF		ON - OFF		ON

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FIG. T135 BAND, ROLLER CLUTCH AND CLUTCH APPLICATION CHART

- 1 Forward clutch
- 2 Direct clutch
- 3 Second overrun (front) band
- 4 Intermediate clutch
- 5 Intermediate sprag or roller clutch
- 6 Reverse (rear) band
- 7 Rear sprag or roller clutch

- a If the system operates as described above, but did not perform properly during Operations 1-3, replace solenoid after first checking to see that the internal wiring is operational.
 - b If the test lamp bulb fails to light with the throttle in the wide open position, the circuit is open, proceed to Operation 6.
 - c If the test lamp bulb lights with the throttle closed, the circuit is shorted, proceed to Operation 9.
6. Remove the Green/White wire from the transmission down-change switch. Connect the test lamp between the switch terminal and earth; at full throttle ensure that the bulb of the test lamp lights.
- a If the test lamp bulb lights, replace electrical wire. Re-check system.
 - b If the test lamp bulb fails to light, proceed to Operation 7.
7. Check the White feed wire at the transmission down-change switch with test lamp.
- a If the test lamp bulb lights, replace transmission down-change switch. Re-check system.
 - b If the test lamp fails to light, proceed to Operation 8.

8. Check the transmission thermal cut-out on the fuse panel.
 - a If necessary to replace the cut-out, re-check system.
 - b If the cut-out is correct it will be necessary to locate the fault in the wiring. Test for circuit continuity from the White feed wire at the down-change switch to the battery.
9. Remove the Green/White wire at transmission down-change switch. Use the test lamp to check from the bare terminal at the switch with throttle closed.
 - a If the test lamp bulb fails to light, system is correct.
 - b If the test lamp bulb lights, proceed to Operation 10.
10. With the throttle in the closed position, check the White feed wire at transmission down-change switch.
 - a If the test lamp bulb lights, replace transmission down-change switch. Re-check system.
 - b If the test lamp bulb fails to light, it will be necessary to locate the short in the wiring. Test the circuit from the White feed wire at down-change switch to the battery.

Type AA Clutch Parts

Clutch	No. of Flat Steel Clutch Plates	No. of Waved Steel Clutch Plates
Forward Clutch	*4	1
Direct Clutch	*5	1
Intermediate Clutch	2	1

* Steel Plate Thickness 0.0915 in. (2.323 mm.)

Clutch	No. of Clutch Composition Plates	No. of Piston Release Springs
Forward Clutch	5	16
Direct Clutch	6	16
Intermediate Clutch	3	6

For additional information in diagnosing the faults which may occur in a Torque Converter Transmission, a chart showing the application of bands and clutches in the various drive ranges is shown in Figure T135. Transmission fluid passages are shown in Figures T136 and T137.

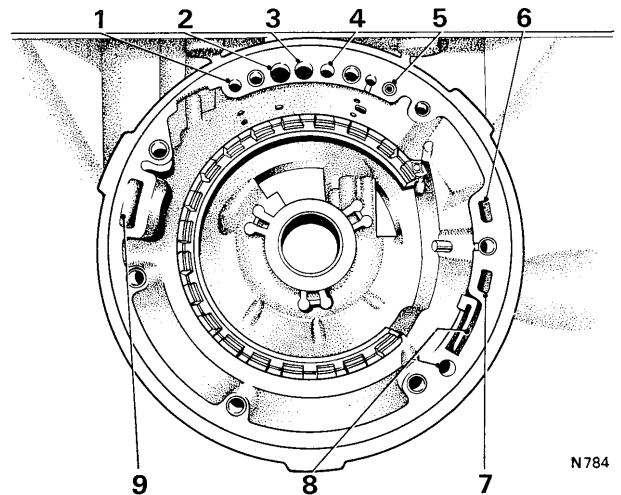


FIG. T136 TRANSMISSION CASE FLUID PASSAGES—FRONT VIEW

- 1 Reverse
- 2 Line
- 3 Drive
- 4 Modulator
- 5 Stator signal (early cars only)
- 6 To heat exchanger
- 7 From heat exchanger
- 8 Vent
- 9 Pump intake

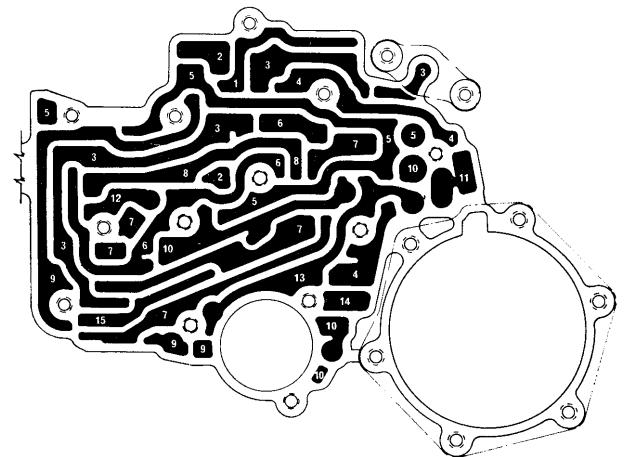


FIG. T137 TRANSMISSION CASE FLUID PASSAGES—BOTTOM VIEW

- 1 Intermediate oil
- 2 Exhaust
- 3 Line pressure oil
- 4 Lo oil
- 5 Reverse oil
- 6 Detent oil
- 7 Modulator oil
- 8 Drive range oil
- 9 Servo oil
- 10 Intermediate clutch oil
- 11 Reverse/Lo oil
- 12 Modulator/intermediate oil
- 13 Direct clutch oil
- 14 1-2 accumulator oil
- 15 Governor oil

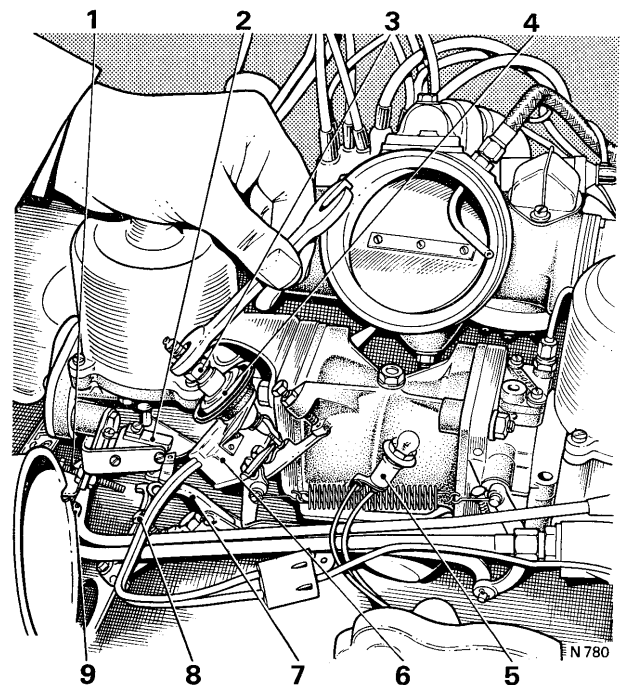
Section T5 CONTROL LINKAGE

It is recommended that the controls be checked before a car is road tested. If any symptoms exhibited during a road test are shown by fault diagnosis to be attributable to controls, another check should be made before proceeding further.

Before altering transmission controls, ensure that the engine controls (throttle and choke) have been correctly adjusted and are operating freely.

Manual linkage—To adjust

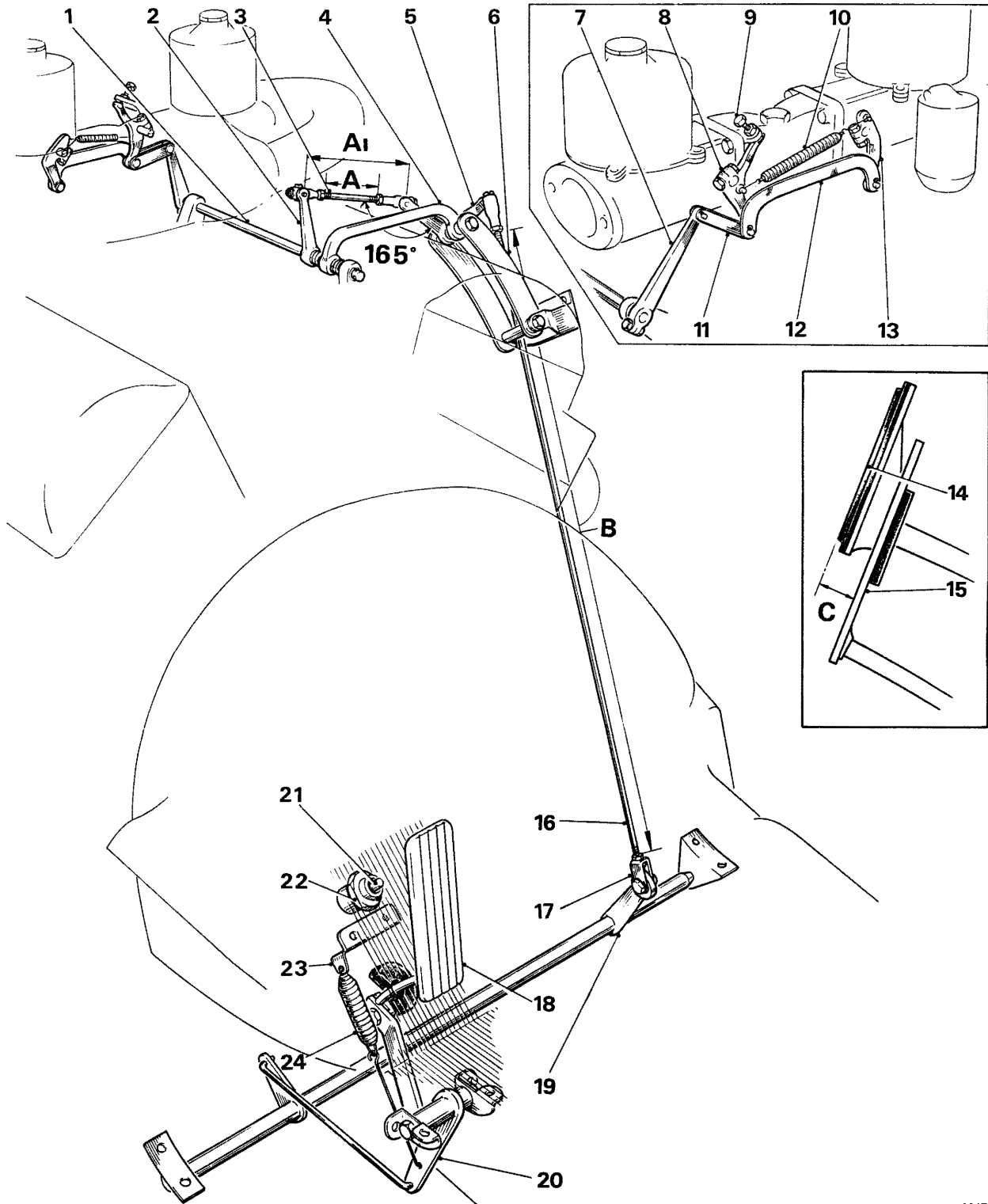
1. Remove the split pin and clevis pin from the gearchange operating rod at the actuator end.
2. Select 'P' on the selector. Push the lower end of the gearchange lever fully forward ('P' position).
3. Connect the gearchange operating rod; fit the clevis pin but not the split pin.
4. Measure the gap between the neutral start and height switch lever and the adjacent pillar; the gap should measure 0.050 in. (1.27 mm.). If necessary adjust the jaw to obtain the required gap. Ensure that there is still clearance when the 3° overrun on the actuator, beyond the Park position, is used up.
5. Select 'L' on the actuator then select 'P'. Adjust the operating rod so that the clevis pin will slide into the jaw and through the lever.
6. Select each of the gear positions in turn, and at each position, ensure that the clevis pin will slide easily into the jaw.
7. Again, check that the pin will slide easily into the jaw when 'L' is selected after 'P' and when 'P' is selected immediately after 'L'.



**FIG. T138 ADJUSTING THE DAMPER AND SWITCH
(EARLY CARS)**

- 1 Throttle stop screw
- 2 Stator solenoid switch
- 3 Adjusting nut
- 4 Throttle damper
- 5 Test lamp
- 6 Stator solenoid switch (closed throttle)
- 7 Stator solenoid switch actuating cam
- 8 Detent solenoid switch
- 9 Detent solenoid micro-switch

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FIG. T139 THROTTLE CONTROL LINKAGE—EARLY LH DRIVE CARS

FIG. T139 THROTTLE CONTROL LINKAGE—EARLY LH DRIVE CARS

- | | |
|--|--|
| <p>A1 = 4.125 in. (10,478 cm.)
 A = 2.175 in. (5,526 cm.)
 B = 22.0 in. (55,88 cm.)
 C = 0.250 in. to 0.500 in.
 (0,63 cm. to 1,27 cm.)</p> <p>1 'A' Bank control shaft
 2 Lever — 'A' Bank control shaft to control rod
 3 Control rod — 'A' Bank manifold lever to fulcrum lever
 4 Tie-rod
 5 Fulcrum lever
 6 Compensator link
 7 Lever — manifold to carburetter
 8 Throttle lever — 'A' Bank
 9 Slow running throttle stop screw
 10 Return spring</p> | <p>11 Coupling link (one link elongated when refrigeration is fitted)
 12 Coupling link
 13 Throttle lever — 'B' Bank
 14 Brake pedal
 15 Accelerator pedal
 16 Control rod — accelerator to compensator linkage
 17 Jaw
 18 Accelerator pedal
 19 Lever — accelerator pedal cross-shaft
 20 Accelerator pedal lever
 21 Kick-down button
 22 Lock-nut
 23 Bracket
 24 Pull-off spring</p> |
|--|--|

8. If, in any position, the pin will not pass through the jaw and lever, adjust the length of the rod and use up the elongated hole in the jaw.

9. Finally, lubricate the clevis pin, fit the pin and secure it with a new split pin.

Accelerator pedal linkage—To adjust

Refer to Chapter K.

Transmission control switches

Initial production cars

Refer to this section.

Cars prior to Car Serial Number SRH 8742

Refer to Chapter K.

Cars from Car Serial Number SRH 8742 and onwards

Refer to Chapter K.

Initial production cars

The stator and detent solenoids in the transmission are actuated by three micro-switches which are in turn actuated by the engine throttle controls.

The damper and micro-switch assembly signals a change in stator blade angle. High angle is signalled when the throttle is closed and low angle is signalled when the throttles are just off the closed throttle stop.

The damper part of the assembly ensures that the throttles close slowly over the last few degrees of travel.

A second micro-switch actuates the stator solenoid also. This switch is operated by a cam on the manifold shaft lever and re-introduces the stator blade high angle at approximately 45 degrees of throttle opening.

The third micro-switch actuates the detent solenoid. This switch is operated at nearly full throttle by the 2 B.A. setscrew in the manifold shaft lever and signals a kick-down gearchange.

Neutral start and height control switches— To adjust

The neutral start and height control switches are housed in an aluminium case, fitted to the left-hand side of the transmission. The switches are actuated whenever Neutral or Park is selected. This enables the engine to be started either in Neutral or Park and also sets the height control to **fast** levelling.

To adjust the switches, proceed as follows.

1. Disconnect the white and red lead at the starter relay. The relay is fitted to the compensating linkage bracket at the rear of the engine compartment, at the right-hand side.

2. Unclip the rubber retainer then remove the left-hand valance plug from the socket. The plug and socket are secured to the valance, directly below the hydraulic system reservoir.

3. Connect a lamp and battery between the White/red lead and the White/black lead in the plug.

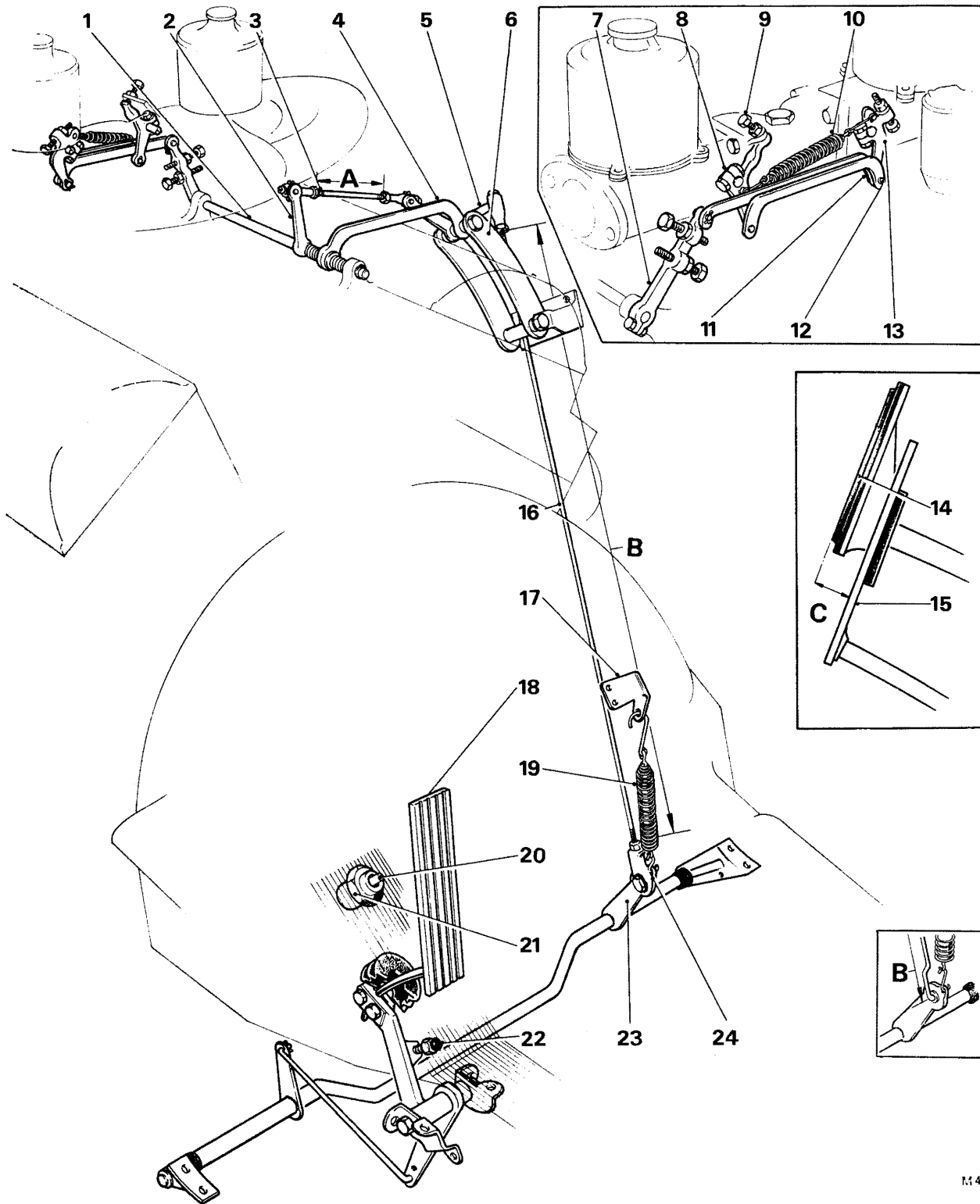
4. When either Neutral or Park is selected, the lamp should light.

5. Select Reverse and Drive. Ensure that the lamp does not light in either of these positions.

6. If necessary, adjust the switch actuating rod to obtain the correct lever position. Ensure that the 0.050 in. (1,27 mm.) clearance is maintained between the lever and the pedestal.

7. Remove the lamp and battery then connect the leads.

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**FIG. T140 THROTTLE CONTROL LINKAGE—LATE
LH DRIVE CARS**

**FIG. T140 THROTTLE CONTROL LINKAGE—LATE
LH DRIVE CARS**

- | | |
|---|---|
| <p>A 2.265 in. to 2.300 in.
(5,75 cm. to 5,84 cm.)</p> <p>B 18.575 in. (47,18 cm.)</p> <p>C 0.250 in. to 0.500 in.
(0,63 cm. to 1,27 cm.)</p> <p>1 'A' Bank control shaft</p> <p>2 Lever — 'A' Bank control shaft to control rod</p> <p>3 Control rod — 'A' Bank manifold lever to fulcrum lever</p> <p>4 Tie-rod</p> <p>5 Fulcrum lever</p> <p>6 Compensator link</p> <p>7 Lever — manifold to carburetter</p> <p>8 Throttle lever — 'A' Bank</p> <p>9 Slow running throttle stop screw</p> <p>10 Return spring</p> | <p>11 Coupling link (one hole elongated when refrigeration is fitted)</p> <p>12 Coupling link</p> <p>13 Throttle lever — 'B' Bank</p> <p>14 Brake pedal</p> <p>15 Accelerator pedal</p> <p>16 Control rod — accelerator to compensator linkage</p> <p>17 Bracket</p> <p>18 Accelerator pedal</p> <p>19 Pull-off spring</p> <p>20 Kick-down button</p> <p>21 Lock-nut</p> <p>22 Stop — accelerator pedal</p> <p>23 Lever — accelerator pedal cross-shaft</p> <p>24 Jaw</p> |
|---|---|

Assuming that the engine throttle controls have been correctly set and the choke and slow running controls are correct, proceed to adjust the micro-switches.

Damper and switch assembly

1. Disconnect the air ducting at the choke body end and move the ducting clear of the switches.
2. Disconnect the Yellow lead from the switch at its Lucar connector.
3. Connect one side of a test lamp to the Yellow lead and the other side to earth.
4. Switch on the ignition.
5. Ensure that the fast-idle cam is in the hot idling position (i.e. choke fully open).
6. Slacken the two $\frac{5}{16}$ in. U.N.F. nuts on the switch mounting spindle (see Fig. T138). Adjust the position of the switch and damper assembly so that the test lamp lights just before the throttle closes completely and extinguishes when the throttle is just clear of its off-stop. Tighten the nuts in this position.

Note The damper slows down the throttle during the last few degrees of movement as it is closing.

Allow time for the throttle to rest on its off-stop when determining the throttle closed position.

7. Switch off the ignition, remove the lamp and connect the Yellow lead.

Stator micro-switch

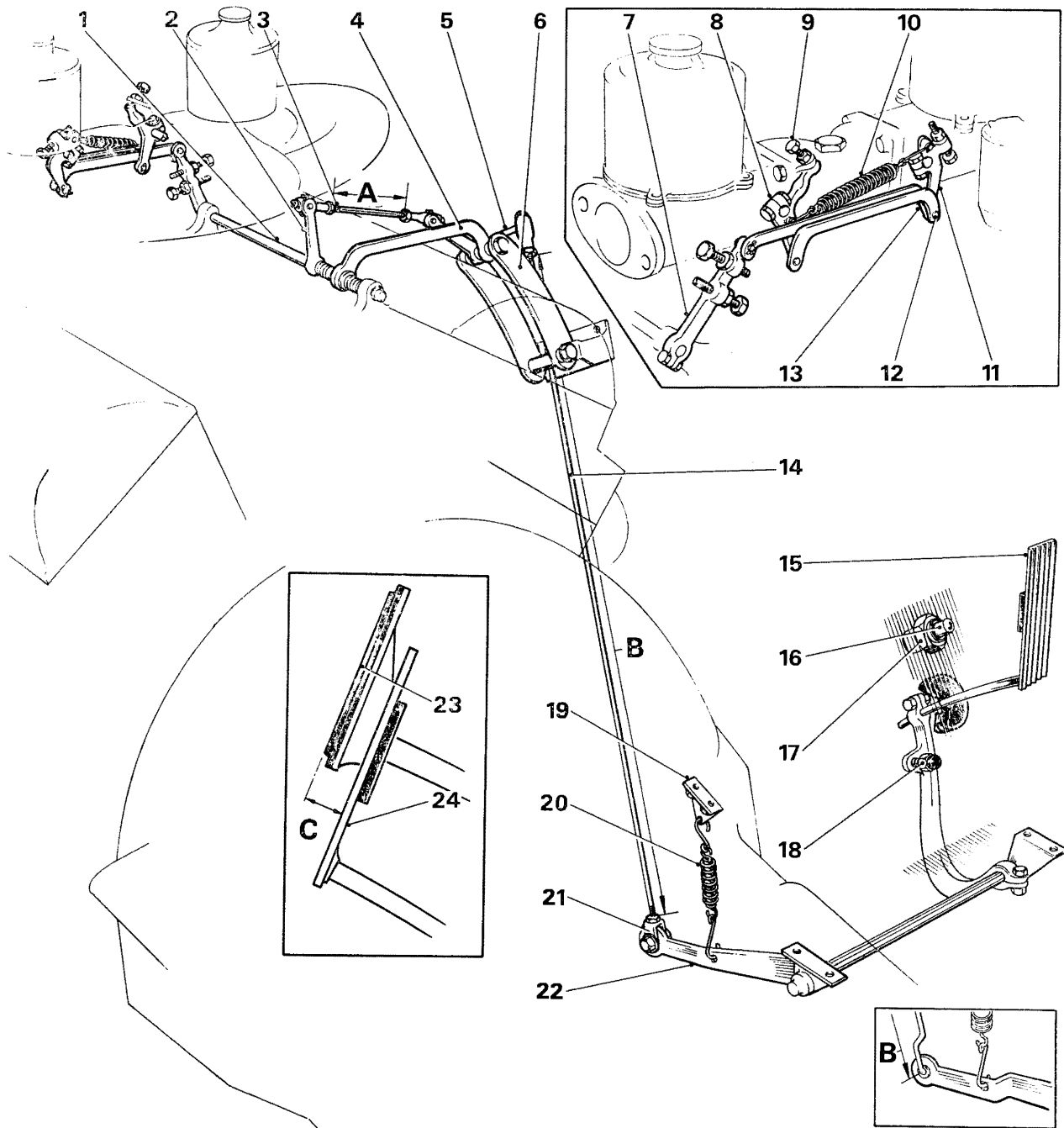
1. The stator micro-switch is non-adjustable.
2. It can be checked for correct operation by connecting a test lamp and checking to see if the lamp lights when the switch is contacted by the cam on the lever, with the ignition switched on.

Kick-down micro-switch

1. Disconnect the White/purple lead from the kick-down micro-switch.
2. Connect one side of a test lamp to the White/purple lead on the switch and the other side to earth.
3. Switch on the ignition.
4. Slacken the lock-nut on the 2 B.A. setscrew in the manifold lever shaft.
5. Adjust the 2 B.A. setscrew in the lever so that the test lamp lights when the lever is 0.025 in. (0,63 mm.) from the full throttle stop. Whilst carrying out this adjustment, ensure that the micro-switch has some over-travel when the lever is contacting the full throttle stop.
6. Tighten the 2 B.A. lock-nut.
7. Connect the air ducting.
8. Adjust the under-pedal kick-down button and full throttle stop so that the button must be depressed before kick-down is obtained. This should be done as follows.

Kick-down button—To adjust Carburetter mounted micro-switch

1. Remove the floor covering from the toe board on the driver's side of the car. The kick-down button can be seen beneath the accelerator pedal.
2. Slacken the large lock-nut, then adjust the body by screwing it up or down as required; tighten the lock-nut.
3. When setting the kick-down, care must be taken not to confuse part throttle down-changes and stator changes with the forced down-change (kick-down).
4. If, when adjusting the kick-down button, its position is such that it is in danger of being hidden by the carpet, an improvement can be made by shorten-



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**FIG T141 THROTTLE CONTROL LINKAGE—
RH DRIVE CARS**

**FIG. T141 THROTTLE CONTROL LINKAGE—
RH DRIVE CARS**

- | | |
|---|--|
| <p>A 2.265 in. to 2.300 in. (5,75 cm. to 5,84 cm.)
 B 18.575 in. (47,18 cm.) inset 19.50 in. (50,00 cm.)
 C 0.250 in. to 0.500 in. (0,63 cm. to 1,27 cm.)</p> <p>1 'A' Bank control shaft
 2 Lever — 'A' Bank control shaft to control rod
 3 Control rod — 'A' Bank, manifold lever to fulcrum lever
 4 Tie-rod
 5 Fulcrum lever
 6 Compensator link
 7 Lever — manifold to carburetter
 8 Throttle lever — 'A' Bank
 9 Slow running throttle stop screw
 10 Return spring
 11 Throttle lever — 'B' Bank</p> | <p>12 Coupling link
 13 Coupling link (one hole elongated when refrigeration is fitted)
 14 Control rod — accelerator to compensator linkage
 15 Accelerator pedal
 16 Kick-down button
 17 Lock-nut
 18 Stop — accelerator pedal
 19 Bracket
 20 Pull-off spring
 21 Jaw
 22 Lever — accelerator pedal cross-shaft
 23 Brake pedal
 24 Accelerator pedal</p> |
|---|--|

ing the accelerator to compensator link control rod (see Figs. T139, T140 and T141). This will throw the pedal further away from the toe board, thus allowing the kick-down button to be raised.

5. The accelerator lever stop-bolt will have to be adjusted to suit.

6. Ensure that the closed throttle condition is still available.

Kick-down button—To adjust Toe board mounted micro-switch

See Chapter K or Chapter U.

Stator and detent solenoid circuits— To check

The stator and detent solenoids can be checked for correct operation whilst the car is being driven on the road. This will enable the tester to determine whether or not the stator is changing its angle and also whether kick-down is obtainable at full throttle.

Stator solenoid—To check

1. Disconnect the White/brown lead from the Lucar connector on the solenoid case connector in the left-hand side of the transmission.

2. Connect a 12 volt test lamp between the lead and the connector. Position the test lamp so that it is visible from the driver's seat.

3. Drive the car and observe the test lamp.

4. The test lamp should light when the ignition is switched on and remain so until the accelerator pedal is moved sufficiently to 'crack' the throttles, then become extinguished above this speed.

5. At approximately 45 degrees of throttle opening the test lamp should again be illuminated and remain so regardless of any further throttle opening.

6. If the test lamp fails to light, check the solenoid micro-switch and controls for correct operation, and the circuit for continuity.

7. The solenoid itself can be checked by using a lamp and battery. Touch the solenoid case with one lead and the connector with the other lead; the lamp should light.

8. Remove the test lamp and connect the stator lead.

Detent solenoid—To check

All cars

1. Disconnect the White/green lead from the case Lucar connector.

Note On early cars the detent lead is White/purple. Connect a test lamp between the lead and the connector.

2. Drive the car in Drive range — third gear at a speed below approximately 70 m.p.h. (113 k.p.h.).

3. Depress the accelerator pedal so that the detent button on the toe board is felt. Press the pedal further to move the button. The lamp should light as the solenoid enforces the down-change.

4. If the lamp does not light, check the micro-switch and the controls for correct operation, also check the circuit for continuity.

5. The solenoid can be checked in a similar manner to the stator solenoid.

6. Check the detent lead inside the transmission case.

Checking controls with test box RH 7932

If actuator test box RH 7932 is available it can be used to check both the stator and detent solenoids as well as selecting the gear range positions. Proceed as follows.

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1. Remove the stator and detent leads from the case connector, then position the test box where it can be seen by the driver.

2. Fit the stator and detent leads from the test box to the Lucar connections on the case connector. Ensure that the leads are correctly positioned.

3. Fit the transmission detent and solenoid leads onto the pick-a-back connectors on the test box leads.

4. Remove the multi-pin plug from the electric gearchange actuator and fit the plug from the test box in its place.

5. Pick up a positive power supply from the fascia of the car (an old cigar lighter suitably wired would suffice) and connect it to the inlet side of the test box.

6. The transmission will then be isolated from the

selector switch on the column and all the selector positions can be obtained by selecting the appropriate range as shown by the marked dial on the test box cover.

7. Drive the car and check the selection of the gear ranges and the operation of the stator and detent solenoids by observing the lamps on the test box.

8. The gearchange actuator can be checked by inserting the test box between the actuator and the feed from the multi-pin plug. The car multi-pin plug must be fitted to the test box, and the test box plug fitted to the actuator.

9. By operating the switch on the box and observing the lamps, the actuator can be operated and checked for correct operation.

Section T6 REMOVAL OF UNITS

Removable units—Transmission in car

The following units can be removed from the transmission without the transmission being removed from the car.

The removal procedure for all the units is described in the appropriate section, with the exception of the pressure regulator valve, details of which are included in this Section.

1. Gearchange actuator (*see Section T7*).
2. Neutral start and height control switches (*see Section T7*).
3. Vacuum modulator and valve (*see Section T11*).
4. Governor assembly (*see Section T12*).
5. Speedometer drive (*see Section T13*).
6. Sump, strainer and intake pipe (*see Section T14*).
7. Control valve unit (*see Section T15*).
8. Rear servo (*see Section T16*).
9. Detent solenoid, connector, control valve spacer and front servo (*see Section T17*).
10. Rear extension (*see Section T18*).
11. Control rods, levers and parking linkage (*see Section T20*).

Pressure regulator valve—To remove (Transmission in car)

The current type of pressure regulator valve is a solid type and does not contain oil holes and an orifice cup plug as previous pressure regulator valves. This solid type of valve must only be used in the pump cover with the squared pressure regulator boss (*see Fig. T142*).

The previous pressure regulator valve with the oil holes and orifice cup plug can be used to service either type of pump cover.

1. Run the car onto a ramp or over an inspection pit. Drain the oil from the sump.

2. Remove the sump as described in Section T14.
3. Withdraw the intake pipe and strainer assembly.
4. Remove and discard the intake pipe 'O' ring.
5. Remove the setscrew which secures the detent roller spring; remove the spring and roller.
6. Slacken the lock-nut which secures the detent lever to the manual shaft.

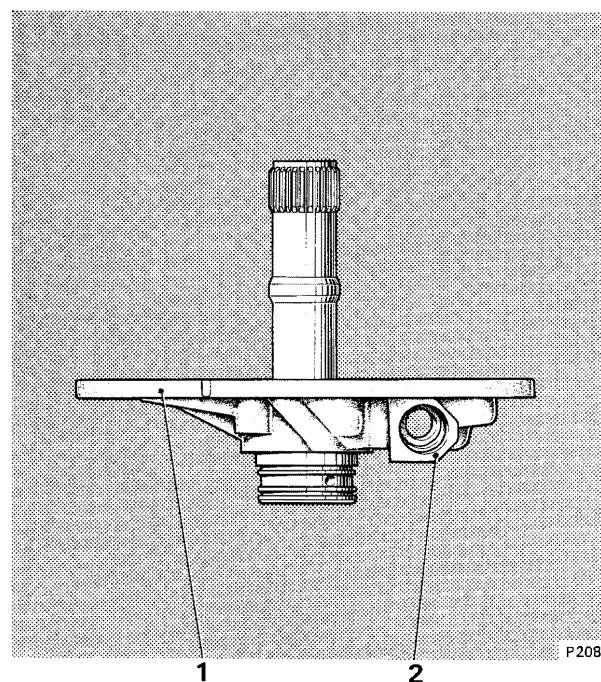


FIG. T142 SOLID TYPE REGULATOR VALVE

- 1 Regulator valve
- 2 Squared-off pressure regulator boss

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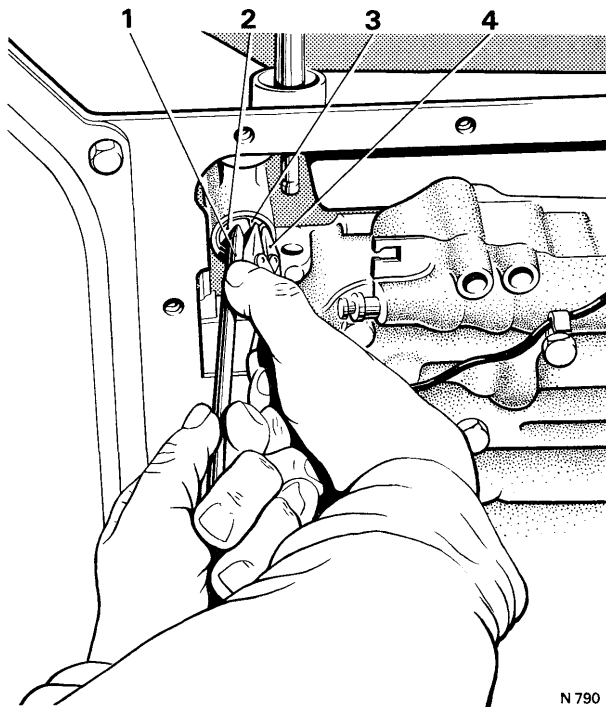


FIG. T143 REMOVING THE PRESSURE REGULATOR VALVE

- 1 Rod
- 2 Sleeve
- 3 Circlip
- 4 Circlip pliers

7. Remove the manual shaft pin from the case.
8. Remove the gearchange lever from the manual shaft.
9. Prise the detent lever from the manual shaft then remove the parking actuator rod and detent lever.
10. Ensure that the manual valve does not slide out of its bore in the control valve unit.
11. Push the manual shaft through the bore in the case in order to gain access to the pressure regulator valve bore.
12. Using a screwdriver or a steel rod, push the regulator boost valve sleeve against the pressure regulator spring (see Fig. T143).

Caution The pressure regulator spring is under extreme pressure and will force the valve sleeve out of its bore when the circlip is removed unless the sleeve is firmly held.

13. Continue to exert pressure on the valve sleeve then remove the circlip. Gradually relax the pressure on the valve sleeve until the spring pressure is released.
14. Carefully remove the regulator boost valve sleeve and valve, then withdraw the regulator spring.
15. Take care not to drop the valves, as they will fall out if they are not held.
16. Remove the pressure regulator valve and spring retainer. Remove the spacers (if fitted).

Pressure regulator valve—To fit

Before fitting, wash and examine all parts as described in Section T19.

1. Fit the spring retainer onto the pressure regulator spring. Fit any spacers which were previously removed.
2. Fit the pressure regulator valve onto the spring, stem end first.
3. Fit the boost valve into the sleeve with the valve stem outward then hold together all the parts so that the pressure regulator spring is against the valve sleeve.
4. Fit the complete assembly into the pressure regulator valve bore, taking care that the parts do not fall during the operation.
5. Using a screwdriver or a steel rod, push the regulator boost valve sleeve against the regulator spring pressure until the end of the sleeve has passed beyond the circlip groove.
6. Fit the circlip then relax the pressure on the sleeve.

Note To facilitate fitting the circlip, encircle it around the screwdriver or steel rod, compress the circlip, then push it upward into the groove in the valve bore.

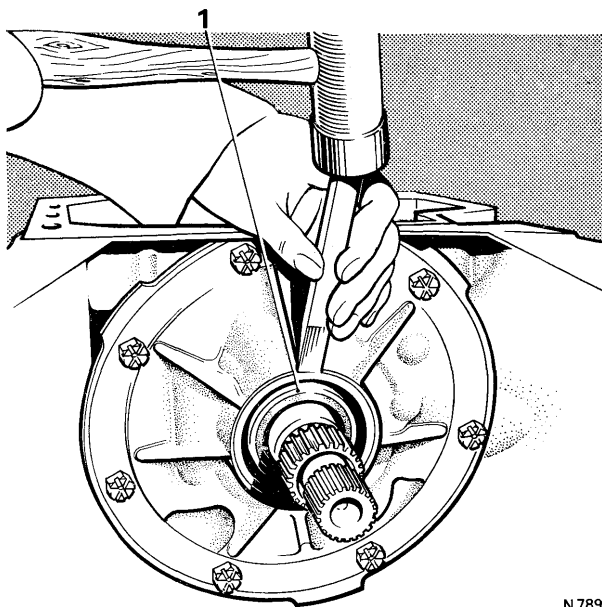


FIG. T144 REMOVING THE OIL PUMP SEAL

- 1 Oil seal

7. Fit the parking actuator rod and the detent lever, ensuring that the rod plunger is under the parking brake bracket and over the parking pawl.

8. Slide the manual shaft into the case and through the detent lever.

9. Fit the gearchange lever.

10. Fit the lock-nut onto the manual shaft. Torque tighten the nut.

11. Ensure that the manual valve is engaging with the pin on the detent lever.

12. Retain the manual shaft with the pin. Straighten the pin to lock it in position.

13. Fit the detent spring and roller assembly; torque tighten the setscrew.

14. Fit the intake pipe and strainer assembly and the sump as described in Section T14.

15. Top-up the transmission with an approved fluid as required.

Oil pump seal—To renew

1. Remove the transmission from the car (*see Section T9*).

2. Carefully drive the point of a chisel under the lip of the seal then prise the seal out of the pump body (*see Fig. T144*).

3. Before fitting a new seal, ensure that the body bore is clean and free from burrs and that the garter ring is on the seal.

4. Check the finish of the converter neck and the bearing surface in the pump body.

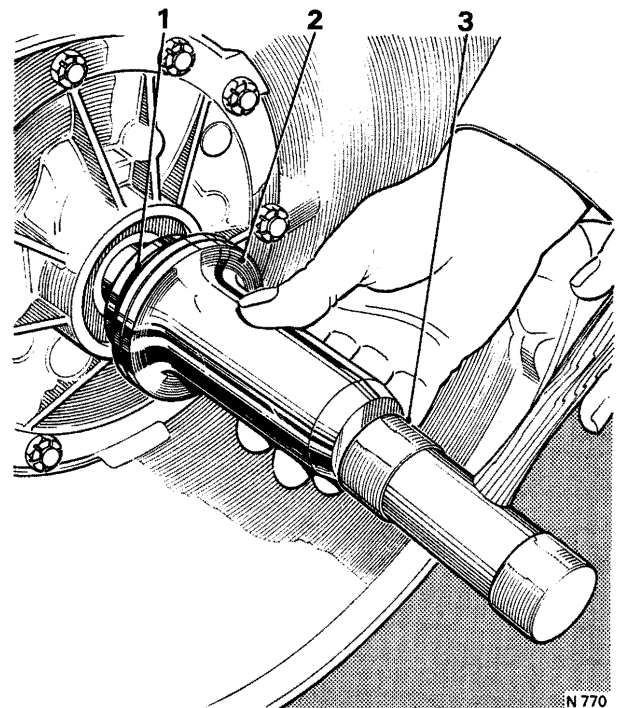


FIG. T145 FITTING THE OIL PUMP SEAL

- 1 Oil seal
- 2 Seal fitting tool
- 3 Mallet

5. Lightly smear the outer edge of the seal case with 'Wellseal' then fit the seal to the pump using tool RH 7953 (J-21359) as shown in Figure T145.

6. Fit the transmission to the car (*see Section T9*).

Section T7

GEARCHANGE ACTUATOR, NEUTRAL and HEIGHT CONTROL SWITCHES

The electric gearchange actuator (*see Figs. T146 or T147*) is mounted on a bracket secured to the transmission rear extension.

When the ignition is switched on and the selector lever on the steering column is moved to one of the gear range positions, current is allowed to flow to the actuator motor via a relay.

The motor rotates and turns the worm shaft through the flexible coupling. As the worm gear rotates, the slip ring which is secured to the worm gear also rotates until an insulated slot in the slip ring is aligned with the live contact. When this position is reached, the current is cut off and the motor ceases to rotate.

The electric actuator is wired so that should the driver stop the car in a gear range other than Park then switch off the ignition, he can still lock the transmission by moving the selector lever on the steering column to the parking 'P' position.

Having done this, if he then moves the lever out of this position, or if the lever is accidentally moved to a drive position, the actuator will not respond until the ignition is switched on again.

The neutral start switch is actuated only when the transmission is in Neutral or Park; the engine cannot be started until the micro-switch is in its operating position. Also actuated when in Neutral or Park is the height control switch which selects fast levelling whilst the car is stationary (*for information concerning the operation of the levelling switch see Chapter G – Section G9 – Solenoid valve – T.S.D. 2476 Workshop Manual*).

Actuator—To test

(Cars prior to car serial number SRX 9001)

The two tests described are designed to prove if a fault lies within the gearbox actuator or elsewhere in the gearchange electrical circuit.

The first test is designed to discover whether the pins of the actuator loom socket receive the correct electrical signal in sequence, as dictated by the position of the gear range selector lever.

1. Ensure that the gearchange thermal cut-out switch on the distribution board (fuse panel) has not cut-out. This can be done by depressing the Red button. The position of the button will not change whether the switch has tripped or not, however a tripped switch will click on pressing the button.

2. Ensure that fuse number 12 is intact.

3. Disconnect the low tension wire from the distributor and turn the ignition switch to the 'on' position.

4. Slightly loosen the actuator loom socket and check the actuator function. This will reveal any poor contact which may exist between the plug and socket.

5. Unscrew and withdraw the loom socket from the plug of the gearchange actuator.

6. Connect the negative side of a suitable voltmeter to a good earth point. The positive side should be connected in turn to the various pins of the loom socket (*see Test Chart — Actuator Socket*).

7. Move the gear range selector lever to the 'Reverse' position and check that all the pins of the

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loom socket are of the correct polarity or are neutral, as indicated in the 'Test Chart'.

Note Each pin in the socket is identified by a letter which is moulded in the rubber body adjacent to each pin.

8. Carry out the above operation in each of the gear range selector lever positions, checking each pin in turn with the information given in the 'Test Chart'.

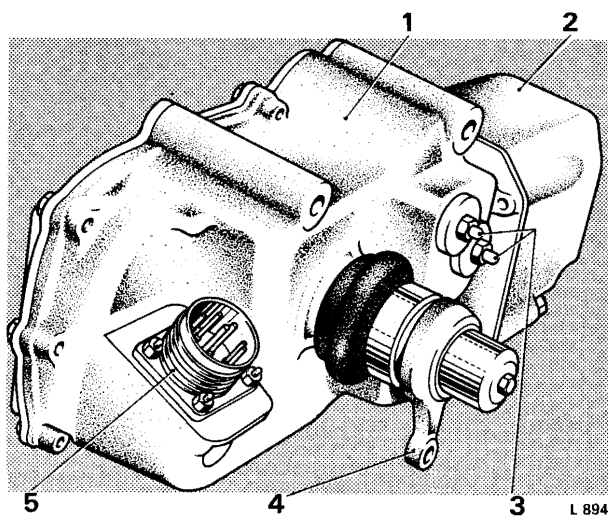


FIG. T146 ELECTRIC GEARCHANGE
(Cars prior to Car Serial number SRX 9001)

- 1 Actuator casing
- 2 Motor cover
- 3 Solenoid securing nuts
- 4 Actuating lever
- 5 Plug socket

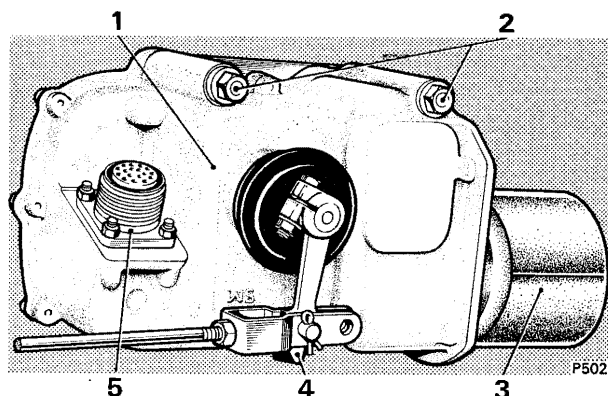


FIG. T147 ELECTRIC GEARCHANGE ACTUATOR
(Car Serial Number SRX 9001 and onwards)

- 1 Actuator casing
- 2 Actuator securing bolts
- 3 Motor cover
- 4 Actuating lever
- 5 Plug socket

9. Switch off the ignition and ensure that pin number G of the actuator socket is now neutral.

10. Reconnect the socket to the actuator and refit the distributor low tension cable.

Note If an incorrect reading is obtained during any of the above tests, this will indicate that the gearchange circuit is probably at fault and not the actuator.

It should be noted that the voltage readings obtained must not be more than 0.25 Volts less than the battery voltage. However, if the test sequence does not reveal a discrepancy, then the fault may be either inside the transmission actuator or in the transmission and neutral start switch linkage.

Before removing the actuator the transmission linkage should be disconnected from the actuator output lever and checked for excessive stiffness.

The transmission linkage should move into any gear when a load of approximately 10 lb. (4.53 kg.) is applied to the disconnected rod.

If the linkage operation is satisfactory then it will be necessary to remove, recondition and test the actuator as described later in this Section.

After fitting the reconditioned actuator to the car, it should be finally tested as follows.

1. Disconnect the earth cable from the battery negative terminal, or from the boot quick release terminal when fitted.

2. Connect an ammeter capable of reading at least 20 Amps. between the battery negative terminal and the loose end of the earth cable.

3. Ensure that all accessories such as the rear window demister and blower motors are switched off and then switch on the ignition. Note the reading shown on the ammeter.

4. Move the gear range selector lever between 'Neutral' and 'Reverse' gear positions and check that the extra reading on the ammeter caused by the operation of the actuator does not exceed 10 Amps.

5. Check that the actuator moves smoothly and quietly to each position selected and that the output lever stops in the correct position and does not 'hunt' about that position more than once before finally stopping.

6. Remove the ammeter and connect the battery negative cable.

Actuator—To Test
(Car serial number SRX 9001 and onwards)

The gearbox actuator contains a series of cams which operate micro-switches to fulfil the functions of the neutral start switch, the fast levelling switch and the Park anti-theft switch. In view of this, the test procedures for the actuator and for the switch circuits have been segregated.

TEST CHART — ACTUATOR SOCKET (Cars prior to Car Serial Number SRX 9001)							
Socket Pin No.	Gear Range Lever Position						General Notes
	P	R	N	D	I	L	
A	N	N	Pos	N	N	N	<p>This pin is Negative when the ignition is ON, and Neutral when the ignition is OFF.</p> <p>This pin is directly connected to the thermal cut-out switch.</p> <p>This pin is fixed to the valance earth point.</p>
B	Pos	N	N	N	N	N	
C	N	N	N	Pos	N	N	
D	N	N	N	N	Pos	N	
E	N	N	N	N	N	Pos	
F	N	Pos	N	N	N	N	
G	Neg	Neg	Neg	Neg	Neg	Neg	
H	Pos	Pos	Pos	Pos	Pos	Pos	
I	Neg	Neg	Neg	Neg	Neg	Neg	
<p>Key</p> <p>Pos. Common with the battery positive terminal</p> <p>Neg. Common with the battery negative terminal</p> <p>N Neutral — no connection to either battery terminal</p>							

Test procedure for micro-switch circuits

Before conducting these tests ensure that fuse number 11 and 12 are intact.

Switch the ignition on.

Battery voltage should now be available at pin 'T' of the loom socket.

'Park' anti-theft switch circuit

1. Using a suitable length of cable connect pin 'P' of the actuator loom socket to earth. This action should produce an audible 'click' as the anti-theft relay at the rear of the switchbox operates.

'Neutral' start switch circuit

- Place the gear range selector lever in the 'Neutral' position.
- Check that each time the ignition key is turned to the 'Start' position, battery voltage is available at pin 'S' of the loom socket.
- Repeat operation 2 with the gear range selector lever in the 'Park' position.
- Disconnect the thin Brown cable from the 'Lucar' connector of the starter motor solenoid.
- Using a suitable length of cable connect pins 'S' and 'K' together. The starter relay on the longeron should now operate each time the ignition key is turned to the 'Start' position.
- Fit the Brown cable to the starter motor solenoid.

'Fast level' switch circuit

1. Using a suitable length of cable connect pins 'T' and 'J' together. This action should cause the fast levelling solenoid to operate.

If a fault is discovered in the switch circuits during any of the three tests, the fault should be traced and rectified and the test repeated.

If no fault is evident in the switch circuits this would indicate that the actual switches in the gearbox actuator are in need of adjustment or renewal.

The procedure for renewal and/or adjustment of these switches is illustrated in Figure T157.

Actuator test

- Ensure that the gearchange thermal cut-out switch on the distribution board (fuse panel) has not cut-out. This can be done by depressing the red button on the thermal cut-out switch.
- Disconnect the low tension cable from the distributor and turn the ignition switch to the 'on' position.
- Slightly loosen the actuator loom socket and re-check the actuator function. This will reveal any poor contact which may exist between the plug and the socket.
- Unscrew and withdraw the loom socket from the plug of the gearbox actuator.
- Move the gear range selector lever to the 'Park'

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TEST CHART — ACTUATOR SOCKET (Car Serial Number SRX 9001 and onwards)							
Socket Pin No.	Gear Range Lever Position						General Notes
	P	R	N	D	I	L	
A	N	Pos	N	N	N	N	This pin is Neg. when ignition is switched ON and Neutral when ignition is OFF. This pin is permanently connected to earth. This pin is connected to the thermal cut-out switch.
B	N	N	Pos	N	N	N	
C	N	N	N	Pos	N	N	
D	N	N	N	N	Pos	N	
E	N	N	N	N	N	Pos	
F	Neg	Neg	Neg	Neg	Neg	Neg	
H	Neg	Neg	Neg	Neg	Neg	Neg	
M	Pos	N	N	N	N	N	
N	Pos	Pos	Pos	Pos	Pos	Pos	
Key Pos. Common with the battery Positive terminal Neg. Common with the battery Negative terminal N Neutral — no connection to either terminal							

position and check that the pins of the actuator loom socket are of the correct polarity or are neutral. (see Test Chart — Actuator Socket).

Note Each pin in the socket is identified by a letter which is moulded into the rubber body adjacent to each pin.

6. Carry out Operation in each of the gear range selector lever positions checking each pin in turn with the information given in the chart.

7. Switch off the ignition and ensure that pin 'F' is now neutral.

8. Connect the socket to the actuator and fit the distributor low tension cable.

Note If an incorrect reading is obtained during any of the above tests, this will indicate that the gearchange circuit is at fault and not the actuator.

It should also be noted that the voltage reading obtained must not be more than 0.5 Volt less than the battery voltage. However, if the test sequence does not reveal a fault then the problem must be caused by a fault within the transmission actuator.

Before removing the actuator, the gearbox linkage should be disconnected from the actuator output lever and checked for excessive stiffness.

The transmission linkage should move into any gear when a load of approximately 10 lbs. (4.53 kg.) is applied to the disconnected rod.

If the linkage operation is satisfactory then it will be necessary to remove, re-condition and test the actuator as described later in this section.

After fitting the reconditioned actuator to the car, it should be finally tested as follows.

1. Disconnect the earth cable from the battery.
2. Connect an ammeter capable of reading at least 15 amps between the battery negative terminal and the loose end of the earth cable.
3. Ensure that all accessories such as the rear window demister and blower motors are switched off and then switch on the ignition. Note the reading shown on the ammeter.
4. Move the gear range selector lever progressively through each gear position and check that the extra reading on the ammeter caused by the operation of the actuator does not exceed 7.50 amps.
5. Check that the actuator moves smoothly and quietly to each position selected and that the output lever stops in the correct position and does not 'hunt' about that position before finally stopping.
6. Remove the ammeter and reconnect the battery negative cable.

**Gearchange electric actuator—To remove
(All cars)**

Should the electric gearchange actuator fail to operate it should be noted that the system includes a thermal cut-out. This device prevents the motor from being

overloaded should the gearchange linkage become obstructed and as a result, gives the impression of actuator failure.

Before removing the actuator, ensure that the controls are free and adequately lubricated, also that the actuator electrical system is cool enough for the thermal cut-out to permit the motor to operate. Press the reset button in the main fuse box to reset the cut-out.

It is recommended that the easiest and quickest method of dealing with actuator failure, is by substituting the faulty actuator for a service exchange unit. If a service exchange unit is not obtainable but adequate repair facilities are available, proceed as follows.

1. Disconnect the negative lead from the battery situated in the luggage compartment.
2. Remove the split pin and clevis pin from the actuating lever on the electric actuator; disconnect the rod from the lever.
3. Unscrew and remove the 'multi-pin' plug.
4. Disconnect the breather pipe from the governor cover plate and the actuator side cover.
5. Remove the three bolts which secure the actuator to the rear extension bracket then remove the actuator.

Gearchange electric actuator—To fit (All cars)

1. Fit the actuator to the rear extension of the transmission.
2. Torque tighten the bolts.
3. Fit the 'multi-pin' plug and tighten the knurled nut.
4. Fit the breather pipe to the actuator cover and to the top rearmost setscrew of the governor cover plate.

Cars produced after Car Serial Number SRX 3254 — **other than Coachbuilt** and CRH 3399 — **Coachbuilt** are fitted with a modified actuator breather system.

Originally, the breather system consisted of a steel breather pipe which connected the actuator to atmosphere. The modified system, incorporates a flexible plastic tube as an extension to the early system and connects the open end of the steel breather pipe to an adapter in the cross-member.

It is **essential**, that the **early** type of system is vented to atmosphere at the end of the steel pipe and that the **later** type of system is connected to the adapter in the cross-member by the flexible pipe.

Gearchange electric actuator— To dismantle (Cars prior to car serial number SRX 9001)

1. Unscrew the setscrew in the centre of the actuating lever cover then remove the cover.
2. Using spring compressing tool (RH 7843) compress the coil spring sufficiently to enable the hardened

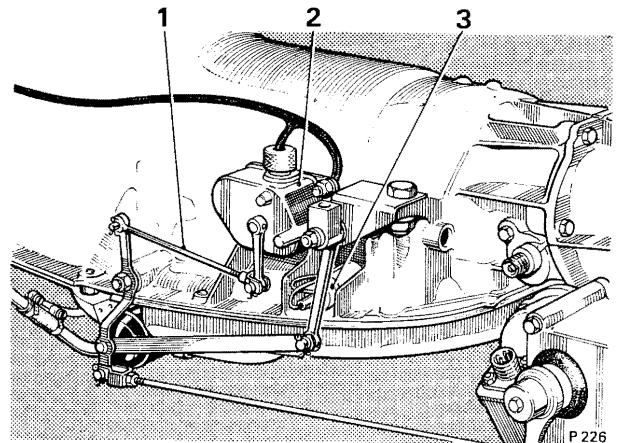


FIG. T148 DETENT AND STATOR SOLENOID CONNECTIONS (INITIAL PRODUCTION CARS)

- 1 Link rod
- 2 Micro-switch casing
- 3 Detent and stator solenoid connections

steel pin to be removed; drive out the pin.

3. Remove the spring compressing tool then withdraw the operating lever, spring and spring retaining cup from the shaft.

4. Remove the nuts and washers which secure the side cover to the main casing; remove the cover.

Note The cover gasket is sealed initially with jointing compound on both sides, as a result, the cover may not be easily removable. Use a hardwood wedge to loosen the cover. Do **not** use a screwdriver between the joint faces in an effort to remove the cover as this may cause damage to the joint faces and destroy the waterproofing effect. Discard the gasket.

5. Disconnect the motor feed to the relays.
6. Disconnect the leads from the motor earth and solenoid feed.
7. Remove the four nuts which secure the motor cover to the main casing; remove the cover.
8. The gasket is sealed with jointing compound and care should be taken when removing the cover.
9. Discard the gasket.
10. Withdraw the motor from the four long studs. The motor is secured to a mounting plate and this will be removed with the motor.
11. Remove the rubber grommet and withdraw the leads.
12. Discard the gasket.
13. Remove the coupling dog from the motor output shaft.
14. Remove the flexible rubber coupling from the brake drum.
15. Remove the nuts and washers which secure the motor to its mounting plate.

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16. Remove the motor from the mounting plate, withdraw the leads from the grommet and through the hole in the plate.

17. Remove the nuts and washers which secure the plug leads to the connection on the insulated base plate; detach the leads from the connections.

18. Unscrew the nuts and washers which secure the plug assembly to the actuator casing.

19. Remove the plug and withdraw the leads from the casing; retain the rubber gasket which fits between the casing and the plug.

20. Remove the nuts and washers which secure the insulated base plate to the main casing. Carefully lift the base plate from the studs.

Note Care should be exercised when handling the baseplate assembly to avoid damaging the relays and contacts.

21. Using tool (RH 7841) remove the roll pin which secures the brake drum to the worm shaft. Push the pin through the drum and shaft until it can be removed; discard the pin.

22. Remove the drum from the worm shaft. It will be necessary to hold the brake shoe away from the drum whilst the drum is being removed.

23. Mark the top of the brake shoe in pencil to facilitate correct assembly.

24. Unscrew the dome nuts which secure the brake solenoid assembly to the main casing; remove the cup washers and the rubber washers. Remove the assembly from the casing.

25. Secure the brake shoe assembly and spring to the solenoid with adhesive tape to retain them as a unit.

26. Remove the circlip and washers from the outer side of the seal which fits over the actuator casing and around the output shaft; remove the seal.

27. Remove the circlip which locates the output shaft and slip ring assembly in the main casing then remove the washer.

28. Withdraw the slip ring and shaft from the bush in the actuator casing; remove the washer from the shoulder behind the slip ring.

29. Remove the circlip which locates the worm shaft and bearings in the actuator casing.

30. Remove the adjusting washer and label it to ensure that the correct washer is fitted during assembly.

31. Gently tap the worm shaft and the bearings from the casing. The bearings are a push fit in the casing bores and no difficulty should be experienced when removing them.

It is recommended that no further dismantling of the actuator be attempted. If necessary, the following components should be renewed as separate assemblies, the base plate, plug, brake shoe, solenoid, brake solenoid and the output shaft and slip ring. The motor should be renewed as an assembly also although it may be dismantled for inspection.

**Gearchange electric actuator—To dismantle
(Car serial number SRX 9001 and onwards)**

It should be noted that there are differences between the actuators fitted to cars with or without Automatic Speed Control. The differences are in the type and terminations of the micro-switches and in one of the cables to the height control switch.

1. Disconnect the transmission linkage, the actuator loom plug and breather pipe; then remove the actuator from the car.

2. Remove the eight 2 B.A. nuts and washers and carefully withdraw the side casing.

3. Remove the 0.250 in. (6.35 mm.) nut and washer and withdraw the cam noting the relative position between the cam and the output lever.

4. Disconnect all terminals on the contact plate, the dual relay and the micro-switches.

5. Remove the four 3 B.A. nuts and withdraw the contact plate. It should be noted that on early actuators, two of the four studs are sleeved and these sleeves should be removed together with the contact plate.

6. Remove the nuts and bolts which secure the micro-switches and the dual relay to the contact plate. Discard the micro-switches, relay and contact plate.

7. Slacken the clamping bolt and remove the output lever.

8. Remove the washer and rubber boot; discard the boot.

9. Remove the circlip and thrust washer.

10. Withdraw the slip ring and gear assembly from the actuator case.

11. Remove and discard the contact segments from the slip ring.

12. Remove the three 0.250 in. (6.35 mm.) setscrews from the side of the actuator casing and carefully remove the motor assembly and drive collars. Remove the sealing ring from the actuator case.

13. Remove the internal circlip holding the bearing into the case and push the wormshaft and bearings out of the casing.

14. Remove the loom socket from the actuator casing.

Note It will now be necessary to inspect and prepare certain components for re-use.

**Gearchange electric actuator—To inspect
(All cars)**

1. Examine the magnesium casing for cracks or other damage.

2. Ensure that the joint faces are clean and free from burrs.

3. Wash the gearchange operating lever, spring and covers in clean paraffin then examine them for general wear.

4. Ensure that the breather pipe is clear and free from damage.

5. Examine the driving dog slot for excessive wear, also the mating shaft on the drive end of the motor armature shaft. The dog should be an easy sliding fit on the shaft but without excessive side play.

6. Examine the general condition of the plug assembly.

7. Ensure that no strands of wire are broken where they enter the pins. In the event of the plug being considered unserviceable, it is recommended that the whole assembly be renewed, rather than an individual connection. Special crimping tools and 'Cannon' insert tools are required for assembly purposes and unless these are available the work should not be attempted.

8. Examine the eight spring contacts for security on the insulated base.

Care must be exercised when handling the assembled base plate so that the contacts and the relays are not damaged in any way.

9. Check the height of the contacts from the base plate. The contact point should be approximately 0.485 in. (12.3 mm.) from the contact (lower) side of the base. If excessive wear has occurred on the contact points the base assembly should be renewed.

10. If the dual relay assembly is faulty, it is recommended that a new assembly be fitted rather than attempt rectification. The relays are precision units and are accurately set to give the correct operating times. The spring-loaded adjusting screw is set during the initial build of the relay and the setting should not be altered.

11. Ensure that the terminals and the terminal blocks are secure on the insulated base.

Cars prior to car serial number SRX 9001

12. Examine the brake drum for scoring or damage. The brake drum should be a push fit on the worm shaft. If the drum is slack on the shaft, examine the drum bore and the shaft for signs of fretting.

13. Remove the adhesive tape from the brake shoe and solenoid assembly.

14. Ensure that the assembled plunger and brake shoe will slide freely into the solenoid.

15. If either the brake shoe assembly or the solenoid is unserviceable they should not be renewed separately. The components are tested as one complete assembly during initial build and must remain as such, unless equipment is available that will enable separate assemblies to be tested and 'paired' (*see Dimensional Data at the end of this Section*).

16. Examine the brake linings for wear.

(All cars)

17. Examine the general condition of the wiring.

18. If the components are satisfactory, retain them

with adhesive tape until they are required for final assembly.

19. Check the tightness of the four 5 B.A. screws which secure the slip ring assembly to the shaft.

20. Ensure that a 0.025 in. (0.64 mm.) air gap exists on each side of the silver plated segments which are secured to the slip ring.

21. Ensure that the edges of the slip ring around the air gap are free from burrs.

22. Examine the slip ring face for signs of tracking. This should not normally occur but, if signs of tracking are found, the slip ring assembly must be renewed.

23. Examine the teeth on the worm gear and the worm for damage or uneven wear.

24. Examine the ball bearing bores in the main casing for signs of fretting. The bearing should be a light push fit in the casing. Reject the casing if the push fit cannot be obtained.

25. Examine for wear the bush which supports the output shaft. The shaft should be a running fit in the bush, without excessive clearance i.e. the shaft should not rock in the bush (*see Dimensional Data at the end of this Section*).

Actuator socket and cable assembly

1. Inspect the cables where they enter the pins of the plug.

2. Ensure that no corrosion exists and that none of the individual cable strands are broken.

Actuator casing

1. Inspect all the sealing faces and the actuator casing and the side cover.

2. Remove all traces of sealing joint and sealing compound.

Wormwheel

1. Inspect the wormwheel for abnormal wear of the teeth.

Wormshaft bearings

1. Inspect the bearings for undue wear or signs of roughness when rotated.

Gearchange electric actuator—To assemble (Cars prior to car serial number SRX 9001)

1. Wash the bearings and shaft assembly in clean paraffin (kerosene) then dry them with compressed air.

2. Lightly lubricate the bearings with Esso Beacon grease.

3. Ensure that the actuator casing is clean and dry, then fit the shaft and bearings. Do not use force to fit the bearings to the casing.

4. Fit the adjusting washer and the circlip.

5. Mount a dial test indicator so that the plunger rests on the end of the worm shaft (*see Fig. T149*).

6. Move the worm shaft backward and forward, noting the clock reading. If necessary, adjust the

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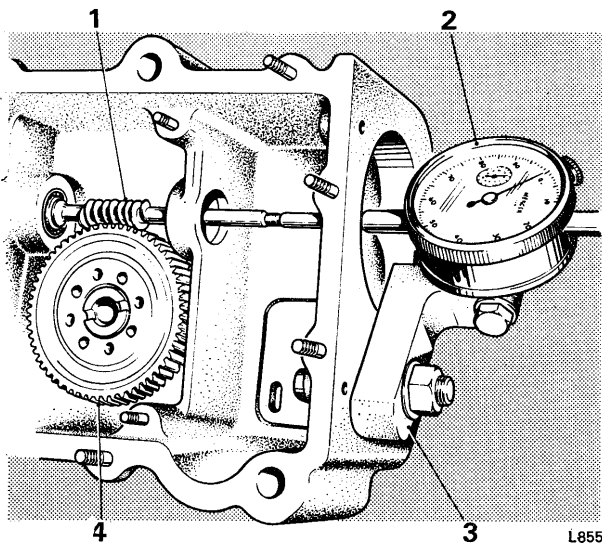


FIG. T149 CHECKING WORM SHAFT END FLOAT

- 1 Worm shaft
- 2 Dial indicator gauge
- 3 Gauge arm
- 4 Slave gear

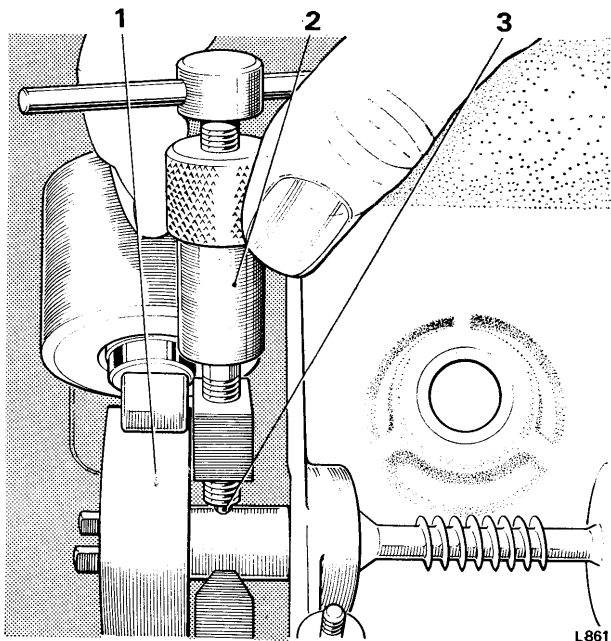


FIG. T150 FITTING THE BRAKE DRUM ROLL PIN (EARLY CARS)

- 1 Brake drum
- 2 Tool
- 3 Roll pin

washer to give an end float of between 0.002 in. and 0.005 in. (0,05 mm. and 0,13 mm.). It should be appreciated that the bearings must be no more than a light push fit in the casing to achieve this end float (see *Dimensional Data at the end of this Section*).

7. Ensure that both the output shaft and the porous bronze bush are clean; **do not wipe the bush with a degreasing agent.**

8. Lightly lubricate the shaft with Shell Tonna E oil. Fit a washer over the shaft then fit the shaft into the bush in the casing.

9. Fit a washer over the end of the output shaft then to the circlip.

10. Lightly lubricate the nylon worm gear with Esso Beacon grease.

11. Fit the rubber seal to the casing. A light smear of Esso Beacon grease applied to the inside of the seal will make this operation easier.

12. Fit the remaining washer and circlip to the shaft.

13. Ensure that the worm shaft will turn freely.

14. Rotate the output shaft until the open circuit sections are parallel with the worm shaft.

Note If the open circuits are at 90° to the worm shaft, the actuator will not operate when switched on initially.

15. Ensure that the pencil mark on the brake shoe is at the top.

16. Remove the adhesive tape from the brake shoe and solenoid assembly.

17. Fit the assembly into the actuator casing.

18. Fit the seal washers, cup washers and dome nuts. **Do not** tighten the nuts at this stage.

19. Push down the brake drum onto the worm shaft until the pin holes are aligned. If either the drum or the shaft is a new component, ensure that the drum can be pushed onto the shaft, otherwise it will be difficult to align the holes. It will be necessary to hold the brake shoe in, against spring pressure, whilst the drum is fitted.

20. Fit a new roll pin to the shaft and drum, using tool (RH 7841) as shown in Figure T150.

21. Remove the tool, ensuring that the pin protrudes equally on each side.

22. The brake should be set in relation to the brake drum and solenoid as follows.

23. Obtain a smooth strip of soft metal e.g. aluminium, 0.048 in. (1,22 mm.) thick, 0.75 in. (19,0 mm.) wide and bend it into half circle, 1.00 in. (25,4 mm.) radius.

24. Slide the metal onto the outside of the drum.

25. Push the solenoid assembly in the direction of the brake drum until the brake shoe abuts the metal strip (see *Fig. T151*).

26. Tighten the two dome nuts.

27. Remove the metal strip. When the solenoid is operated, the plunger will then travel a distance of 0.035 in. (0.89 mm.).

28. Fit the insulated base plate with the eight contacts and the relays. Care should be taken with this operation so that the settings of the relays and the position of the contacts are not disturbed.

29. Evenly tighten the four 3 B.A. nuts.

30. Ensure that a gap of approximately 0.050 in. (1.3 mm.) exists between each contact. The slip ring and contacts can be seen through the motor mounting orifice.

31. View the contacts through the gaps in the contact plate and ensure that the contacts touch the slip ring centrally, between the outside diameter of the slip ring and the outer perimeter of the rivet heads. There should be a clearance of approximately 0.062 in. (1.6 mm.) on each side (see Fig. T152).

32. Fit the rubber gasket to the plug assembly mounting face on the actuator casing.

33. Fit the plug assembly, ensuring that the two largest pins are lowermost. It is advisable to contain the leads with adhesive tape before attempting to thread them through the casing and the contact assembly.

34. Remove the tape, then run all the leads to their respective connections (see Fig. T153).

35. Fit the nuts and washers then tighten them, starting at the one furthest away from the plug and progressing toward the plug.

Caution Do not fit any nuts which are tight on the threads of the studs in the terminal blocks. If a tight nut is fitted there is a danger that the terminal screw will turn and the terminal block will become loose, resulting in a loose connection between contact and screw. If in doubt about the firmness of a contact, remove the base plate and tighten the terminal screw.

36. Secure the actuator motor to its mounting plate studs with the three 2 B.A. half nuts and spring washers.

37. Feed the motor supply leads through the bore of the mounting plate, then through the grommet. The longer end of the grommet fits into the casing.

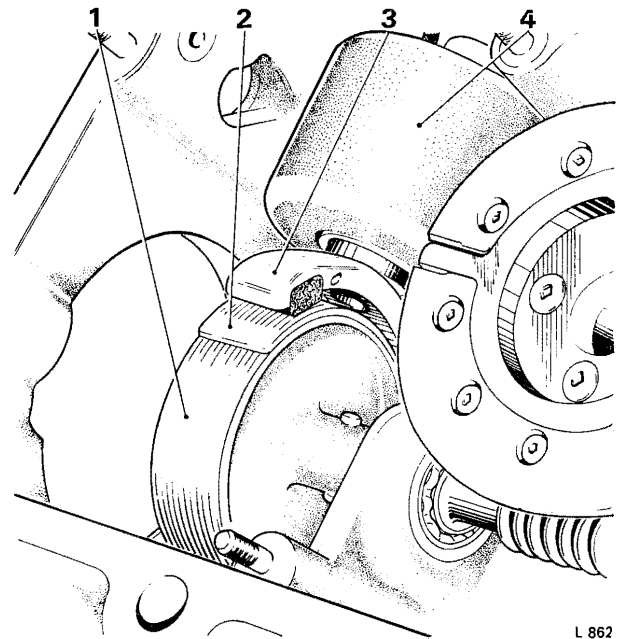
38. Ensure that the rear face of the actuator casing and the front face of the mounting plate are clean and free from burrs, then apply a thin coat of Wellseal to the faces.

39. Fit a new gasket to the rear face.

40. Fit the flexible coupling onto the brake drum.

41. Fit the coupling dog onto the drive end of the motor armature shaft.

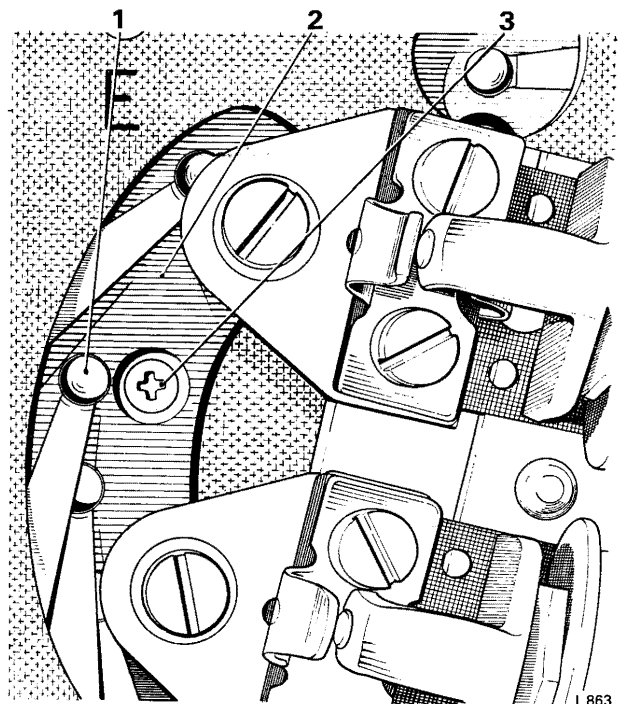
42. Fit the motor onto the four long studs.



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FIG. T151 SETTING THE SOLENOID BRAKE (EARLY CARS)

- 1 Brake drum
- 2 Spacer
- 3 Brake shoe
- 4 Solenoid

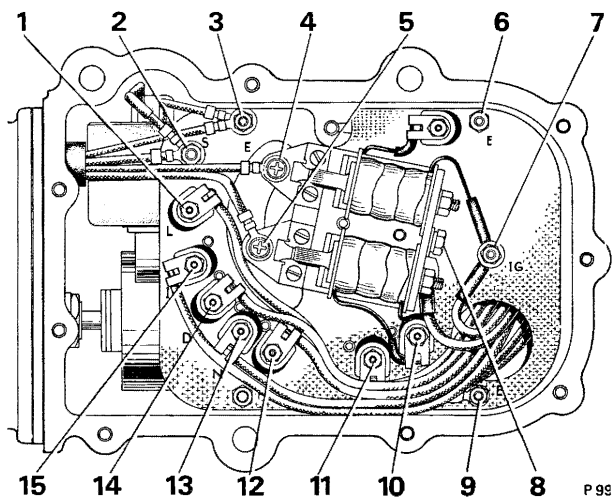


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FIG. T152 CHECKING CONTACT POSITION

- 1 Contact
- 2 Slip ring
- 3 Securing screw

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**FIG. T153 WIRE CONNECTIONS
(Cars prior to Car Serial Number 9001)**

- 1 Black/White from plug to terminal L
- 2 Green from both solenoid and motor to terminal S
- 3 Black from solenoid and black/green from motor to terminal E
- 4 Red/Green from motor to F1 relay terminal
- 5 Blue/Green from motor to F2 relay terminal
- 6 Black from relay coil motor end to terminal F2
- 7 Black from relay coil end and green/black from plug to terminal 1G
- 8 Brown/black from plug to relay positive feed terminal
- 9 Black from plug and red from relay coil plug end to terminal E
- 10 Red from relay coil motor end to terminal F1
- 11 Black/brown from plug to terminal P
- 12 Black/red from plug to terminal R
- 13 Black/blue from plug to terminal N
- 14 Black/green from plug to terminal D
- 15 Black/yellow from plug to terminal I

43. Feed the leads through to the actuator casing, at the same time position the grommet.
44. Push the motor forward, align the driving dog with the rubber coupling, then push the motor fully home.
45. Ensure that the rubber grommet fits correctly into its recess in the casing and has not become trapped.
46. Ensure that the rear face of the mounting plate and the joint face of the motor cover are clean and free from burrs.
47. Apply a thin smear of Wellseal to the faces, fit a new gasket to the mounting plate then fit the motor cover.
48. Fit and tighten the four 2 B.A. nuts and washers.
49. Connect the motor feed and the solenoid feed leads (*see Fig. T153*).

50. Fit the solenoid leads first with the lead ends to the eyelets lowermost.
51. Fit the motor earth and the solenoid connection with the lead to the eyelet uppermost.
52. Fit the motor feed leads to the relays.
53. Examine all connections to ensure that they are all correctly connected.
54. Ensure that the slip ring is positioned with the open circuit sections parallel with the worm shaft, as described earlier.
55. Ensure that the joint faces of the actuator casing and the cover are clean and free from burrs.
56. Apply a thin smear of Wellseal to both faces then fit a new gasket to the casing.
57. Fit the cover and secure it with the eight 2 B.A. nuts and washers.
58. Fit the spring retaining cup onto the output shaft.
59. Liberally apply Rocol M 204 G Ragsine to the inside of the cup and to the output shaft.
60. Smear both ends of the spring with the same lubricant then fit the spring over the shaft and into the cup.
61. Lubricate the spring housing in the lever then fit the lever to the shaft with the lever pointing downward.
62. Smear the detent face of the lever, again using Rocol M 204 G Ragsine.
63. Using tool No. (RH 7843) compress the spring then fit the hardened steel pin.
64. Coat the inside of the cover with the same lubricant, then fit the cover and secure it with a setscrew.
65. To test the lever to ensure that the torque required to make the lever slip is correct, proceed as follows.
66. Operate the lever at least three times in each direction to relieve any initial stiffness.
67. Fit a spring balance to the lever, with one end of the spring balance located in the clevis pin hole in the end of the lever.
68. Move the lever forward until it slips; note the reading on the spring balance.
69. Move the lever in the opposite direction, again noting the reading. The lever should slip at a load of between 60 lb. and 75 lb. (27,2 kg. and 34 kg.).
70. If the load required to move the lever does not comply with the figures quoted, check the spring poundage (*see Dimensional Data at the end of this Section*) then renew either the spring or the lever to obtain the correct slipping load.
71. If rig testing facilities are available, test the actuator to the specification given in 'Dimensional Data' at the end of this Section.

Gearchange electric actuator—To assemble (Car serial number SRX 9001 and onwards)

1. Press the output shaft bearing into the actuator casing. The bearing should be fitted such that it is slightly proud on both the inside and outside of the casing.

Note This bearing is an oil retaining type and should **not** be soaked in any solvent.

2. Fit the wormshaft bearings to the wormshaft ensuring that the bearings are adequately lubricated with Esso Beacon grease.

3. Assemble the wormshaft and bearings into the actuator case. The bearings must be a slide fit in the casing bores. Adjust the end float of the wormshaft to between 0.002 in. and 0.005 in. (0.005 mm. and 0.012 mm.) using a suitable thickness of packing washer. Fit the circlip.

4. Fit new contact segments to the slip ring. Ensure that the edges of the segments are free of burrs.

5. Fit the slip ring and gear assembly into the main bush checking that the shaft is a slide fit in the bush.

Lubricate the gear teeth with Esso Beacon grease.

Use only the minimum amount of grease as any excess is liable to be thrown off.

6. Fit the thrust washer and circlip to the output shaft.

7. Fit the rubber gaiter, washer and output lever to the shaft. Noting the position of the output lever.

8. Check that the wormshaft can rotate freely. Rotate the wormshaft until the open circuit sections of the slip ring are at 90° to the wormshaft and the flat side of the 'O' section of the output shaft inner end is uppermost.

9. Fit the splined collar and coupling onto the wormshaft.

10. Fit the new sealing ring provided to the groove in the case and pass the motor cables through the hole.

11. Mate the splined collar on the motor shaft with the nylon coupling.

12. Fit the three 0.250 in. (6.35 mm.) motor mounting bolts.

13. Check that the wormshaft is free to rotate.

14. Fit the dual relay provided to the new contact assembly and check the tightness of the 5 B.A. terminal screws on the contact assembly.

Note This dual relay is a precision component and its internal settings can easily be upset by maltreatment.

15. Loosely fit the micro-switches to the contact plate assembly ensuring that the spring washers are fitted under the heads of the long 6 B.A. screws in the slotted holes or under the nuts adjacent to the contact plate in the plain holes.

16. Loosely fit the contact plate assembly into the casing locating the sleeves, if fitted, on the studs and taking care not to damage the relay assembly and guiding the motor feed wires between the casing and the indentation in the contact base plate.

17. Fit the four 3 B.A. nuts and washers to the contact plate and connect the motor feed cables and the suppressor across the relay mounting bolts as shown in Figure T154. All slack in the motor cables should be taken up by rotating the eyelets about the terminal posts.

18. View the layout of the contacts onto the slip ring through the elongated hole in the contact plate and ensure that there is a minimum of 0.50 in. (12.7 mm.) between adjacent contacts as well as being approximately 0.062 in. (1.58 mm.) from either the edge of the segments or the countersinkings for the retaining screws.

19. Fit the rubber gasket and the socket assembly, guiding the cables through the casing and the aperture in the contact plate.

The socket should be fitted so that the locating tong adjacent to pin A is uppermost on the sloping mounting face of the casing.

20. Fit all cables to their respective connections in accordance with Figures T154 and T156.

The longer cables to the contact plate should be fitted first, followed by the shorter cables and finally the micro-switch and relay connection.

If the actuator was fitted with black micro-switches it will be necessary to suitably alter the cable connections to suit the new grey micro-switches provided.

It is helpful to sort out the wires into their respective positions before attachment. It should be noted that when making connections to the 5 B.A. terminal screws on the contact plate extreme care should be used when fitting the terminal securing nuts as if these are tight the first nut on the terminal will be loosened resulting in a poor connection.

Note On the pre-automatic speed control type of actuator the Yellow/black wire is replaced by a Green/black one and the Green/blue wire is deleted.

21. Fit the actuator onto the gearbox mounting bracket and refit the loom plug to the actuator.

Neutral start and height control switches— To remove

(Cars prior to car serial number SRX 9001)

1. Remove the split pin and clevis pin which secures the link rod to the switch actuating lever; disconnect the link rod.

2. Disconnect the two leads at the Lucar connections on the detent and stator solenoid case connector; note the position of the leads to ensure correct assembly (*see Fig. T155*).

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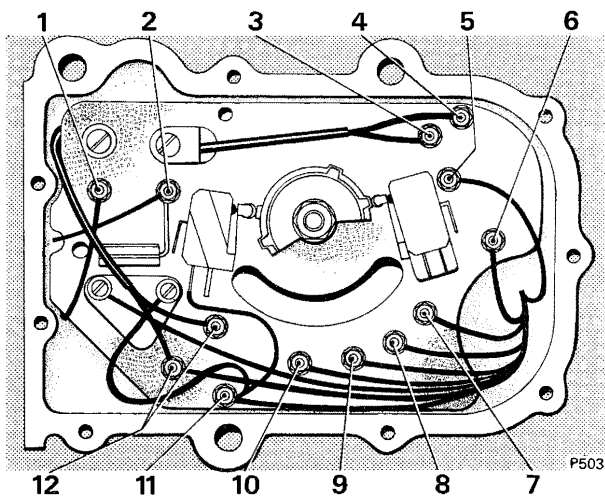


FIG. T154 WIRE CONNECTIONS
(Car Serial Number SRX 9001 and onwards)

- 1 Blue/green to motor
- 2 Red/green to motor
- 3 Red to relay
- 4 Red to relay
- 5 Black/brown from plug to terminal P
- 6 Black/red from plug to terminal R
- 7 Black/blue from plug to terminal N
- 8 Black/green from plug to terminal D
- 9 Black/yellow from plug to terminal I
- 10 Black/white from plug to terminal L
- 11 Black from plug to earth terminal
- 12 Green/black from plug to 'ignition' terminal

3. Remove the two bolts which secure the switch cover to the bracket on the left-hand side of the transmission; remove the cover.

Note Before the switches can be removed from the car, the switch assembly must be partially dismantled and the leads disconnected (*see Neutral start and height control switches — To dismantle*).

**Neutral start and height control switches—
To dismantle**

(Cars prior to car serial number SRX 9001)

If the transmission has been removed from the car, the switch cover will have been removed from the transmission but it will still be connected to the car by the wire leads. Dismantle the switches in the same way as described for dismantling the switches when the transmission is in position in the car.

To dismantle the neutral start and height control switches, proceed as follows.

1. Remove the four screws which secure the cover to the casing.
2. Remove the cover and discard the joint. The gasket is sealed with jointing compound on both sides during initial assembly and this may make separation

of the cover and casing difficult. Do **not** use a screw-driver blade between the joint faces otherwise the waterproofing may be impaired.

3. Unscrew the knurled nut at the top of the cover.
4. Unscrew the two 6 B.A. screws which secure the micro-switches to the casing.
5. Remove the switches and separator, disconnect the leads, then remove the leads and rubber grommet from the casing.
6. It should not be necessary to remove the operating cam and shaft which is secured in the casing by the lever. The lever is positioned and secured on the shaft by a roll pin.

**Neutral start and height control switches—
To assemble**

(Cars prior to car serial number SRX 9001)

1. Ensure that the lever and cam assembly is free to rotate.
2. Examine the cork seal and should it require renewal, press out the roll pin using tool No. (RH 7841), remove the lever and washer, then renew the seal. Fit the lever using a new roll pin.
3. If the cam and shaft assembly has been removed from the casing, lubricate the shaft with Rocol M 204 G Ragsine when fitting the shaft to the casing.
4. Feed the leads into the casing then connect them to the micro-switches as shown in Figure T155.
5. Fit the micro-switches and separator to the casing. The insulated separator fits between the two switches.
6. When the cam actuates the switches, ensure that a gap of 0.050 in. (1.27 mm.) exists between the flat on lever and the stop on the cover.
7. Draw the rubber sealing plug down the loom until it fits into the tapered bore in the casing. Tighten the knurled nut.
8. Ensure that the joint faces of the casing and cover are clean and free from burrs then apply a thin smear of Wellseal to both faces.
9. Fit a new gasket to the casing then secure the cover, using four 3 B.A. screws.

**Neutral start and height control switches—
To fit**

(Cars prior to car serial number SRX 9001)

1. Fit the switch to the bracket on the side of the transmission. Torque tighten the nuts.
2. Connect the control rods to both units, then adjust the controls as described in Section T5 — Control Linkage.
3. Fit the leads to the Lucar connections on the detent and stator solenoid (if fitted) connection.

Neutral start and height control switches— To dismantle

(Car serial number SRX 9001 and onwards)

Refer to Page T199—Gearchange electric actuator—
To dismantle.

Neutral start and height control switches— To assemble

(Car serial number SRX 9001 and onwards)

1. Remove the low tension cable from the ignition distributor, switch on the ignition and check that the actuator will select all six gear stations correctly.

2. Move the gear selector lever to 'D' and fit the micro-switch cam to the actuator output shaft. When tightening the 0.250 in. (6.35 mm.) nut, the torque reaction should be taken by gripping the output lever such that the tightening force is not absorbed by the nylon teeth of the wormwheel.

3. Move the gear range selector lever to the 'Park' position.

4. Locate the two micro-switches adjacent to the actuator socket (Neutral start and Height control switches).

Move the switches towards the peak of the cam until the switch plungers are in the centre of the peak and are depressed to within 0.020 in. (0.51 mm.) of the switch body as shown in Figure T157. When both switches are in the correct position, tighten the mounting bolts.

5. Repeat this procedure on the left-hand micro-switch which operates the 'Park' anti-thief device.

6. Select 'Reverse' gear and check that all three switches are clear of the cams.

7. Select 'Neutral' and ensure that the right-hand pair of switch plungers are correctly depressed and that the right-hand micro-switch is clear of the cam.

8. Switch off the ignition and fit the distributor low tension cable.

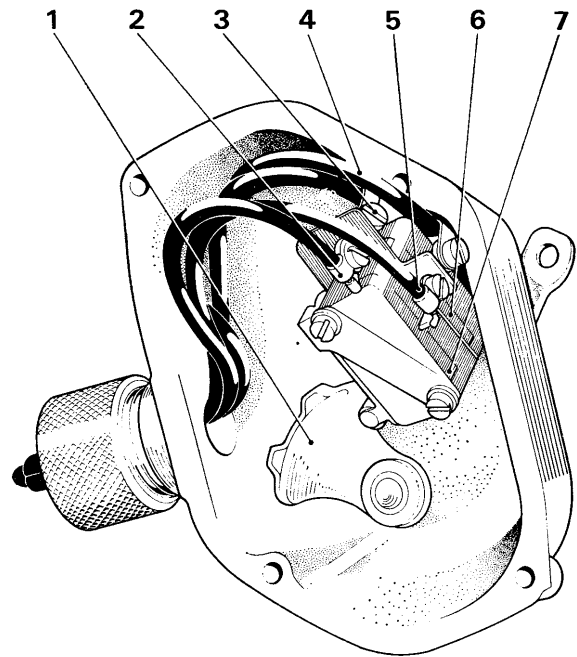
9. Remove the actuator from the car and fit the casing side cover, painting both sides of the new gasket provided with a suitable jointing compound. Fit the actuator to the transmission, connecting the loom plug and the actuator linkage.

Gearchange actuator motor—To dismantle (Cars prior to car serial number SRX 9001)

1. Unscrew and withdraw the two through-bolts.
2. Remove the end covers.

3. Withdraw the armature from the drive end. Retain the shim washers which fit between the shoulder on the drive end of the armature shaft and the drive end bush.

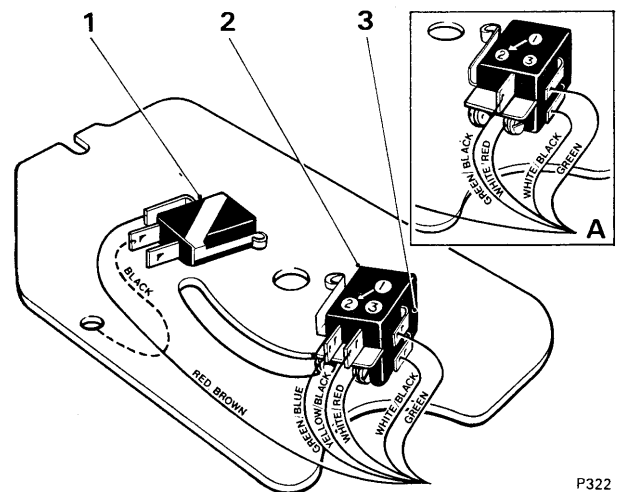
4. Note the side and the position of each brush to



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**FIG. T155 MICRO-SWITCH CONNECTIONS
(Cars prior to Car Serial Number SRX 9001)**

- 1 Actuating cam
- 2 Red/white lead
- 3 Green/black lead
- 4 Green lead
- 5 White/black lead
- 6 Height control switch
- 7 Neutral start switch



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**FIG. T156 MICRO-SWITCH CONNECTIONS
(Car Serial Number SRX 9001 and onwards)**

- 1 'Park' micro-switch
- 2 Height control switch
- 3 Neutral start switch

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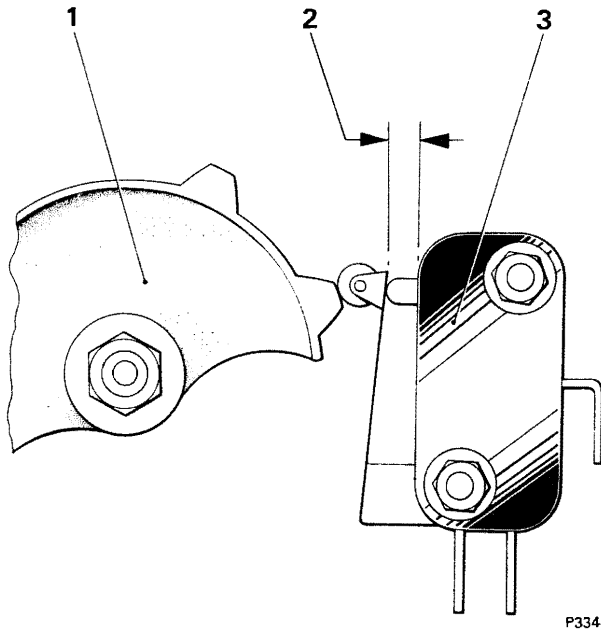


FIG. T157 ADJUSTMENT OF MICRO-SWITCHES
(Car Serial Number 9001 onwards)

- 1 Cam
- 2 Gap 0.020 in. (0,51 mm.)
- 3 Micro-switch

ensure correct assembly then remove the brushes, taking care not to stretch excessively the brush tension spring.

5. Should the pole piece require removal, mark the pole piece and the two retaining screws so that they can be fitted in their original positions.

Gearchange actuator motor—To inspect
(Cars prior to car serial number SRX 9001)

Under normal operating conditions the gearchange actuator motor should need no attention. The porous bronze bearings are impregnated with oil and the brushes are carbon copper.

Details of motor tests and performance are given in 'Dimensional Data' at the end of this Section.

Gearchange actuator motor—To assemble
(Cars prior to car serial number SRX 9001)

Assemble the gearchange actuator motor as follows (see Fig. T158).

1. Fit the pole pieces and the two self-tapping screws, ensuring that the marks made during dismantling are correlated.
2. Fit the brushgear assembly, ensuring that the brushes are fitted in their original position. Take care not to overstretch the brush tension springs. Ensure

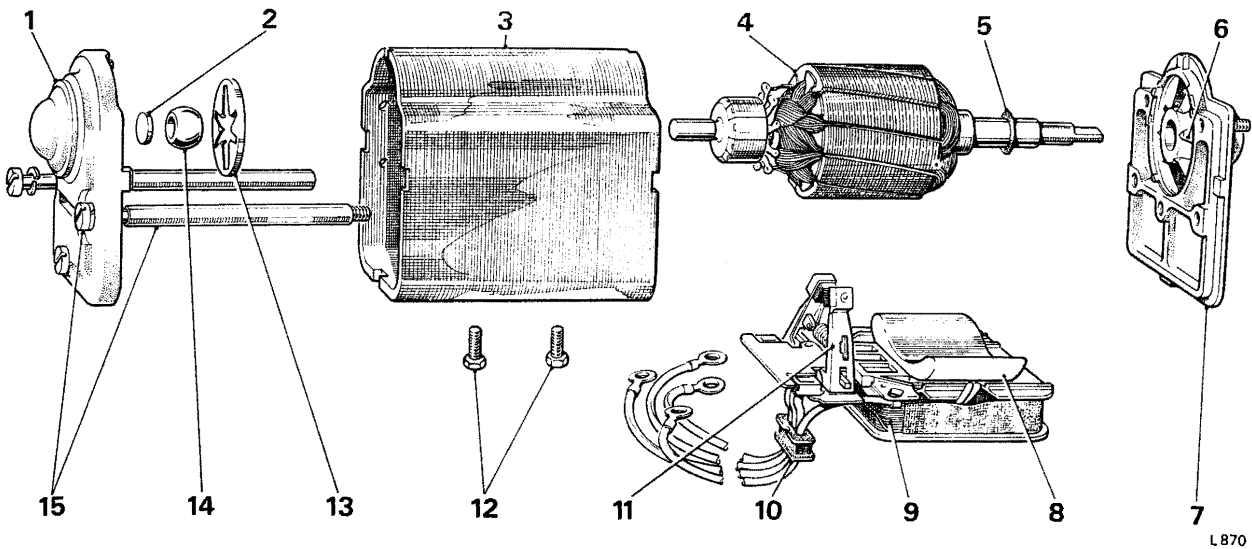
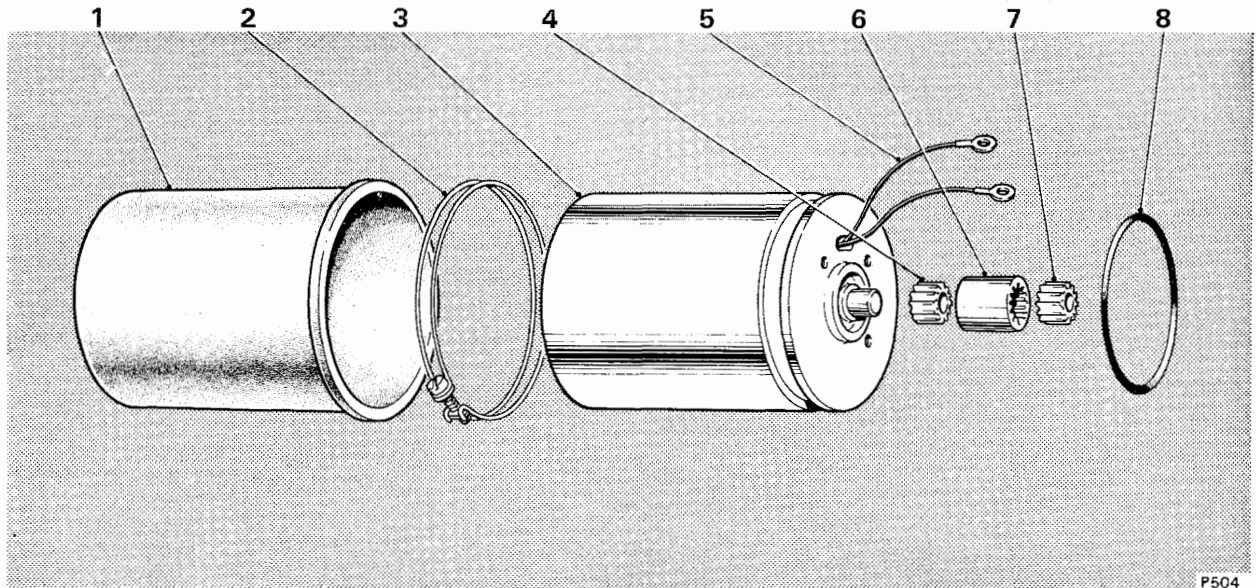


FIG. T158 GEARCHANGE ACTUATOR MOTOR
(Cars prior to Car Serial Number SRX 9001)

- | | |
|---------------------------------|------------------------------|
| 1 Commutator end bracket | 8 Pole piece |
| 2 Thrust pad | 9 Field coil |
| 3 Yoke | 10 Grommet |
| 4 Armature | 11 Brushgear |
| 5 Shim | 12 Pole piece securing screw |
| 6 Bearing retainer | 13 Bearing retainer |
| 7 Drive end bracket | 14 Self aligning bearing |
| 15 Through-bolts and insulators | |



**FIG. T159 GEARCHANGE ACTUATOR MOTOR
(Car Serial Number SRX 9001 and onwards)**

- 1 Motor cover
- 2 Motor cover securing clip
- 3 Motor
- 4 Motor flying leads
- 5 Motor drive shaft
- 6 Coupling (splined)
- 7 Splined drive
- 8 'O' ring

that the brush arms pivot freely on the terminal plate locations.

3. Lightly smear the armature shaft with Shell Turbo 41 oil, taking care to prevent any oil from reaching the commutator.

4. Fit the armature.

5. Fit the shim(s) to the drive end of the armature shaft.

6. Fit the end covers and secure them with the through-bolts.

7. Check the end float of the armature. The end float should be between 0.002 in. and 0.012 in. (0.05 mm. and 0.30 mm.). If the end float does not conform to these figures remove the drive end bracket and adjust the shim(s) to suit.

Gearchange actuator motor—To dismantle (Car serial number SRX 9001 and onwards)

1. Using a suitable puller remove the drive gear from the motor.
2. Unscrew and withdraw the 2 bolts securing the motor housing, remove the housing.
3. Remove the armature from the end plate.

Gearchange actuator motor—To inspect (Cars serial number SRX 9001 and onwards)

1. Examine the magnets for any damage, cracks or fractures.
2. Examine the brushes for wear; fit new brushes if necessary.
3. Examine the armature commutator for wear or damage, if scored polish with fine emery cloth. If scores are heavy and cannot be removed with light polishing, fit a new armature.
4. After polishing carefully clean commutator slots to remove particles of carbon.
5. Examine bearing bushes for wear, replace if necessary.
6. Examine the armature shaft for wear on the bearing diameter.

Gearchange actuator motor—To assemble (Car serial number SRX 9001 and onwards)

Assemble the actuator motor (*see Fig. T159*) by reversing the proceeds given previously. Test the motor after assemble, if the current consumption exceeds 7.5 amps. the armature has an electrical fault and should be renewed.

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**DIMENSIONAL DATA FOR
GEARCHANGE ACTUATOR,
NEUTRAL START AND HEIGHT CONTROL SWITCHES**

DESCRIPTION	DIMENSION	PERMISSIBLE WORN DIMENSION	REMARKS
Output shaft bearing bush i/d.	0·6273 in. — 0·001 in. (15,932 mm. — 0,025 mm.)	————	The bush is oil impregnated phosphor bronze and should not be cleaned with a degreasing agent.
Output shaft o/d.	0·6245 in. — 0·0005 in. (15,863 mm. — 0,013 mm.)	————	————
Clearance.	0·0018 in. to 0·0033 in. (0,045 mm. to 0,083 mm.)	————	————
Front bearing bore — actuator casing.	0·7480 in. + 0·0005 in. (19,0 mm. + 0,013 mm.)	————	————
Front bearing o/d.	0·7480 in. — 0·0004 in. (19,0 mm. — 0,010 mm.)	————	————
Clearance.	0·000 in. to 0·0009 in. (0,00 mm. to 0,023 mm.)	————	————
Rear bearing bore — actuator casing.	0·7497 in. + 0·0005 in. (19,041 mm. + 0,013 mm.)	————	————
Rear bearing o/d.	0·7497 in. — 0·0004 in. (19,041 mm. — 0,010 mm.)	————	————
Clearance.	0·000 in. to 0·0009 in. (0,00 mm. to 0,023 mm.)	————	————
Front bearing i/d.	0·2362 in. — 0·0004 in. (6 mm. — 0,010 mm.)	————	————
Worm shaft front bearing diameter.	0·2363 in. — 0·0005 in. (6,001 mm. — 0,013 mm.)	————	————
Interference or clearance.	0·0005 in. tight to 0·0004 in. clear (0,013 mm. tight to 0,010 mm. clear)	————	————
Rear bearing i/d.	0·250 in. + 0·0002 in. (6,35 mm. + 0,005 mm.)	————	————
Worm shaft rear bearing diameter.	0·250 in. — 0·0005 in. (6,35 mm. — 0,013 mm.)	————	————
Interference or clearance.	0·0002 in. tight to 0·0007 in. clear (0,005 mm. tight to 0,018 mm. clear)	————	————
Brake drum — shaft diameter.	0·2485 in. + 0·0005 in. (6,312 mm. + 0,013 mm.)	————	————
Wormshaft — drum diameter.	0·2485 in. — 0·0005 in. (6,312 mm. — 0,013 mm.)	————	————
Interference or clearance.	0·000 in. tight to 0·001 in. clear (0,000 mm. tight to 0,025 mm. clear)	————	————
Worm gears backlash.	0·002 in. to 0·007 in. (0,05 mm. to 0,18 mm.)	————	————
Worm shaft end float.	0·002 in. to 0·005 in. (0,05 mm. to 0,13 mm.)	0·005 in. (0,13 mm.)	Adjust end float by selecting suitable adjusting washer.
Motor armature end float.	0·002 in. to 0·012 in. (0,05 mm. to 0,03 mm.)	0·012 in. (0,03 mm.)	Adjust end float by selecting suitable adjusting washer.
Pressure of brushes on commutator.	4·4 oz. to 5·6 oz. (125 g. to 160 g.)	————	Renew spring or brushes to maintain pressure.
Solenoid brake spring — free length.	1·287 in. (approx.) (32,69 mm.) (approx.)	————	————
Load required to compress spring to a length of 1·045 in. (26,55 mm.)	6 lb. 8 oz. to 7 lb. (2,95 kg. to 3,18 kg.)	————	————

DESCRIPTION	DIMENSION	PERMISSIBLE WORN DIMENSION	REMARKS
Dimensional Data—continued			
Operating spring free length.	1.00 in. (approx.) (25,4 mm.) (approx.)	—	—
Load required to compress spring to a length of 0.70 in. (17,8 mm.)	100 lb. (45,4 kg.)	—	—
2 B.A. half nuts — motor to mounting plate.	Torque tighten to between 30 lb.in. and 36 lb.in. (0,34 kg.m. and 0,41 kg.m.)	—	—
Remainder of 2 B.A. nuts.	Torque tighten to between 48 lb.in. and 60 lb.in. (0,55 kg.m. and 0,69 kg.m.)	—	—
Pole piece screws.	Torque tighten to between 6 lb.ft. and 8 lb.ft. (0,83 kg.m. and 1,11 kg.m.)	—	—
Bolts — actuator to rear extension.	Torque tighten to between 16 lb.ft. and 18 lb.ft. (2,21 kg.m. and 2,49 kg.m.)	—	—

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ACTUATOR MOTOR TEST DATA

	Cars prior to Car Serial Number SRX 9001	Car Serial Number SRX 9001 and onwards
Nominal operating voltage	12.	12.
Torque developed in either direction of armature rotation at 20°C.	40 oz. in. at 200 r.p.m. (min.) at 16.5 amp. (max.) and 20 oz. in. at 700 r.p.m. (min.) at 14.5 amp. (max.)	50 oz. in. (min) at 200 r.p.m. at 8 amp. (max.) and 12.5 oz. in. (min.) at 1 000 r.p.m. at 2.75 amp. (max.)

DUAL RELAY TEST DATA

	Cars prior to Car Serial Number SRX 9001	Car Serial Number SRX 9001 and onwards
Contact gap	0.020 in. to 0.025 in. (0,51 mm. to 0,64 mm.)	0.025 in. to 0.030 in. (0,64 mm. to 0,76 mm.)
Core gap (contacts open)	0.030 in. to 0.035 in. (0,76 mm. to 0,89 mm.)	0.040 in. to 0.045 in. (1,02 mm. to 1,14 mm.)
Contact pressure (closed)	5.1 oz. to 6.8 oz. (145 g. to 195 g.)	3.5 oz. min. (100 grms. min.)
Cut-in volts	4 volts to 9 volts	9 volts max.
Drop-off volts	2.5 volts (min.)	
Relay winding resistance	17 ohms. to 19 ohms. (at 20°C.)	17.5 ohms. to 20 ohms. (at 20°C.)

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Cars prior to car serial number SRX 9001

The volt drop across the contacts should not exceed 100 milli-volts when a current of 10 amps. is flowing through them and the relay coil is supplied with a nominal 12 volts.

Car serial number SRX 9001 and onwards

The volt drop across the contacts should not exceed 50 milli-volts when a current of 6 amps. is flowing through them and the relay coil is supplied with a nominal 12 volts.

Chapter T

ACTUATOR TEST DATA

(All cars)

Voltage required to operate actuator — temperature range 70°C. to minus 17·8°C. 9 volts (min.)
Time taken to rotate a 2 in. (50,8 mm.) lever through 80° 15' with a torque of 15·0 lb. in. (0,17 kg.m.)
applied to the lever 1·5 seconds (max.)
With 9 volts applied at the motor and an ambient temperature of 20°C. the stall torque on the end of the
lever must be 40 lb. in. (0,46 kg.m.).
With 12 volts applied at the motor and an ambient temperature of 20°C. the stall torque on the end of the
lever must be 70 lb. in. (0,81 kg.m.).
With 12 volts applied to the motor and 10 lb. in. (0,12 kg.m.) load applied to the lever the actuator must
select to within 3° of the correct position.
With 14 volts applied at the motor and no load on the lever, the actuator must not 'hunt' between selector
positions. It is permissible for the lever to move slightly past a selected position then return to that
position before halting. It is not permissible for the actuator lever to move forward and backward past the
selected position before finally halting in the position required.

SOLENOID TEST DATA

(Cars prior to car serial number SRX 9001)

Voltage required to withdraw plunger against spring loading from a set distance of 0·075 in. (1,91 mm.) 5·0 volts (max.)
Voltage required to hold plunger back against spring pressure 1·0 volts (min.)
Note When the plunger and solenoid assembly has been satisfactorily tested the components should be
kept together and fitted as a complete unit.

Section T8

REMOTE GEARCHANGE SELECTOR

The remote gearchange selector is clamped to the steering column assembly just below the steering wheel.

An exploded view of the selector is shown in Figures T160 and T161.

Movement of the selector lever moves a pointer over an indicator scale which is marked 'P', 'R', 'N', 'D', 'I' and 'L' representing Park, Reverse, Neutral and three forward gear ranges.

The selector is in the form of a switch. When the lever is moved from Neutral, an electrical signal is transmitted to the electric actuator which is mounted on the transmission rear extension and connected to the gearchange lever on the transmission. On receiving the signal, the electric actuator will automatically select the required gear range. The transmission will remain in the selected range until the lever is again moved.

The electric actuator is wired so that, should the driver stop the car in a gear other than 'Park' then switch off the engine, he can still lock the transmission by moving the selector lever to the 'Park' position.

Having done this, if he moves the selector lever out of this position or the lever is accidentally moved to a drive position, the actuator will not respond until the ignition is switched on.

Remote gearchange selector—To remove

1. Remove the screws retaining the upper and lower halves of the cowlings. These halves should always be retained as a set. Carefully remove the upper half of the cowlings.

2. Remove the screw retaining the lower half of the cowlings to its clamping bracket; remove the lower half of the cowlings.

3. Disconnect the indicator lamp.

4. Disconnect the micro-switch.

5. Remove the screw securing the switch insulating plate.

6. Remove the gearchange selector.

Remote gearchange selector—To dismantle

1. Remove the screws securing the micro-switch(es) to the rear face of the base assembly and remove the micro-switch(es).

2. Remove the operating arm from the spindle of the quadrant.

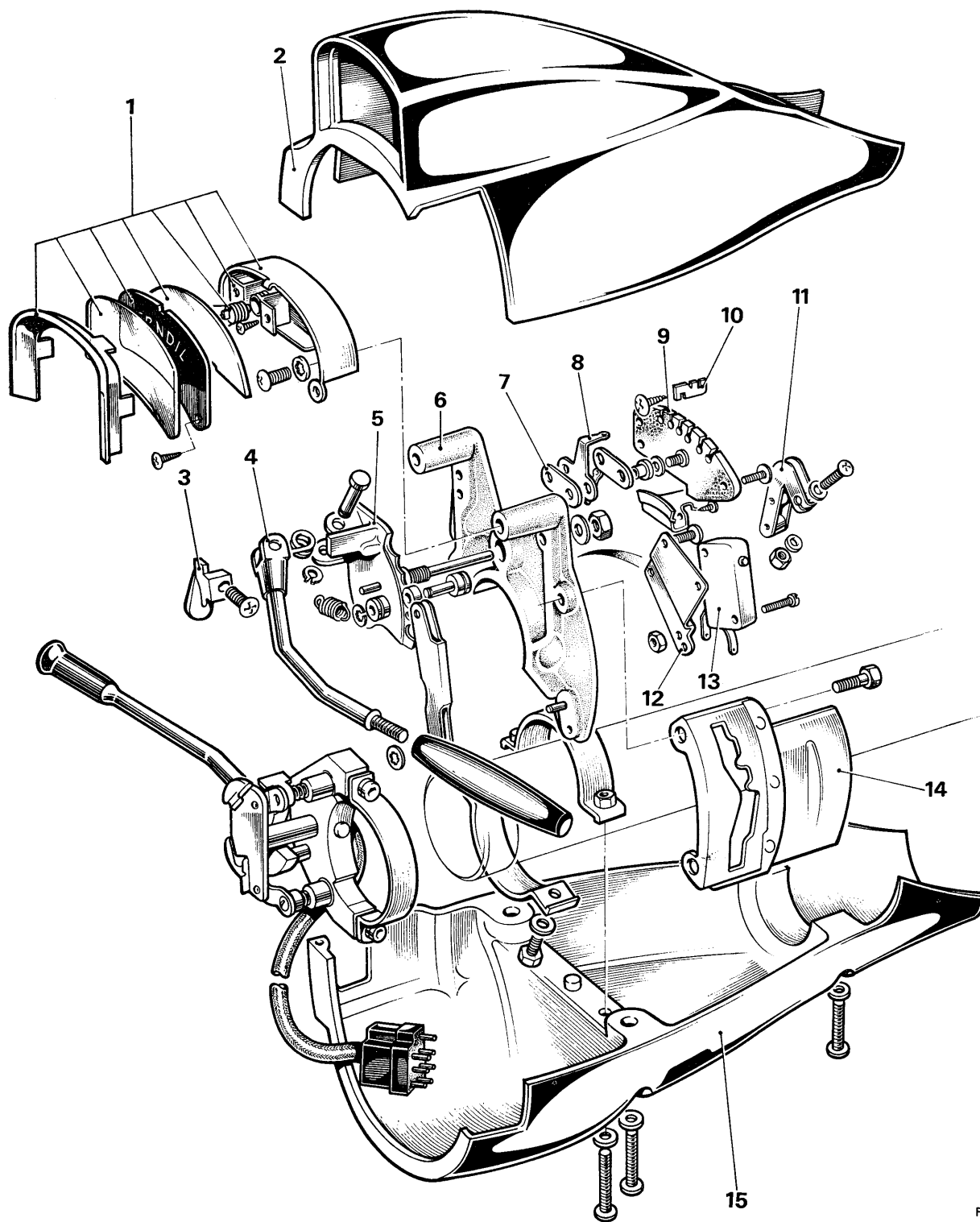
3. Remove the single 5 B.A. screw securing the pointer to the quadrant boss and remove the pointer; take care not to lose the washer(s) from beneath the head of the 5 B.A. screw.

Note Care must be taken not to scratch the pointer or the indicator scale.

4. Remove the two 5 B.A. screws and shake-proof washers securing the indicator support bracket to the two bosses on the base assembly, then remove the indicator support bracket assembly.

5. Remove the two hexagon-headed 3 B.A. screws securing the gate assembly to the underside of the base.

6. Remove the circlip, clevis pin and spring securing the gearchange selector lever to the quadrant, then remove the lever with the gate assembly attached.



**FIG. T160 REMOTE GEARCHANGE SELECTOR
(EARLY CARS)**

**FIG. T160 REMOTE GEARCHANGE SELECTOR
(EARLY CARS)**

- | | |
|--|--|
| <ul style="list-style-type: none"> 1 Gear position indicator scale components 2 Upper half of steering column cowl 3 Pointer — gear range selector 4 Gear range selector lever 5 Quadrant assembly 6 Base assembly 7 Insulating piece 8 Spring — contact — gear range selector | <ul style="list-style-type: none"> 9 Insulating plate 10 Contact 11 Reverse lamps operating lever 12 Micro-switch mounting plate — reverse lamps 13 Micro-switch — reverse lamp 14 Support assembly bracket 15 Lower half of steering column cowl |
|--|--|

7. Remove the two 5 B.A. screws and washers securing the phosphor-bronze contact, two insulating strips and two insulating dowels to the quadrant and remove these items.

8. Remove the retaining clip from the rocking arm.

9. Remove the tension spring from the rocking arm and quadrant, and remove the rocking arm assembly.

10. Remove the eccentric stud which forms the rocking arm assembly pivot.

11. Remove the $\frac{1}{4}$ in. UNF nut and washer from the quadrant spindle and remove the quadrant assembly from the base assembly.

Remote gearchange selector—To assemble

1. Fit the quadrant assembly onto the base and nip the $\frac{1}{4}$ in. UNF nut and washer onto the spindle. Check that the quadrant is free to rotate.

2. Remove the quadrant and lubricate the spindle with Ragsine 204G. Refit the quadrant and finally tighten the $\frac{1}{4}$ in. UNF nut.

3. Do not overtighten the nut, since the bearing boss tends to spread slightly and a tight bearing may be formed.

4. Fit the eccentric stud to the base plate, fit the retaining nut and temporarily tighten.

5. Temporarily fit the gear change selector lever and the gate; ensure that when the roller lines up with the quadrant, the selector lever seats in the correct position in the gate. Adjust by rotating the eccentric stud.

6. Tighten the stud retaining nut.

7. Fit the rocking arm assembly, then check to ensure that the roller lines up correctly with the quadrant with respect to height above the base.

8. Remove the selector lever and gate.

9. Remove the rocking arm and hook the tension spring onto the anchor pin roller on the underside of the quadrant and onto the spring anchor on the underside of the rocking arm.

10. This operation is made easier by rotating the quadrant anti-clockwise beyond its normal travel, so that the spring is not under tension. Rotate the quadrant clockwise whilst holding the rocking arm clear, then allow the roller to locate on the detent

forms. Fit the spring on the top side of the quadrant and rocking arm.

11. Fit the circlip.

Note Do not fit the pivot retaining clip to the rocking arm at this stage. (They are difficult to remove, should the need arise).

12. Move the quadrant to a mid-way selection and fit the phosphor-bronze contact. This contact is assembled between two insulating strips and all are located by two insulating dowels. This sandwich assembly is then secured to the quadrant by two 5 B.A. screws and washers.

Note Extreme caution must be taken with the moving contact, so that it is not bent or damaged in any way. This contact has a deflection imposed upon it by fitting the fixed contacts and it is **extremely important** that the pressure between the contacts which the deflection produces is correct (*see Remote gearchange selector — To test*).

13. Before fitting the selector lever assembly carry out the following checks.

14. Check that the clevis pin will slide through both the fork end on the lever and the holes in the mounting bosses on the quadrant, then check that the fork end will slide between these bosses.

15. Lightly smear Ragsine 204G on the outside of the fork end, the inside of the bosses, the clevis pin and the clevis pin holes, then locate the fork end in the bosses by the clevis pin and fit the spring inside the fork end and over the clevis pin.

16. Push home the pin and fit the circlip and washer.

17. Check that the lever will return easily under the load of the spring.

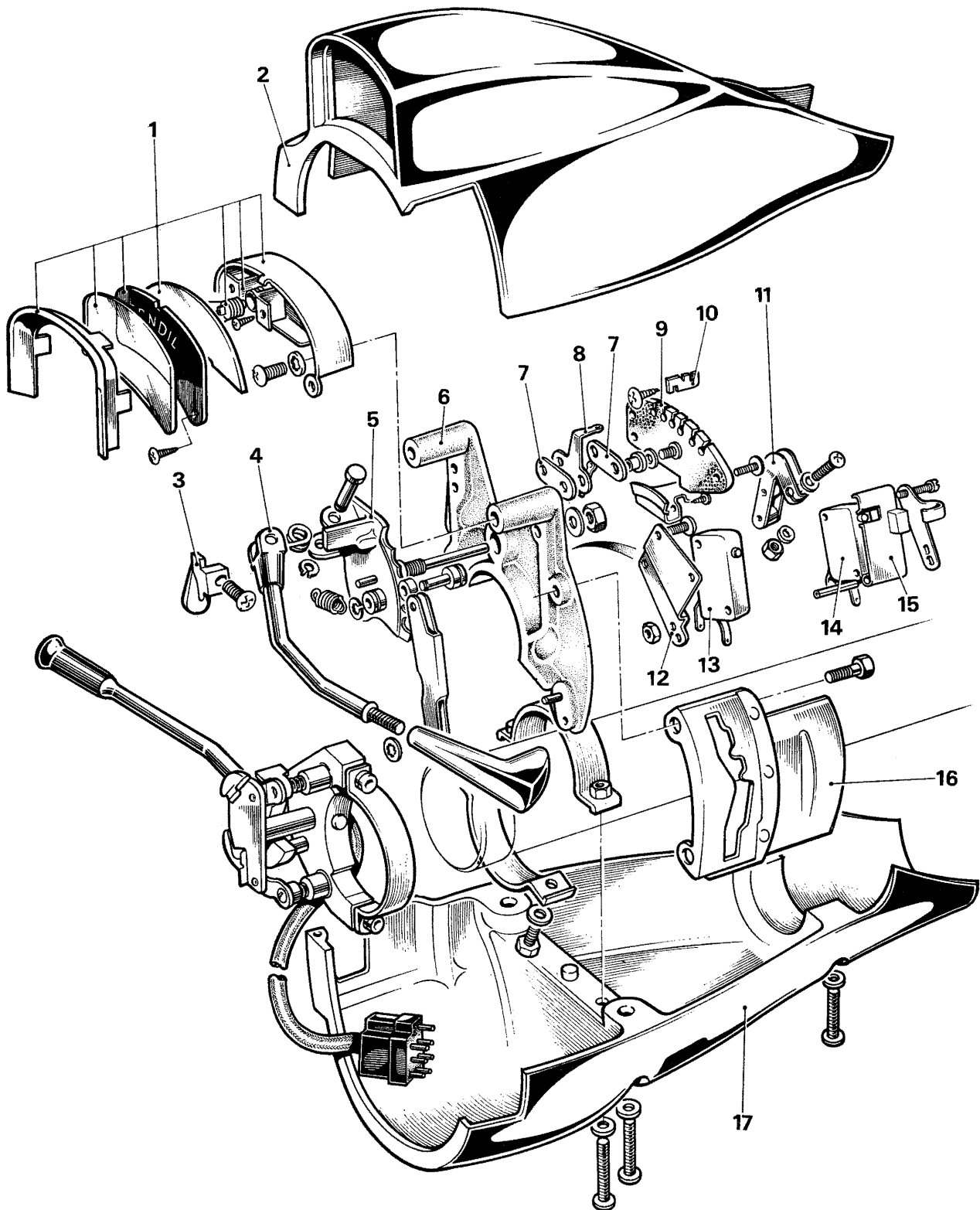
18. Fit the retaining clip to rocking arm pivot.

19. Fit the bulb holder and support bracket.

20. Secure the gate assembly to the underside of the base by means of the two hexagon-headed 3 B.A. screws.

21. Check that, when the position of the lever is controlled by the detents, it lines up with the profile of the gate liner and that the extreme positions of the lever are not limited by the gate.

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**FIG. T161 REMOTE GEARCHANGE SELECTOR
(LATER CARS)**

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**FIG. T161 REMOTE GEARCHANGE SELECTOR
(LATER CARS)**

- | | |
|---|--|
| <p>1 Gear position indicator scale components
2 Upper half of steering column cowl
3 Pointer — gear range selector
4 Gear range selector lever
5 Quadrant assembly
6 Base assembly
7 Insulating piece
8 Spring — contact — gear range selector
9 Insulating piece</p> | <p>10 Contact
11 Reverse lamps operating lever
12 Micro-switch mounting plate — reverse lamps
13 Micro-switch — reverse lamps
14 Micro-switch — fast-idle
15 Lever and buffer assembly
16 Support assembly bracket
17 Lower half of steering column cowl</p> |
|---|--|

22. Fit the insulating plate complete with the feed and supply contacts fitted to it.

23. When the unit is screwed down by the three 5 B.A. screws, check that the inside leg of the moving contact is pressing onto the supply contact and that at the extremities of its travel the hemispherical head is still making good contact with supply contact (see *Remote gearchange selector — To test*).

24. Each selection should then be made in turn, checking that the outside leg on the moving contact lines up correctly with each of the feed contacts.

25. Mount this assembly on the two bosses on the base by means of the two 5 B.A. screws and shake-proof washers.

26. Fit the blue filter with its flattened end in front of the bulb and behind the bracket mounting screw heads. Bend the top radiused end over the bulb and check that it follows the contours of the support bracket.

27. Hold the filter in this position by means of a 0.025 in. (0.64 mm.) feeler gauge held from the front of the unit, fit the indicator scale over the support bracket and secure it with two self-tapping screws. The scale should drop onto the bracket and its lip must not be forced down.

28. Feed the pointer under the indicator scale, then with 'I range' selected, use a thin-bladed Phillips head screwdriver, to feed the single 5 B.A. screw through the pointer leg and screw it into the quadrant boss. Care should be taken not to scratch either the pointer or the indicator scale.

29. Each selection should then be made and the alignment of the pointer checked. Packing washers fitted to the 5 B.A. screw will give the adjustment necessary to correctly 'line-up' the pointer.

30. Screw the micro-switch onto the two bosses on the rear face of the base assembly.

31. Fit the operating arm onto the spindle of the quadrant.

32. **On an early car, not fitted with refrigeration** set the operating arm so that the single micro-switch is depressed when the selection is 'R'.

33. **On a car fitted with refrigeration** the two micro-switches require setting so that the fast-idle micro-switch is depressed just as the selector is engaging 'N'.

34. Check that the 'R' micro-switch is operated satisfactorily. The screw is 5 B.A., therefore it should not be overtightened.

35. Fit the retaining clip to the rocking arm pivot.

36. Lightly smear Ragosine 204G on the quadrant detents, then operate the switch several times to ensure that the Ragosine is spread evenly.

Remote gearchange selector—To fit

1. Fit the remote gearchange selector onto the steering column, locating the dowel in the hole in the column outer tube. The two $\frac{1}{4}$ in. UNF screws which pass through the clamping bracket and into the base are fitted with spring washers.

2. Connect the selector switch and the micro-switch wiring so that the looms leave clearance for fitting the cowling.

3. Fit the lower half of the cowling onto its clamping bracket then fit the upper half of the cowling.

Note Care must be taken when tightening the cowling retaining screws, since the unit, being made of plastic, will crack if overstressed.

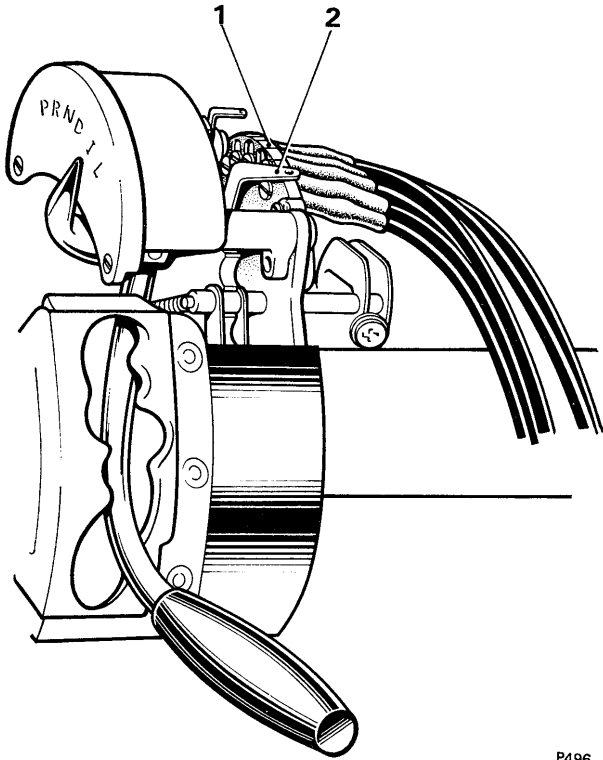
4. Check the clearance between the steering wheel hub and the cowling.

Remote gearchange selector contacts— To set

Whenever the moving or fixed contacts have been disturbed or after the remote gearchange selector have been dismantled and assembled always test the assembly as follows:

When the remote change selector is assembled on the production line the moving contact is shaped such that fitting the fixed contact insulating plate against its machined stops deflects the fixed contact by between 0.050 in. and 0.100 in. (1.27 mm. and 2.54 mm.). This produces the correct pressure between

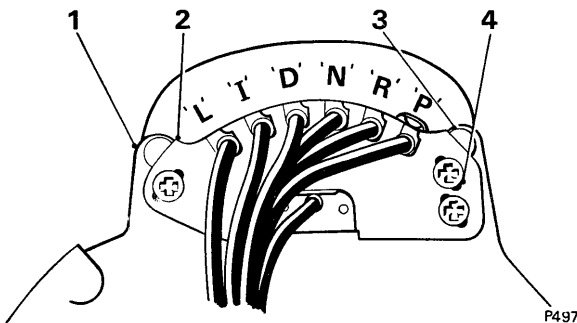
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FIG. T162 MOVING AND FIXED CONTACTS (FRONT VIEW)

- 1 Stationary contacts
- 2 Moving contacts



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FIG. T163 MOVING AND FIXED CONTACTS (REAR VIEW)

- 1 Casting
- 2 Insulating plate
- 3 Stop — to which insulating plate (2) must abut
- 4 Elongated hole

the two contacts and is checked in the following procedure using a 0.001 in. (0,025 mm.) thick piece of paper (e.g. cigarette paper or typists carbon paper). The pressure is correct when the paper is 'nipped' by the contacts. What constitutes sufficient degree of 'nip' can be established by assessment on a car that has had its contacts correctly set.

1. Ensure the handbrake is applied and the ignition switch turned to the 'Lock' position.

2. Remove the top half of the steering column cowl.

Note On Corniche cars it may be found necessary to slacken the two screws retaining the lower half of the cowl in order that the top half be removed without damage.

3. Operate the selector lever and ensure that when the lever is in its detent for all of the 'P', 'R', 'N', 'D', 'I', and 'L' positions, the moving contact is positioned on the relevant fixed contact.

Note Radial adjustment of the fixed contact insulating plate is provided by elongated holes used to attach it to the casting (see Fig. T163).

4. Check that the moving contact is exerting sufficient pressure on each of the fixed contacts by feeling the amount of 'nip' on a 0.001 in. (0,025 mm.) thick piece of paper placed between the contacts.

5. Carefully remove the paper without lifting the moving contact.

6. If this check reveals insufficient contact pressure on any of the fixed contacts ensure that the insulating plate is in its uppermost position. This is when the plate end stops are touching the machined lugs as shown in Figure T163.

7. When adjustment is necessary the contact pressure should be rechecked after this has been carried out.

8. If the contact pressure is still too low it will be necessary to reshape the moving contact such that the deflection produced when fitting the fixed contact insulating plate against its stops is between 0.050 in. and 0.100 in. (1,27 mm. and 2,54 mm.).

Note The fixed contact insulating plate **MUST** be removed when reshaping the moving contact.

9. Ensure that the moving contact is not running on the edge of the fixed contacts.

10. Fit the steering column cowl and test the assembly.

Remote gearchange selector—To test

1. Switch on the ignition with the gear range selector in 'P'.

2. Move the selector slowly to 'R', 'N', 'D', 'I' and 'L' ensuring that the transmission responds correctly by listening for its operation at each position.

3. Select 'P' and 'N' in turn and check that the engine will start.
4. Switch off the engine and select 'R', 'D', 'I', 'L' and at each position ensure that the engine will **NOT** start.
5. Refit the top half of the steering column cowl.
6. With **CARE** ensure that the car:

- (i) Reverses when 'R' is selected.
- (ii) Parks when 'P' is selected.
- (iii) Drives forward when 'D', 'I', 'L' are selected.

Note These checks to be done first by slow deliberate selection of each gear position and secondly by fast operation of the gear selector.

Section T9

TRANSMISSION—TO REMOVE AND FIT

Transmission—To remove

The following procedure is applicable to **all cars** fitted with the Torque Converter Transmission except where divided for either **early** or **later cars**.

1. Drive the car onto a ramp or over a pit; this will enable the transmission to be lowered as it is removed from the car.
2. Ensure that both front road wheels and one rear road wheel are suitably 'chocked' to prevent the car moving.
3. Switch on the ignition and select the 'Neutral' position with the gearchange selector lever; this will ensure that the transmission and propeller shaft are not 'locked' in the 'Park' position.
4. Switch off the ignition and remove the transmission thermal cut-out from the fusebox; refer to the fuseboard identification plate for location.
5. Disconnect the negative lead from the battery, situated in the luggage compartment.
6. Jack up the 'un-chocked' rear road wheel to enable the propeller shaft to be rotated.
7. Disconnect and remove the propeller shaft (see *Propeller shaft — To remove, Chapter F, Section F1*).
8. Lower the rear road wheel of the car and suitably 'chock' as the other three road wheels.
9. Raise the bonnet.
10. Drain the engine coolant (see *Cooling system — To drain, Chapter L, Section L1*).
11. Drain the transmission fluid (see *Section T2 — Servicing*).

12. Remove the dipstick and filler tube. Blank off the hole in the sump to prevent any remaining transmission fluid from running out as the transmission is removed.

13. Disconnect the speedometer cable from the transmission case. Suitably mask both transmission connection and cable end to prevent the ingress of dirt.

14. Unscrew and remove the multi-pin plug from the socket on the gearchange actuator. Suitably mask both the actuator connection and cable end to prevent the ingress of dirt.

15. On **early cars**, remove the nuts and washers securing the neutral start and height control switches to the mounting bracket on the side of the transmission case.

16. Tie the switch and lead assembly to a convenient point so that it will **not** be damaged.

17. Remove the Lucar connection from the solenoid connection on the side of the transmission case. On **early cars** note the colour of the leads to assist correct assembly; there are two leads, one to the detent solenoid and the other to the stator solenoid. On **later cars** there is only one (Green/white) wire to the side of the transmission case and this operates the detent solenoid. Tie the lead to a convenient point so that it will not be damaged.

18. Disconnect and remove the actuator breather pipe. On **later cars** also disconnect the flexible tube end of the breather from the adapter in the crossmember. Mask all open connections.

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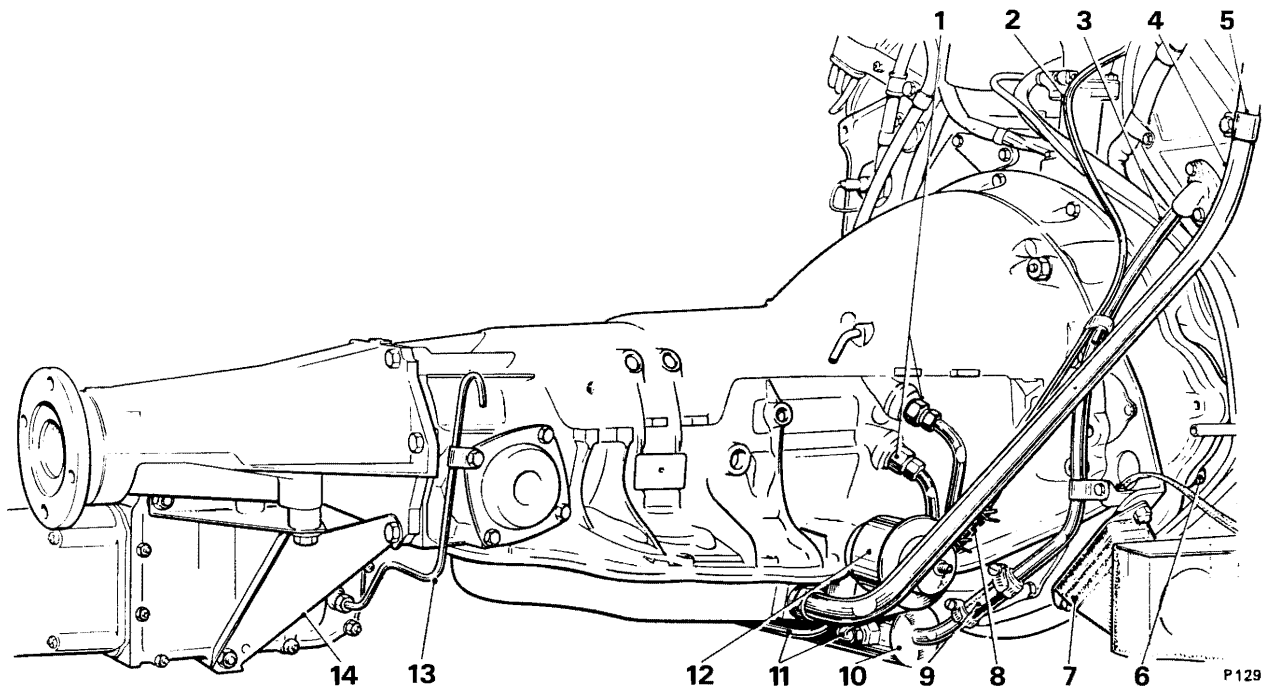


FIG. T164 TRANSMISSION DISCONNECTING POINTS — OFF-SIDE (EARLY CARS)

- | | |
|--|--|
| 1 Transmission fluid feed and return pipes | 8 Vacuum pipe connection |
| 2 Vacuum pipe | 9 Coolant pipe connection |
| 3 Coolant feed pipe to heat exchanger | 10 Heat exchanger |
| 4 Dipstick and filler tube | 11 Transmission fluid pipes (heat exchanger end) |
| 5 Dipstick and filler tube clip | 12 Vacuum modulator |
| 6 Starter motor bottom bolt | 13 Electric actuator breather pipe |
| 7 Right-hand flexible mount | 14 Actuator mounting brackets |

19. Disconnect and remove the various operating rods and levers from the side of the transmission case (see Figs. T165 and T167).

20. Remove the three bolts which secure the actuator to the rear extension; remove the actuator.

21. Disconnect the throttle operating rod (see Figs. T139, T140 and T141 — *Control rod — accelerator to compensator linkage*), at the compensating linkage. On right-hand drive cars, also disconnect the throttle operating rod at the lower end and remove the complete rod. On left-hand drive cars, remove the setscrews which secure the accelerator cross-shaft brackets to the underside of the body; remove the brackets, shaft, levers and rods, including the rod connecting the accelerator lever to the cross-shaft lever.

22. Remove the starter motor (see *Starter motor — To remove, Chapter M, Section M4*).

23. Disconnect the vacuum modulator pipe at the modulator end and at the induction manifold; remove the pipe and mask the open connections.

24. On early cars, disconnect the two short rubber hoses, one on each side of the heat exchanger.

Note There will be coolant in the heat exchanger and associated pipes which will not drain until the rubber hoses are disconnected. Therefore, it is advisable for the operator to ensure that a suitable container is available.

25. On early cars, disconnect the heat exchanger coolant feed pipe from the rear of 'A' bank cylinder head. Remove the various clips and bolts which secure the coolant pipe to the transmission and the vacuum pipe; remove the coolant pipe. Disconnect the coolant return pipe from the junction above 'B' bank rocker cover. Remove the various clips and bolts which secure the coolant return pipe; remove the pipe.

26. On early cars, disconnect and remove the heat exchanger transmission fluid pipes; these are located on the dipstick side of the transmission. Remove the setscrews which secure the heat exchanger to the bell

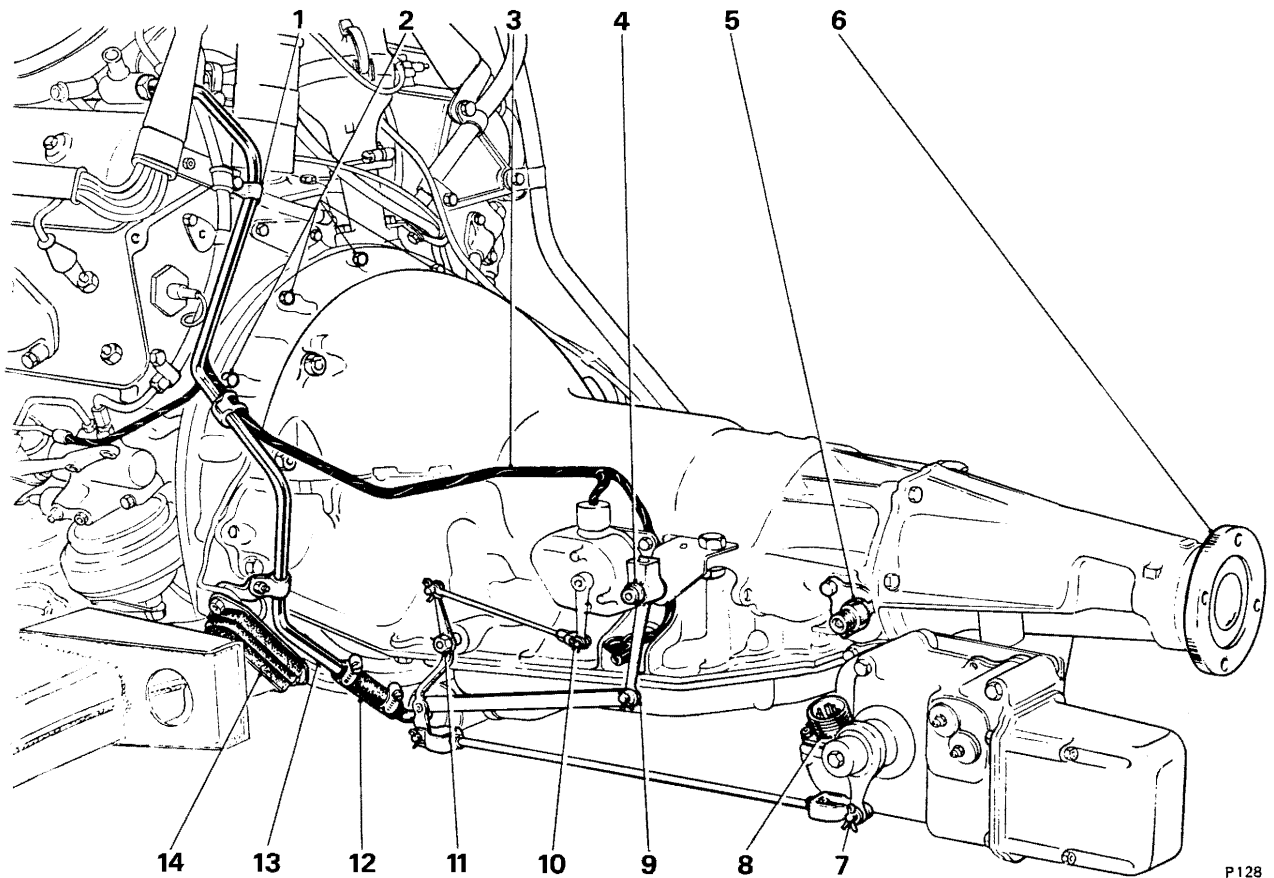


FIG. T165 TRANSMISSION DISCONNECTING POINTS—NEAR-SIDE (EARLY CARS)

- | | |
|---------------------------------------|---------------------------------------|
| 1 Coolant return pipe clip | 8 Jack plug socket |
| 2 Transmission top securing setscrews | 9 Detent and stator lead contents |
| 3 Micro-switch and solenoid leads | 10 Micro-switch lever clevis pin |
| 4 Emergency (get-you-home) lever | 11 Gearchange lever lock-nut |
| 5 Speedometer drive | 12 Heat exchanger cooling connection |
| 6 Coupling flange | 13 Heat exchanger coolant return pipe |
| 7 Actuator lever clevis pin | 14 Near-side flexible mount |

housing bottom cover; remove the heat exchanger and mask the open connections.

27. On **later cars**, disconnect the two transmission fluid flexible pipes leading to and from the heat exchanger situated in the engine coolant radiator. The pipes should be disconnected at a point by the dipstick side of the transmission case where the flexible pipe joins the solid metal pipe.

Note There may be a small quantity of transmission fluid in the pipes which will drain out when the pipes are disconnected, therefore, ensure a suitable container is available.

28. Remove the setscrews which secure the front cover plate and the bell housing bottom cover; remove the plate and cover.

29. Remove the setscrews which secure the engine flexplate to the torque converter.

Note Take care when turning the torque converter to reach the setscrews; do not lever on the flexplate or starter ring as they may become damaged.

30. On **early cars** the transmission is secured to the adapter plate by through bolts and therefore, the adapter plate must be removed with the transmission. **In these instances proceed as follows.**

31. Position a jack under the rear of the engine sump. Ensure that the load is spread evenly by placing a piece of soft wood between the sump and the head of the jack.

32. Raise the jack to take the weight of the engine and transmission.

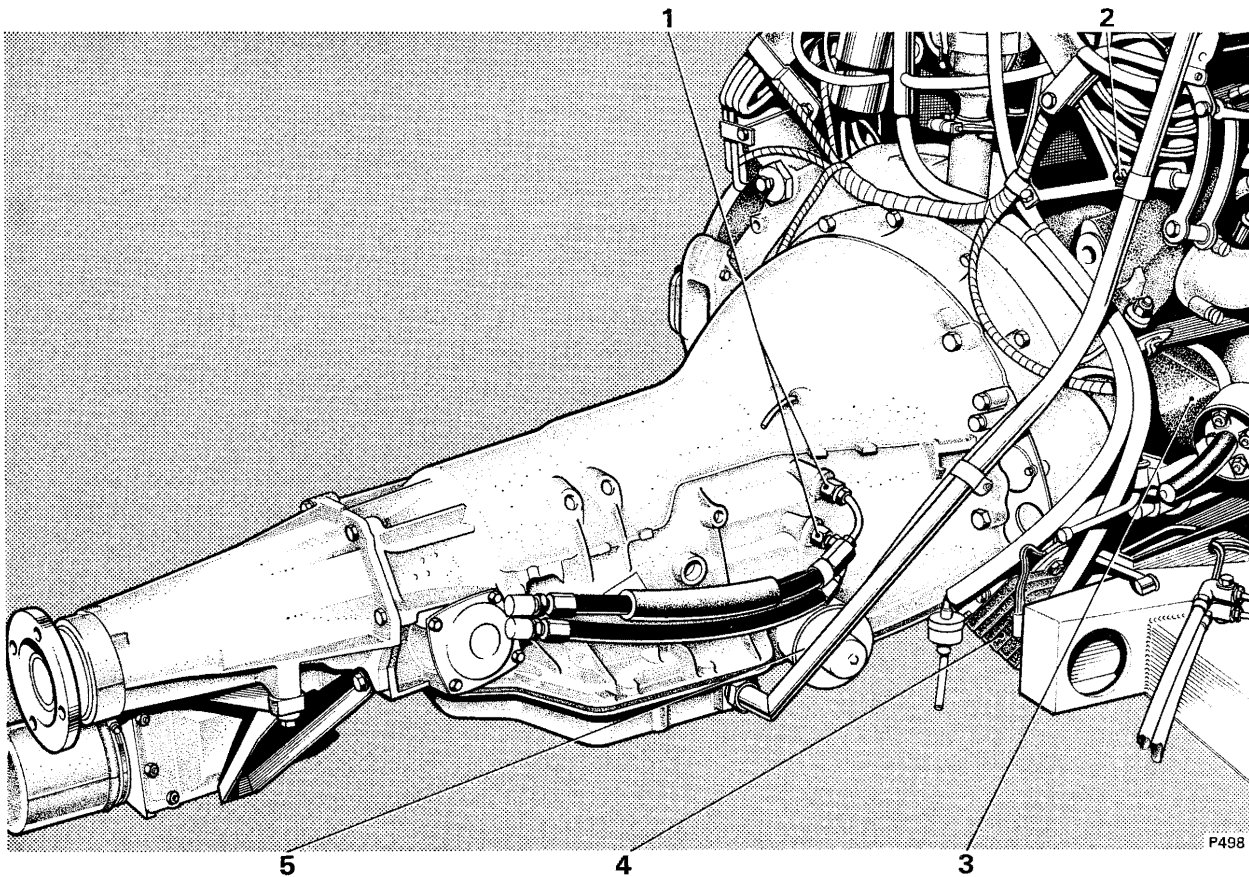


FIG. T166 TRANSMISSION DISCONNECTING POINTS—OFF-SIDE (LATER CARS)

- 1 Transmission oil cooler pipe connections
- 2 Dipstick/filler tube clip
- 3 Starter motor setscrews
- 4 Offside flexible mount
- 5 Vacuum modulator pipe

33. Remove any dirt around the mounting brackets, then scribe correlation marks on the transmission feet and the sub-frame around the mounting brackets.

Note Scribing the correlation marks on the mounting brackets will enable the transmission to be correctly positioned when it is fitted.

34. Support the transmission with the aid of a trolley jack and extension, using a suitable platform to fit around the transmission sump.

35. Remove the bolts which secure the rubber mountings to the transmission.

36. Remove the setscrews which secure the brackets to the sub-frame. Remove the mounting brackets and rubber mounts.

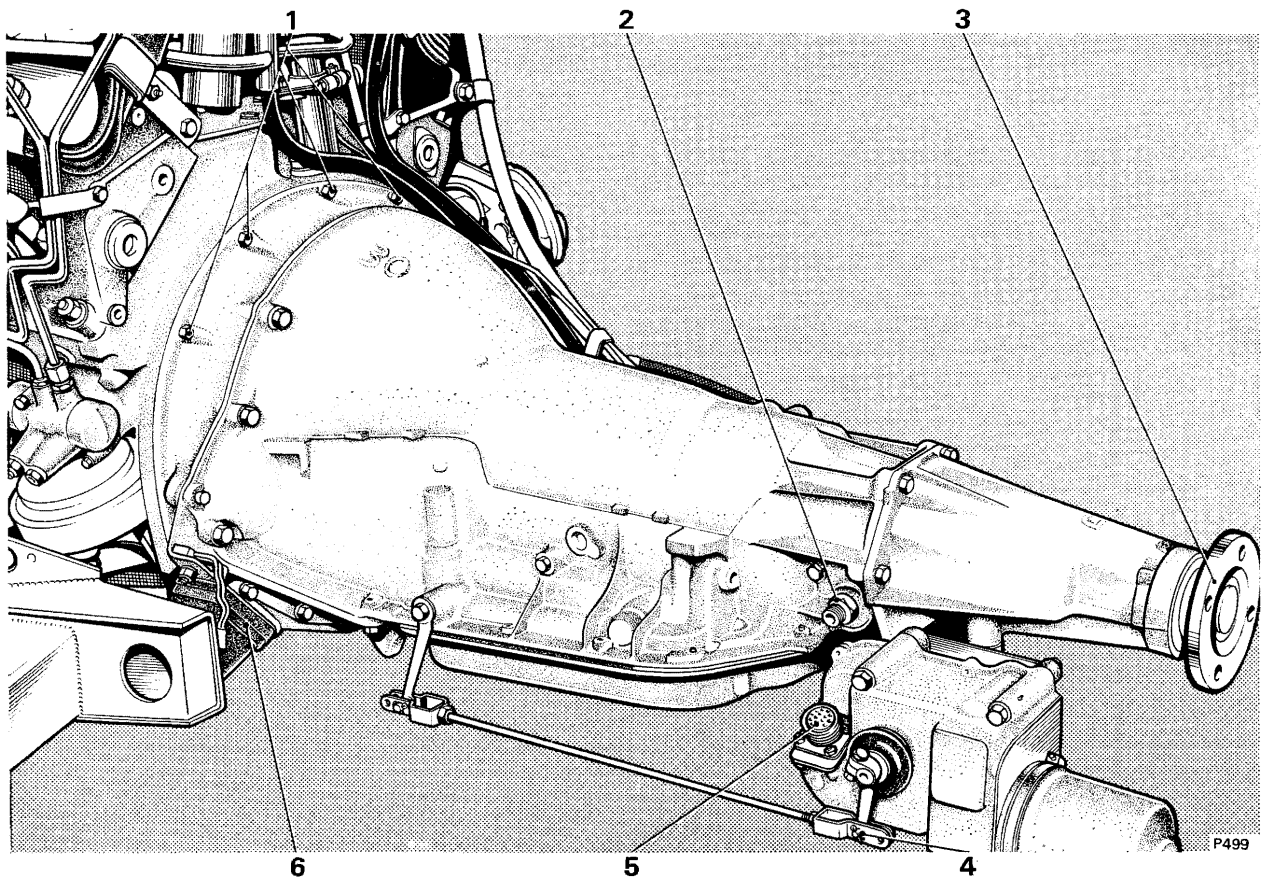
37. Unscrew the eight setscrews which secure the transmission to the engine. It may be necessary to lower the engine and transmission slightly to gain

access to some of the setscrews; the uppermost setscrews can be reached from the engine compartment.

Note It may not be possible to remove all setscrews completely owing to the close proximity of the adjacent components, however, the setscrews may be unscrewed sufficiently to clear their mating threads. **Do not** remove the five large nuts and one setscrew which secure the transmission to the adapter.

38. Carefully move the transmission towards the rear of the car, disengaging the adapter from the engine crankcase. The adapter is dowelled to the crankcase.

39. On **later cars**, the transmission is secured to the adapter plate by setscrews, and can be removed from



**FIG. T167 TRANSMISSION DISCONNECTING POINTS—NEAR-SIDE
(LATER CARS)**

- 1 Transmission top securing setscrews
- 2 Speedometer drive
- 3 Coupling flange
- 4 Actuator lever clevis pin
- 5 Actuator socket
- 6 Near-side flexible mount

the car whilst leaving the adapter and the mounting plate in position.

40. Support the transmission with the aid of a trolley jack and extension, using a suitable platform to fit around the transmission sump.

41. Unscrew the five setscrews which secure the transmission to the adapter.

42. Carefully move the transmission towards the rear of the car until the dowels in the transmission are clear of the mounting plate.

43. **The remaining procedure is applicable to all cars.**

44. Fit the retaining clamp RH 7952 (J-21366) to prevent the converter from becoming disengaged from the transmission.

Note The retaining clamp must be used, otherwise the converter may fall as the transmission is being removed.

45. Lower the jack until the transmission is clear of the body then remove the transmission from the car.

46. Remove the retaining clamp then withdraw the converter.

Note A converter with oil weighs approximately 50 lb. (22,7 kg.).

47. If overhaul work is to be carried out, fit the transmission into the holding fixture RH 7956 (J-8763-20) as shown in Figure T168.

Transmission—To fit

Fit the transmission by reversing the procedure given for the removal, noting the following points.

1. Torque tighten the various nuts, bolts, setscrews etc. to the figures quoted in Chapter P.

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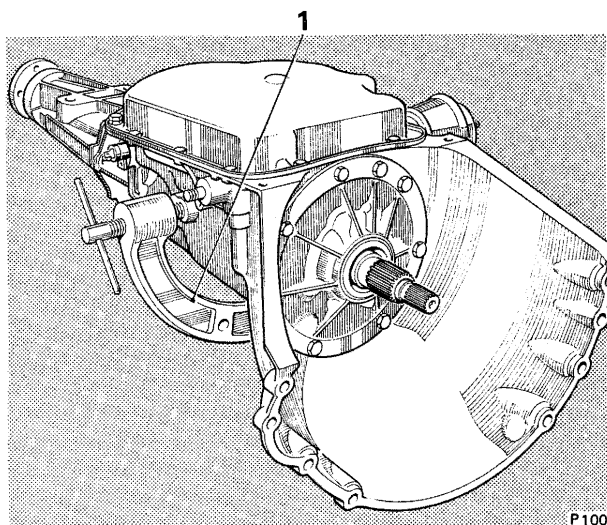


FIG. T168 TRANSMISSION IN HOLDING FIXTURE

1 Holding fixture

2. On early cars, ensure that the mating faces of the transmission adapter and the engine crankcase are clean and free from damage.

Note It is advisable to fit the setscrews into those holes which are difficult to reach once the transmission is in position.

3. On later cars, ensure that the mating faces of the transmission and the mounting plate are clean and free from damage.

Observe the following notes carefully when securing the torque converter to the engine flexplate.

1. Rotate the converter until two of the three weld nuts on the converter line up with the two bolt holes in the flexplate.

2. Position the converter so that the weld nuts are flush with the flexplate. Ensure that the converter is not tilted and that the pilot in the centre of the converter is correctly located in the crankshaft.

3. Fit two setscrews from the front of the flexplate and torque tighten them to 28 lb. ft. (3,9 kg. m.).

Note The two bolts must be tightened at this stage to ensure that the converter is correctly aligned with the flexplate and crankshaft.

4. Insert a screwdriver or pinch bar under one of the converter weld nuts.

5. Rotate the converter until the third setscrew can be fitted. Torque tighten this setscrew. **Do not** lever on the starter ring when rotating the converter.

6. If the adapter and mounting plate have been removed raise the transmission slightly higher than its normal position and fit the mounting brackets and rubber mounts. Before tightening the brackets to the sub-frame and transmission, ensure that the correlation marks which were scribed during removal, are aligned.

7. Ensure the earthing lead is fitted to the top bolt on the right-hand mounting foot.

8. Connect the throttle operating rod; ensure that the joints are adequately lubricated and that the throttles open fully when the accelerator pedal is depressed and return to the closed position immediately the pedal is released.

9. After completion of the fitting operation, fill the engine cooling system and the transmission system with their respective fluids.

10. Finally road test the car for satisfactory operation.

Section T10

TORQUE CONVERTER

The torque converter serves two primary functions. It acts as a fluid coupling to transmit engine torque smoothly to the transmission, it also multiplies the engine torque when additional performance is required.

The torque converter comprises three basic elements; a pump, a turbine and a stator (*see Fig. T169*).

The converter cover is welded to the pump to seal all three members in an oil filled housing. An engine driven flexplate bolts directly onto the converter cover so that the converter pump is mechanically connected to the engine and turns whenever the engine rotates.

When the engine is running and the converter pump is rotating, oil is picked up at the centre of the pump and discharged at the rim, between the pump blades.

The pump shell and blades are designed so that the oil leaves the pump rotating clockwise, toward the turbine blades. As the oil strikes the turbine blades, it causes the turbine to rotate.

When the engine is idling, the converter pump rotates slowly and the force of oil is not sufficient to rotate the turbine with any efficiency. This situation enables the car to stand in gear with the engine slowly idling. As the engine throttle is opened, the pump speed increases and the force of oil striking the turbine causes it to transmit torque to the gear train. After the oil has imparted its force to the turbine, the oil follows the contour of the turbine shell and blades, leaving the centre of the turbine, and rotating anti-clockwise.

Because the turbine member has absorbed the force required to reverse the direction of the clockwise

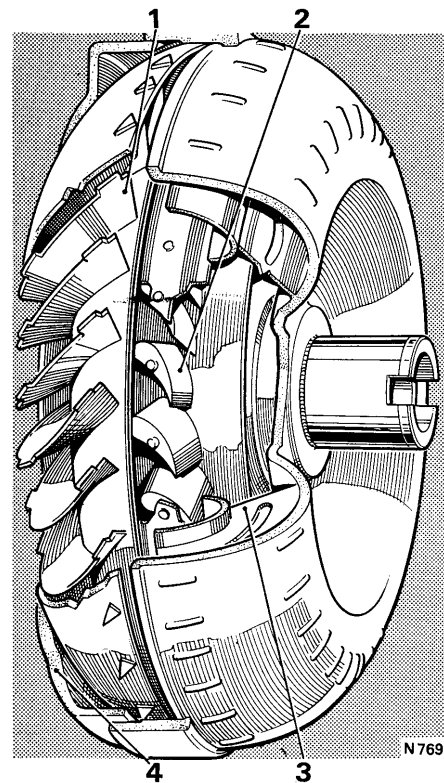


FIG. T169 TORQUE CONVERTER—CUT-AWAY VIEW

- 1 Turbine
- 2 Variable angle stator (early cars)
- 3 Pump
- 4 Converter cover

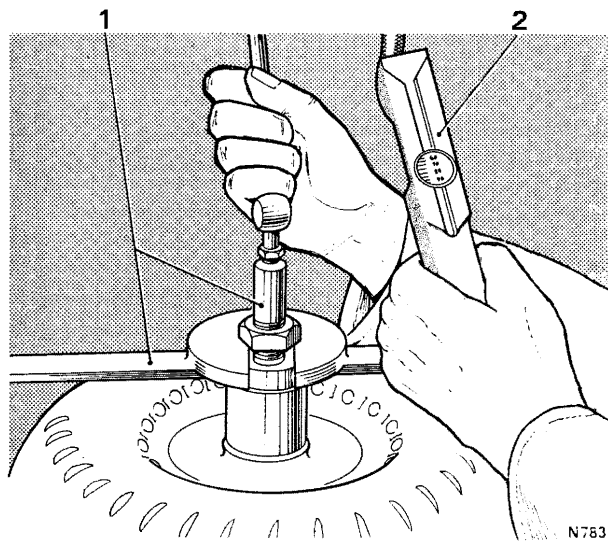


FIG. T170 TORQUE CONVERTER—LEAK TESTING FIXTURE

- 1 Converter leak test fixture
- 2 Pressure gauge

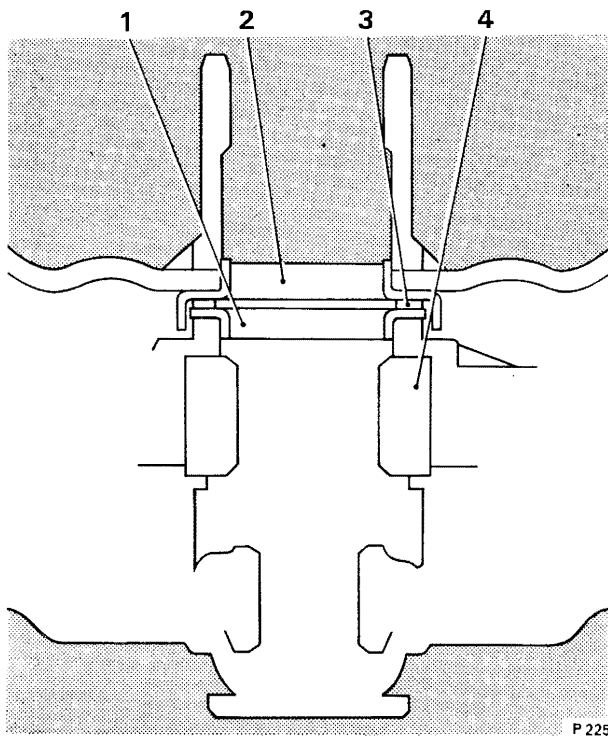


FIG. T171 TORQUE CONVERTER—INTERNAL BEARING ARRANGEMENTS

- 1 Thrust race L
- 2 Thrust race Z
- 3 Thrust roller bearing
- 4 Roller clutch stator race

rotating oil it now has greater torque than is being delivered by the engine.

To prevent the anti-clockwise spinning oil from striking the pump blades at an angle that would hinder its rotation, a stator assembly is interposed between the pump and the turbine. The purpose of the stator is to redirect the oil returning from the turbine so that its direction is altered to suit that of the pump (see Fig. T169); the energy of the oil is then used to assist the engine in turning the pump. This increases the force of the oil driving the turbine and, as a result, multiplies the torque.

The force of oil flowing from the turbine to the stator blades tends to rotate the stator anti-clockwise, but a clutch, on which the stator is mounted, prevents this.

As both turbine and car speeds increase, the direction of the oil leaving the turbine changes. The oil flows clockwise against the rear side of the stator vanes. If the stator was fixed, the flow of oil would be impeded, but the clutch allows the stator to rotate on its shaft. Once the stator becomes inactive there is no further torque multiplication and the converter functions as a fluid coupling at a ratio of 1 : 1.

Torque converter—To remove

1. Remove the transmission as described in Section T9 — Transmission — To remove and fit.

Note Do not forget to fit the Convert Holding Clamp RH 7952 (J-21366) otherwise the converter may fall when the transmission is removed.

2. Position a drip tray underneath the converter.
3. Remove the converter retaining clamp from the bell housing end of the transmission casing; remove the converter.

Caution The converter and oil weigh approximately 50 lb. (22,7 kg.) and care should be taken when removing it to ensure that it is not dropped or damaged.

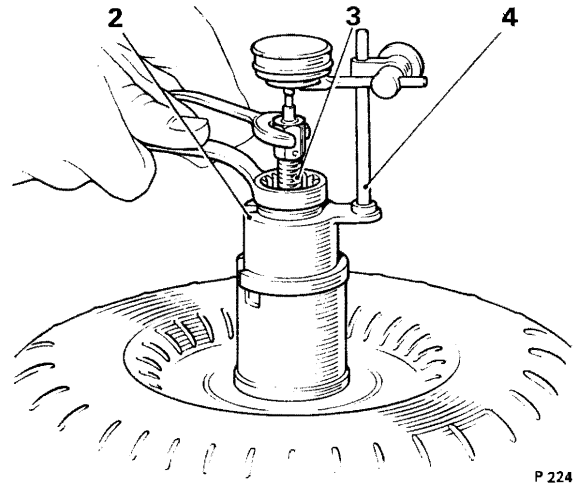
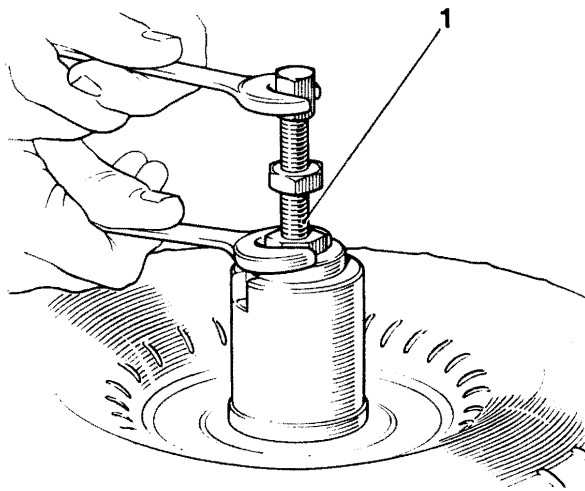
Torque converter—To fit

1. If the torque converter has been leak tested, ensure that all traces of water have been removed.
2. Fit the converter to the transmission, ensuring that the driving slots engage with the tangs in the transmission oil pump.
3. Fit the converter holding clamp RH 7952 (J-21366).

Torque converter—To inspect

After removing the torque converter from the transmission visually inspect as follows.

1. Examine the converter for signs of damage.
2. Examine the neck of the converter for wear.
3. Examine the pump drive slots for wear.



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FIG. T172 CHECKING CONVERTER END CLEARANCE

1 Tool J-21371-8
2 Tool J-21371-3

3 Tool J-21371-8
4 Tool J.8001

For a more detailed procedure of inspection refer to 'Torque Converter' in the 'Fault Diagnosis Chart' on Page T175.

8. Depress the valve stem to release the air pressure; remove the leak test fixture.

Caution Ensure that the pressure is released before removing the fixture, otherwise the valve may blow out during removal.

Torque converter—To leak Test

Fit Workshop Tool RH 7954 (J-21369) to the torque converter as follows.

1. Fit the valve portion of the fixture into the neck of the converter; unscrew the large hexagonal nut.
2. Fit the fixture band crosswise onto the converter so that the slotted plate fits around the valve and under the nut (*see Fig. T170*).
3. Tighten the nut to expand the 'O' ring so that a good seal is obtained.
4. Apply compressed air to the valve in the top of the tool at 80 lb/sq.in. (5,6 kg/sq.cm.).
5. Immerse the converter in water, noting any sign of bubbles which would indicate a leak.
6. Remove the converter from the water.
7. Renew the converter if a leak is evident.

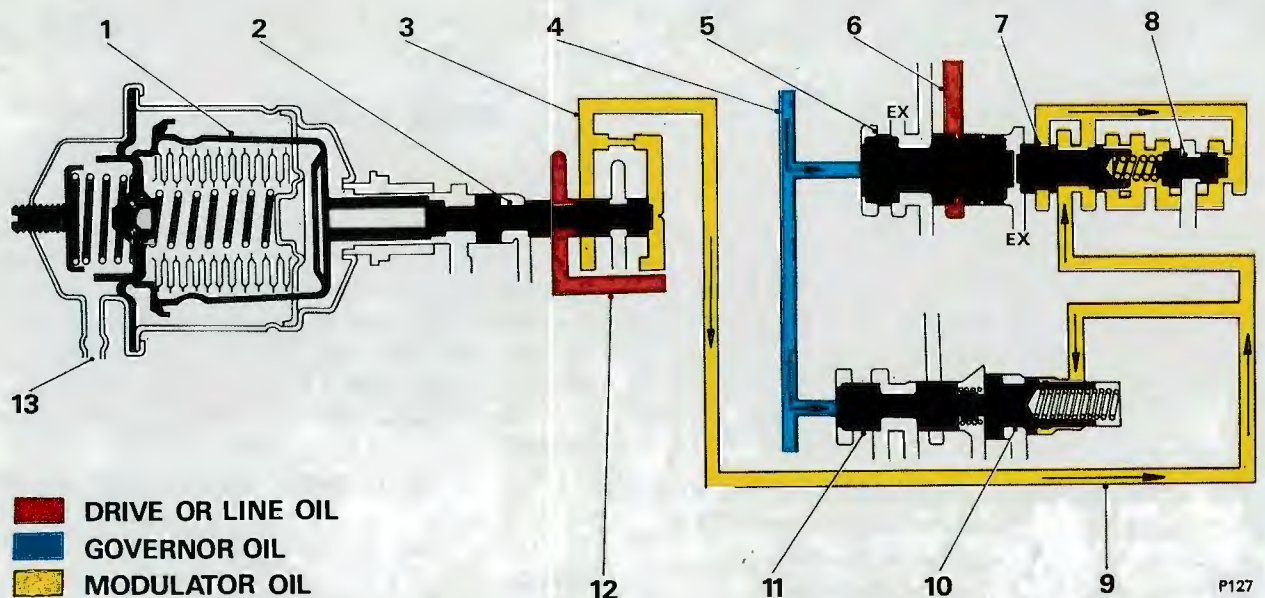
Converter end clearance—To check

1. Fully release collet end of Tool J-21371-8.
2. Install collet end of Tool J-21371-8 into converter hub until it bottoms (*see Fig. T172*); then tighten its cap nut to 5 lb. ft. (0,691 kg.m.).
3. Install tool J-21371-3 and tighten hexagon nut to 3 lb. ft. (0,415 kg.m.) (*see Fig. T172*).
4. Install Dial Indicator J-8001 and set it at 'Zero', while its plunger rests on the cap nut of Tool J-21371-8.
5. Loosen the hexagon nut while holding the cap nut stationary. With the hexagon nut loosened and holding tool J-21371-3 firmly against converter hub, the reading obtained on the Dial Indicator will be the converter end clearance. End clearance should be less than 0.050 in. (1,27 mm.). If the end clearance is 0.050 in. (1,27 mm.) or more replace the converter.

Section T11 VACUUM MODULATOR AND VALVE

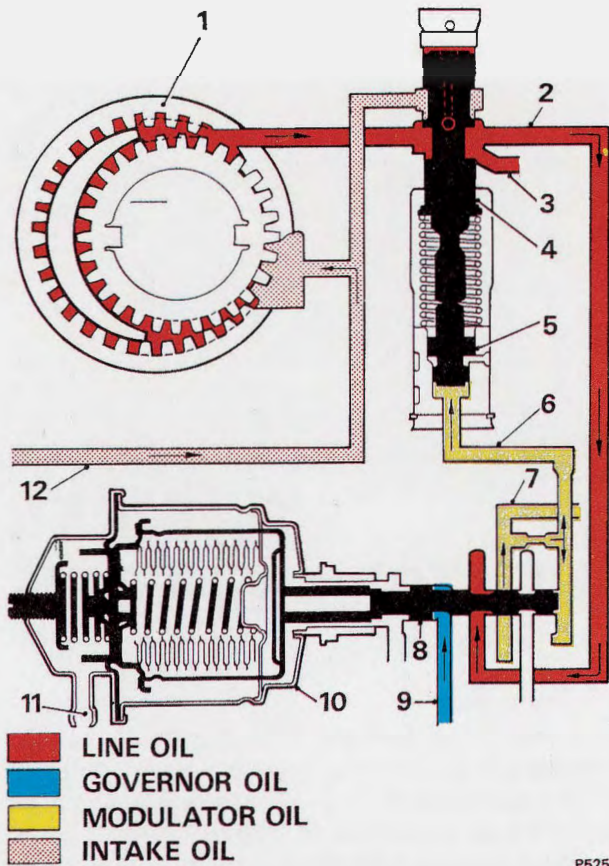
The vacuum modulator is secured to the right-hand side of the transmission case and is connected by a pipe to the engine induction system. The modulator consists of a metal case which encloses an evacuated metal bellows, a diaphragm and two springs. These

components are arranged so that when fitted, the bellows and an external spring apply a force that acts on the modulator valve to increase modulator pressure. Engine vacuum and an internal spring act in the opposite direction to decrease modulator pressure.



**FIG. T173 VACUUM MODULATOR AND VALVE
SHOWING MODULATOR PRESSURE**

- | | | |
|--------------------|--------------------|------------------------|
| 1 Vacuum modulator | 6 Drive oil | 9 Modulator oil |
| 2 Modulator valve | 7 1-2 detent valve | 10 2-3 modulator valve |
| 3 Modulator oil | 8 Regulator valve | 11 2-3 valve |
| 4 Governor oil | | 12 Line oil |
| 5 1-2 valve | | 13 Vacuum connection |



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FIG. T174 VACUUM MODULATOR AND VALVE SHOWING LINE PRESSURE CONTROL

- 1 Vacuum modulator
- 2 Modulator valve
- 3 Modulator oil
- 4 Governor oil
- 5 1-2 valve
- 6 Drive oil
- 7 1-2 detent valve
- 8 Regulator valve
- 9 Modulator oil
- 10 2-3 modulator valve
- 11 2-3 valve
- 12 Line oil
- 13 Vacuum connection

To reduce the effect of altitude on shift points, the effective area of the diaphragm is different than that of the bellows. Atmospheric pressure acts on the resulting differential area to reduce modulator pressure.

The vacuum modulator fitted to a transmission can vary dependent upon 'model year' and original build specification of the car. It is therefore, of utmost importance to ensure that the correct parts are fitted to a transmission should replacement parts be required.

To identify the modulator change the prefix letters of the transmission were change from RR to RS. It

should also be noted that on later cars a restrictor is fitted at the bottom of the modulator pipe and an error in assembly at this point could result in a blocked signal line especially on cars fitted with full emission control systems.

Modulator pressure is directed to the 1-2 regulator valve which regulates modulator pressure to a lesser pressure which is proportional to modulator pressure. This tends to keep the 1-2 shift valve in the closed or down-change position. Modulator pressure is directed also to the 2-3 modulator valve to apply a variable pressure proportional to modulator pressure. This tends to hold the 2-3 shift valve in the closed, or down-change position. As a result, the gear change points can be delayed to take place at higher road speeds with heavy throttle application (see Fig. T173).

Main line oil pressure is controlled in Drive range so that it will vary with torque input to the transmission. Since torque input is a product of engine torque and converter ratio, modulator pressure is directed to a pressure regulator boost valve, to adjust main line (pump) pressure for changes in either engine torque or converter ratio (see Fig. T174).

To regulate modulator pressure and in turn, line pressure, with the converter torque ratio that decreases as car speed increases, governor pressure is directed to the modulator valve to reduce modulator pressure with increases in car speed. In this way, line pressure is regulated to vary with torque input to the transmission for smooth changes with sufficient capacity for both heavy and light acceleration.

Vacuum modulator and valve—

To remove

The vacuum modulator can be removed from the transmission without removing the transmission from the car. The following instructions apply whether or not the transmission has been removed.

1. Place a drip tray beneath the vacuum modulator.
2. Disconnect the vacuum pipe at the modulator end if the transmission is in the car (see Fig. T175).
3. Remove the setscrew and retainer which secure the modulator to the transmission.
4. Remove the modulator and 'O' ring; discard the 'O' ring.
5. Remove the modulator valve from the transmission case.

Vacuum modulator and valve—

To inspect

1. Examine the vacuum modulator for signs of distortion.
2. Examine the 'O' ring seat for damage.
3. Apply suction to the vacuum tube on the modulator and check for leakage.

4. Examine the modulator valve for scores or damage.

5. Ensure that the valve will move freely in its bore in the case.

6. Examine the modulator for damaged bellows. The modulator plunger is under approximately 16 lb. (7,3 kg.) pressure. If the bellows is damaged, very little pressure will be applied to the plunger.

Vacuum modulator and valve—To fit

1. Fit the valve into the bore in the case with the stem outward.

2. Fit a new 'O' ring to the modulator.

3. Fit the modulator to the case with the vacuum pipe connection toward the front of the car, approximately 20° from the vertical.

4. Fit the retainer with the curved side of the tangs facing the transmission.

5. Fit the retaining setscrew and torque tighten it to 18 lb. ft. (2,5 kg. m.).

6. Connect the vacuum pipe.

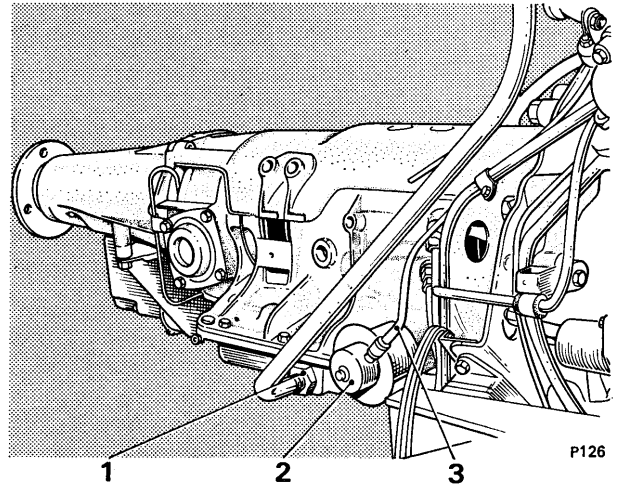


FIG. T175 VACUUM MODULATOR AND VACUUM PIPE

- 1 Oil filler tube securing nut
- 2 Vacuum modulator
- 3 Vacuum pipe

Section T12

GOVERNOR ASSEMBLY

The governor assembly (*see Fig. T176*) fits into the rear of the transmission casing on the right-hand side and is driven by a gear on the transmission output shaft.

The car speed signal to the transmission is supplied by this governor.

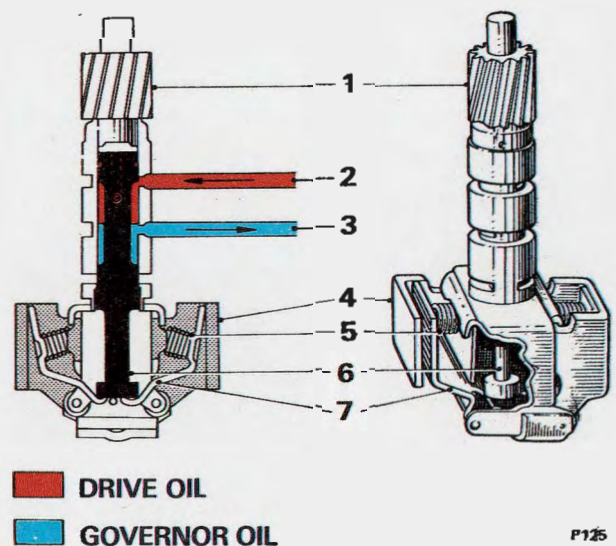
The assembly comprises a regulating valve, two primary weights, two secondary weights, secondary springs, body and driven gear. The weights are arranged so that only the secondary weights act on the valve. The primary weights contribute to the secondary weights through the secondary springs.

Slight changes in output shaft r.p.m. at low speeds result in small governor pressure changes.

The primary weights add heavy force to the secondary weights to obtain greater changes in pressure as road speed and output shaft r.p.m. increase. As the primary weights move out at higher car speeds they reach a stop and no longer become effective. From this point, the secondary weights and springs only are used to apply pressure on the governor valve.

Drive oil pressure is fed to the governor where it is regulated by the governor and gives an oil pressure that is proportional to car road speed.

To initiate the gear change from first to second, governor oil pressure is directed to the end of the 1-2 shift valve where it acts against spring pressure which is holding the valve in the down-change (closed) position (*see Fig. T177*).

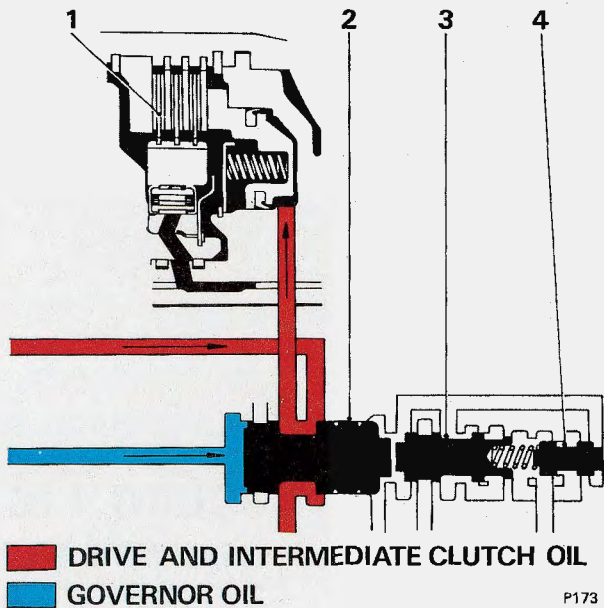


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FIG. T176 GOVERNOR ASSEMBLY

- 1 Driven gear
- 2 Drive oil
- 3 Governor oil
- 4 Primary weight
- 5 Spring
- 6 Valve
- 7 Secondary weight

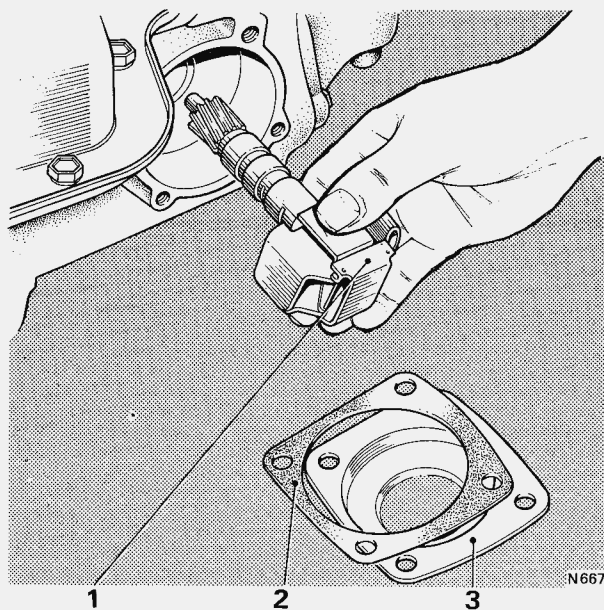
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FIG. T177 GOVERNOR OIL ACTING ON THE 1-2 SHIFT VALVE

- 1 Intermediate clutch
- 2 1-2 valve
- 3 1-2 detent valve
- 4 Regulator valve



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FIG. T178 REMOVING THE GOVERNOR ASSEMBLY

- 1 Governor
- 2 Gasket
- 3 Cover plate

As the car road speed and subsequently the governor oil pressure increases sufficiently to overcome the spring resistance, the 1-2 shift valve train moves, allowing drive oil to flow into the intermediate clutch passage and through an orifice to apply the intermediate clutch. This makes the intermediate clutch effective which moves the transmission into second gear. Further increases in road speed and governor pressure will cause the transmission to change into third gear when governor pressure overcomes the 2-3 shift valve spring pressure.

Governor pressure is directed also to the modulator valve to regulate modulator pressure as described in Section T11.

On cars fitted with **transmissions prior to Serial Number 72 RR 2268** lubrication for the governor was provided by means of an output shaft with an axial lubrication passage which takes lubricant to a point rearwards of the speedometer drive gear. From this point the lubricant passes through a radial drilling to the governor sleeve, providing lubrication for governor.

Cars fitted with **transmission Serial Number 72 RR 2268 and onwards**, governor lubrication is provided by a flat in the governor sleeve which allows oil to pass to the moving parts of the governor. The output shaft of these later transmissions is not provided with any lubrication passages.

In view of these changes it is most important that the new output shaft without the oil passage and the governor with the lubrication flat are used on the later transmission only.

Governor assembly—To remove

The governor assembly can be removed from the transmission whether the transmission is fitted to the car or not.

1. Position a drip tray beneath the governor cover plate.
2. Remove the four setscrews which secure the plate to the case; remove the plate and discard the gasket.
3. Withdraw the governor assembly from the case (see Fig. T178).

On later transmissions, changes to manufacture of the transmission case has eliminated the shoulder at the bottom of the governor pipe holes. As a result it is possible to force the governor pipes deep enough into the transmission case to enter the governor bore and either bind or lock the governor.

Therefore, if difficulties are experienced when removing the governor assembly, withdraw the pipes approximately 0.125 in. (0,32 cm.).

Governor assembly—To dismantle

All the governor assembly components, with the exception of the driven gear, are selectively assembled and each assembly is calibrated. Therefore, it is recommended that if the governor assembly becomes unserviceable, it be renewed as an assembly. If the driven gear is damaged, it can be renewed separately.

It is necessary to dismantle the governor assembly in order to renew the driven gear. Dismantling may be necessary also to thoroughly clean the governor should dirt cause it to malfunction. In such cases proceed as follows.

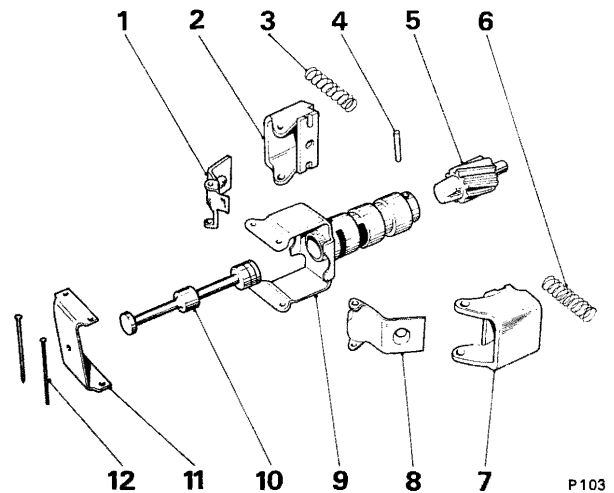
1. Cut off one end of each of the governor weight retaining pins.
2. Remove the pins, thrust cap, governor weights and springs (see Fig. T179). The weights are interchangeable and need not be marked for identification.
3. Carefully remove the governor valve from the sleeve.

Governor assembly—To inspect

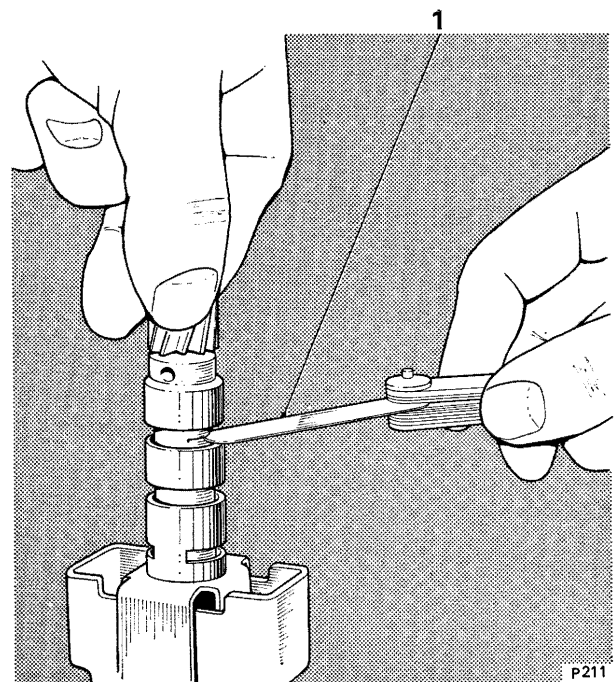
1. Wash all the components in clean paraffin (kerosene) then dry them with compressed air.
2. Examine the governor sleeve for scores or burrs.
3. Ensure that the governor sleeve will slide freely into its bore in the transmission casing.
4. Examine the valve for scores and burrs.
5. Ensure that the valve will slide freely in the governor sleeve bore.
6. Examine the driven gear for damage. Ensure that the gear is secure on the shaft.
7. Examine the springs for damage or distortion.
8. Ensure that the weights operate freely in their retainers.
9. Check the valve opening at inlet and exhaust; the minimum is 0.020 in. (0.508 mm.).
10. Hold the governor as illustrated in Figures T180 and T181 when carrying out this check.

Governor driven gear—To renew

1. Drive out the gear retaining pin using a hammer and drift (see Fig. T182).
2. Support the governor sleeve on two 0.187 in. (4.76 mm.) thick plates inserted in the exhaust slots in the sleeve.
3. Position the plates on the bed of a press with provision for the gear to pass through, then, using a long drift, press the gear out of the sleeve.

**FIG. T179 GOVERNOR ASSEMBLY—EXPLODED**

- 1 Spring retainer (secondary weight)
- 2 Weight
- 3 Weight spring
- 4 Gear retaining pin
- 5 Driven gear
- 6 Weight spring
- 7 Weight
- 8 Spring retainer (secondary weight)
- 9 Sleeve and carrier assembly
- 10 Valve
- 11 Thrust cap
- 12 Retaining pins

**FIG. T180 CHECK VALVE OPENING (INLET)**

- 1 0.020 in. (0.508 mm.) feeler gauge

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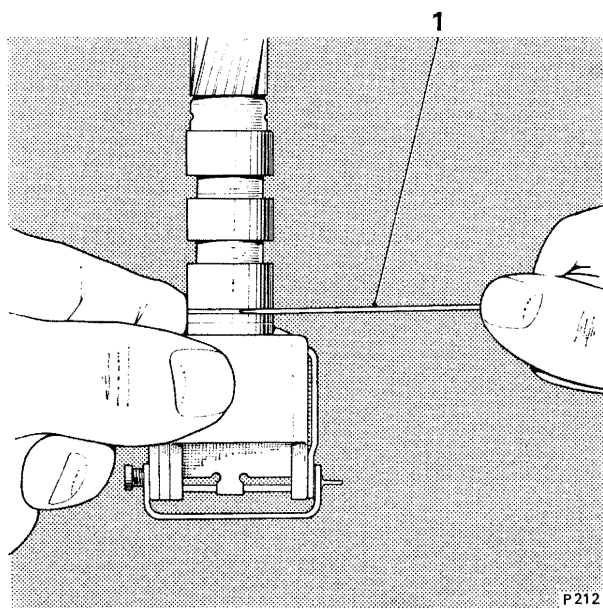


FIG. T181 CHECK VALVE OPENING (EXHAUST)
1 0.020 in. (0.508 mm.) feeler gauge

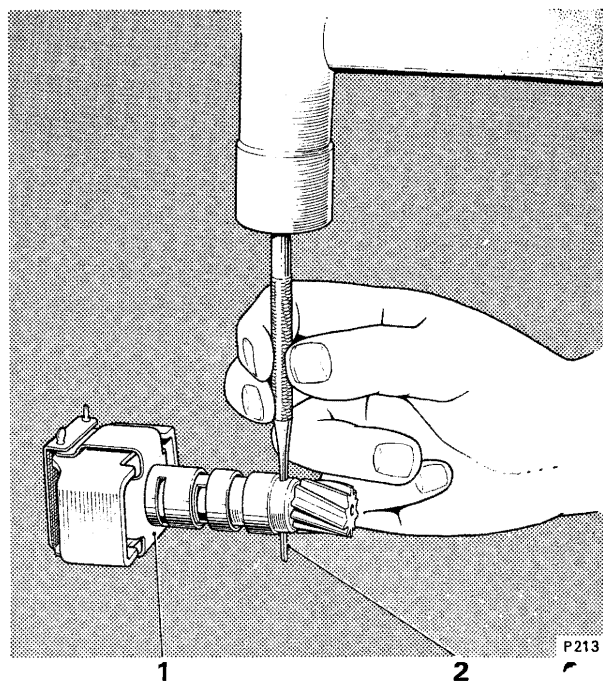


FIG. T182 REMOVING GOVERNOR DRIVEN GEAR RETAINING PIN

- 1 Governor assembly
- 2 Gear retaining pin

4. Thoroughly clean the governor sleeve to remove any swarf which may be present from the original gear assembly operation.

Note Ensure that the new gear is the correct one for the transmission casing in which it is to be fitted. A later type of casing incorporates a steady pin which locates the governor driven gear (*see Parts List*).

5. Support the governor sleeve on the two 0.187 in. (4.76 mm.) plates.

6. Position the new gear in the sleeve then, using a suitable drift, press the gear into the sleeve until it is nearly seated.

7. Carefully remove any swarf which may have shaved off the gear hub, then, press the gear down until it abuts the sleeve.

8. Mark the position of a new hole on the sleeve at 90° to the original hole, then using a drill of 0.187 in. (4.76 mm.) diameter, drill a new hole through the sleeve and gear.

9. Fit the gear retaining pin.

10. Thoroughly wash the gear and sleeve assembly in clean paraffin (kerosene) and dry with compressed air.

Governor assembly—To assemble

1. Lightly oil the valve then fit it into the governor sleeve.

2. Fit the governor weights, springs and thrust cap onto the governor sleeve.

3. Align the pin holes in the thrust cap, governor weight assemblies and governor sleeve.

4. Fit new pins and crimp both ends of the pins.

5. Ensure that the governor weights are free to operate on the pins and check the valve for freeness in the sleeve bore.

Governor assembly—To fit

1. Lightly lubricate the governor sleeve and gear then fit the governor assembly into the transmission case.

2. Fit the cover, together with a new gasket.

3. Fit the four setscrews and torque tighten.

4. On later transmissions when installing the governor assembly ensure that a clearance of approximately 0.250 in. (0.64 cm.) is maintained between the governor pipes and transmission case, at a point 1.00 in. (2.54 cm.) from the right angle bend of the pipes.

Section T13

SPEEDOMETER DRIVE

The speedometer drive (*see Fig. T183*) is secured to the left-hand side of the transmission main casing by a setscrew and retainer. It is driven by a gear on the transmission output shaft at a ratio of 43 : 19.

Speedometer drive—To remove

1. To disconnect the speedometer cable unscrew the knurled nut at the transmission end then withdraw the cable.
2. If the speedometer drive is to be removed for any length of time, mask the open end of the drive cable to prevent the ingress of dust and dirt.
3. Remove the setscrew and retainer then withdraw the speedometer drive; discard the 'O' ring.

Speedometer drive—To dismantle

1. Hold the gear between soft jaws in a vice.
2. Remove the split pin then remove the nut and washer securing the gear to the drive-shaft.
3. Tap the gear off the shaft using a soft-headed mallet.
4. Utilizing the two machined flats on the oil seal housing, hold the housing in soft jaws in a vice then unscrew the halves of the assembly.
5. Withdraw the drive-shaft.

Speedometer drive—To inspect

1. Wash all the dismantled parts in clean paraffin (kerosene).
2. Examine the gear teeth for damage or excessive wear.

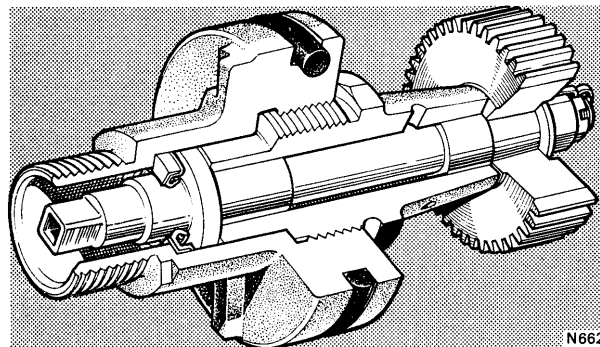


FIG. T183 SPEEDOMETER DRIVE

3. Examine the squared end of the shaft for cracking.
4. Examine the threads on the oil seal retainer for damage.
5. If the oil seal is to be renewed it should be pressed out of the housing using a suitable drift.
6. Examine the drive-shaft for burrs or sharp edges which may damage the oil seal during assembly.

Speedometer drive—To assemble

To assemble the speedometer drive, reverse the procedure given for dismantling, noting the following points.

1. Torque tighten the castellated nut to 8 lb. ft. (1,1 kg. m.) then take the nut to the nearest split pin hole.

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2. Do not slacken the nut to correlate the hole and slot.
3. Fit a new split pin.
4. Lightly lubricate the drive-shaft before passing it through the oil seal.
5. Ensure that the body and the seal housing are screwed tightly together.
6. Check the drive-shaft end float; there should be a minimum of 0.015 in. (0,38 mm.).

Speedometer drive—To fit

1. Fit a new 'O' ring to the groove in the speedometer drive housing.
2. Lightly lubricate the 'O' ring to ease the fitting of the speedometer drive; fit the drive to the case.
3. Fit the retainer and setscrew. Torque tighten the setscrew to 18 lb. ft. (2,49 kg. m.).
4. Connect the speedometer drive cable.

**DIMENSIONAL DATA FOR SECTION T13
SPEEDOMETER DRIVE**

DESCRIPTION	DIMENSION	PERMISSIBLE WORN DIMENSION	REMARKS
Drive-shaft end float.	0.015 in. (0,38 mm.) minimum	—	—
Gears backlash.	0.008 in. to 0.014 in. (0,20 mm. to 0,35 mm.)	—	—
Castellated nut — gear to shaft.	Torque tighten to 8 lb. ft. (1,11 kg.m.)	—	Take nut to next split pin hole.
Setscrew — speedometer housing retainer to casing.	Torque tighten to 18 lb. ft. (2,49 kg.m.)	—	—

Section T14

SUMP, STRAINER AND INTAKE PIPE

Strainer and intake pipe—To remove

The strainer and intake pipe assembly may be removed from the transmission whether the transmission is fitted to the car or not.

The following procedure should be adopted, assuming that the transmission is fitted to the car.

1. Position a clean container under the dipstick tube nut where it enters the sump. The capacity of the container should be 4 pints (Imp.), 4,8 pints (U.S.), 2,27 litres minimum.
2. Slacken the setscrews in the clips at the top of the dipstick tube.
3. Unscrew the sleeve nut at the bottom of the tube then pull the tube clear of the sump; allow the oil to drain.

Early cars only

4. Remove the heat exchanger fluid pipes (see Fig. T184). Blank off the feed and return holes in the case and the heat exchanger.
5. Remove the four setscrews which secure the heat exchanger to the bottom cover of the torque converter.
6. Push the heat exchanger clear of the sump and secure it temporarily to obtain access to the setscrews securing the front of the sump.

All cars

7. Remove the thirteen setscrews securing the sump.
8. Lower the sump and drain the remaining oil; discard the gasket.

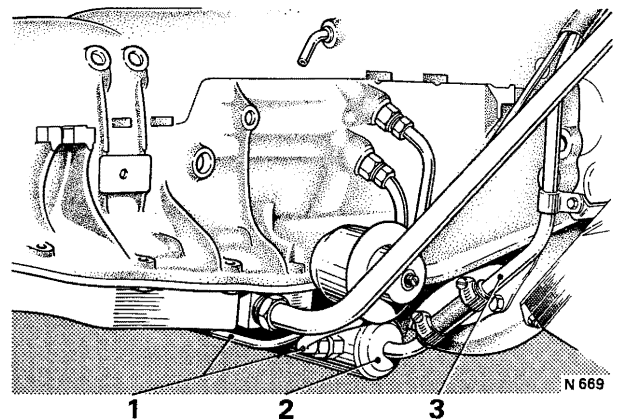


FIG. T184 HEAT EXCHANGER FLUID PIPES (EARLY CARS)

- 1 Transmission fluid pipes
- 2 Heat exchanger
- 3 Coolant pipe

Early cars only

9. Lift out the strainer and intake pipe assembly (see Fig. T185).
10. Remove and discard the intake pipe 'O' ring.

Later cars

11. Remove the filter retaining bolt.
12. Lift out the pump intake pipe and filter assembly (see Fig. T186). Remove the intake pipe from the filter and discard the filter.

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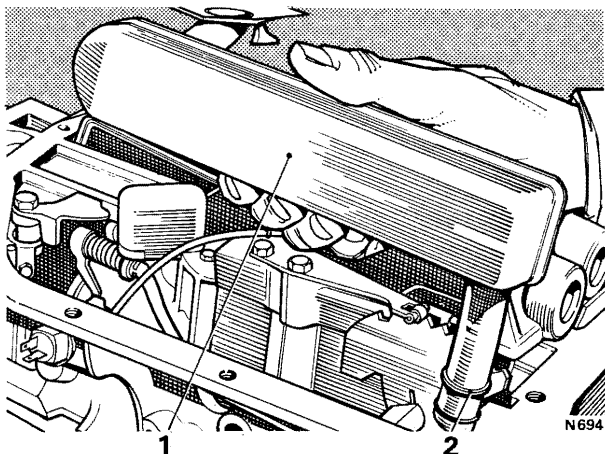


FIG. T185 REMOVING THE STRAINER AND INTAKE PIPE ASSEMBLY (EARLY CARS)

- 1 Strainer and intake pipe assembly
- 2 'O' ring

13. Remove and discard the intake pipe 'O' ring.

Note In cases where the transmission has failed, the strainer and intake pipe must be renewed.

Strainer and intake pipe—To fit

Early cars

- 1. Fit a new 'O' ring into the intake pipe bore in the transmission case.
- 2. Lightly lubricate the 'O' ring then fit the strainer and intake pipe assembly.

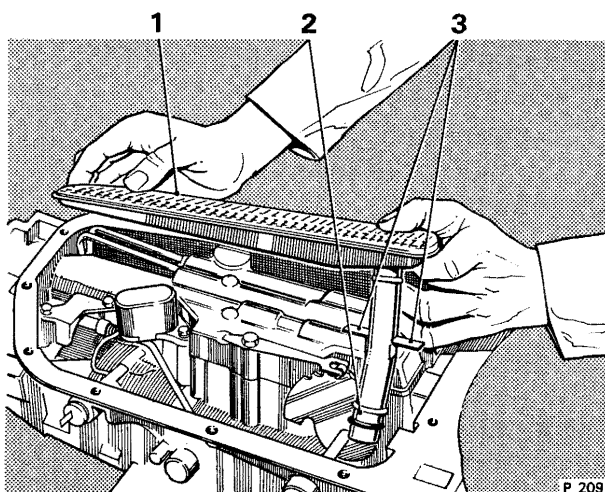


FIG. T186 REMOVING INTAKE PIPE AND FILTER ASSEMBLY

- 1 Filter assembly
- 2 Intake pipe with 'O' Ring
- 3 Locator tabs

Later cars

3. Fit a new intake pipe 'O' ring onto the pipe. Lightly lubricate the 'O' ring. Fit the intake pipe into the strainer. Fit the intake pipe and strainer assembly into the transmission.

All cars

- 4. Ensure that the sump is clean then fit the sump, using a new gasket.
- 5. Fit the setscrews to secure the sump; torque tighten them to 12 lb. ft. (1,66 kg. m.) (see Chapter P).
- 6. Fit the heat exchanger and pipes, ensuring that the ends of the pipes and the sleeve nut threads are clean and free from dirt.
- 7. Fit the dipstick tube; tighten the sleeve nut and the two clip securing setscrews.

Note Reports indicate that the first early type strainer assembly with the integral intake pipe and shroud, has been installed in transmissions with the later type sump.

The late sump does not have the configuration to accommodate the first type strainer assembly. Use of the first type strainer assembly with the second type sump will result in low or erratic oil pressure and pump cavitation noise caused by the restricted intake to the strainer assembly because of the oil sump configuration. A transmission failure will result from this incorrect combination of sump and strainer assembly.

The first type oil sump is not deep enough to accommodate the flat second type strainer assembly and if their installation as a combination is attempted, the strainer assembly will be crushed.

When service replacement of the strainer assembly and/or oil sump is required, they must be used in the following combinations.

COMBINATION 1 — Use the first type strainer, Part Number GM 5579822, with the first type sump, Part Number GM 8623778.

COMBINATION 2 — Use the second type strainer assembly, Part Number GM 6437741, and intake pipe assembly, Part Number GM 8625428, with the second type oil sump, Part Number GM 8625766.

Always consult the latest relevant service literature concerning part numbers, etc.

Section T15

CONTROL VALVE UNIT

The control valve unit comprises a cast iron body containing various shift valves and regulator valves which control the gear changes and the timing and spacing of the changes. The unit is secured to an oil guide plate on the bottom face of the transmission.

Drive range

When the selector lever on the steering column is moved to 'D', the actuator moves the manual valve, by way of levers and rods, to allow main line oil pressure to be delivered to the forward clutch (see Fig. T187). With the forward clutch applied, mechanical connection between the turbine shaft and the mainshaft is provided. The Low roller assembly becomes effective as the result of power flow through the compound planetary gear arrangement and the transmission will be in first gear.

As the speed of the car increases, first gear is no longer suitable and an up-change to second is required.

To initiate the change from first to second, governor pressure (see Section T12 — Governor Assembly) is directed to the end of the 1-2 shift valve. As the car speed increases, governor pressure moves the valve to allow drive oil to apply the intermediate clutch (see Fig. T177 in Section T12). This makes the intermediate roller clutch effective and the transmission changes into second gear.

The change to third gear is controlled by the 2-3 shift valve. The operation of the 2-3 shift valve is similar to that of the 1-2 shift valve. Springs acting on the valve tend to hold the valve closed against governor pressure. When the speed of the car is sufficient,

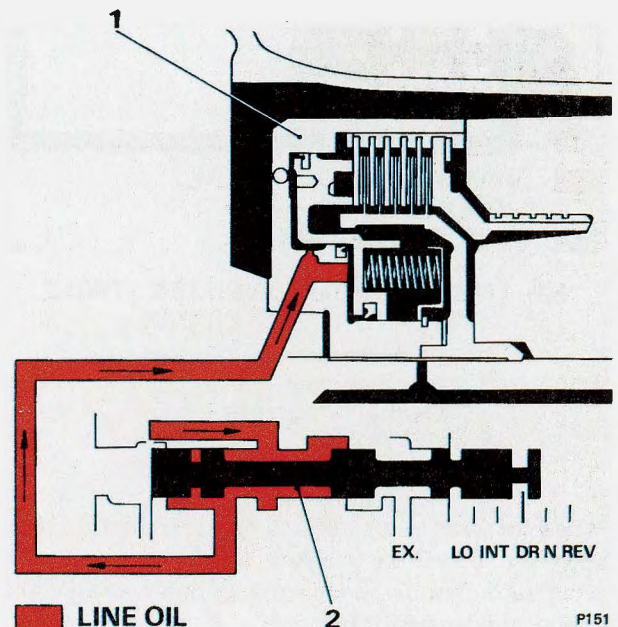


FIG. T187 MANUAL VALVE AND FORWARD CLUTCH

- 1 Forward clutch
- 2 Manual valve

the 2-3 shift valve opens and allows intermediate clutch oil to apply the direct clutch. The transmission then moves into third (top) gear. Oil pressure to the direct clutch piston is applied only to a small inner area of the piston in third gear.

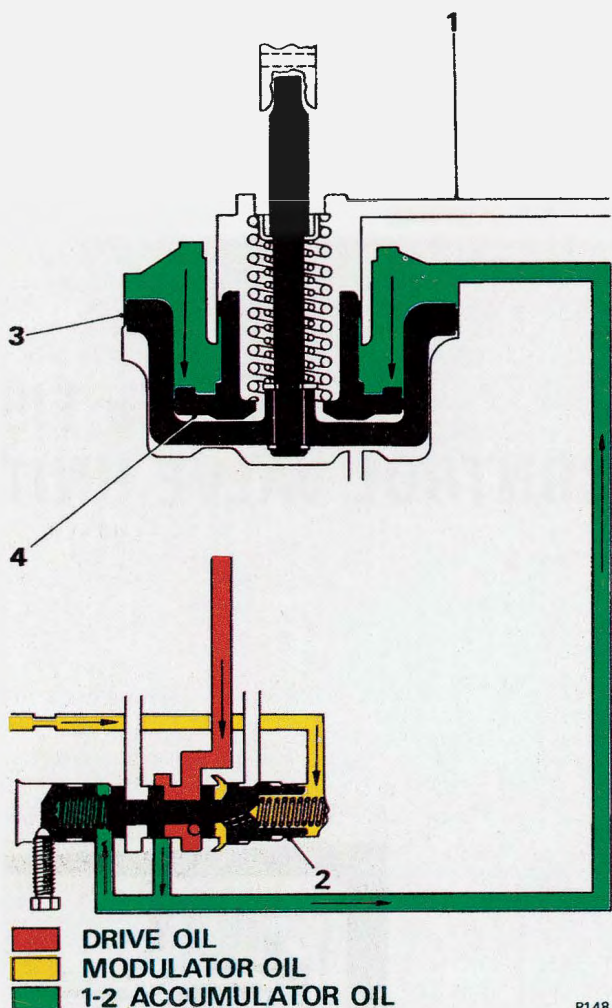


FIG. T188 ACCUMULATOR PISTON STROKE PRIOR TO 1-2 UP-CHANGE

- 1 Intermediate clutch passage
- 2 1-2 accumulator valve
- 3 Accumulator piston
- 4 Servo piston

Down-change

When the accelerator pedal is released and the car is allowed to decelerate to a stop, the down-changes will occur automatically as the valve springs overcome the diminishing governor pressure.

Delayed up-change

If the hydraulic system was as basic as previously described, the gear change points would always occur at the same road speeds. When accelerating under heavy loads or when maximum performance is required, it is desirable to have the change points occurring at higher road speeds. To achieve this, a modulator valve is used (see Section T11 — Vacuum Modulator and Valve).

Clutch application control

To introduce gearchange 'feel', and to ensure long clutch plate life, the clutch apply pressure is regulated

to suit throttle application (see Fig. T188). The intermediate clutch is controlled according to throttle opening as follows.

Line pressure is varied by the modulator.

A 1-2 accumulator valve train provides a variable accumulator pressure to cushion clutch apply. The 1-2 accumulator valve train is supplied with drive oil and is controlled by modulator pressure. During light throttle application, drive oil is reduced to a low accumulator pressure. During heavy throttle applications, accumulator pressure approaches full main pressure. Accumulator pressure is made to act on one side of the rear accumulator piston in the rear servo (see Section T15 — Rear Servo). In first gear, the accumulator piston is stroked to its lower position to prepare it for the change to second gear.

When the 1-2 shift valve opens, intermediate clutch apply oil is also directed to the rear servo accumulator piston, stroking the piston against the 1-2 accumulator oil and the accumulator spring (see Fig. T189). This action absorbs a small amount of the intermediate clutch apply oil and permits the clutch apply time and pressure to be controlled for the correct gear change feel.

The direct clutch apply rate is controlled by the front accumulator piston. Located in the control valve assembly, it is part of the front accumulator and servo piston system (see Fig. T190). In 'D' range, second gear, the accumulator is stroked against the accumulator spring by servo oil. Because servo oil is main line pressure and varies with throttle opening, the pressure in the accumulator is varied according to throttle opening.

When the 2-3 shift valve opens, direct clutch oil flows to the direct clutch and the front accumulator piston (see Fig. T191). Direct clutch pressure rises so that the force from it, plus the accumulator spring force, overcomes the force from the servo pressure and moves the accumulator piston to the stop on the accumulator piston pin. This in turn strokes the servo piston the same amount, allowing it to just contact the band apply washer on the servo pin. However, it will not move the pin or apply the band. The stroking of the accumulator piston absorbs an amount of direct clutch oil and permits the direct clutch to apply at a controlled rate for a smooth 2-3 change.

3-2 valve operation

To take full advantage of the torque converter's ability to multiply torque when required, a 3-2 valve is used. This valve permits the accelerator to be depressed for moderate acceleration at low speeds in third gear without causing the transmission to change down. This allows the torque converter to sense the changes in engine speed and thus provide additional converter ratio for improved performance

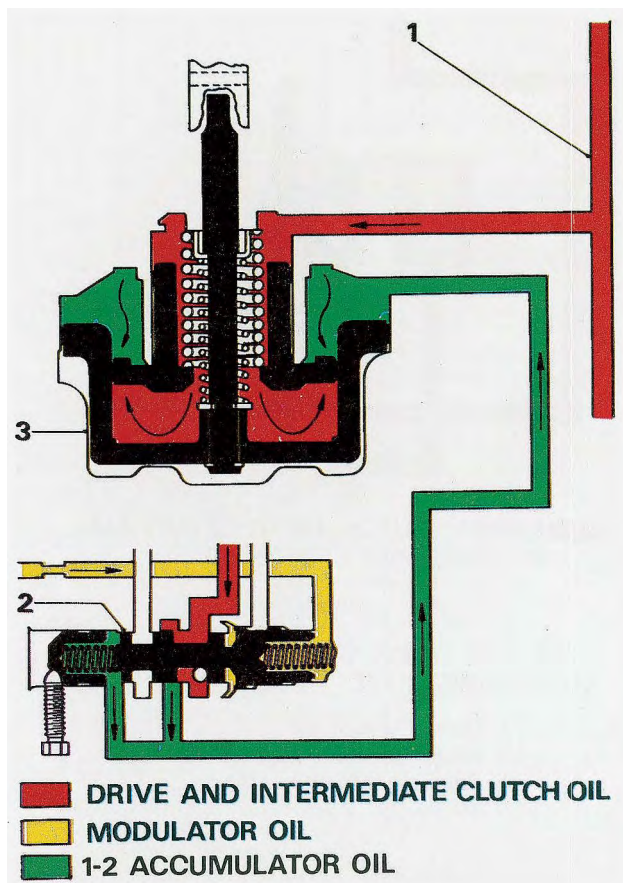


FIG. T189 ACCUMULATOR CUSHIONING INTERMEDIATE CLUTCH APPLICATION

- 1 Intermediate clutch oil
2 1-2 accumulator valve
3 Rear servo

The 3-2 valve system is such that it will permit a 3-2 down-change during moderate to heavy acceleration when modulator pressure reaches approximately 108 lb/sq. in. (7,59 kg/sq. cm.) (see Fig. T192). Modulated oil pressure, plus spring pressure, will move the 3-2 valve against the force of direct clutch oil allowing modulator pressure to be directed to the shift valve trains. Modulator oil can then close the 2-3 valve train against governor pressure causing the part throttle 3-2 down-change.

Forced down-change (kick-down)

At road speeds below approximately 70 m.p.h. (113 k.p.h.) a detent (forced) down-change can be obtained by depressing the accelerator pedal. When the accelerator pedal is fully depressed, the detent valve train takes over from the modulator as the change-point controller.

Main line oil is fed through a small orifice to one end of the detent valve. During normal operation, the port at the orifice end of the valve is sealed by the needle valve in the detent solenoid assembly. Line pressure thus holds the detent valve in an inoperative or normal position (see Fig. T193).

When the throttle is wide open, an electric micro-switch is closed, energising the detent solenoid. This opens an exhaust port at the solenoid causing a pressure drop on the end of the detent valve. The detent valve is moved by the detent valve regulator valve spring and allows the detent regulator to regulate detent oil to a fixed pressure of approximately 70 lb/sq. in. (4,92 kg/sq. cm.).

When the detent valve moves, detent oil is allowed to flow into both the modulator and the detent oil passages to the shift valve trains. The points at which up-changes will then occur is controlled by detent pressure in the modulator passages. Detent down-changes are controlled by detent pressure in the detent passages. These change points are fixed at relatively high speeds by the constant oil pressure.

Detent pressure directed to the 1-2 regulator valve makes a detent 2-1 change available at car speeds below approximately 20 m.p.h. (32 k.p.h.).

To preserve the clutch linings during 1-2 up-changes under full throttle conditions, detent oil is directed to the 1-2 accumulator valve to increase 1-2 accumulator pressure (see Fig. T194).

Detent oil is also directed to the modulator valve to prevent modulator pressure from falling below 70 lb/sq. in. (4,92 kg/sq. cm.). This prevents main line pressure from falling below approximately 105 lb/sq. in. (7,38 kg/sq. cm.) regardless of altitude or car speed.

Intermediate range

When the selector lever is moved to the Intermediate 'I' position, the manual valve is moved to uncover a passage which will allow intermediate range oil to act on the 2-3 shift valve. Intermediate oil pressure on the 2-3 shift valve will cause the valve to move and the transmission will change down, regardless of car speeds (see Fig. T195).

To provide overrun engine braking, the front band is applied by the front servo. Intermediate clutch oil flows to the apply side of the servo piston. An orifice is incorporated in the flow path to ensure a smooth piston movement and band application. Intermediate range oil is directed to a check ball which allows the oil to enter the modulator passage leading to the pressure regulator boost valve. The resultant increase of pressure on the end of the boost valve raises main line pressure to 150 lb/sq. in. (10,55 kg/sq. cm.) and provides sufficient holding forces for overrun engine braking.

Low range

When the selector lever is moved to the Low 'L' range position, the manual valve is moved to allow Low range oil to flow to the detent regulator valve and spacer pin. The spring behind the regulator valve then moves the regulator and detent valves to the opposite

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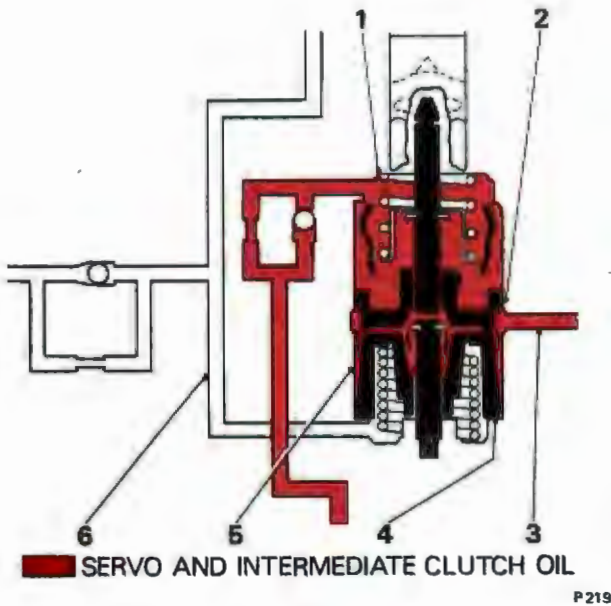


FIG. T190 FRONT ACCUMULATOR PISTON STROKED PRIOR TO 2-3 UP-CHANGE

- 1 Transmission case
- 2 Servo piston
- 3 Intermediate clutch oil
- 4 Accumulator piston
- 5 Valve body
- 6 Direct clutch oil passage

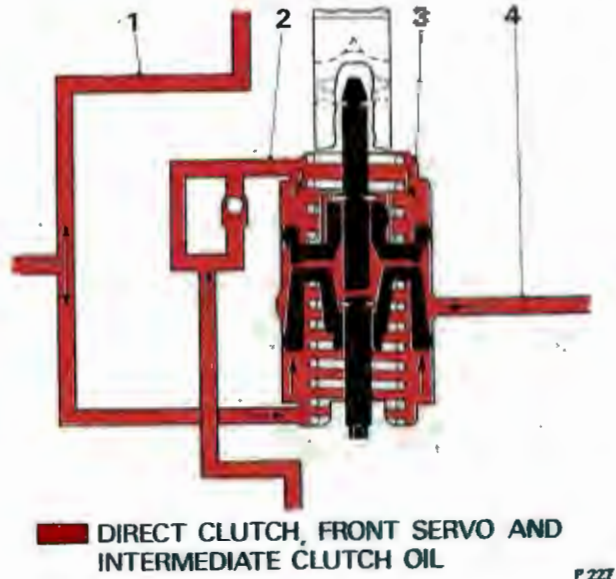
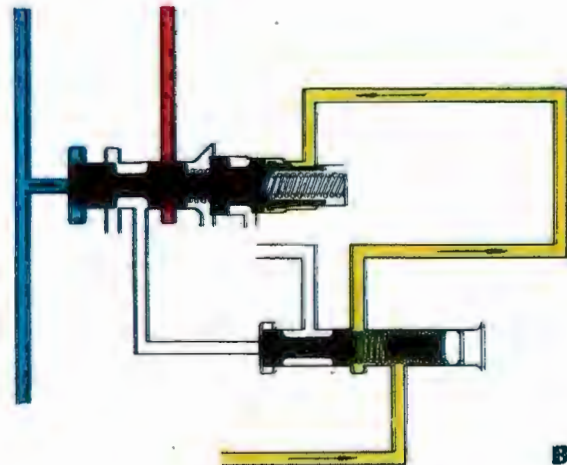
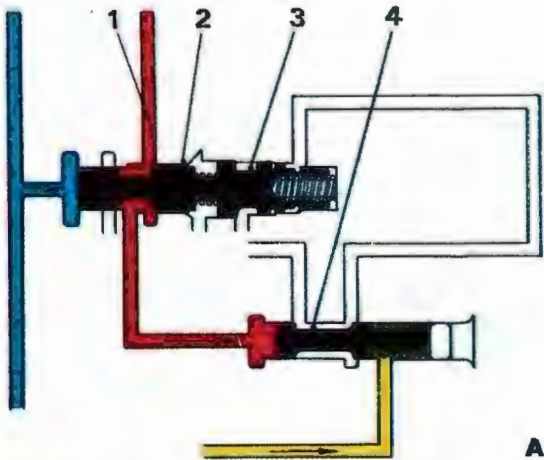


FIG. T191 FRONT ACCUMULATOR PISTON CUSHIONING DIRECT CLUTCH APPLICATION

- 1 Direct clutch oil
- 2 Intermediate clutch oil
- 3 Accumulator housing
- 4 Servo oil



- INTERMEDIATE CLUTCH AND DIRECT CLUTCH OIL**
 - GOVERNOR OIL**
 - MODULATOR OIL**
- P 226

FIG. T192 PART THROTTLE DOWN-CHANGE

- 1 Intermediate clutch oil
- 2 2-3 valve
- 3 2-3 modulator valve
- 4 3-2 valve

- A** Valves in 3rd gear position, modulator pressure below approximately 108 lb/sq. in. (7,6 kg/sq. cm.)
- B** Part throttle down-change valves in 2nd gear position modulator pressure above 108 lb/sq. in. (7,6 kg/sq. cm.)

end of the valve bore. Low range oil then prevents the regulator valve from regulating and drive oil passes through the hole in the regulator valve into the detent and modulator passages at a Low range pressure of 150 lb/sq. in. (10,55 kg/sq. cm.). As a result of this, the 1-2 shift valve will move to cause a down-change at road speeds below approximately 40 m.p.h. (64 k.p.h.) and will prevent an up-change, regardless of the speed of the car.

When the 1-2 shift valve closes, the exhausting intermediate clutch oil lifts two check balls off their seats to enable the front band and the intermediate clutch to release quickly (see Fig. T196).

To provide overrun engine braking, the rear band is applied by directing Low range oil pressure to the rear servo.

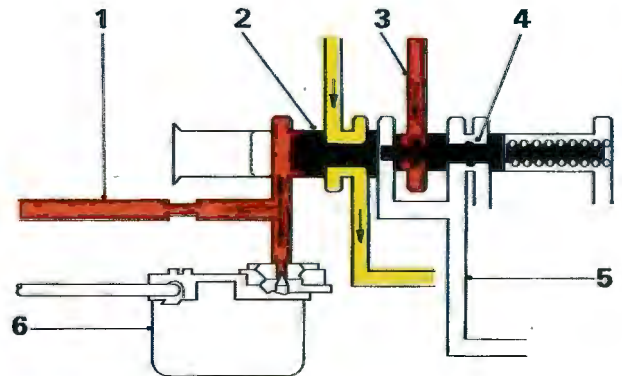
Low range oil is directed to the 1-2 accumulator valve during Low range operation to raise 1-2 accumulator pressure to line pressure. This increased pressure, directed to the rear servo accumulator piston, resists servo apply pressure and slows down the application of the rear band to enable a smooth change to be obtained during manual change to Low range, first gear, or for a 2-1 change in Low range.

Reverse

When Reverse 'R' is selected, the manual valve is moved to allow Drive, Intermediate, and Low range oil to be exhausted, and allows main line oil to enter the reverse passages (see Fig. T197). Reverse oil pressure is directed from the manual valve to the large outer area of the direct clutch piston and to the 2-3 shift valve where it enters the direct clutch exhaust port. Reverse oil then flows past the 2-3 shift valve, which is in the down-change position, and enters the third gear direct clutch apply passage. This passage directs reverse oil pressure to the small inner area of the direct clutch piston. With oil pressure on both inner and outer positions of the piston, the clutch applies. Reverse oil pressure is directed also to a check ball which allows oil to enter the same passage to the rear servo apply piston that Low range oil occupied in Low range; this applies the rear band. To ensure adequate oil pressure for the torque requirements in Reverse, reverse oil pressure is directed to the pressure boost valve which increases line pressure to a maximum of approximately 260 lb/sq.in. (18,28 kg/sq.cm.).

Control valve unit—To remove

Note Before removing the control valve unit from a transmission installed in a vehicle, take note of the transmission serial number. If the Transmission Serial Number is 70-RR-2626 and onwards take extreme care when removing the control valve unit as the front servo piston and related parts may fall from the transmission due to the normal freeness of the 'Teflon' oil sealing rings.



■ LINE AND DRIVE OIL
■ MODULATOR OIL

P177

FIG. T193 DETENT VALVE CLOSED

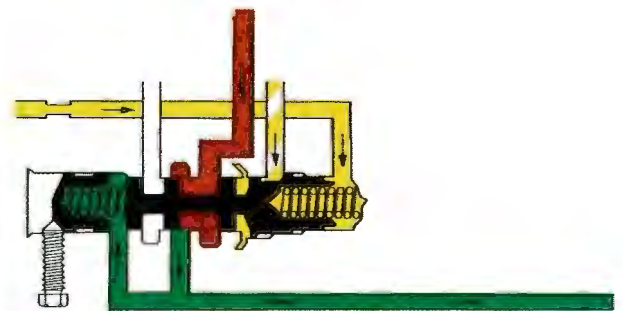
- 1 Line oil
- 2 Detent valve
- 3 Drive oil
- 4 Detent regulator valve
- 5 Detent oil passage
- 6 Line oil

The control valve unit may be removed with the transmission in position in the car. The oil must be drained and the sump removed to gain access to the control valve unit.

1. Unscrew the setscrew which secures the detent spring and roller assembly. Remove the spring and roller assembly.

2. Remove the twelve setscrews which secure the control valve unit to the transmission case; remove the clips but leave them attached to the lead. Do not remove the solenoid securing screws.

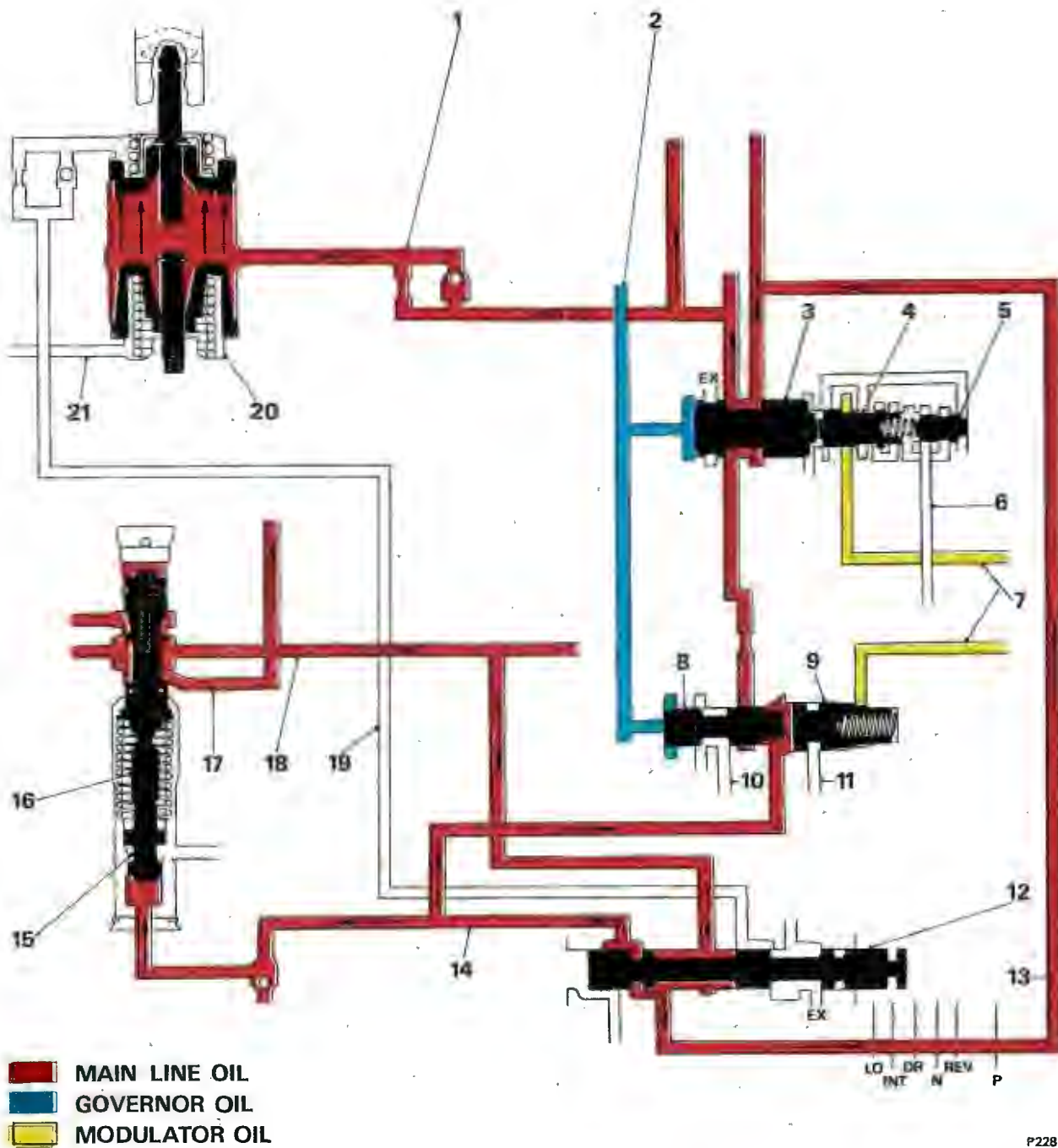
Note On later models, the number of setscrew holes in the control valve unit was reduced by two, whilst the holes in the transmission case, spacer plate and gasket remain the same. When renewing a control valve unit, all the setscrew holes in the control valve unit must be used.



■ DRIVE OIL
■ MODULATOR OIL
■ 1-2 ACCUMULATOR OIL
■ DETENT OIL

P178

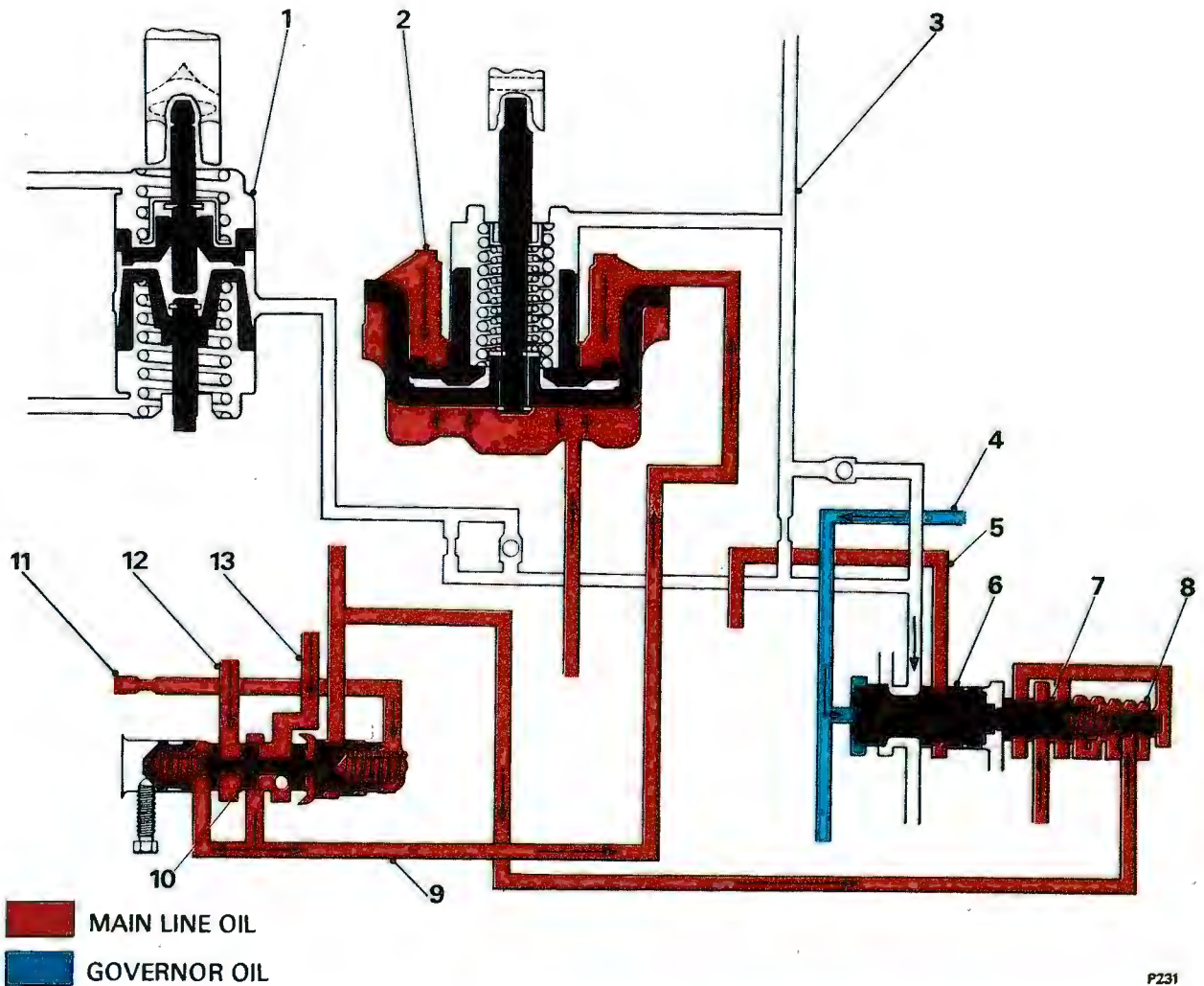
FIG. T194 1-2 ACCUMULATOR VALVE



P228.

FIG. T195 VALVES—INTERMEDIATE RANGE— 2ND GEAR

- | | | |
|---------------------------|--------------------------|-----------------------------|
| 1 Intermediate clutch oil | 8 2-3 valve | 15 Boost valve |
| 2 Governor oil | 9 2-3 modulator valve | 16 Pressure regulator valve |
| 3 1-2 valve | 10 Direct clutch passage | 17 Converter oil |
| 4 1-2 detent valve | 11 Detent passage | 18 Line oil |
| 5 Regulator valve | 12 Manual valve | 19 Servo oil passage |
| 6 Detent passage | 13 Drive oil | 20 Accumulator piston |
| 7 Modulator oil | 14 Intermediate oil | 21 Servo oil passage |



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FIG. T196 LOW RANGE—1ST GEAR—REAR BAND APPLIED

- | | | |
|-------------------------------|-----------------------|--------------------------|
| 1 Front servo | 6 1-2 valve | 10 1-2 accumulator valve |
| 2 Rear servo | 7 1-2 detent valve | 11 Modulator oil |
| 3 Intermediate clutch passage | 8 Regulator valve | 12 Low oil |
| 4 Governor oil | 9 1-2 accumulator oil | 13 Drive oil |
| 5 Drive oil | | |

3. Remove the control valve unit, together with the two governor pipes (see Fig. T198).

Caution Ensure that the manual valve does not slide out of its bore. Take care to retain the front servo piston should it come out with the control valve assembly.

Remove the governor screen assembly from the end of the governor feed pipe or governor feed pipe hole.

4. Withdraw the governor pipes from the control valve assembly; the pipes are interchangeable and need not be marked for identification.

Note If the transmission is to be dismantled further, remove the stator connector (if fitted) from its connection in the case, then remove the detent (short) lead from the stator connector.

Control valve unit—To dismantle

1. Hold the control valve unit with the cored passages uppermost, and the accumulator piston bore to the front as shown in Figure T199.
2. Remove the manual valve from its bore.
3. Fit the control valve accumulator installing tool RH 7961 (J-21885) onto the accumulator piston.

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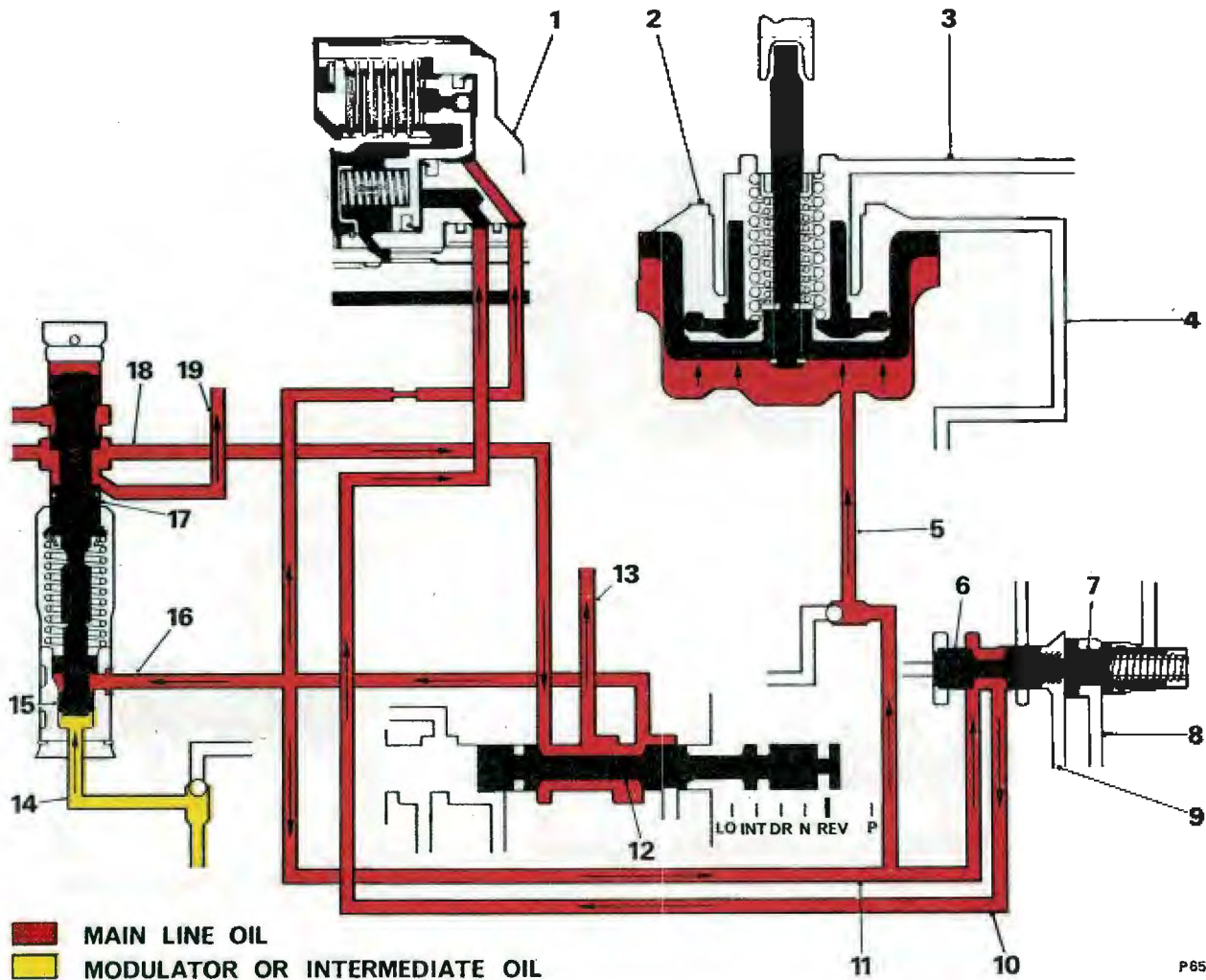


FIG. T197 REVERSE - REAR BAND APPLIED

- | | | |
|-----------------------------------|----------------------------|-----------------------|
| 1 Direct clutch (applied) | 8 Detent oil passage | 13 Servo oil |
| 2 Rear servo applied | 9 Intermediate oil passage | 14 Modulator oil |
| 3 Intermediate clutch oil passage | 10 Direct clutch oil | 15 Boost oil |
| 4 1-2 accumulator oil passage | 11 Reverse oil | 16 Reverse oil |
| 5 Reverse oil | 12 Manual valve | 17 Pressure regulator |
| 6 2-3 valve | | 18 Line oil |
| 7 2-3 modulator valve | | 19 Converter oil |

4. Compress the piston and remove the 'E' ring container.
5. Remove the accumulator control valve and spring.
6. Remove the retaining pin, 1-2 bushing, 1-2 regulator valve and spring from the upper right-hand bore.
7. Remove the 1-2 detent valve and the 1-2 valve.
8. Remove the retaining pin, 2-3 valve spring, 2-3 bushing, 2-3 modulator valve and the 2-3 intermediate spring from the middle right-hand bore.
9. Remove the 2-3 shift valve.
10. Remove the retaining pin, bore plug, 3-2 spring

- and spacer and the 3-2 valve from the lower bore.
11. Remove the retaining pin and bore plug from the upper left-hand bore, adjacent to the manual valve bore. Use an extractor to remove the pin from the back face of the valve.
12. Remove the bore plug, detent valve, detent regulator valve spring and the spacer.
13. Ensure that the 1-2 accumulator valve in the remaining bore is free, by moving the valve against the spring.

Note **Early cars only** The small adjusting screw on the outside of the 1-2 accumulator valve bore regulates accumulator valve pressure.

Do not disturb the adjusting screw unless it is necessary to remove the valve to free it in the bore.

14. If it is necessary to remove the screw, its **exact** position must be determined before removal, using a 1.00 in. to 2.00 in. (2.5 cm. to 5.0 cm.) micrometer.
15. After removing any burrs, measure from the screw head to the machined surface of the valve body (see Fig. T200). Note the measurement.
16. Remove the adjusting screw.
17. Remove the 1-2 accumulator valve retaining pin from the machined surface of the valve body; remove the plug.
18. Remove the 1-2 accumulator sleeve, secondary spring and valve.
19. Remove the primary 1-2 accumulator valve and spring.

Control valve unit—To inspect

1. Wash in Trichlorethylene, the control valve unit body, valves and the remainder of the parts. Do not allow the valves to knock together as this may cause burrs, or damage to the shoulders of the valves.
2. Examine all valves and sleeves to ensure that they are free from dirt. Any burrs should be carefully removed with a fine stone, or crocus paper slightly moistened with oil. Do not round-off the shoulders of the valves.
3. When satisfactory, wash the parts and lightly smear all valves and bushings with clean transmission fluid.
4. All valves and bushes should be tested in their individual bores to ensure that free movement is obtainable.
5. The valves should fall under their own weight, with perhaps a slight tapping of the valve body to assist them. During these checks, ensure that the valves and valve bores are not in any way damaged.
6. The manual valve is the only valve that can be renewed separately. If other valves are damaged or defective, a new control valve unit must be fitted.
7. Examine the valve body for cracks or scored bores.
8. Ensure that the cored face is free from damage.
9. Examine all springs for collapsed or distorted coils.

Control valve unit—To assemble

Before commencing assembly, ensure that all springs can be positively identified, otherwise the transmission will not function correctly. Refer to Figure T199 during assembly procedure.

1. Lightly lubricate all parts with clean transmission fluid before assembly.
2. Fit the front accumulator spring and piston into the valve body.
3. Fit the valve body accumulator installing tool

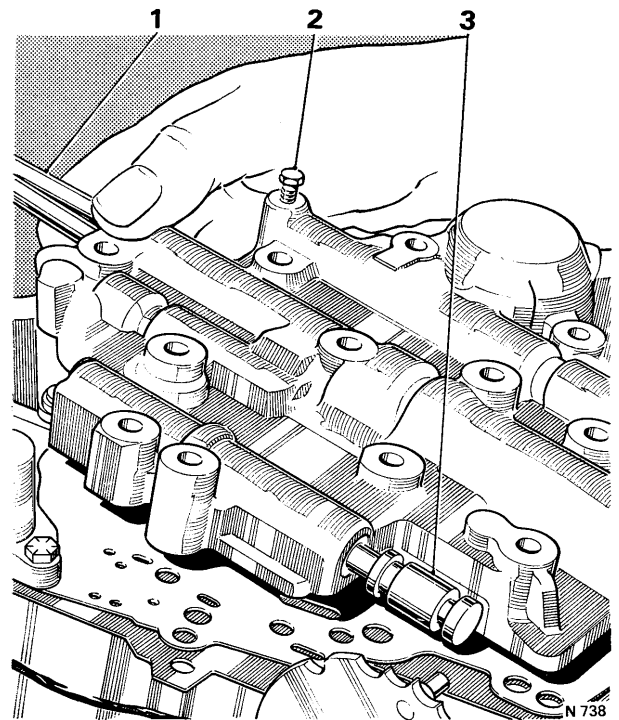


FIG. T198 REMOVING THE CONTROL VALVE UNIT

- 1 Governor pipes
- 2 Accumulator valve pressure adjusting screw (early cars only)
- 3 Manual valve

RH 7961 (J-21885). Align the piston and spring with the bore then compress the spring and piston (see Fig. T201).

4. Secure the piston with the 'E' ring retainer.
5. If the 1-2 accumulator valve train has been removed, fit the 1-2 primary spring into the primary 1-2 accumulator valve.
6. Fit the valve and spring into the lower left-hand bore, spring first.
7. Use a retaining pin as a retractor to hold the valve in its operating position.
8. Fit the 1-2 accumulator valve (wide land first) into the 1-2 accumulator sleeve.
9. Fit the 1-2 accumulator sleeve into its bore.
10. Fit the retaining pin.
11. Fit the 1-2 accumulator valve secondary spring and the 1-2 accumulator plug into the sleeve.
12. Fit the adjusting screw to conform to its original micrometer measurement.
13. Fit the detent spring and spacer into the next left-hand bore above.
14. Compress the spring and hold it with a small screwdriver.
15. Fit the detent regulator valve, wide land first.
16. Fit the detent valve, small land first.
17. Fit the bore plug with the hole facing the outside then fit the retaining pin. Remove the screwdriver.
18. Fit the 3-2 valve into the lower right-hand bore.

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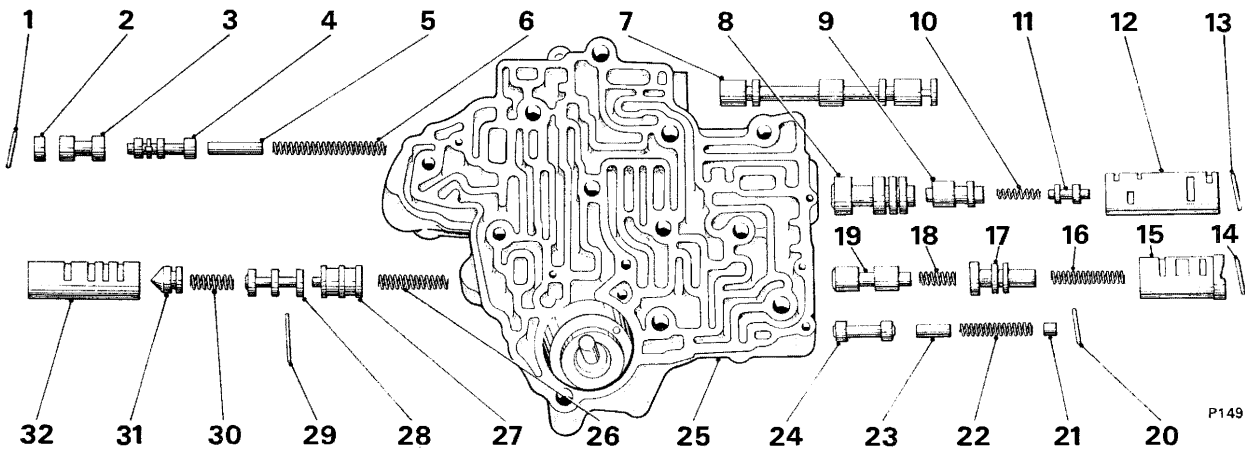


FIG. T199 CONTROL VALVE UNIT

- | | | | |
|--------------------|-------------------------|----------------------------|----------------------------------|
| 1 Retaining pin | 9 1-2 detent valve | 17 2-3 modulator valve | 25 Valve body |
| 2 Bore plug | 10 1-2 regulator spring | 18 2-3 intermediate spring | 26 Primary spring |
| 3 Detent valve | 11 1-2 regulator valve | 19 2-3 valve | 27 Primary 1-2 accumulator valve |
| 4 Detent regulator | 12 1-2 sleeve | 20 Retaining pin | 28 Retaining pin |
| 5 Spacer | 13 Retaining pin | 21 Bore plug | 29 1-2 accumulator valve |
| 6 Detent spring | 14 Retaining pin | 22 3-2 spring | 30 Secondary spring |
| 7 Manual valve | 15 2-3 sleeve | 23 Spacer | 31 Bore plug |
| 8 1-2 valve | 16 2-3 valve spring | 24 3-2 valve | 32 1-2 accumulator sleeve |

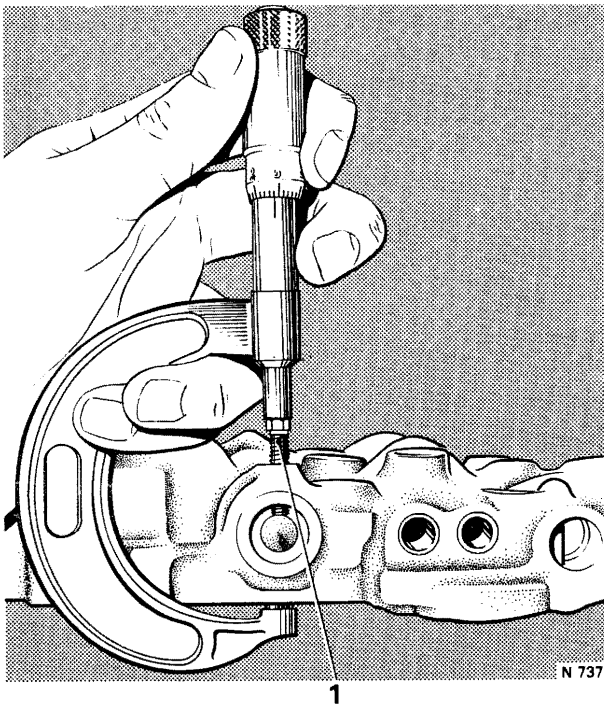


FIG. T200 MEASURING THE ADJUSTING SCREW (EARLY CARS)

- 1 Accumulator valve pressure adjusting screw

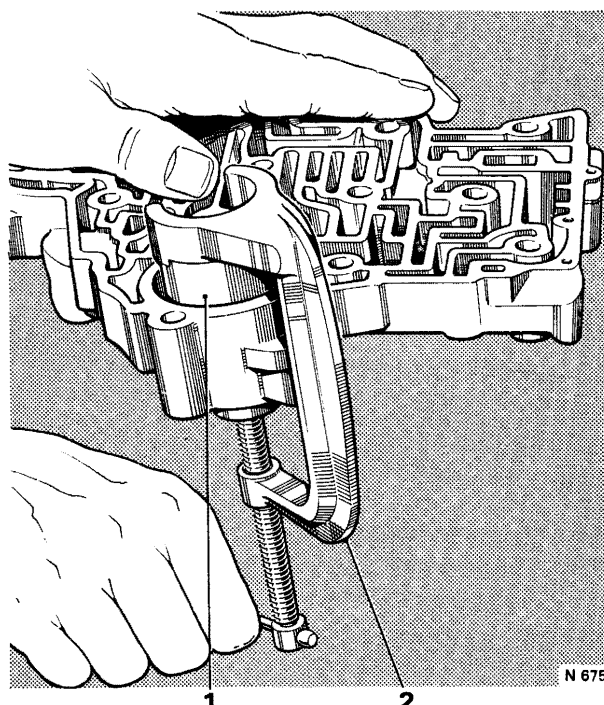


FIG. T201 FITTING THE ACCUMULATOR AND SPRING

- 1 Accumulator piston 2 Inserting tool

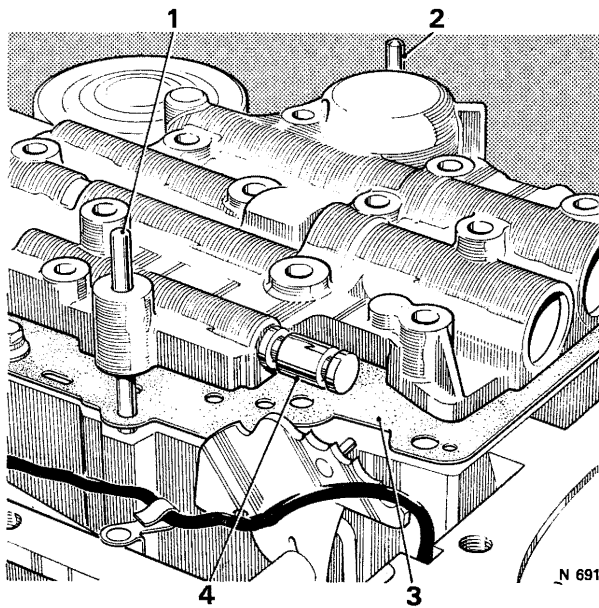
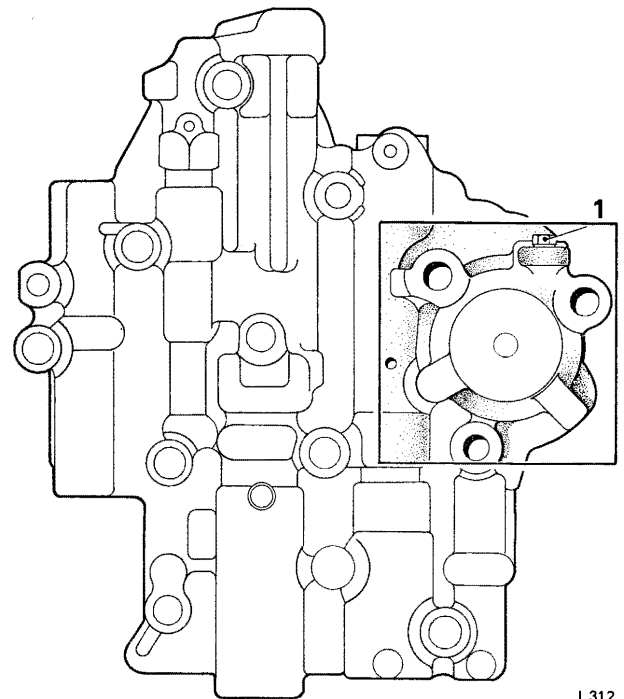
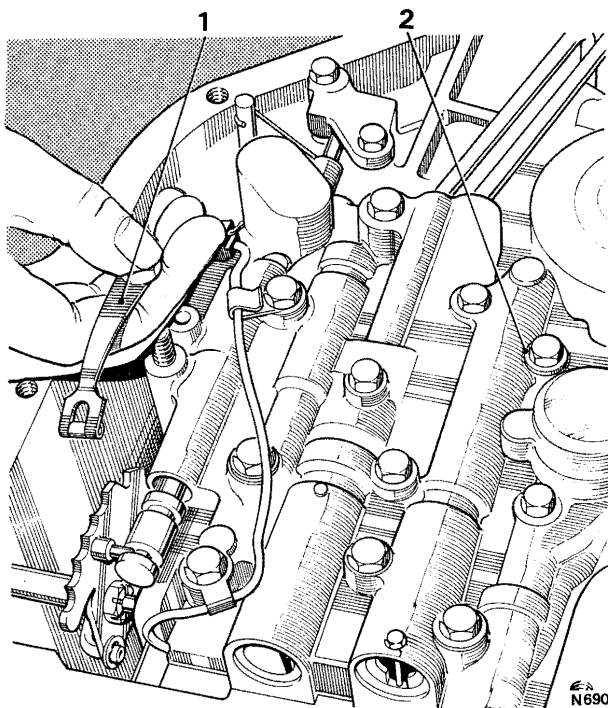


FIG. T202 FITTING THE CONTROL VALVE UNIT

- 1 Guide pin
- 2 Guide pin
- 3 Gasket
- 4 Manual valve

FIG. T204 PRESSURE SWITCH PLUG—
REPLACEMENT CONTROL VALVE ASSEMBLY

- 1 Pressure switch pipe plug

FIG. T203 FITTING THE DETENT SPRING AND
ROLLER

- 1 Detent spring
- 2 Washer

19. Fit the 3-2 spring, spacer, bore plug with the hole facing the outside, and the retaining pin.
20. Fit the 2-3 shift valve, with the stem facing the outside, in the next right-hand bore above.
21. Fit the 2-3 intermediate spring.
22. Fit the 2-3 modulator valve into the sleeve, then fit both parts into the valve bore.
23. Fit the 2-3 valve spring and the retaining pin.
24. Fit into the next right-hand bore above, the 1-2 shift valve — small diameter first — then fit the 1-2 spring.
25. Fit the 1-2 regulator valve, spring and detent valve into the sleeve. Align the spring in the bore of the detent valve. Fit the parts into the valve bore.
26. Push in the sleeve against spring pressure then fit the retaining pin.
27. Fit the manual valve with the detent pin groove to the right-hand side (outmost).

Control valve unit—To fit

If a service replacement control valve assembly is to be fitted, ensure the switch pipe plug (if fitted) situated in the tapped hole adjacent to the front accumulator pocket is securely tightened in position.

1. Fit the governor pipes to the control valve unit.

Note Fit the governor screen assembly, **open end first** into the governor feed pipe hole (*hole nearest the centre of transmission*).

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2. Using two guide pins screwed into the casing, fit the control valve unit into position (*see Fig. T202*).

3. Ensure that the gasket and oil guide plate (spacer) are correctly positioned.

Note It is important that only a gasket which is a genuine service part be used.

4. Ensure that the governor pipes are correctly aligned and the feed pipe fits over the governor screen.

5. On later transmissions when installing the governor assembly ensure that a clearance of approximately 0.250 in. (0,64 cm.) is maintained between the governor pipes and transmission case, at a point 1.00 in. (2,54 cm.) from the right angle bend of the pipes.

Ensure that the manual valve is correctly located by the pin on the detent lever.

6. Remove the guide pins and fit the control valve unit securing setscrews; do not fit the detent spring and roller securing screw.

7. Torque tighten the securing screws (*see Chapter P*).

8. Ensure that the stator lead is secured to the clips.

9. Fit the detent spring and roller assembly (*see Fig. T203*); fit the securing screw and torque tighten it to 8 lb. ft. (1,1 kg. m.) (*Chapter P*).

10. Fit the short (detent) lead to the stator connector (if it was removed) then fit the connector to the case.

Section T16

REAR SERVO

The rear servo comprises an assembly of pistons and springs, and fits onto the bottom face of the transmission casing, adjacent to the control valve unit. It is secured to the casing by six setscrews. The purpose of the servo is to act as an accumulator to absorb an amount of intermediate clutch oil, thus cushioning the application of the clutch, also to apply the rear friction band in Low range and Reverse.

Drive—Intermediate—first gear

In first gear, Drive and Intermediate ranges, 1-2 accumulator oil is directed to the rear servo accumulator piston in preparation for the 1-2 up-change.

Drive—Intermediate—second gear

Intermediate clutch apply oil is directed to the rear servo accumulator piston, stroking the piston against the 1-2 accumulator oil and the accumulator spring (see Fig. T205). This action absorbs an amount of intermediate clutch apply oil and permits the intermediate clutch to apply at reduced pressure for a smooth 1-2 up-change.

Low range—first gear

Overrun engine braking in Low range — first gear is provided by the rear servo which applies the rear band and prevents the reaction carrier from rotating clockwise (see Fig. T206).

The 1-2 accumulator oil is directed to the accumulator piston which attempts to prevent application of the servo. Low range oil is directed to the servo piston which, because it has a larger area, applies the rear band. Because 1-2 oil is present and is opposing the movement of the piston, the pressure applying the rear band is reduced. This provides a smooth band application.

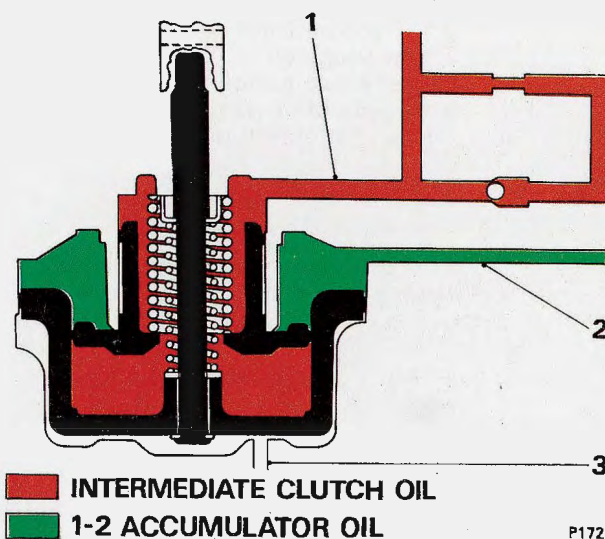


FIG. T205 DRIVE AND INTERMEDIATE—
2ND GEAR

- 1 Intermediate clutch oil
- 2 1-2 accumulator oil
- 3 Reverse or low oil

Low range—second gear

In second gear the rear band is released. Intermediate clutch oil is directed to the release side of the servo piston which, with line oil in the 1-2 accumulator oil passage, balances out the Low range oil on the apply side of the servo piston (see Fig. T207). The servo release spring then strokes the servo piston to the band release position.

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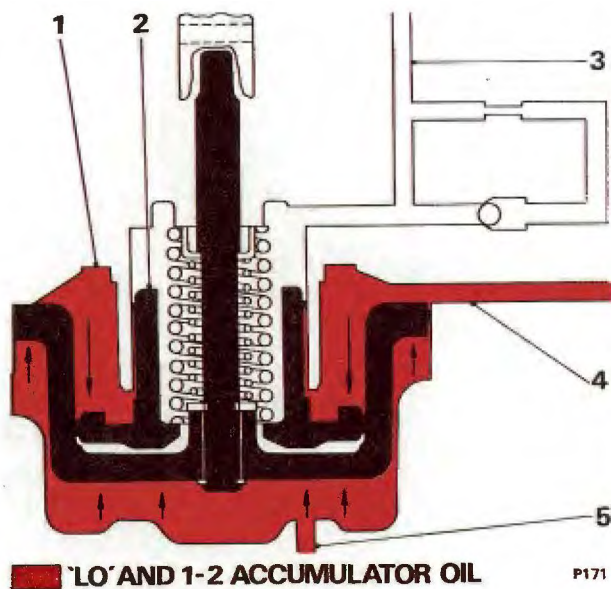


FIG. T206 LOW RANGE—1ST GEAR

- 1 To intermediate clutch
- 2 1-2 accumulator oil
- 3 Low range oil
- 4 Rear servo piston (applying)
- 5 Accumulator piston (resisting servo piston)

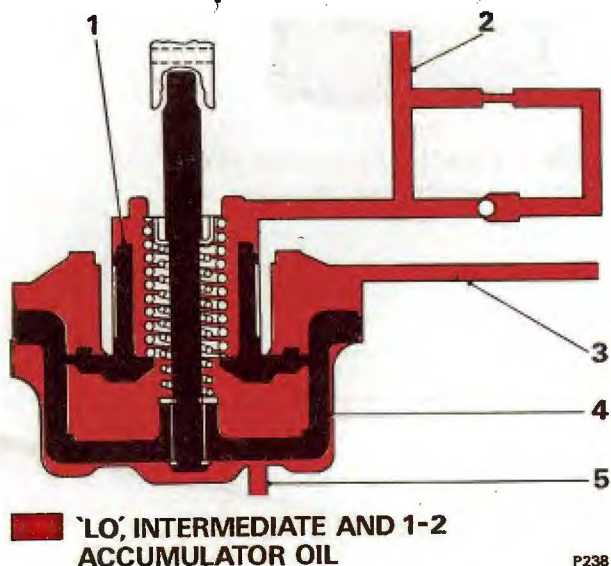


FIG. T207 LOW RANGE—2ND GEAR

- 1 Accumulator piston
- 2 To intermediate clutch
- 3 1-2 accumulator oil
- 4 Servo piston
- 5 Low range oil

Reverse

In Reverse, the rear band is applied to hold the reaction carrier. Reverse oil is directed to the servo piston to apply the band (see Fig. T208). To ensure that the rear band will hold the reaction carrier for the reverse gear ratio, line pressure is increased. No other oil is present in the servo to resist the movement of the servo piston.

Rear servo—To remove

The rear servo can be removed whether the transmission is removed from the car or not.

1. Remove the sump (see Section T14).
2. Remove the control valve unit (see Section T15).
3. Remove the six setscrews which secure the servo cover to the transmission casing.
4. Remove the cover and discard the gasket.
5. Remove the servo unit from the casing (see Fig. T209).
6. Remove the servo accumulator spring.

To ensure that the rear band is correctly adjusted when the rear servo is fitted, the apply pin must be checked as follows.

Rear band apply pin—To select

1. Fit the band apply pin selector gauge RH 7957 (J-21370-5) onto the bottom face of the transmission casing. The gauge must fit over the rear servo bore with the hexagonal nut on the side of the gauge facing the parking brake linkage, and the smaller diameter end of the gauge pin RH 7957 (J-21370-5) in the servo pin bore (see Fig. T210).
2. Secure the gauge with two suitable setscrews e.g. rear servo cover screws; torque tighten the screws. (see Chapter P).
3. Ensure that the stepped gauge pin moves freely in the tool and in the servo pin bore. The stepped side of the pin must face the front of the transmission case.
4. Band apply pins are available in three sizes as shown in the following chart.

IDENTIFICATION	LENGTH
Three rings	Long
Two rings	Medium
One ring	Short

5. The identification ring is located on the band lug end of the pin. Selecting the correct pin is the equivalent of adjusting the rear band.

6. To determine the correct size pin to use, apply 25 lb. ft. (3,46 kg. m.) to the hexagonal nut on the side of the gauge (see Fig. T210). This will cause the lever on top of the gauge to depress the stepped gauge pin into the servo pin bore, simulating the actual operation of the servo.

7. Note the relationship between the steps on the gauge pin and the machined surface on the top of the gauge.

8. If the machined surface on top of the gauge is level with, or even above the upper step on the gauge pin, a long (3 rings) pin is required.

9. If the machined surface on top of the gauge is between the upper and lower steps on the gauge pin, a medium pin (2 rings) is required.

10. If the machined surface on top of the gauge is level with, or below the lower step on the gauge pin, a short (1 ring) is required.

11. If a new pin is required, make a note of the size of the required pin, then remove the gauge from the transmission.

Rear servo—To dismantle

1. Remove the rear accumulator piston from the rear servo piston (see Fig. T211).
2. Remove the 'E' ring which retains the rear servo piston on the band apply pin.
3. Remove the rear servo piston and the seal from the band apply pin.
4. Remove the washer, spring and retainer.

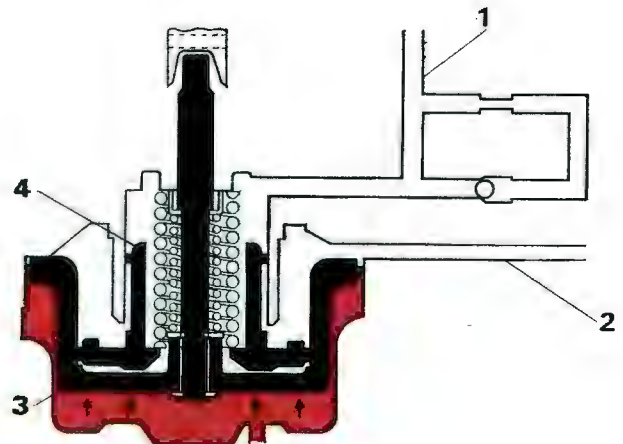
Rear servo—To inspect

1. Check the fit of the oil sealing rings in the accumulator piston. The rings should be free to turn in the grooves with a maximum clearance of 0.003 in. (0.076 mm.).
2. Fit the accumulator piston lower oil sealing ring into its bore in the casing and check the ring-to-bore fit.
3. Check the fit of the band apply pin in each piston.
4. Examine the band apply pin for scores, cracks or the opening of drilled passages.
5. Examine the accumulator piston for an open bleed passage.
6. Ensure that the pin is the correct size as determined by the check under heading 'Rear band apply pin — To select'.

Rear servo—To assemble

1. Fit the spring retainer (open end first), spring and washer onto the band apply pin.
2. Fit the servo piston onto the pin and secure it with the 'E' ring.
3. If necessary, fit a new oil seal ring onto the servo piston.
4. If they were removed for cleaning purposes, fit the oil sealing rings onto the accumulator piston.
5. Fit the accumulator piston into the servo piston.

Transmissions with a Serial Number 71-RR-1287 and onwards, have a 'Teflon' oil sealing ring fitted to the large diameter ring groove of the rear accumulator piston (see Fig. T212).



REVERSE OIL

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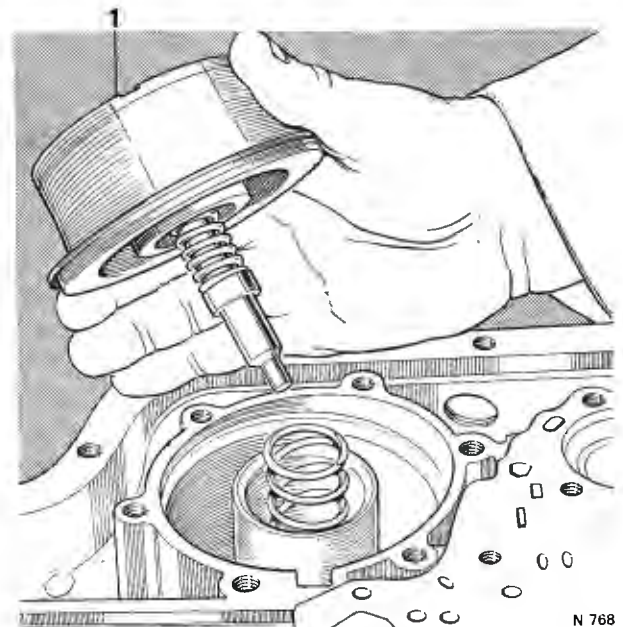
FIG. T208 REAR SERVO IN REVERSE POSITION

- 1 Accumulator piston
- 2 To intermediate clutch
- 3 1-2 accumulator passage
- 4 Rear servo piston (applying)

The 'Teflon' type of oil sealing ring requires a shallower machined ring groove in the piston and therefore, the two types of pistons and rings are **not** interchangeable as individual items.

As a complete assembly with their respective large diameter piston ring fitted, the early and late rear accumulator pistons are interchangeable.

The smaller diameter piston ring and ring groove have not been changed.



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FIG. T209 REMOVING THE REAR SERVO

- 1 Rear servo

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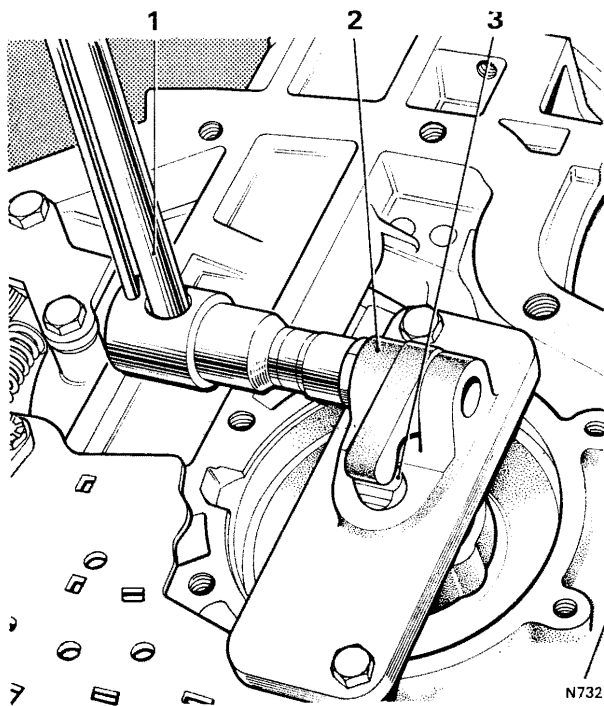


FIG. T210 SELECTING THE BAND APPLY PIN

- 1 Torque spanner
- 2 Gauge
- 3 Gauge pin

Rear servo—To fit

1. Using clean transmission fluid, lightly lubricate the inner and outer rear servo bores in the transmission casing.
2. Fit the servo accumulator spring into the servo inner bore.
 - Note** Before fitting the rear servo to the casing, ensure that the rear band apply lug is aligned with the servo pin bore in the transmission casing. If the lug is not aligned, the servo will not apply the rear band.
3. Position the rear servo assembly in the transmission casing.
4. Using hand pressure, push the servo into the transmission casing, ensuring that the servo piston sealing ring is correctly seated in the bore.
5. Fit a new gasket and fit the cover.
6. Torque tighten the six setscrews (*see Chapter P*).

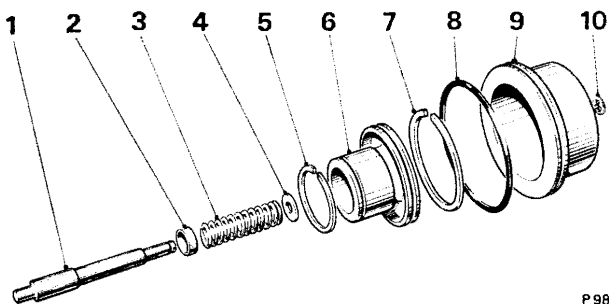


FIG. T211 REAR SERVO AND ACCUMULATOR—EXPLODED

- 1 Servo pin
- 2 Spring retainer
- 3 Servo spring
- 4 Washer
- 5 Oil sealing ring
- 6 Accumulator piston
- 7 Oil sealing ring
- 8 Servo oil seal
- 9 Servo piston
- 10 'E' ring

Section T17

DETENT SOLENOID, CONNECTOR, CONTROL VALVE SPACER and FRONT SERVO

The detent solenoid is secured to the lower face of the transmission casing and is connected by a lead to a connector on the left-hand side of the transmission. When the solenoid receives a signal from a micro-switch at full throttle (kick-down button depressed) a needle valve is caused to move and an exhaust port is opened behind the detent valve. This allows the detent valve spring to move the detent valve and allow oil at high pressure to be fed to the shift valves to oppose governor pressure (see *Forced down-change — kick-down — Section T15 — Control Valve Unit*).

The control valve spacer fits between the control valve unit and the transmission casing and forms part of the hydraulic system which contains restrictors and check balls.

The front servo is an assembly of pistons and springs, similar to the rear servo. It fits partly in the transmission casing and partly in the control valve unit. The servo applies the front band in Intermediate range — second gear and Low range — second gear, to provide engine braking. It is used also as an accumulator for the application of the direct clutch and, in conjunction with the check balls and orifices, is part of the timing for the release of the direct clutch.

Front servo operation

Drive range—first gear

In Drive range, servo oil from the manual valve charges the accumulator by stroking both the accumulator piston and the servo piston against the accumulator spring. This prepares the accumulator for the controlled application of the direct clutch during the

2-3 up-change. The charging of the accumulator in Drive range, first gear, also makes it possible to have a controlled 1-3 let-up change as the accumulator is prepared in first gear for direct clutch application.

Servo oil and the servo release spring prevent the application of the band in second gear — Drive range, when intermediate clutch apply oil is directed between

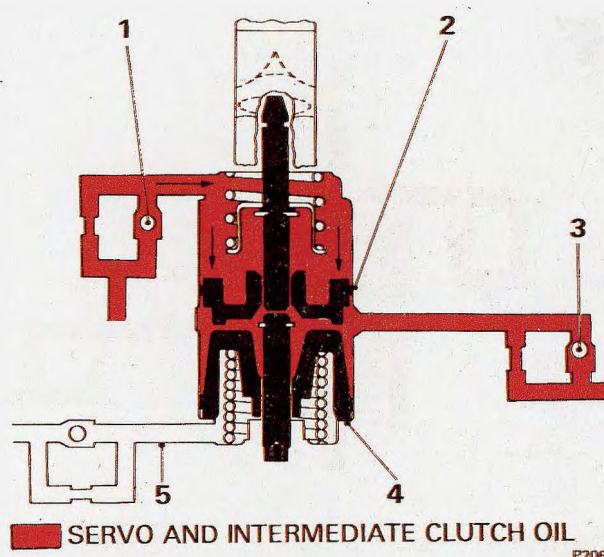


FIG. T212 DRIVE RANGE—2ND GEAR

- 1 Check ball (seated)
- 2 Servo piston
- 3 Intermediate clutch oil check ball (seated)
- 4 Accumulator piston
- 5 Direct clutch passage
- 6 Servo oil

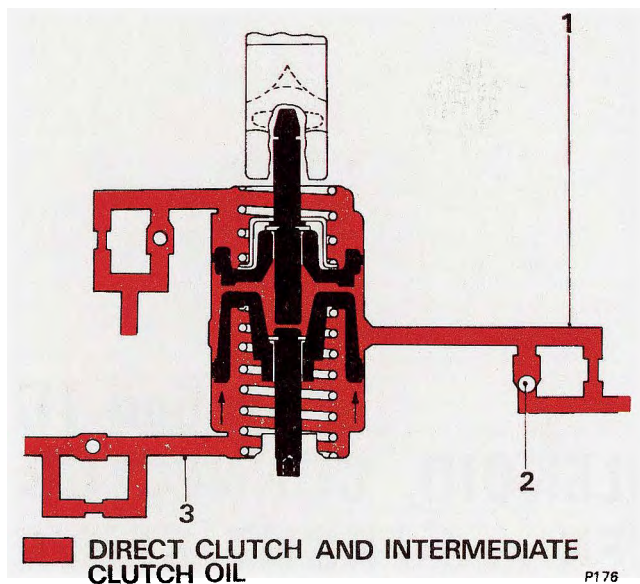


FIG. T213 DRIVE RANGE—3RD GEAR

- 1 Intermediate clutch oil
- 2 Check ball
- 3 Direct clutch oil

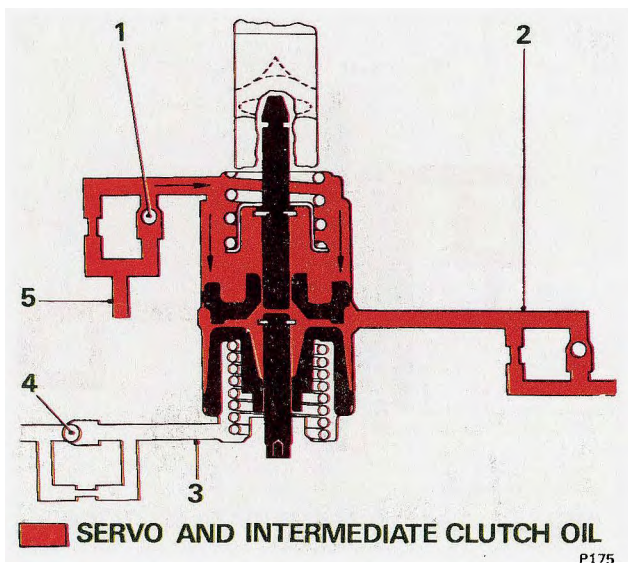


FIG. T214 DRIVE RANGE—3-2

- 1 Check ball (seated)
- 2 Intermediate clutch oil
- 3 Direct clutch passage
- 4 Check ball (seated)
- 5 Servo oil

the servo and accumulator pistons. Servo oil is also present in Reverse and Neutral.

Drive range—second gear

In Drive range — first and second gears, the accumulator is charged with servo oil (see Fig. T212). In second gear, intermediate clutch oil is fed between the servo and accumulator pistons but does not force them apart. This is because the force of the servo oil which holds the piston down is equal to the intermediate clutch oil pressure.

Drive range—third gear

When the direct clutch is applied, intermediate clutch oil pressure increases. This increased pressure, plus the accumulator spring, overcomes the servo oil pressure and the accumulator piston is moved until it reaches the stop on the pin (see Fig. T213). As the accumulator piston moves, it abuts the servo piston which moves a corresponding distance, until it contacts a washer on the servo pin; it will not, however, move any further and the front band will not be applied.

As the accumulator piston moves, an amount of direct clutch oil is absorbed and this permits the direct clutch to apply at a controlled rate for a smooth 2-3 up-change.

Drive range—3-2

The release of the direct clutch is controlled by the front servo, two orifices and two check balls. This allows the driving load to be transferred smoothly to the intermediate roller.

The controlled release pressure allows the engine to increase its r.p.m. to suit the lower gear ratio of second gear during detent down-changes, resulting in a smooth change with better acceleration.

During the stroking of the servo and accumulator pistons, servo oil seats a check ball and the oil must pass through a restrictor. This slows down the stroking of the pistons (see Fig. T214).

The exhausting oil from the accumulator and the direct clutch seats another check ball and the oil is forced to flow through an orifice. This controls the clutch pressure during direct clutch release.

Intermediate range—second gear

During a manual 3-2 down-change, intermediate clutch oil from the 1-2 shift valve seats a check ball and flows through an orifice to apply the front band (see Fig. T215). The oil which applies the band is controlled also by the stroking of the accumulator piston which is resisted by the accumulator spring and the restricted exhaust of direct clutch oil.

Detent solenoid, connector, control valve spaces and front servo—To remove

The units may be removed from the transmission whether the transmission is removed from the car or not.

1. Drain the transmission fluid and remove the sump.
2. Remove the control valve unit and governor pipes (see Section T15 — Control Valve Unit).
3. Disconnect the solenoid lead(s) from the connector terminals.
4. Compress the tabs on the connector and remove the connector and 'O' ring from the casing; discard the 'O' ring.
5. Remove the two setscrews which secure the detent solenoid.
6. Remove the solenoid and gasket.
7. Remove the control valve spacer plate and gasket.

Note If the last operation is being carried out with the transmission in the car, lower the control valve spacer plate in a level plane so that the check balls do not fall out. Remove the check balls from the spacer plate.

8. Remove the six check balls from the cored passages in the transmission case (see Fig. T216).
9. Lift the front servo piston, washer, pin, retainer and spring from the transmission case. An exploded view of the front servo is shown in Figure T217.

Front servo—To inspect

1. Examine the servo pin for damage.
2. Examine for damage the oil seal ring groove in the piston.
3. Ensure that the ring is free in the groove.
4. Examine the piston for cracks and other damage.
5. Check the fit of the servo pin in the piston.

Detent solenoid, connector, control valve spacer and front servo—To fit

'Teflon' oil sealing rings are fitted to Transmission Serial Number 70-RR-2626 and onwards. Therefore, when overhauling the front servo or front accumulator piston it will be noticed that the 'Teflon' ring allows the piston to slide very freely in its bore. This is a normal characteristic of the ring and does not indicate leakage during operation.

When servicing pistons fitted with 'Teflon' oil sealing rings the following points should be noted.

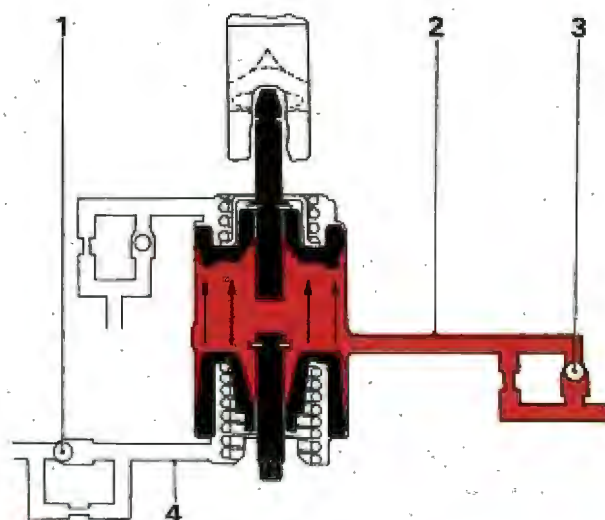
Only remove a 'Teflon' oil sealing ring from a piston ring groove if the ring is to be renewed.

Only renew a 'Teflon' oil sealing ring if it shows evidence of leaking during operation or visual damage.

When changing a 'Teflon' oil sealing ring, renew with the current aluminium (front servo) or cast iron (front accumulator) service rings.

Note The front accumulator piston, front servo piston and related parts are changed on 1971 transmissions and onwards; individual parts are not interchangeable (see Fig. T218).

1. Fit the front servo spring and retainer into the bore of the transmission casing.



■ INTERMEDIATE CLUTCH OIL

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FIG. T215 INTERMEDIATE RANGE—2ND GEAR

- 1 Check ball
- 2 Intermediate clutch oil
- 3 Check ball
- 4 Direct clutch passage

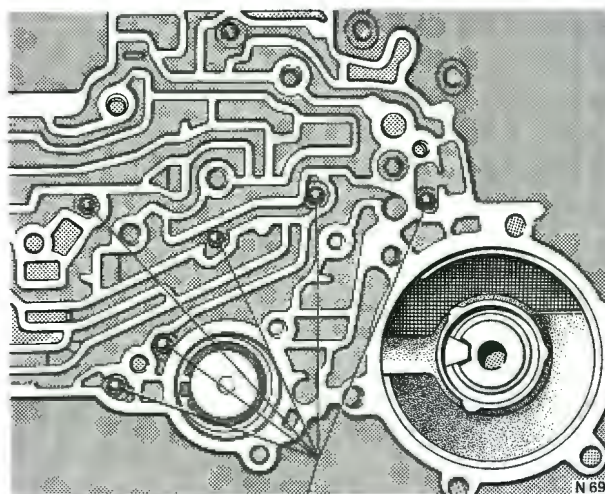


FIG. T216 LOCATION OF CHECK BALLS

- 1 Check balls

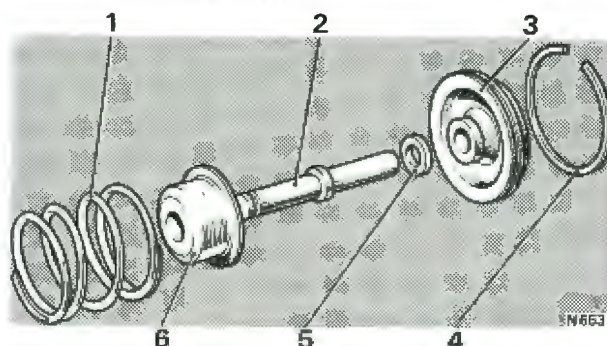


FIG. T217 FRONT SERVO—EXPLODED

- | | |
|----------|-------------------|
| 1 Spring | 4 Oil seal ring |
| 2 Pin | 5 Washer |
| 3 Piston | 6 Spring retainer |

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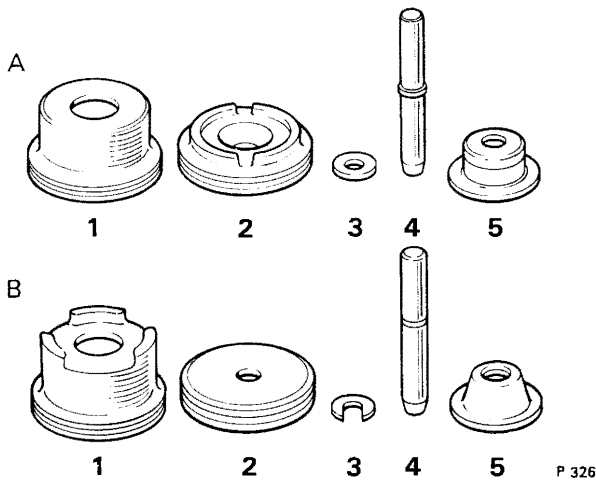


FIG. T218 IDENTIFICATION OF FRONT SERVO AND FRONT ACCUMULATOR COMPONENTS

A 1965 through to 1970 components

- 1 Accumulator piston
- 2 Servo piston
- 3 Washer — front servo piston
- 4 Pin front servo piston
- 5 Retainer front servo spring

B 1971 components

- 1 Accumulator piston
- 2 Servo piston
- 3 'C' ring — front servo piston
- 4 Pin — front servo piston
- 5 Retainer — front servo spring

- 2. Fit the flat washer onto the front servo pin on the end opposite to the taper.
- 3. Fit the pin into the casing so that the tapered end contacts the forward band.
- 4. Fit the piston ring to the piston if it was removed.
- 5. Fit the piston onto the band apply pin so that the number on the shoulder of the piston faces toward the sump.

Note If the front servo assembly is to be fitted with the transmission in the car, hold temporarily in position until the accumulator piston has entered the front servo piston by means of a length of clean 0.020 in. (0.508 mm.) feeler gauge position across the servo piston as shown in Figure T219. Withdraw the feeler gauge before tightening the control valve body bolts.

- 6. Check the piston for freedom of movement by pushing it against the spring.
- 7. Fit the six check balls into the ball seat pockets in the transmission casing (*see Fig. T216*).

Note If the operation is being performed with the transmission in the car, fit the check balls into the ball seat pockets on the spacer plate.

- 8. Fit the case-to-spacer gasket (gasket with an extension for the detent solenoid).
- 9. Fit the control valve spacer.
- 10. Fit the control valve-to-spacer gasket (gasket with slot).
- 11. Fit the detent solenoid gasket.
- 12. Fit the detent solenoid assembly with the connector facing the outer edge of the casing. Fit the securing setscrews but do not tighten them.
- 13. Fit a new 'O' ring onto the solenoid connector.
- 14. Fit the connector with the lock tabs pointing into the casing.
- 15. Bend up the locating tabs on the side of the casing.
- 16. Fit the solenoid and stator leads to the connector terminals.
- 17. Fit the control valve unit as described in Section T15 then torque tighten the two solenoid securing setscrews (*see Chapter P*).

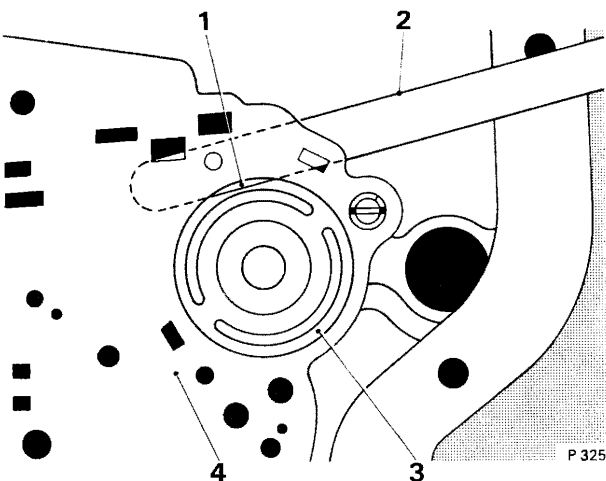


FIG. T219 METHOD OF TEMPORARILY HOLDING FRONT SERVO PISTON IN POSITION (TRANSMISSION INSTALLED IN A VEHICLE)

- 1 Locate feeler gauge in this position, allowing accumulator piston to enter the front servo piston before the feeler gauge is withdrawn
- 2 Feeler gauge
- 3 Front servo piston
- 4 Spacer plate

Section T18

REAR EXTENSION

Rear extension—To remove

This Section describes the procedure for removal of the rear extension when the transmission is fitted to the car.

The procedure is the same when the transmission is removed from the car except that the gearchange actuator and the propeller shaft will have been removed.

1. Remove the gearchange electric actuator as described in Section T18.
2. Remove the propeller shaft as described in Chapter F.
3. Place a drip tray beneath the rear extension.
4. Remove the coupling flange by withdrawing it from the output shaft.
5. Remove the six setscrews which secure the rear extension to the transmission casing.
6. Slide the rear extension rearward and downward until it clears the output shaft.

Caution Make certain that the output shaft splines do not damage the oil seal in the end of the rear extension.

7. Remove and discard the square section 'O' ring or gasket, whichever is fitted, from the rear extension.

Rear extension—To inspect

1. Examine the rear extension for cracks or damage.
2. Examine the bush for excessive wear or damage.
3. Examine the oil seal for damage.
4. If a new oil seal is to be fitted, push out the old seal using a suitable drift.
5. Ensure that the bore in which the seal fits is clean and free from damage and that the seal drain-back port is not obstructed.

6. Lightly smear with Wellseal the outer edge of the new seal then, drive in the seal using tool RH 7953 (J-21359).

Note The webbing on the seal installation tool RH 7953 (J-21359) must be undercut by approximately 0.125 in. (3.17 mm.) as shown in Figure T220.

7. Ensure that the rear face of the transmission casing and the front face of the extension are clean and free from burrs.



FIG. T220 UNDER CUTTING WEBBING OF SEAL INSTALLATION TOOL RH 7953 (J-21359)

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Rear extension—To fit

1. Fit a new square sectioned 'O' ring or a gasket, whichever was removed, onto the extension housing.
2. Carefully fit the extension casing over the output shaft until the extension abuts the rear of the transmission casing.
3. Ensure that the splines on the output shaft do

not touch the oil seal in the end of the extension casing otherwise the seal lip may be damaged.

4. Fit the six setscrews and torque tighten them to the figure specified in Chapter P.
5. Fit the coupling flange.
6. Fit the propeller shaft.
7. Fit the electric actuator.

Section T19

OIL PUMP

The oil pump is an internal/external gear type which is secured to the front face of the transmission housing. The oil pump cover contains an oil pressure regulator valve train, a stator valve and an heat exchanger by-pass valve. The pump is connected mechanically to the engine flexplate and operates whenever the engine is running.

As the engine flexplate revolves it turns the torque converter pump which is keyed to the inner gear of the oil pump. The inner gear turns the outer gear and causes oil to be lifted from the transmission sump via an oil strainer.

As the gears turn, the oil is carried in pockets formed by the gear teeth, past a crescent shaped projection of the pump. Beyond the crescent, the gear teeth move closer together causing the oil to be squeezed out at pressure from between the teeth. At this point the oil is delivered through the pump outlet to the pressure system (see Fig. T221).

The oil pressure is controlled by a pressure regulator valve. As the pressure builds up, the oil is directed through an orifice to the top of the pressure regulator valve. When the desired pressure is reached, the valve moves against spring pressure, opening a passage to feed the torque converter.

When the torque converter is full, oil returns to the transmission heat exchanger by way of an external pipe. Upon leaving the heat exchanger, the oil is fed by way of another external pipe to the transmission lubricating system.

Should the heat exchanger become obstructed, returning oil is diverted to the by-pass valve, unseating the valve and permitting oil to flow directly to the lubrication system.

As pressure continues to increase, the pressure regulator valve moves to expose a port which directs excess oil to the suction side of the pump. The pressure regulator valve is spring-balanced to regulate line pressure at approximately 70 lb/sq. in. (4,9 kg/sq. cm.).

Note There is a change to the regulator valve fitted to 1971 onwards transmission. Early transmissions (prior to 1971) were fitted with a regulator valve having oil holes and an orifice cup plug, later transmissions (1971 onwards) have a solid type of regulator valve. The solid type of valve must only be fitted to a pump cover with a squared off pressure regulator boss (see Fig. T222). The earlier type of valve with oil holes and cup plug can be used to service either type of pump cover.

Oil pump—To remove

1. Remove the transmission from the car.
2. Remove the sump and oil strainer.
3. Remove the stator solenoid lead (if fitted) from the connector in the transmission casing.

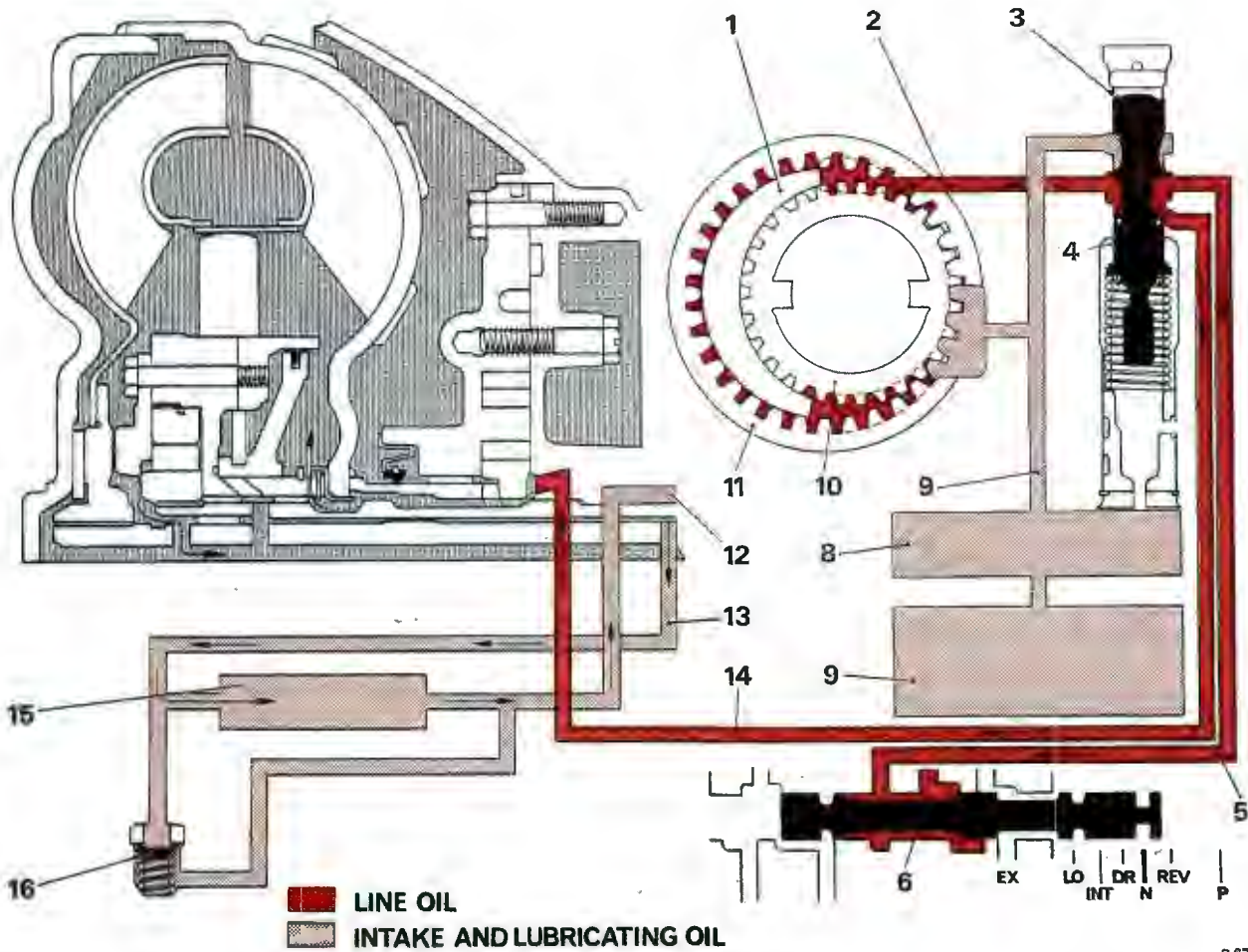


FIG. T221 OIL PUMP AND PRESSURE REGULATING SYSTEM

- | | | |
|----------------------------|---------------------|---------------------------|
| 1 Pump crescent | 7 Transmission sump | 11 Driven gear |
| 2 Pump outlet | 8 Strainer assembly | 12 Lubricating oil |
| 3 Line pressure oil | 9 Pump intake | 13 Converter return |
| 4 Pressure regulator valve | 10 Drive gear | 14 Converter oil |
| 5 Line pressure oil | | 15 Heat exchanger by-pass |
| 6 Manual valve | | 16 Heat exchanger |

4. Remove the lead from the clips.

Note Before removing the pump, opportunity should be taken to check the front unit end play as follows.

5. Remove one of the screws securing the oil pump also the 'O' ring, at either the 10 o'clock or 5 o'clock position.

6. Fit slide hammer RH 7958 (J-6125) into the pump in the tapped hole from which the setscrew was removed.

7. Secure a dial test indicator on the slide hammer bolt, then adjust the indicator to register against the end of the turbine shaft.

8. Hold the output shaft forward whilst pushing the turbine shaft rearward to its stop.

9. Set the dial indicator to zero.

10. Pull the turbine shaft forward as shown in Figure T223.

11. Make a note of the indicator reading (shaft travel).

12. If the transmission is to be dismantled further it will enable the correct adjusting washer to be selected during assembly, thus ensuring that the front unit has the correct amount of end float. End float should be between 0.003 in. and 0.024 in. (0.076 mm. and 0.610 mm.). The selective washer which controls the end float is located between the pump cover and the forward clutch housing. If the end float is not within the limits, select a new washer, referring to the following chart.

THICKNESS	COLOUR
0.060 in. to 0.064 in. (1,52 mm. to 1,63 mm.)	Yellow
0.071 in. to 0.075 in. (1,803 mm. to 1,905 mm.)	Blue
0.082 in. to 0.086 in. (2,08 mm. to 2,18 mm.)	Red
0.093 in. to 0.097 in. (2,36 mm. to 2,46 mm.)	Brown
0.104 in. to 0.108 in. (2,64 mm. to 2,74 mm.)	Green
0.115 in. to 0.119 in. (2,92 mm. to 3,02 mm.)	Black
0.126 in. to 0.130 in. (3,20 mm. to 3,30 mm.)	Purple

Note An oil soaked washer may tend to discolour. If necessary, measure the washer to ascertain the thickness.

13. Remove the dial indicator gauge. If oil is to be removed, do not remove the slide hammer at this stage.

14. Proceed with the removal of the oil pump as follows.

15. Remove the seven remaining setscrews securing the pump.

16. Fit slide hammer RH 7958 (J-6125), with a $\frac{3}{8}$ in. \times 16 threaded adapter, into the other threaded hole in the pump body.

17. Remove the pump from the casing by driving it outward using the slide hammers (see Fig. T224).

Note Operate the slide hammers simultaneously otherwise the pump will tilt and jam in the bore of the casing.

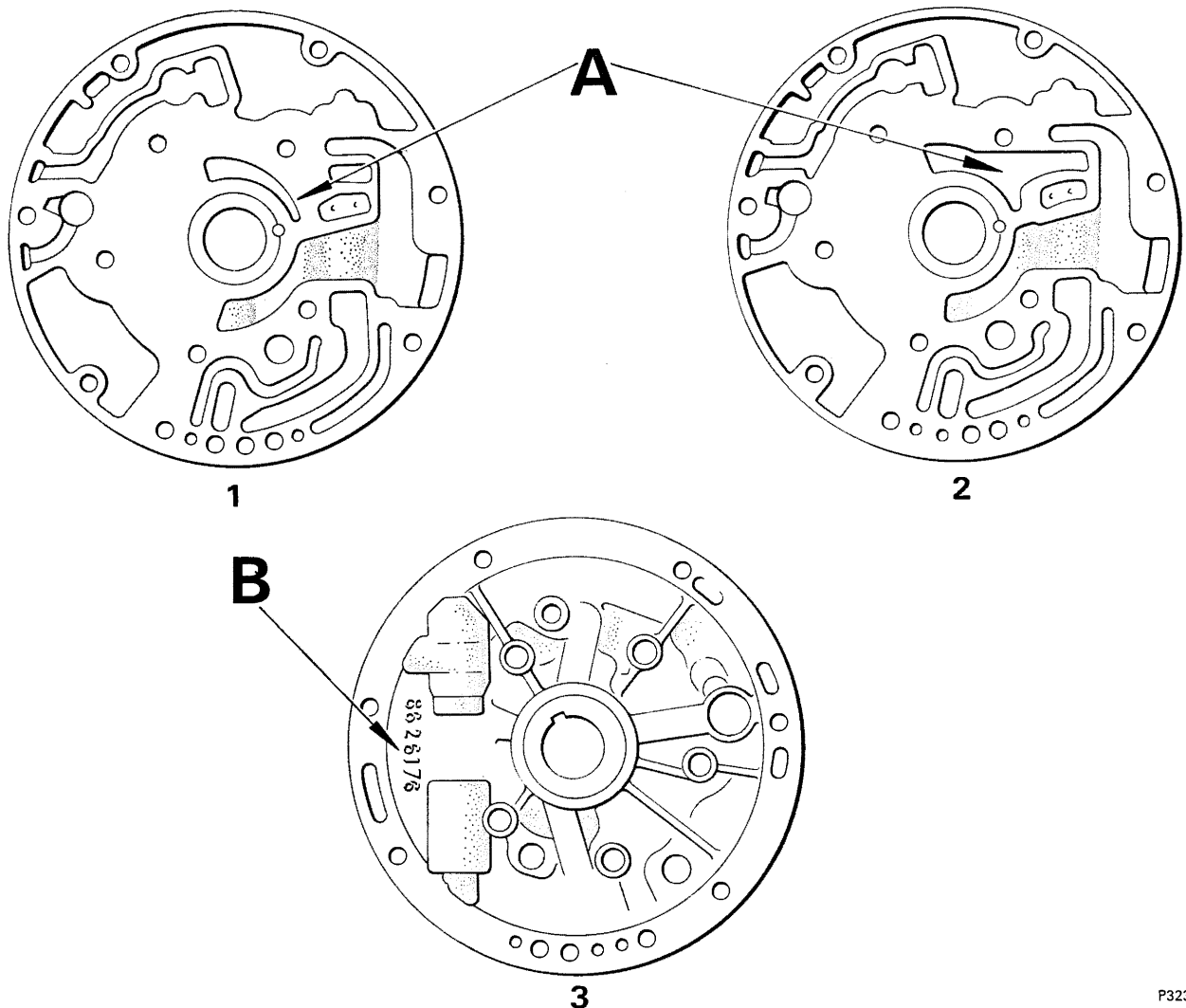


FIG. T222 PUMP COVER IDENTIFICATION

1 Oil pump cover type 1
2 Oil pump cover type 2

3 Oil pump cover type 2
(opposite side)

A Note differences in oil passages
B Identification number

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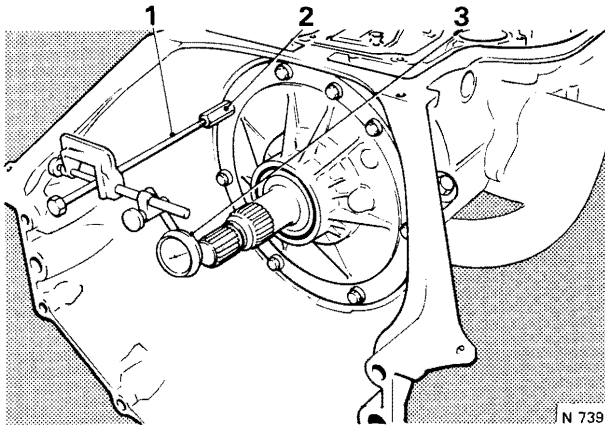


FIG. T223 CHECKING THE FRONT UNIT END FLOAT

- 1 RH 7958 (J 6125-1)
- 2 RH 7958 (J 6125-2)
- 3 Dial indicator (J-8001)

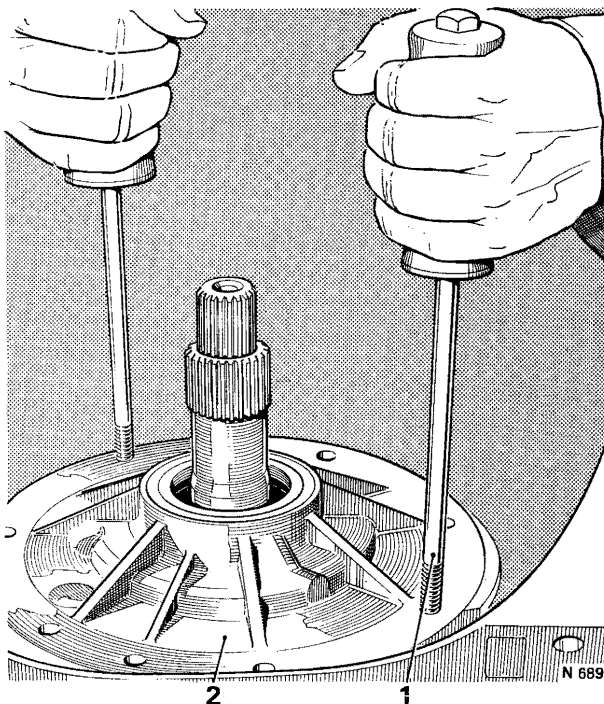


FIG. T224 REMOVING THE OIL PUMP

- 1 Slide hammer
- 2 Oil pump

- 18. Remove the slide hammers from the pump.
- 19. Remove and discard the square sectioned 'O' ring and the gasket.

Oil pump—To dismantle

- 1. Using adaptor RH 7960 (J-21364) in the rear unit holding fixture RH 7959 (J-6116), fit the pump into the holding fixture with the stator shaft pointing downward. Take care not to damage the shaft.
- 2. Remove the stator solenoid (if fitted) from the pump cover; discard the gasket.
- 3. Compress the regulator boost valve, against spring pressure, then remove the circlip (see Fig. T225).

Caution The pressure regulator spring is under extreme pressure and care should be exercised when removing the boost valve and sleeve.

- 4. Remove the regulator boost valve sleeve and valve.
- 5. Remove the pressure regulator spring.
- 6. Remove the regulator valve, spring retainer and spacer or spacers (if fitted).
- 7. Remove the five setscrews which secure the pump cover to the pump body; separate the cover and body; note that the setscrews are of differing lengths.
- 8. Mark the driving and driven gears to facilitate correct assembly. Do not use a scribe or a punch; an indelible pencil is recommended.
- 9. Remove the gears from the pump body as shown in Figure T226.
- 10. Remove the retaining pin and the plug from the end of the regulator bore.
- 11. If fitted, remove the stator valve retaining pin; remove the stator valve and spring.
- 12. Remove the two oil rings from the pump cover.
- 13. Remove the fibre adjusting washer.
- 14. Remove the converter return check valve from the by-pass assembly (if fitted).

Note Do not remove the heat exchanger by-pass valve unless it is necessary to renew the seat, valve or spring.

- 15. The sealing qualities of the by-pass valve can be checked by pouring a small quantity of thinners or spirits into the valve pocket and checking for excessive leakage.

If it is necessary to remove the heat exchanger by-pass valve seat proceed as follows.

Note On service replacement pumps the cooler by-pass valve is not used.

- 1. Using pump by-pass valve seat remover RH 7963 (J-21361), in conjunction with slide hammer RH 7958 (J-6125) and the $\frac{3}{8}$ in. \times 16 threaded adapter, fit the removal tool into the valve seat and drive upward on the slide hammer (see Fig. T227); remove and discard the valve seat.

Note The seat may be removed also by threading the seat with a $\frac{3}{8}$ in. \times 16 tap and using the $\frac{3}{8}$ in. \times 16 adapter on the slide hammer to drive out the seat. If this method is used, flush out the bore of the by-pass valve to remove all swarf and foreign material before fitting the new seat.

2. Remove the by-pass valve and spring.
3. If the pump oil seal requires renewal, drive out the seal with a hammer and chisel.
4. Take care not to damage the pump cover, especially the seal bore diameter.

Oil pump—To inspect

Wash all parts, except the stator solenoid (if fitted), in clean paraffin (kerosene) then dry them with compressed air.

1. Examine the gear pockets and the crescent for scoring or other damage.
2. Fit the gears into the pump body then check the end clearance as shown in Figure T228. The clearance should be between 0.0008 in. and 0.0035 in. (0,020 mm. and 0,099 mm.).
3. Examine the face of the pump body for scores or burrs.
4. Examine the oil passages for blockages and porosity.
5. Examine the threads into which the cover securing setscrews fit.
6. Examine the pump body face for overall flatness.
7. Examine the bush for scores or burrs.
8. Examine the setscrew 'O' rings for damage; renew if necessary.
9. Examine the pump cover face for overall flatness.
10. Examine the stator valve bore and the pressure regulator valve bore for scores or dirt (*see Fig. T229*).
11. Ensure that all the oil passages are clear and are not interconnected due to porosity.
12. Examine for scores or damage the face against which the pump gears rotate.
13. Examine the stator shaft for damaged splines or scored bushes.
14. Examine the oil ring grooves for damage or wear.
15. Examine the heat exchanger by-pass valve for free operation and good sealing qualities.
16. Examine for damage the face against which the selective washer fits.
17. Fit the oil sealing rings into their bore in the forward clutch housing and check for slack or badly fitting rings.
18. Ensure that the pressure regulator and the boost valve will move freely in their bores.

Oil pump—To assemble

Note Before commencing with the assembly of the oil pump, always ensure that any new or replacement parts to be used are appli-

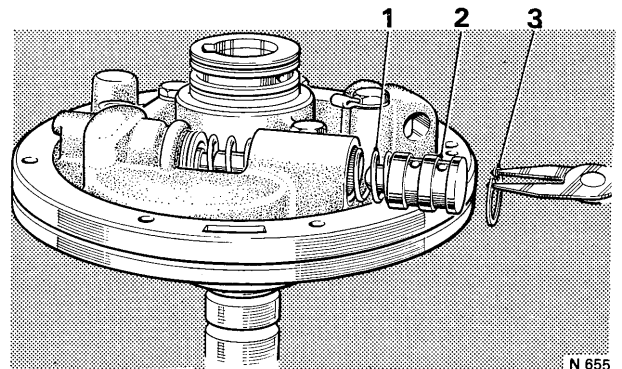


FIG. T225 REMOVING THE REGULATOR VALVE RETAINING CIRCLIP

- 1 Regulator valve spring
- 2 Boost valve sleeve
- 3 Circlip

cable to the assembly in question and are not intended for either an earlier or later assembly. **Always consult the relevant Parts Lists, Spares Information Sheets and Service Bulletins.**

1. Fit the oil pump driving and driven gears into the pump body with the alignment marks and tangs uppermost.
2. Fit the pressure regulator spring spacer or spacers, if any were removed, then fit the retainer and spring into the bore.
3. Lightly lubricate the pressure regulator valve with clean transmission fluid then fit the valve into the opposite end of the bore, stem end first.

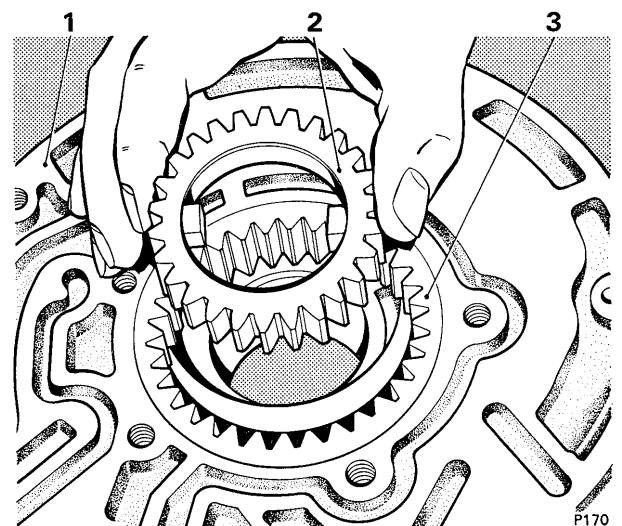


FIG. T226 REMOVING THE PUMP GEARS

- 1 Pump body
- 2 Driving gear (tangs uppermost)
- 3 Driven gear

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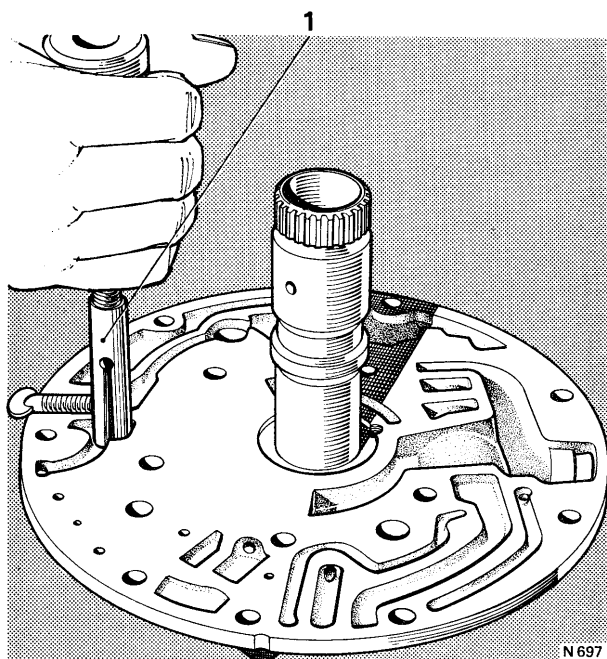


FIG. T227 REMOVING THE BY-PASS VALVE SEAT

1 By-pass valve seat extractor

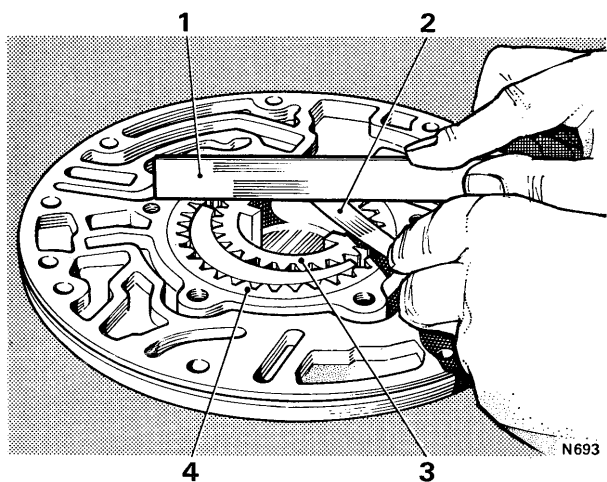


FIG. T228 CHECKING GEAR END CLEARANCE

- 1 Straight edge
- 2 Feeler gauge
- 3 Inner (driving gear)
- 4 Outer (driven gear)

4. Lightly lubricate the boost valve and sleeve then fit the valve into the sleeve with the stem of the valve outermost. Fit both parts into the bore in the pump cover by compressing the sleeve against the pressure regulator valve spring.

5. Retain the sleeve with the circlip.

6. Fit the pressure regulator valve end plug and retaining pin into the opposite end of the bore.

7. Lightly lubricate the stator valve then fit the valve and spring into the bore in the pump cover; fit the retaining pin.

8. Fit the previously selected front unit adjustable thrust washer (fibre) over the pump cover delivery sleeve.

Note The correct washer size should have been determined at the time of the front unit end float check as described under 'Oil pump — To remove'.

9. Fit the oil rings.

10. If previously removed, fit the heat exchanger by-pass valve spring (large end first), valve and valve seat; lightly lubricate the valve. Use the pump by-pass valve fitting tool RH 7964 (J-21360) to fit the valve seat (see Fig. T230).

11. Fit the converter by-pass valve into the by-pass valve assembly.

12. Fit the pump body into the rear unit holding fixture RH 7959 (J-6116), with the stator shaft pointing downward. Take care not to scratch or damage the shaft.

13. Lubricate the pump gears with clean transmission fluid then fit the pump cover to the pump body.

14. Fit the cover securing setscrews in their original positions with the clip adjacent to the stator valve. Leave the screws one turn slack.

15. Fit the pump body and cover alignment band J-21368 around the pump assembly. Tighten the wing nut on the band to align the cover with the body (see Fig. T231).

16. With the band in position, tighten the body-to-cover securing setscrews to 18 lb. ft. (2,49 kg. m.). Remove the band.

17. Fit a new square sectioned 'O' ring to the pump.

18. If necessary, fit a new pump oil seal using seal installing tool RH 7953 (J-21359).

19. Fit the stator solenoid (if fitted). Tighten the securing setscrews to 12 lb. ft. (1,66 kg. m.).

20. Fit the stator wire to the clip.

Oil Pump—To fit

1. Fit a new gasket to the oil pump, retaining it with petroleum jelly.

2. Align the holes in the gasket with the corresponding holes in the pump cover.

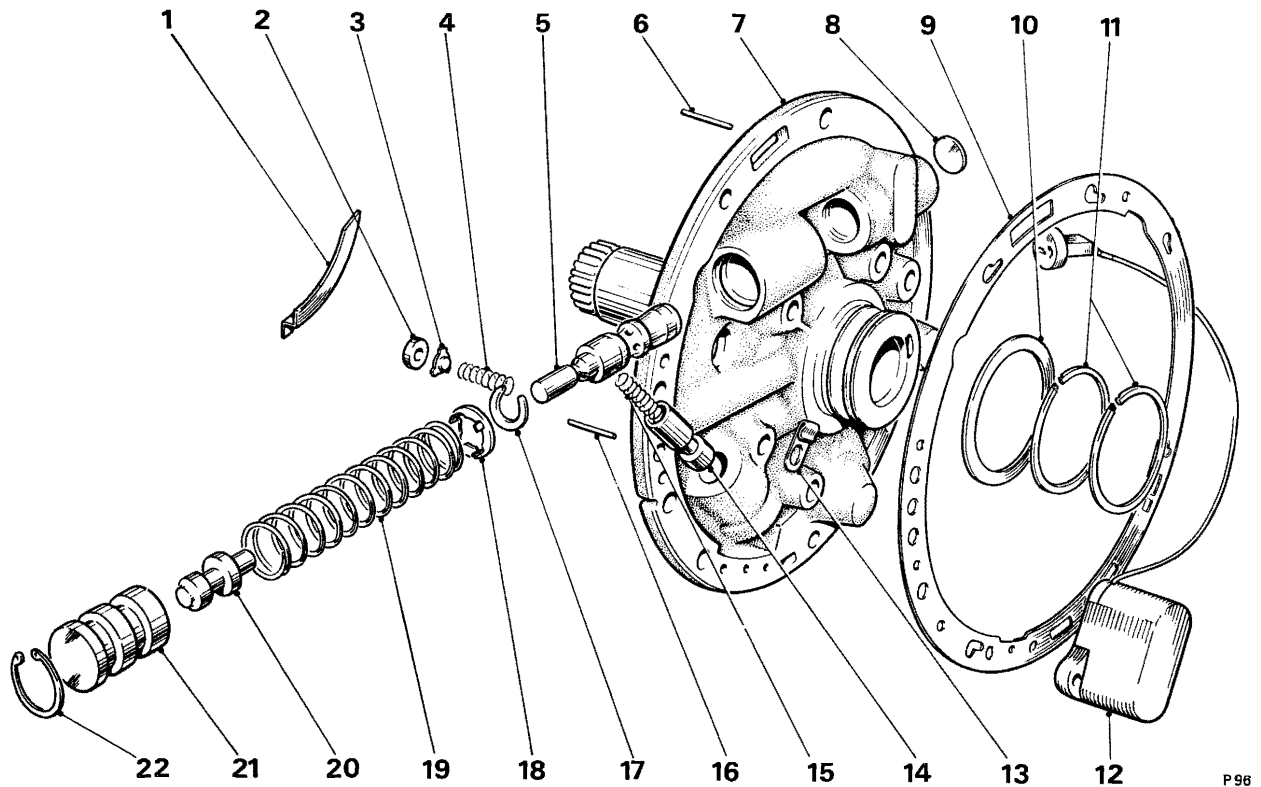


FIG. T229 PUMP COVER—EXPLODED

- | | | |
|--|-------------------------------------|-------------------------------------|
| 1 Converter out — check valve (early cars) | 8 Bore plug | 15 Stator valve spring (early cars) |
| 2 Heat exchanger by-pass valve seat | 9 Gasket | 16 Retaining pin |
| 3 Heat exchanger by-pass valve | 10 Selective washer | 17 Spacer |
| 4 Heat exchanger by-pass valve spring | 11 Oil sealing rings | 18 Spring retainer |
| 5 Pressure regulator valve | 12 Stator solenoid (early cars) | 19 Spring-pressure regulator |
| 6 Retaining pin | 13 Wire retaining clip (early cars) | 20 Boost valve |
| 7 Pump cover | 14 Stator valve (early cars) | 21 Sleeve |
| | | 22 Snap ring |

3. Lubricate the turbine shaft journals with clean transmission fluid. Lubricate the hooked oil seal rings on the pump delivery sleeve with petroleum jelly; ensure that the ends of the rings are interlocked.

4. Fit two $\frac{5}{16}$ in. \times 18 slide hammer bolts RH 7958 (J-6125), through two opposite threaded holes in the pump assembly. The bolts will serve as guide pins when the pump is being fitted to the casing.

5. Position the pump assembly in the transmission casing, then screw the two threaded guide bolts into the corresponding holes in the transmission casing.

6. Feed the stator connector and lead (if fitted) through the hole in the casing adjacent to the pressure regulator (see Fig. T232).

7. Fit the pump assembly into the transmission casing.

8. Fit new 'O' rings to the pump securing setscrews then fit the setscrews. Do not remove the guide bolts until all but two of the setscrews have been fitted.

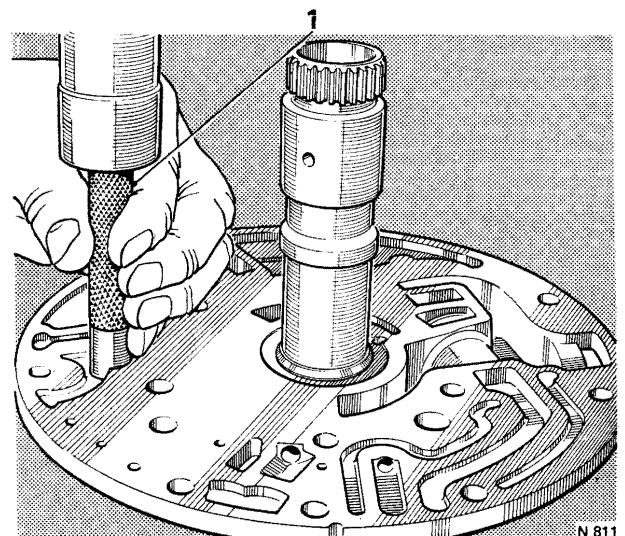


FIG. T230 FITTING THE BY-PASS VALVE SEAT

1 Punch

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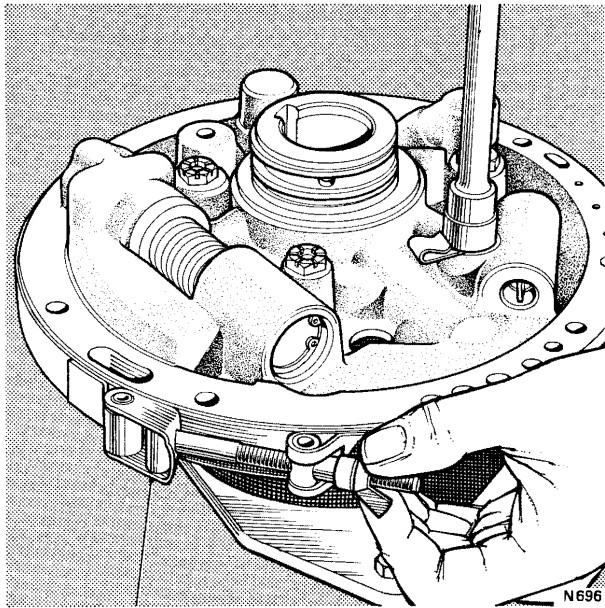


FIG. T231 ALIGNING THE PUMP COVER WITH PUMP BODY

1 Alignment band

9. Remove the guide bolts, but leave out one securing screw at either the 5 o'clock or 10 o'clock position so that the front unit end float can be rechecked. Torque tighten the setscrews to 18 lb. ft. (2,49 kg. m.).

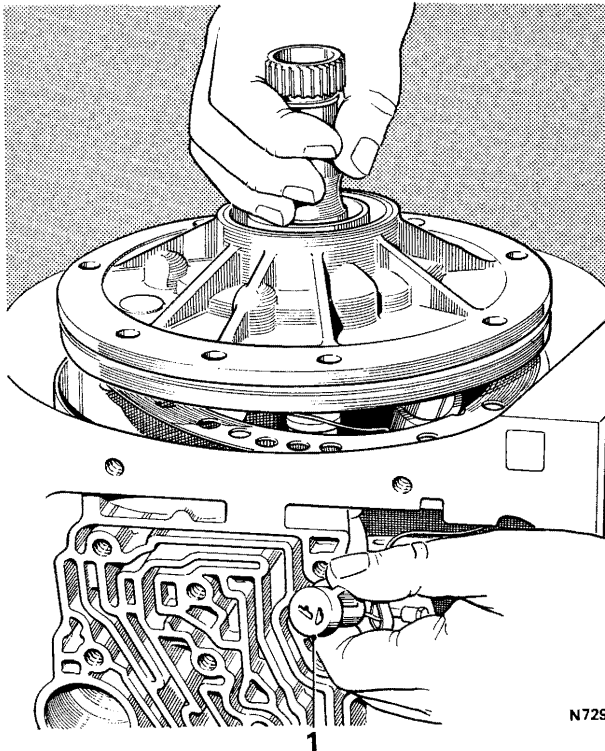


FIG. T232 FITTING THE OIL PUMP

1 Stator solenoid connector (if fitted)

Note If the turbine shaft cannot be rotated as the the pump is being pulled into position, it is possible that either the forward or direct clutch housings have not been correctly indexed with all the clutch plates. This condition should be corrected before the pump is finally pulled into position.

10. Recheck the front unit end float as described earlier in this Section.

11. Fit the remaining setscrew using a new 'O' ring; torque tighten the setscrew to 18 lb. ft. (2,49 kg. m.).

12. Fit the remainder of the units (see Section T14).

Section T20

CONTROL RODS, LEVERS and PARKING LINKAGE

The control rods, levers and parking linkage consist of an assembly of levers and rods which are operated by the electric gearchange actuator; some are fitted to the transmission interior and some externally. The inside detent lever is connected to the manual control valve in the control valve unit and is retained in the desired position by a spring-loaded detent roller.

The parking brake actuating rod causes the parking pawl to engage the transmission whenever Park is selected. This provides a mechanical lock which will hold the car on the steepest of gradients.

On early cars an emergency 'Get-You-Home' lever is pivoted on a pin secured to a bracket on the 'controls' side of the transmission. The lever is connected to the gearchange operating lever, and in the event of gear change actuator failure, will enable the driver to manually select the desired Range.

When the gear selector lever on the steering column is moved and the ignition is switched on, the electric actuator will move the gearchange operating lever to the required position via an adjustable rod. The gearchange operating lever is secured to the outer end of the manual shaft and the inside detent lever is secured to the inner end of the shaft, thus the inside detent lever will move a corresponding distance, moving the manual control valve. By this means it is possible for the driver to position the manual valve to give him the gear range he desires.

When the lever on the steering column is moved to Park, a rod which is secured to the inside detent lever causes the parking pawl to engage with a gear ring on the rear unit planet carrier. The rear unit planet carrier is mechanically connected to the transmission output shaft, thus the shaft is prevented from rotating.

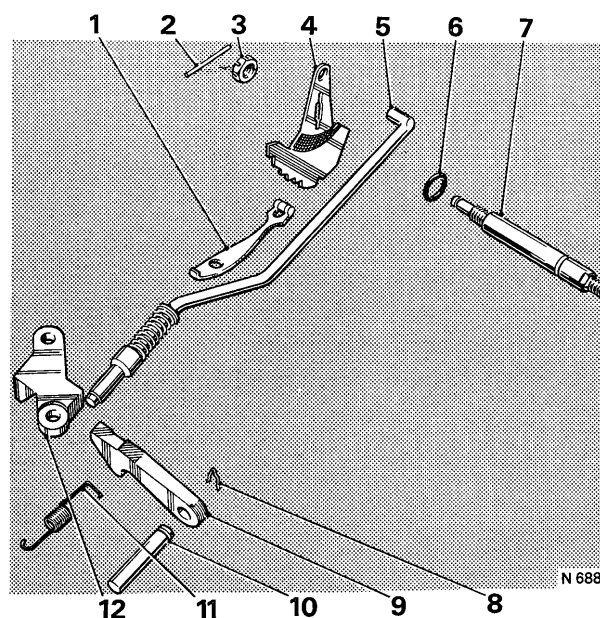


FIG. T233 MANUAL AND PARKING LINKAGE—EXPLODED

- 1 Detent roller and spring
- 2 Retaining pin
- 3 Lock nut
- 5 Inside detent lever
- 4 Parking brake actuating rod
- 6 Manual shaft seal
- 7 Manual shaft
- 8 Spring retainer
- 9 Parking pawl
- 10 Parking pawl shaft
- 11 Pawl return spring
- 12 Parking brake bracket

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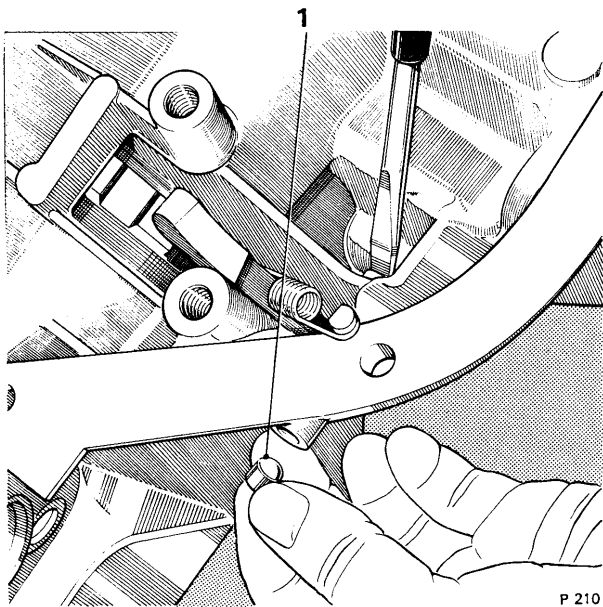


FIG. T234 REMOVING CUP PLUG

1 Cup plug

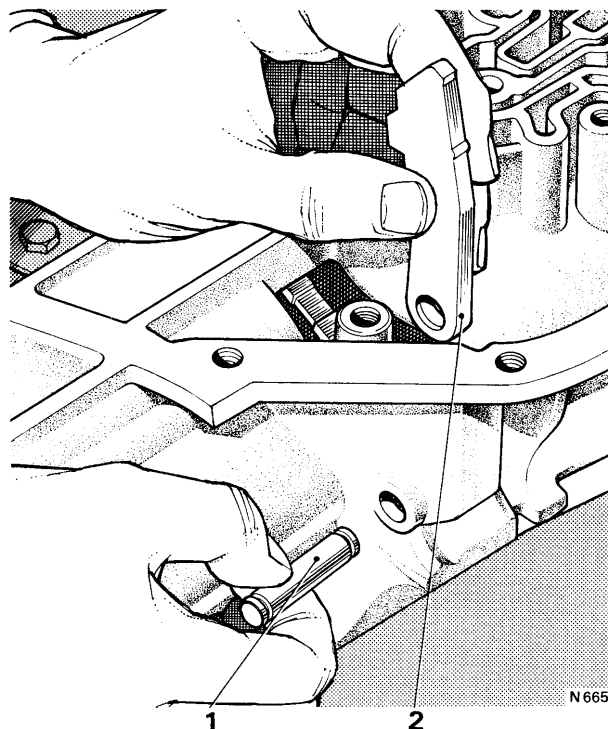


FIG. T235 FITTING THE PARKING PAWL AND SHAFT

1 Shaft
2 Parking pawl

**Control rods, levers and parking linkage—
To remove**

1. The units may be removed from the transmission whether or not the transmission has been removed from the car.

2. If the transmission has not been removed, drain and remove the sump as described in Section T14.

3. If the gearchange electric actuator and the neutral start and height control switches have not been removed, disconnect the gearchange operating rod and the switch operating rod by removing the split pins and clevis pins from the levers at each end; remove the rods.

4. Remove the split pin and clevis pin which secures the link rod to the transmission operating lever.

5. Remove the nut and clamping washer which retains the transmission operating lever to its pivot pin; remove the lever.

6. Remove the lock-nut which retains the gear-change operating lever to the manual shaft; remove the lever.

7. On some early units a shield may be fitted to exclude moisture and dirt from between the shaft and shaft bore in the case; remove the shield from the shaft.

8. Remove the setscrew which secures the detent spring and roller assembly to the control valve unit; remove the detent spring assembly. Refer to Figure T233 for an exploded view of the internal parts.

9. Remove the pin which secures the manual shaft to the case.

10. Slacken the lock-nut which secures the inside detent lever to the manual shaft.

11. Prise the inside detent lever from the manual shaft then remove the lock-nut.

12. Remove the parking brake actuating rod, detent lever and manual shaft from the case.

Note Do not remove manual shaft seal unless replacement is required.

13. Remove the setscrews securing the parking brake bracket; remove the bracket.

14. Remove the parking pawl return spring.

Note The following operations are to be completed only if one or more of the parts involved requires replacement.

15. Remove the spring retainer from the parking pawl shaft. Remove the parking brake pawl shaft cup plug by placing screwdriver between parking pawl shaft and case rib and prying outward (*see Fig. T234*).

16. Remove the parking pawl and the shaft.

Control rods, levers and parking linkage— To inspect

1. Wash all parts in clean paraffin (kerosene) then dry them with compressed air.
2. Examine the gearchange operating rod for signs of bending.
3. Examine the jaws for cracks or damage.
4. Examine the link rod for signs of bending.
5. Examine the switch actuating rod for cracks or signs of bending.
6. Examine the 'Get-You-Home' lever (if fitted), gearchange operating lever and the gearchange actuator lever for damage and wear in the clevis pin bores.
7. Examine the Oilite bushes in the 'Get-You-Home' lever (if fitted) for excessive wear.
8. Ensure that the pin is securely riveted in the gearchange operating lever.
9. Examine the parking actuator rod for cracks, damaged snap ring groove or broken spring retaining lugs.
10. Examine the actuator spring for distortion or damage. Ensure that the actuator fits freely on the actuator rod.
11. Examine the parking pawl for cracks or excessive wear.
12. Examine the manual shaft for damaged threads or shaft roughness at the gearchange operating lever end.
13. Examine the inside detent lever for cracks or a loose pin.
14. Examine the parking pawl shaft for damaged oil seal or retaining clip grooves.
15. Examine the parking pawl return spring for distortion or damaged ends.
16. Examine the parking pawl bracket for cracks or excessive wear.
17. Examine the detent spring and roller assembly for cracks or damage.

Control rods, levers and parking linkage— To fit

1. Fit the parking pawl with the tooth toward the centre of the transmission then fit the parking pawl shaft (see Fig. T235).
2. Fit the parking pawl shaft retaining clip.
3. Fit the parking pawl return spring with the squared end hooked around the pawl.
4. Fit the parking pawl bracket so that the ends fit one each side of the pawl (see Fig. T236). Fit the securing setscrews and torque tighten them to 18 lb. ft. (2.49 kg. m.).
5. Fit the actuator rod into the inside detent lever from the side opposite to the pin.

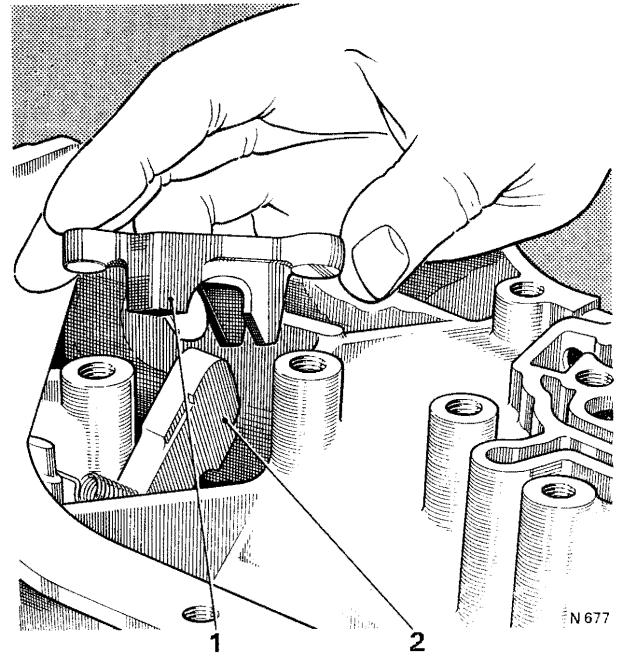


FIG. T236 FITTING THE PARKING PAWL BRACKET

- 1 Parking pawl bracket
- 2 Parking brake pawl

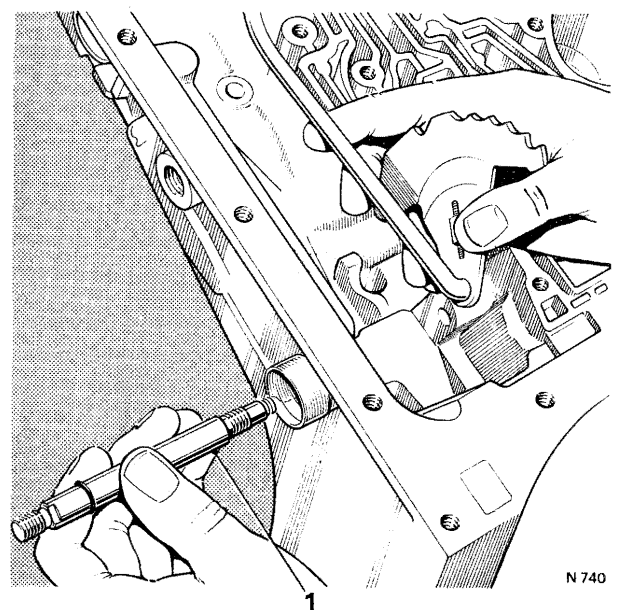
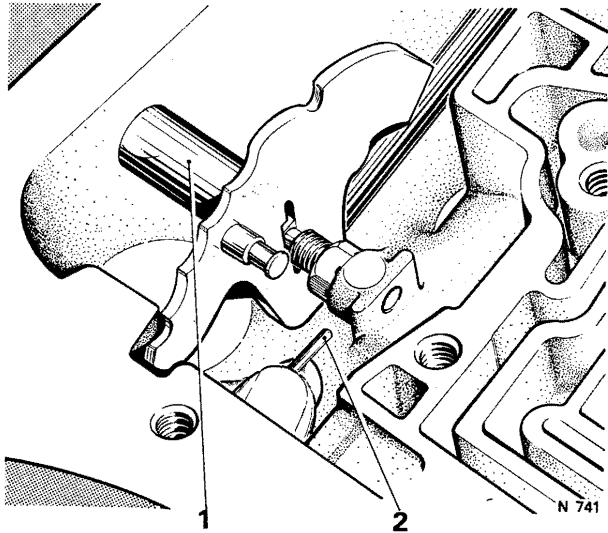


FIG. T237 FITTING THE MANUAL SHAFT

- 1 Manual shaft

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**FIG. T238 FITTING THE MANUAL SHAFT
RETAINING PIN**

- 1 Manual shaft
- 2 Retaining pin

6. Fit the actuating rod plunger under the parking brake bracket and over the parking pawl.

7. Lubricate the manual shaft around the area occupied by the 'O' ring with Shell Retinax A grease.

Fit the shaft into the case and through the detent lever (see Fig. T237).

8. Fit the lock-nut onto the manual shaft then torque tighten the nut (see Chapter P).

9. Fit the retaining pin into the transmission casing, aligning it with the groove in the manual shaft (see Fig. T238).

10. Fit the detent spring and roller. Torque tighten the retaining setscrew to 8 lb. ft. (1,11 kg. m.).

11. If a shield was removed, apply Shell Retinax A grease to the inside of the shield then fit the shield over the shaft.

12. Fit the gearchange operating lever to the manual shaft with the cranked side lowermost and away from the transmission. Fit the lock-nut and tighten it to 18 lb. ft. (2,49 kg. m.) (see Chapter P).

13. Fit the transmission operating lever. Fit the clamping washer and nut; torque tighten the nut to between 8 lb. ft. and 10 lb. ft. (1,11 kg. m. and 1,39 kg. m.).

14. Fit the gearchange operating rod, the switch operating rod and the link rod. Lubricate the clevis pins with Molytone 265 grease then fit new split pins.

15. If the length of either the gearchange operating rod or the switch operating rod has been altered, adjust them as described in Section T5.

16. Fit the sump (see Section T14).

Section T21

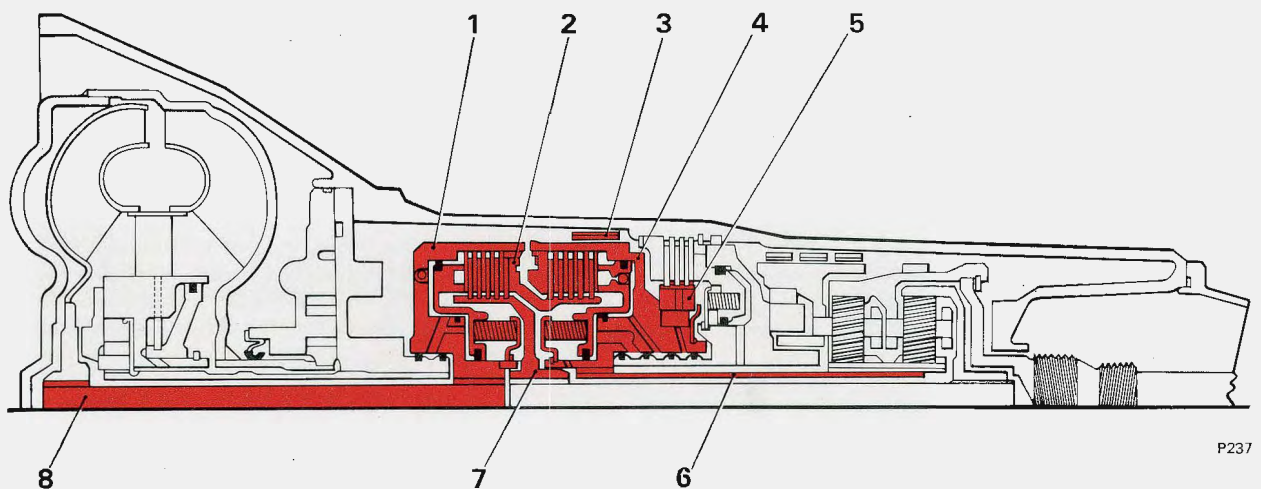
TURBINE SHAFT, FORWARD and DIRECT CLUTCHES, SUN GEAR SHAFT and FRONT BAND

The turbine shaft is a splined shaft which connects the torque converter to the forward clutch.

The forward clutch comprises a housing, splined onto the turbine shaft, steel clutch driving plates which are driven by the clutch housing, composition faced plates which are splined onto a clutch hub and a hydraulically operated clutch piston. The mainshaft is splined into the forward clutch hub.

The direct clutch is similar in construction to the forward clutch (*see Fig. T239*).

The composition plates are splined to a hub which is integral with the forward clutch back plate. The steel plates are splined to a housing which in turn is splined to the sun gear shaft. The clutch is applied hydraulically by a piston housed in the direct clutch drum.



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FIG. T239 SECTIONED VIEW OF TRANSMISSION SHOWING FORWARD AND DIRECT CLUTCHES

- | | | |
|--------------------------------|-----------------------|----------------------|
| 1 Forward clutch drum | 4 Direct clutch drum | 6 Sun gear shaft |
| 2 Direct clutch hub | 5 Intermediate roller | 7 Forward clutch hub |
| 3 Second over-run (front) band | | 8 Turbine shaft |

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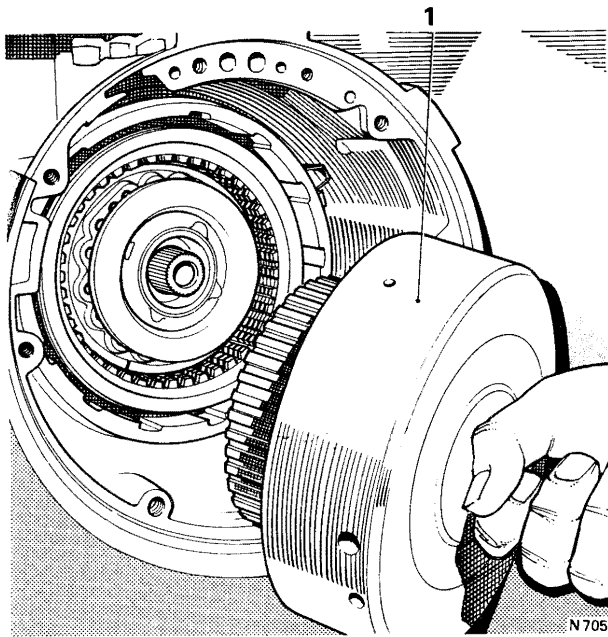


FIG. T240 REMOVING THE FORWARD CLUTCH ASSEMBLY

1 Forward clutch assembly

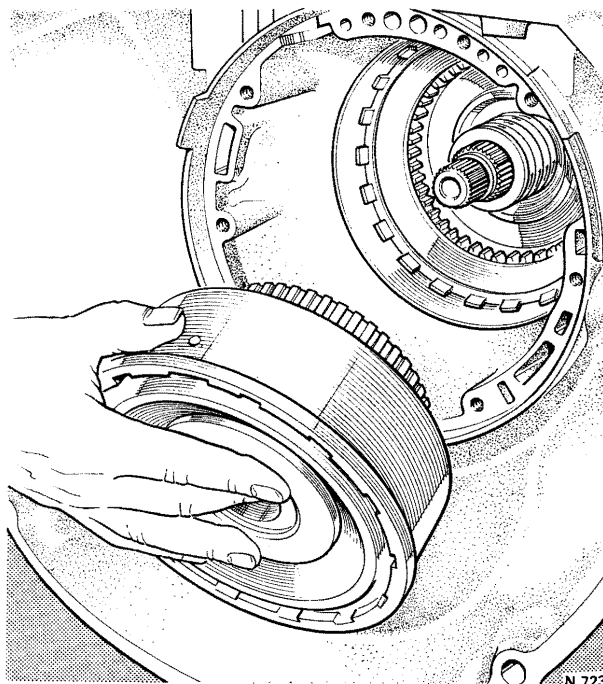


FIG. T241 REMOVING THE DIRECT CLUTCH AND INTERMEDIATE SPRAG ASSEMBLY

The front band is a lined steel band which is anchored to the transmission case at one end and is servo operated at the other end. The band fits around the direct clutch drum, and when moved by the servo, holds the drum stationary.

Whenever the forward clutch is applied, the drive transmitted by the turbine is connected to the transmission mainshaft. When the forward clutch is released the clutch return springs push back the hydraulic piston, the plates are released and the connection between the converter and the mainshaft is broken. As a result, the transmission is in Neutral.

Whenever the direct clutch is applied, drive from the forward clutch is divided and follows two different paths to the gear unit (see Section T22).

By following one path, the drive continues through the forward clutch to the mainshaft and the rear gear unit internal (annulus) gear. The other path is via the forward clutch back plate, through the direct clutch to the sun gear shaft.

As the direct clutch is applied, clockwise torque from the converter causes an intermediate inner roller race to overrun the roller clutch assembly.

An illustrated summary of the power flow through the transmission is given in Section T22.

Turbine shaft, forward and direct clutches, sun gear shaft and front band—To remove

1. Remove the transmission from the car. Withdraw the converter assembly.
2. Remove the oil pump.
3. Withdraw the turbine shaft and the forward clutch from the transmission (see Fig. T240).
4. Remove the thrust washer from between the forward clutch hub and the direct clutch housing; the washer may have come out with the forward clutch.
5. Withdraw the direct clutch and intermediate roller assembly (see Fig. T241). The sun gear shaft may come out with the direct clutch assembly.
6. Remove the sun gear shaft if not previously removed.
7. Remove the front band.

Note The opportunity should be taken at this time to check the end float of the rear unit; proceed as follows.

Rear unit end float—To check

1. Remove the transmission rear extension housing.
2. Fit speedometer gear extractor bolt J-21797, or a similar suitable bolt into one of the holes in the end of the transmission case.
3. Mount a dial test indicator onto the bolt so that the indicator stem registers with the end of the output shaft (see Fig. T242).

4. Set the dial indicator to zero.

5. Move the output shaft to and fro, noting the indicator reading to enable the correct end float adjusting washer to be used when the transmission is assembled. The end float should be between 0.007 in. and 0.019 in. (0,178 mm. and 0,483 mm.).

6. The adjusting washer which controls this end float is the steel washer with the three tabs, located between the thrust washer and the rear face of the transmission case. The notches on the tabs serve to identify washer thickness.

7. If a different washer thickness is required to bring end float within the specified limits, it can be selected with the aid of the following chart.

THICKNESS	IDENTIFICATION NOTCH AND/OR NUMERAL
0.074 in. to 0.078 in. (1,880 mm. to 1,981 mm.)	None 1
0.082 in. to 0.086 in. (2,083 mm. to 2,184 mm.)	On side of 1 tab 2
0.090 in. to 0.094 in. (2,286 mm. to 2,388 mm.)	On side of 2 tabs 3
0.098 in. to 0.102 in. (2,489 mm. to 2,591 mm.)	On end of 1 tab 4
0.106 in. to 0.110 in. (2,692 mm. to 2,794 mm.)	On end of 2 tabs 5
0.114 in. to 0.118 in. (2,896 mm. to 2,997 mm.)	On end of 3 tabs 6

Forward clutch and turbine shaft— To dismantle

1. With adaptor RH 7960 (J-21364) in the rear unit holding fixture RH 7959 (J-6116), fit the forward clutch assembly into the holding fixture with the turbine shaft lowermost; take care not to damage the shaft.

2. Remove the large snap ring which retains the direct clutch hub to the forward clutch drum. Remove the direct clutch hub.

3. Remove the forward clutch hub. Remove the thrust washers, one from each side of the hub. An exploded view of the forward clutch is given in Figure T243.

4. Remove five composition and five steel clutch plates.

5. Place the forward clutch on the bed of a press with turbine shaft lowermost.

6. Using clutch spring compressor RH 7965 (J-4670) in conjunction with adaptor RH 7966 (J-21664), compress the clutch return springs until the retaining snap ring is accessible. Remove the snap ring (see Fig. T244).

7. Remove the tools then remove the spring retainer and the sixteen clutch release springs.

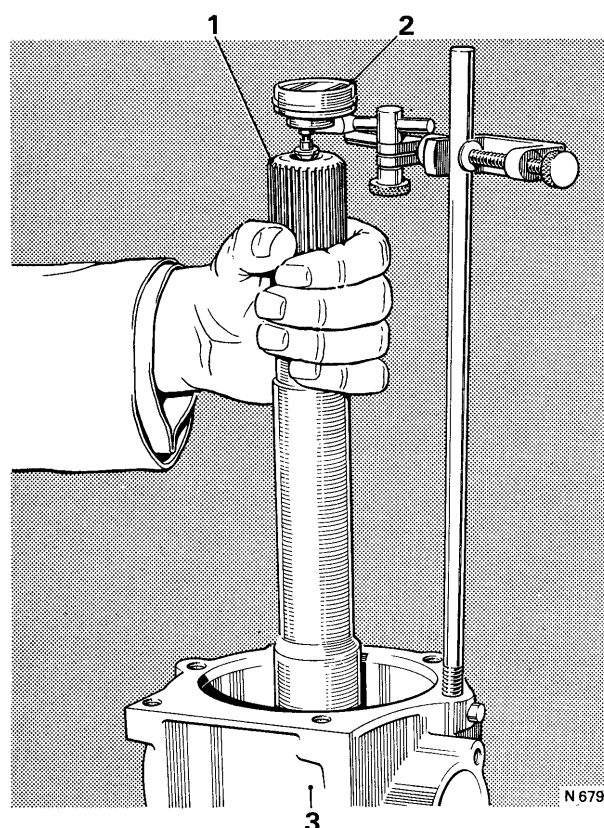


FIG. T242 CHECKING REAR UNIT END FLOAT

- 1 Output shaft
2 Dial indicator gauge
3 Transmission case

8. Remove the piston from the clutch drum (see Fig. T245).

9. Remove and discard the inner and outer seals from the clutch piston.

10. Remove and discard the piston centre seal from the forward clutch drum.

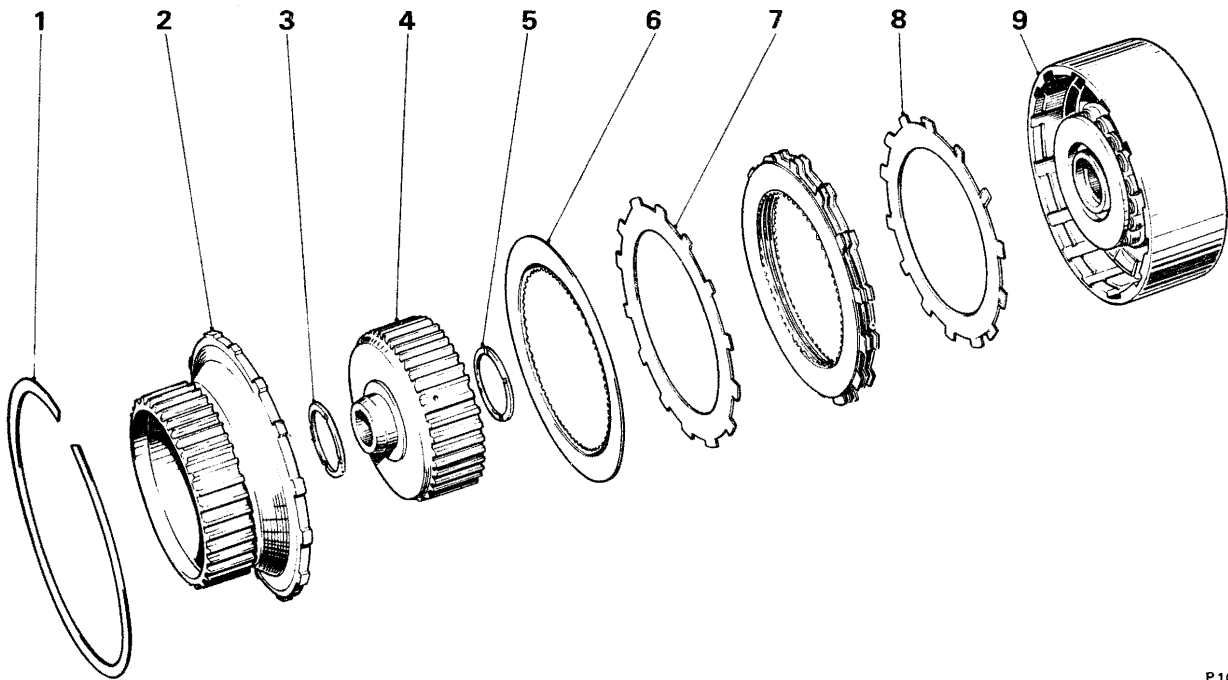
11. It is not necessary to remove the turbine shaft from the forward clutch drum unless either the shaft or the drum is damaged and requires renewal. In such a case proceed as follows.

12. Place the forward clutch drum on the bed of a press with the turbine shaft lowermost.

13. Using a 0.375 in. (9,525 mm.) drive extension approximately 3.00 in. (7,62 cm.) long, or similar tool as a drive, press the turbine shaft out of the forward clutch housing.

Forward clutch and turbine shaft— To inspect

1. Wash all parts except the composition clutch plates in clean paraffin (kerosene) then dry them with compressed air.



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FIG. T243 FORWARD CLUTCH WITH FORWARD AND DIRECT CLUTCH HUBS—EXPLODED

- | | | |
|---------------------|----------------------|---------------------------|
| 1 Snap ring | 4 Forward clutch hub | 7 Flat steel plate |
| 2 Direct clutch hub | 5 Thrust washer | 8 Waved steel plate |
| 3 Thrust washer | 6 Composition plate | 9 Forward clutch assembly |

2. Examine the driving and driven clutch plates for signs of burning, scoring or wear. If the driven (composition) plates are black in colour or have a glazed appearance they should be renewed. The steel driving plates should have a matt grey finish, but if they are discoloured or warped it is a sign of overheating and the plates must be renewed.

3. Examine the sixteen clutch release springs for collapsed coils or signs of distortion. If more than one spring shows these symptoms, the sixteen springs must be renewed.

4. Examine the clutch hubs for worn splines. Ensure that the lubrication holes are clear and that the thrust faces are not scored or damaged.

5. Examine the piston for cracks.

6. Examine the clutch drum for wear, scoring and cracks.

7. Ensure that the oil passages are clear.

8. Ensure that the check ball in the clutch drum is free in its chamber.

9. Ensure that the lubrication holes in the turbine shaft are clear.

10. Examine the splines on the turbine shaft for damage and the shaft for cracks or distortion.

11. Examine the bush journals for damage.

Forward clutch and turbine shaft— To assemble

If the turbine shaft was removed from the forward clutch drum, proceed as follows.

1. Place the clutch drum on the bed of a press with the front face (flat side) uppermost.

2. Lightly lubricate the shorter splined end of the turbine shaft then, align the splines with the mating splines in the forward clutch housing. Using the press, carefully press the turbine shaft into the forward clutch drum until the shaft bottoms on the hub of the drum.

Caution The shaft should be started in the drum, then the pressure on the press arbor relaxed to allow the shaft to straighten itself. Repeat this step several times until it is evident that the shaft is squarely aligned with the drum. If the shaft is not started squarely, damage to the shaft or drum splines may occur.

3. Invert the forward clutch drum on the press so that the turbine shaft is downward.

4. Lubricate new inner and outer clutch piston seals with clean transmission fluid. Lubricate the seal grooves in the piston with petroleum jelly then fit the

seals with the seal lip facing away from the return spring pockets.

Note The forward and direct clutch pistons have identical inside and outside diameters, therefore, ensure that the correct piston is installed in the clutch assemblies.

5. Lubricate a new piston centre seal with clean transmission fluid. Lubricate the seal groove in the forward clutch housing with petroleum jelly then fit the seal with the lip uppermost.

6. Fit the forward and direct clutch inner seal protector RH 7968 (J-21362) over the forward clutch hub.

7. Fit the clutch piston inside the forward and direct clutch piston installing tool RH 7949 (J-21409) then fit the assembly into the forward clutch housing (see Fig. T246).

8. Fit the clutch piston by rotating it clockwise until it is seated in the drum.

9. Fit the sixteen clutch release springs into the spring pockets in the clutch piston.

10. Place the clutch drum on the bed of a press with the turbine shaft lowermost.

11. Position the spring retainer on the springs.

12. Using clutch spring compressor RH 7965 (J-4670) in conjunction with adapter RH 7966 (J-21664), compress the springs ensuring that the retainer does not catch in the snap ring groove. Fit the snap ring then release the tension on the springs. Remove the tools.

Caution Ensure that the clutch release springs are not leaning. If necessary, push the springs into an upright position using a small screwdriver.

13. Remove the forward clutch from the press then fit it to the holding fixture RH 7959 (J-6116) with the turbine shaft lowermost; take care not to damage the shaft.

14. Fit the thrust washer onto the outside of the forward clutch hub. Retain the washers in position with petroleum jelly. The bronze washer is fitted to the side of the hub which faces the forward clutch housing.

15. Fit the forward clutch hub to the forward clutch housing.

16. Lubricate with clean transmission fluid the four flat steel clutch plates, the five composition faced plates and the one waved (notched) steel clutch plate.

17. Fit the clutch plate in the forward clutch housing. Commence with the waved steel plate and fit alternate steel and composition plates, finishing with a composition plate.

18. Fit the direct clutch hub into the forward clutch drum; fit the snap ring.

19. Fit the forward clutch assembly onto the oil pump delivery sleeve then check clutch operation by

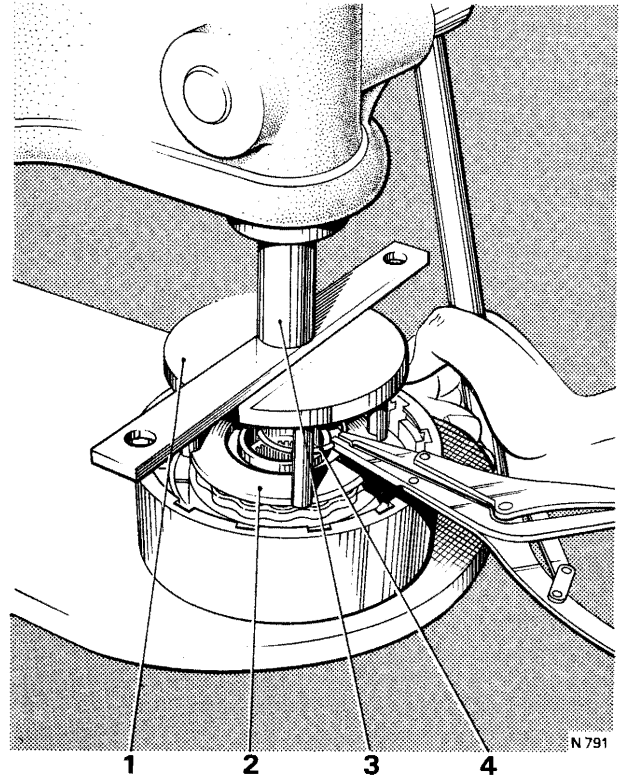


FIG. T244 REMOVING AND FITTING THE FORWARD CLUTCH HOUSING SNAP RING

- 1 Clutch spring compressor
- 2 Adapter
- 3 Press ram
- 4 Snap ring

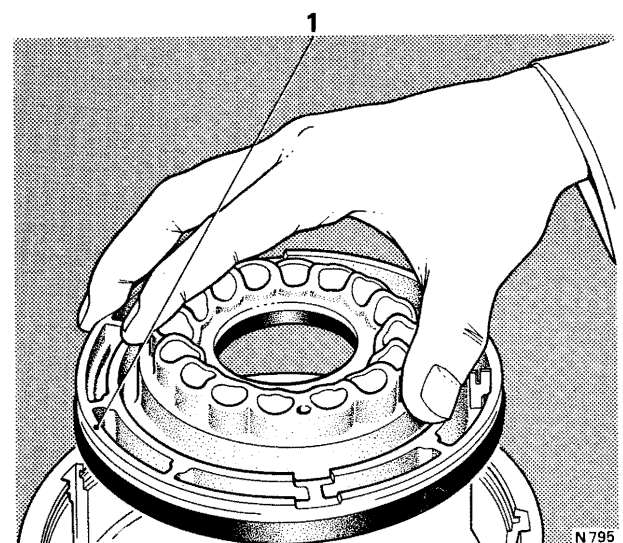


FIG. T245 REMOVING THE FORWARD CLUTCH PISTON

- 1 Clutch piston

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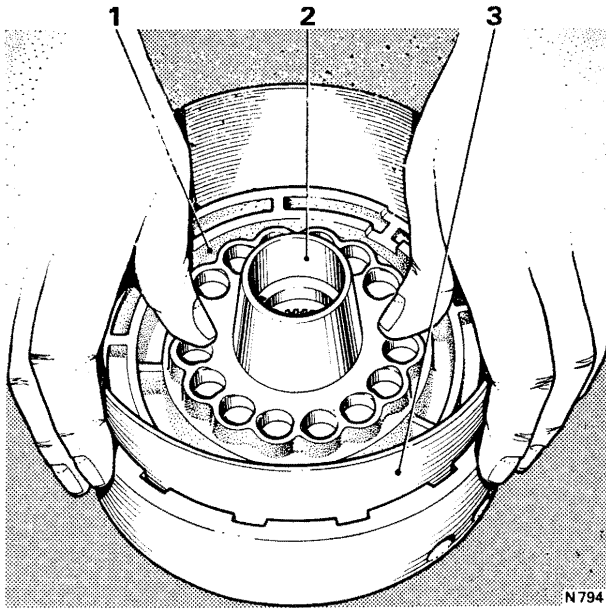


FIG. T246 FITTING THE FORWARD CLUTCH PISTON

- 1 Forward clutch piston
- 2 Seal protector
- 3 Piston fitting tool

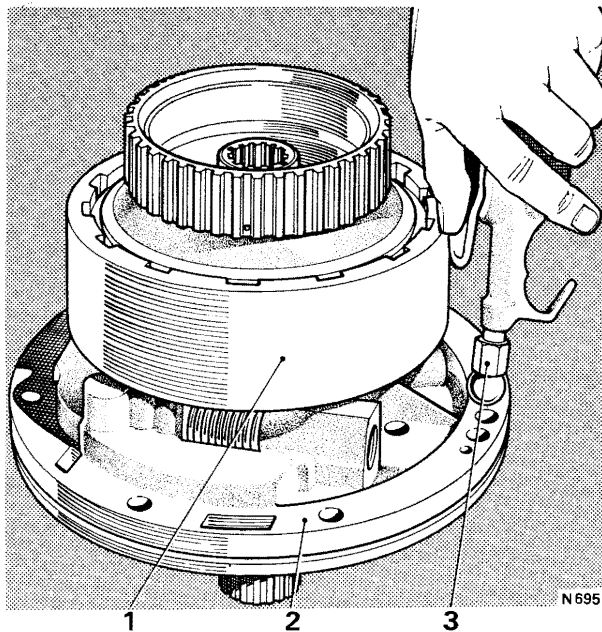


FIG. T247 AIR TESTING THE FORWARD CLUTCH

- 1 Forward clutch assembly
- 2 Oil pump
- 3 Air line nozzle

applying air pressure at approximately 70 lb/sq. in. (4,92 kg/sq.cm.) through the forward clutch apply passage in the pump (see Fig. T247). The clutch should be heard and felt to apply.

Direct clutch and intermediate roller assembly—To dismantle

1. Remove the snap ring which retains the roller retainer.
2. Remove the retainer (see exploded view in Figure T248).
3. Remove the roller outer race and bushes then withdraw the roller clutch assembly from the outer race.
4. Turn the unit over then remove the large snap ring which retains the direct clutch back plate in the clutch housing; remove the back plate.
5. Remove the five composition plates and the five steel plates (see exploded view of direct clutch in Figure T249).
6. Using clutch spring compressor RH 7965 (J-4670) in conjunction with rear clutch spring compressor RH 7967 (J-6129) and adapter RH 7966 (J-21664), compress the clutch return springs and remove the snap ring (see Fig. T250).
7. Remove the tools then lift off the spring retainer and remove the sixteen clutch release springs.
8. Withdraw the direct clutch piston from the clutch drum.
9. Remove and discard the piston inner and outer seals.
10. Remove and discard the piston centre seal from the direct clutch drum.

Direct clutch, sun gear shaft intermediate roller assembly—To inspect

1. Wash all parts, except the composition faced clutch plates, in clean paraffin (kerosene) then dry them with compressed air.
2. Examine the roller assembly for loose rollers.
3. Examine the roller bushes for wear or distortion.
4. Examine the inner and outer races for scratches or wear.
5. Examine the clutch drum for cracks, ensure that the oilways are clear and look for excessive wear on the clutch plate driving lugs.
6. Examine the driving and driven clutch plates for signs of burning, scoring or wear. If the composition plates are black in colour or have a glazed appearance they should be renewed. The steel driving plates should have a matt grey finish, but if they are discoloured or warped it is a sign of overheating and the plates must be renewed.
7. Examine the back plate for scratches or other damage.
8. Examine the sun gear shaft for cracks. Examine the splines for damage, examine the bushes for scoring

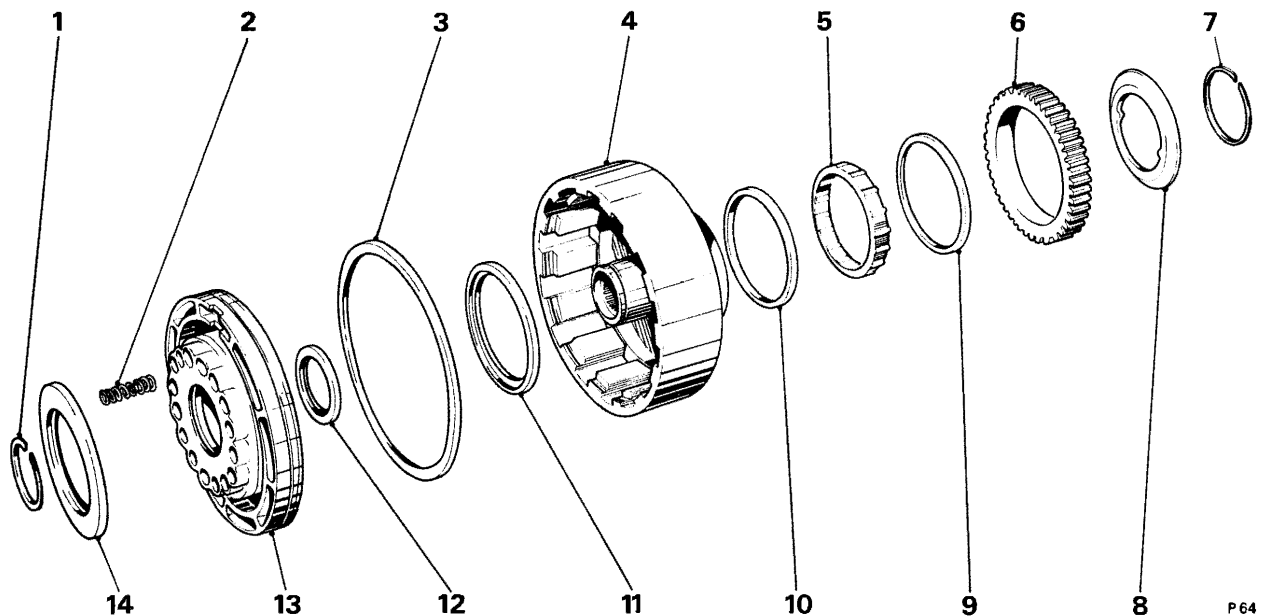


FIG. T248 DIRECT CLUTCH AND INTERMEDIATE SPRAG ASSEMBLY

- 1 Snap ring
- 2 Piston release spring (16)
- 3 Piston outer seal
- 4 Direct clutch drum and sprag inner race

- 5 Sprag assembly
- 6 Sprag outer race
- 7 Snap ring
- 8 Sprag retainer
- 9 Sprag bush

- 10 Sprag bush
- 11 Piston centre seal
- 12 Piston inner seal
- 13 Direct clutch piston
- 14 Clutch spring retainer

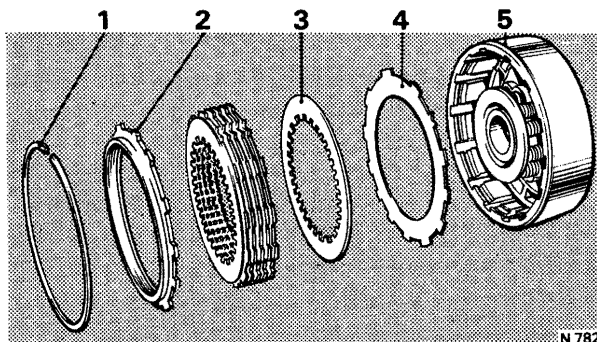


FIG. T249 DIRECT CLUTCH — EXPLODED

- 1 Snap ring
- 2 Back plate
- 3 Composition plate
- 4 Steel plate
- 5 Direct drum and piston assembly

and the ground bush journals for damage. Ensure that the oil feed hole is clear.

9. Examine the piston for cracks. Ensure that the check balls operate freely.

10. Examine the springs for collapsed coils or distortion. If one or more springs show these symptoms all sixteen springs must be renewed.

11. Examine the front friction band for wear at the anchor and apply lugs and for the presence of metallic particles in the band lining. Also examine the band

lining for cracks, flaking, burning and for the lining becoming loose.

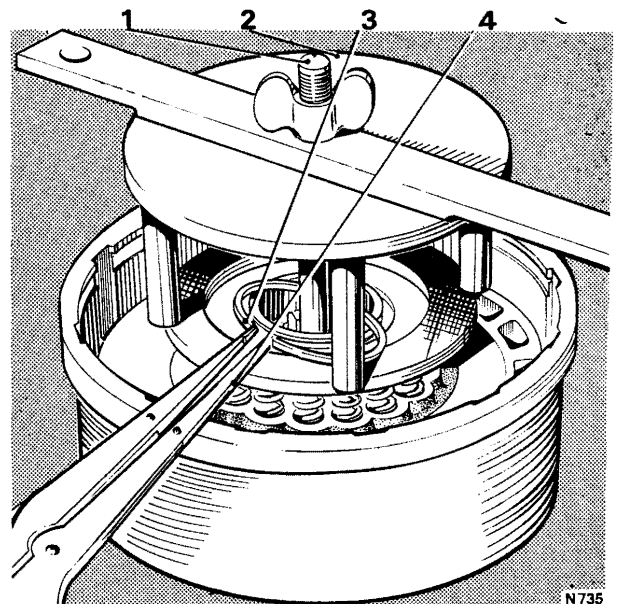


FIG. T250 REMOVING AND FITTING THE DIRECT CLUTCH HOUSING SNAP RING

- 1 Spring compressing tool
- 2 Clutch spring compressor (seated on adapter)
- 3 Snap ring
- 4 Snap ring pliers

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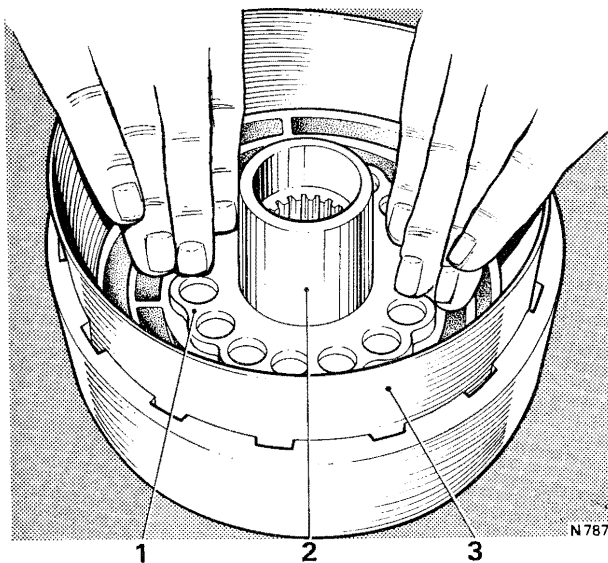


FIG. T251 FITTING THE DIRECT CLUTCH PISTON

- 1 Direct clutch piston
- 2 Inner seal protector
- 3 Outer seal protector

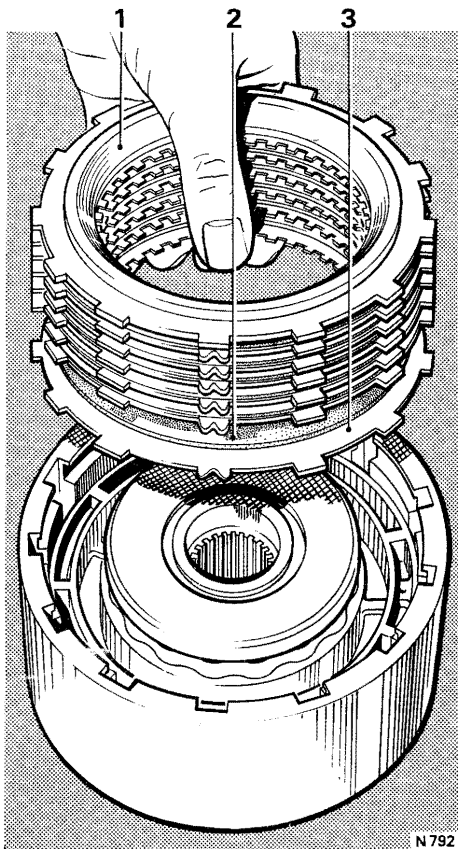


FIG. T252 FITTING THE DIRECT CLUTCH PLATES

- 1 Back plate
- 2 Composition plate (5)
- 3 Steel plate (5)

Direct clutch and intermediate roller assembly—To assemble

1. Lubricate new inner and outer clutch piston seals with clean transmission fluid. Lubricate the seal grooves in the direct clutch piston then fit the seals with the lips facing away from the spring pockets.

Note Ensure that the piston is correct (i.e. direct clutch piston — check ball in piston).

2. Lubricate a new centre seal with clean transmission fluid. Lubricate the seal groove in the direct clutch housing then fit the seal with the lip uppermost.

3. Fit the forward and direct clutch inner seal protector RH 7968 (J-21362) over the direct clutch hub.

4. Fit the clutch piston inside the forward and direct clutch piston installing tool RH 7949 (J-21409). Fit the assembly into the direct clutch housing (see Fig. T251).

5. Fit the piston by turning it clockwise as it is pushed down.

6. Fit the sixteen clutch release springs into the spring pockets in the clutch piston.

7. Position the spring retainer over the springs.

8. Using clutch spring compressor RH 7965 (J-4670), rear clutch spring compressor RH 7967 (J-6129) and adapter RH 7966 (J-21664), compress the springs, ensuring that the retainer does not catch in the snap ring groove. Fit the snap ring then remove the tools.

Caution Ensure that the clutch release springs are not leaning. If necessary, push the springs into an upright position using a small screwdriver.

9. Lubricate the five flat and one waved steel plates and the composition plates with clean transmission fluid then fit the plates into the clutch drum. Commence with the waved steel plate and then alternate composition and steel plates.

Note Do not use radially grooved composition plates at this point of the assembly.

10. Fit the direct clutch backing plate over the clutch plates and fit the large snap ring.

Note Install rollers that may have come out of the roller cage by compressing the energising spring with the forefinger and inserting the roller from the outside.

11. Turn the clutch unit over and install the roller clutch assembly onto the intermediate clutch inner cam.

12. Fit the intermediate clutch outer race with a clockwise turning motion.

Note When fitted, the outer race should not turn anti-clockwise.

13. Fit the roller clutch retainer and snap ring.

14. Fit the direct clutch assembly onto the centre

support then air test the direct clutch to ensure that it operates correctly (see Fig. T253). Use an air pressure of approximately 70 lb/sq. in. (4.92 kg/sq. cm.).

Note If air is applied to the reverse passage (right-hand oil feed hole) it will escape from the direct clutch passage (left-hand oil feed hole). This is considered normal. Also, apply air to the left-hand oil feed hole to actuate the piston and apply the direct clutch.

Turbine shaft, forward and direct clutches, sun gear shaft and front band—To fit

1. Fit the front band so that the band anchor hole fits over the band anchor pin and the band apply lug faces the servo hole (see Fig. T254).

2. Fit the sun gear shaft with the longer splined end innermost.

3. Fit the direct clutch housing and intermediate sprag roller assembly onto the centre support as follows.

4. Ensure that the ends of the oil sealing rings on the centre support are interlocked, and that the rings are lubricated.

5. Carefully slide the direct clutch drum onto the centre support sleeve, at the same time, engage the drum internal splines with the splines on the sun gear shaft.

6. Ensure that the clutch drum hub 'bottoms' on the sun gear shaft and that the splines on the forward end of the sun gear shaft are flush with the splines in the direct clutch drum.

Note It will be necessary to rotate the clutch drum to allow the sprag roller outer race to line up with the intermediate clutch plates. If necessary, remove the direct clutch driving and driven plates to facilitate the handling of the drum.

7. Fit the bronze thrust washer onto the forward clutch hub; retain the washer in position with petroleum jelly.

8. Position the transmission horizontally in the transmission holding fixture then fit the forward clutch assembly and the turbine shaft.

9. Ensure that the end of the mainshaft fully enters into the forward clutch hub.

10. It will be necessary to rotate the clutch drum to allow the direct clutch driving hub to line up with the clutch plates in the direct clutch.

11. When the forward clutch is correctly seated it should be approximately 1.25 in. (3.175 cm.) from the oil pump face in the transmission casing.

Note The missing internal splines in the forward clutch hub are lubrication passages and do not have to be aligned with any particular splines on the mainshaft.

12. Fit the oil pump.

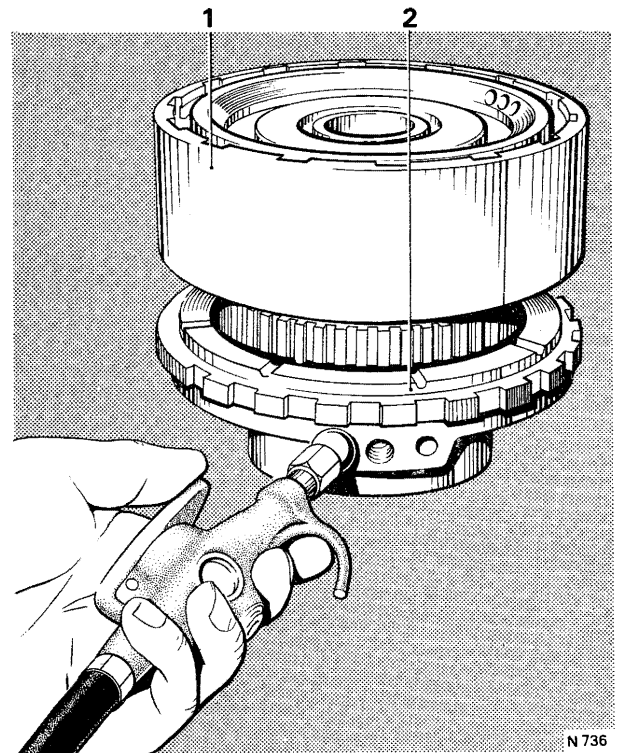


FIG. T253 AIR TESTING THE DIRECT CLUTCH

- 1 Direct clutch assembly
2 Centre support assembly

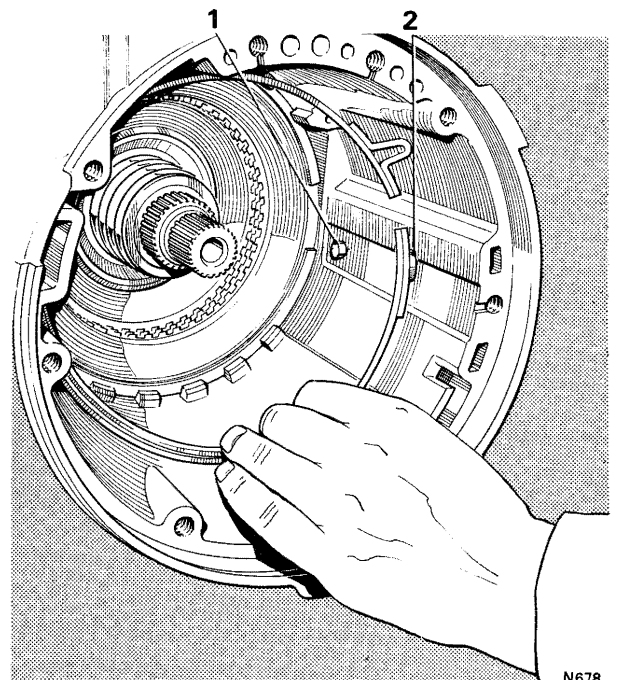
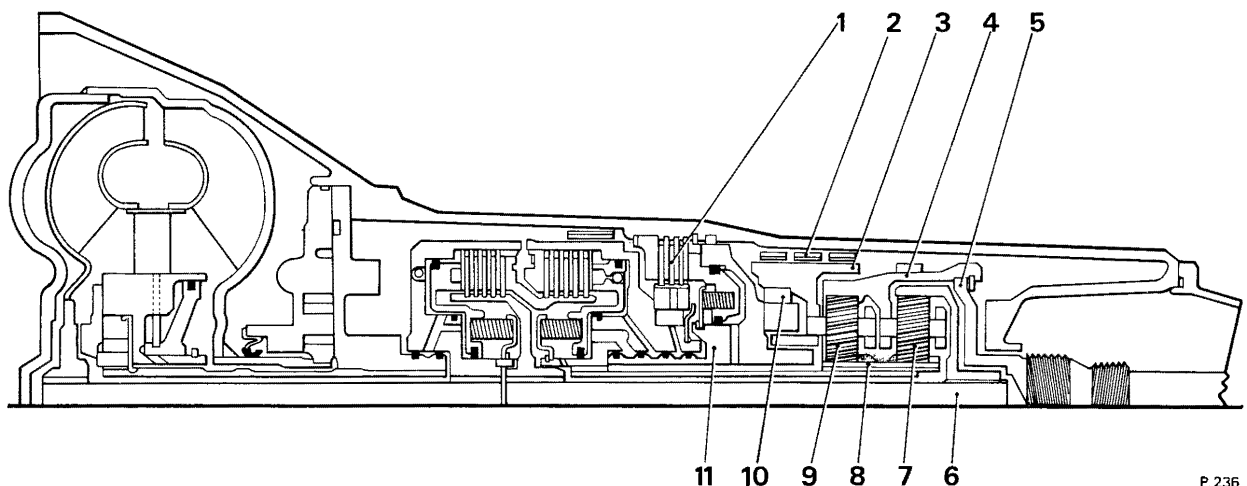


FIG. T254 FITTING THE FRONT BAND

- 1 Anchor pin
2 Front band

Section T22

INTERMEDIATE CLUTCH, GEAR UNIT, CENTRE SUPPORT and REACTION CARRIER



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**FIG. T255 SECTIONED VIEW OF THE
TRANSMISSION SHOWING THE INTERMEDIATE
CLUTCH AND GEAR UNIT**

- | | | |
|------------------------------|--------------------------------------|------------------------------|
| 1 Intermediate clutch | 5 Output shaft driving flange | 8 Sun gear |
| 2 Rear band | 6 Mainshaft | 9 Front planet pinion |
| 3 Reaction carrier | 7 Rear planet pinion | 10 Rear sprag |
| 4 Output carrier | | 11 Centre support |

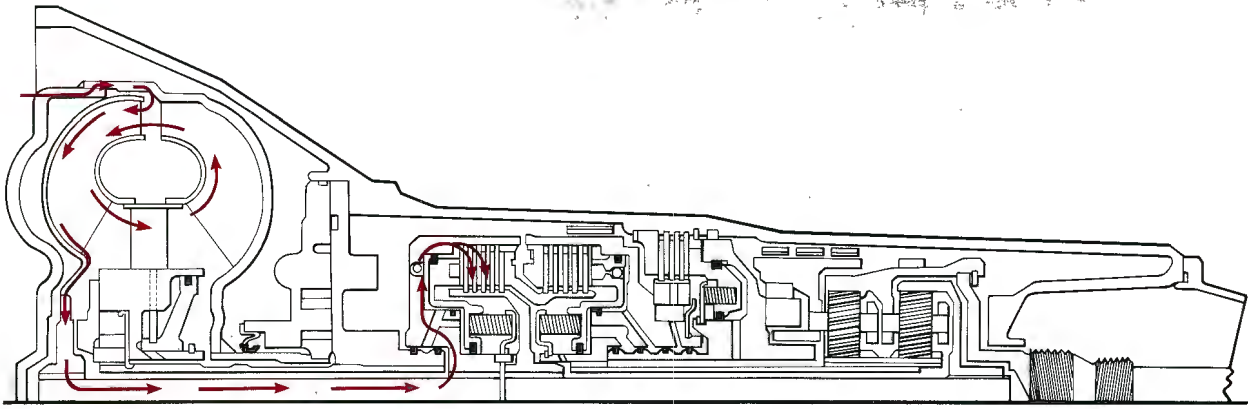
The intermediate clutch comprises three steel plates, three composition plates and an apply piston. The steel plates are slotted directly into the transmission casing whilst the composition plates engage in splines machined in the intermediate roller outer race.

The compound planetary gear unit consists of an internal gear, which is splined onto the mainshaft, an output planet carrier and pinions, an output shaft which is mechanically connected to the output carrier,

and a sun gear which is splined onto the mainshaft (see Fig. T255).

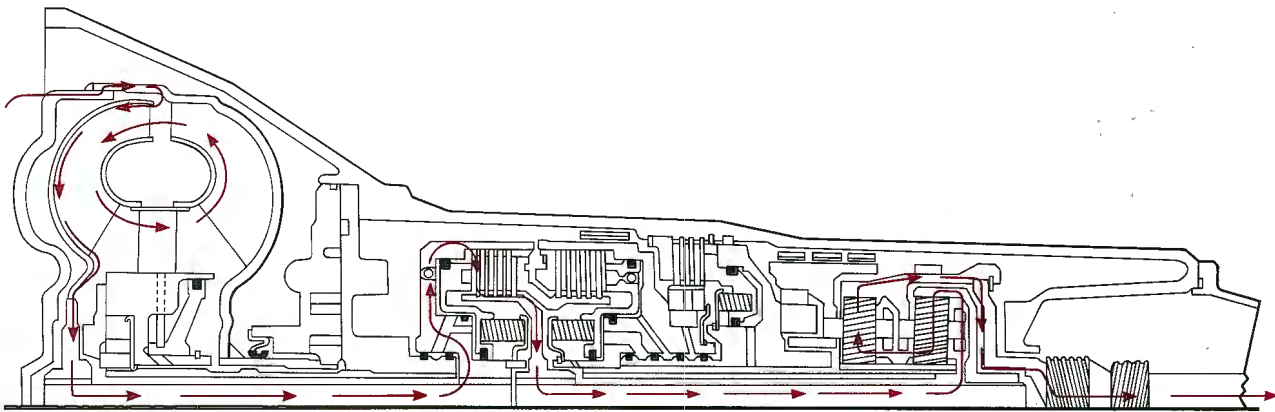
The centre support is keyed and bolted to the transmission casing and forms part of the reaction carrier roller assembly. The oil delivery sleeve, which supplies oil pressure to the direct clutch and the intermediate roller is an integral part of the centre support. The support also houses the piston which applies the intermediate clutch.

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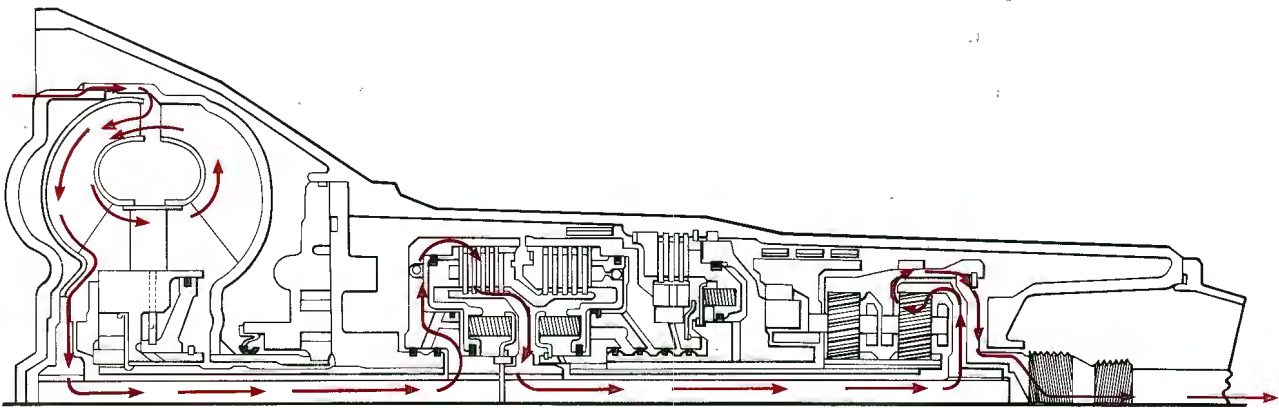
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FIG. T256 NEUTRAL—ENGINE RUNNING



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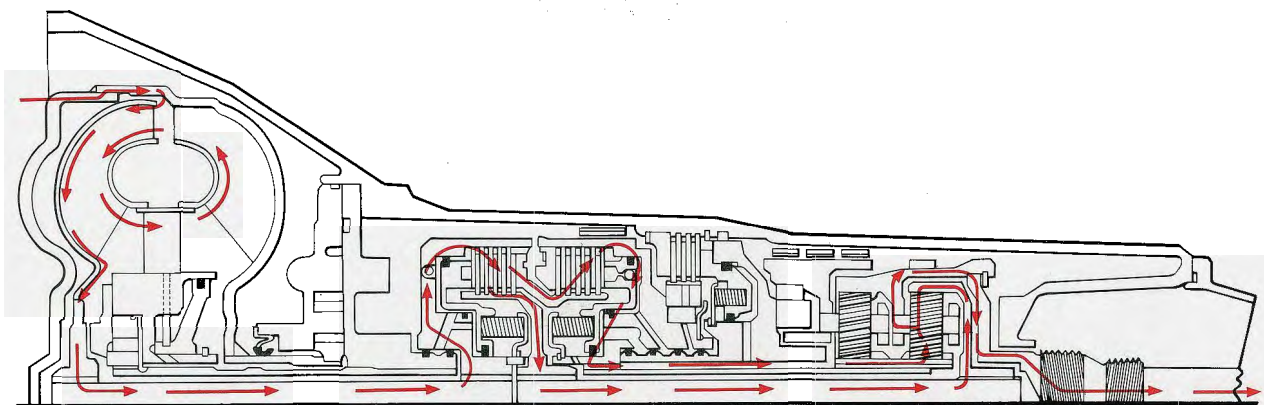
FIG. T257 DRIVE RANGE—1ST GEAR



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FIG. T258 DRIVE RANGE—2ND GEAR

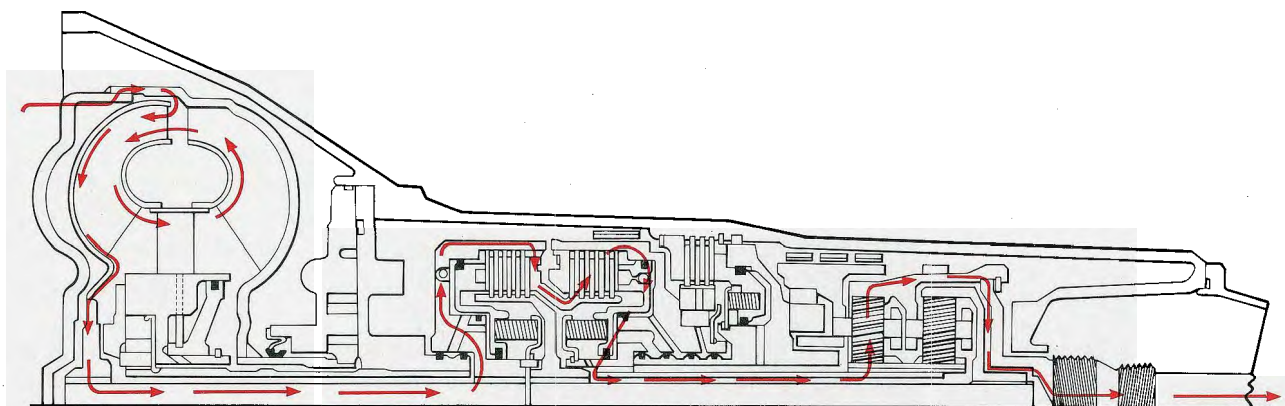
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FIG. T259 DRIVE RANGE—3RD GEAR

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FIG. T260 REVERSE

The reaction carrier comprises a drum, a set of planet pinions and the outer race of the Low roller. The roller outer race is pressed into, and dowelled to, the reaction drum.

When the mainshaft rotates, the internal gear to which it is splined is driven clockwise. This causes the rear planet pinions to idle clockwise and drive the sun gear anti-clockwise.

The front and rear sun gears are integral so they turn as one. As a result, the front planet pinions also idle clockwise and drive the front internal gear clockwise.

The front internal gear is an integral part of the output carrier and is thus connected to the output shaft. This reacts with a force on the front pinions which are trying to drive the front internal gear clockwise. This reaction tends to rotate the front carrier assembly

anti-clockwise instead of allowing the force to turn the internal gear and output shaft against the weight of the car.

To make the gear set effective in driving the car, a roller assembly is used to hold the carrier against anti-clockwise rotation. This roller assembly is in effect a one-way clutch which allows a rotating part to turn one way but not the other.

The roller assembly is fitted in such a manner that its elements will lock and prevent the reaction carrier from rotating anti-clockwise. This provides the required reaction and causes the front planet pinions to drive the front internal gear and output shaft in reduction at a ratio of approximately 2.5 : 1. This gear ratio, coupled with a maximum torque converter reduction of approximately 2 : 1 gives an overall ratio of almost 5 : 1 in first gear.

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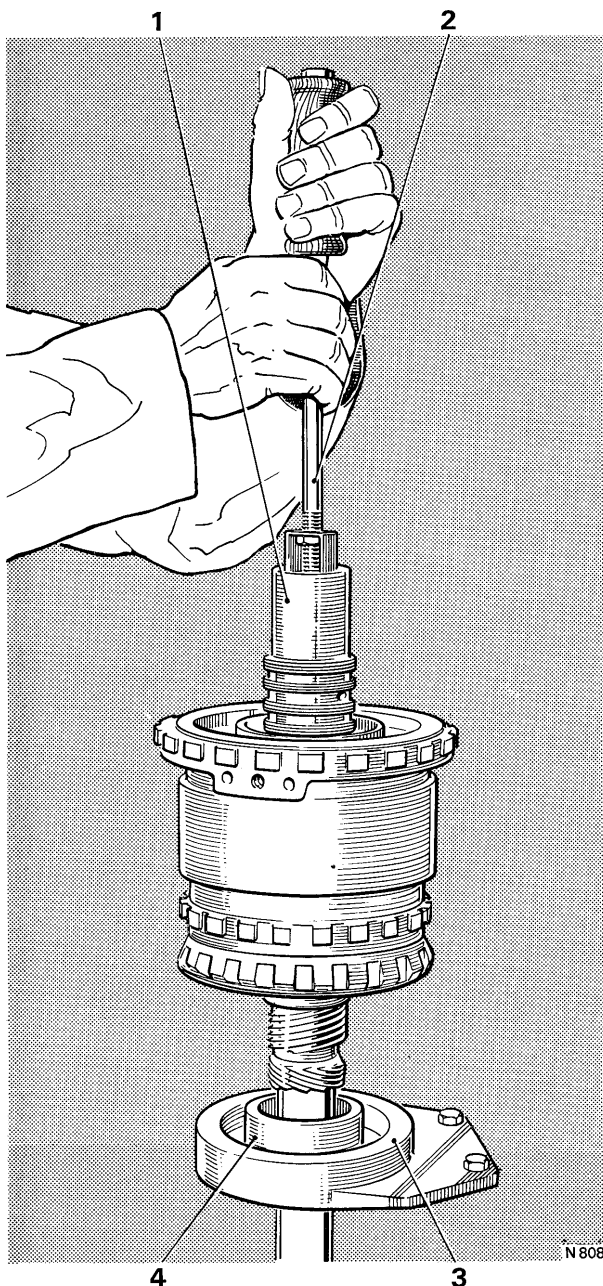


FIG. T261 FITTING THE GEAR UNIT INTO THE HOLDING FIXTURE

- 1** Gear assembly removal and fitting adapter
- 2** Slide hammer
- 3** Adapter
- 4** Holding fixture

As the speed of the car increases, less torque multiplication is required so that the coupling will become more efficient, and it is desirable also to move to a lower ratio. This is accomplished with the aid of the intermediate roller and clutch.

When the intermediate clutch is applied, the drive plates become locked to the reaction plates, and by

doing so they lock the intermediate roller outer race to the transmission case.

This, in effect, holds the direct clutch drum, sun gear shaft and sun gear against anti-clockwise rotation. When the sun gear is stationary, the power flow is as follows.

Converter output is transmitted clockwise through the forward clutch to the mainshaft and rear internal gear. As the rear internal gear turns clockwise, the rear pinions rotate clockwise on their pins and 'walk around' the stationary sun gear. This moves the output carrier and output shaft clockwise in reduction at a ratio of approximately 1.5 : 1 (second gear).

The front gear unit is not required for second gear operation. However, because the output carrier is integral with the front internal gear, the front internal gear runs clockwise in reduction. This causes the front planet pinions to run clockwise around the stationary sun gear, turning the reaction carrier clockwise. This clockwise rotation of the reaction carrier causes the rear roller assembly to over-run or to become ineffective.

As the speed of the car increases further, a lower ratio is again required. The transmission is moved to third or direct gear. This is achieved by applying the direct clutch as well as the forward clutch so that both the rear internal gear and the sun gear rotate at the same speed.

In order to obtain Reverse, a rear friction band is used. This band locks the reaction carrier against clockwise rotation which would cause the Low or rear roller to over-run. Power flow through the transmission in Reverse is as follows.

Turbine torque from the converter is transmitted to the forward clutch drum; the forward clutch is released, thus disconnecting the flow of power to the mainshaft and rear internal gear. Instead of power flowing through the forward clutch, it flows from the turbine shaft, through the forward clutch drum, through the direct clutch hub to the direct clutch which is applied. This applies power to the sun gear shaft and sun gear, turning them clockwise. With the sun gear driving clockwise, the front pinions revolve anti-clockwise as idlers. This drives the front internal gear and output shaft anti-clockwise or in a reverse direction. The overall ratio in Reverse with maximum converter ratio and gear reduction is approximately 4 : 1.

In Intermediate range (second gear) with the accelerator pedal released, the car will slow down, using the engine as a brake. In this situation, however, the rear wheels will drive the transmission through the output shaft and, as a result, the intermediate roller would attempt to over-run. To prevent this happening the front band is applied to the direct clutch drum, holding

it stationary, thus keeping the transmission in second gear to provide effective engine braking.

For even greater engine braking, the transmission can be placed into Low range. At speeds below approximately 40 m.p.h. (64 k.p.h.) the transmission will move to first gear. When the car is in first gear and the throttle is closed, the Low roller tends to over-run. When the Low/Reverse band is applied, the reaction carrier is prevented from over-running the roller and the transmission is retained in first gear.

The following illustrations and text give a summary of the flow of power through the transmission in various gears.

Summary of power flow Neutral—Engine running

Forward clutch released, direct clutch released, intermediate clutch released, roller clutch ineffective, front band released, intermediate roller clutch ineffective, rear band released.

In Neutral, all clutches and bands are released; therefore no power is transmitted from the torque converter turbine to the planetary gear train or output shaft (see Fig. T256).

Drive range—First gear

Forward clutch applied, direct clutch released, intermediate clutch released, roller clutch effective, front band released, intermediate roller clutch ineffective, rear band released.

With the selector in Drive range, the forward clutch is applied. This delivers turbine torque to the mainshaft and turns the rear internal gear clockwise. Clockwise motion of the rear internal gear causes the pinions to turn clockwise, driving the sun gear anti-clockwise. In turn, the sun gear drives the front pinions clockwise, driving the front internal gear, output carrier and output shaft clockwise at a reduction of approximately 2.5 : 1. The reaction of the front pinions against the front internal gear is taken by the reaction carrier and roller clutch assembly to the transmission case (see Fig. T257). (The approximate stall ratio equals 5 : 1).

Drive range—Second gear

Forward clutch applied, direct clutch released, intermediate clutch applied, roller clutch ineffective, front band released, intermediate roller clutch effective, rear band released.

In second gear, the intermediate clutch is applied to allow the intermediate roller clutch to hold the sun gear against anti-clockwise rotation. Turbine torque, through the forward clutch, is applied clockwise through the mainshaft, to the rear internal gear. Clockwise rotation of the rear internal gear turns the pinions clockwise against the stationary sun gear. This causes the output carrier and output shaft to turn clockwise at approximately 1.5 : 1 ratio (see Fig. T258).

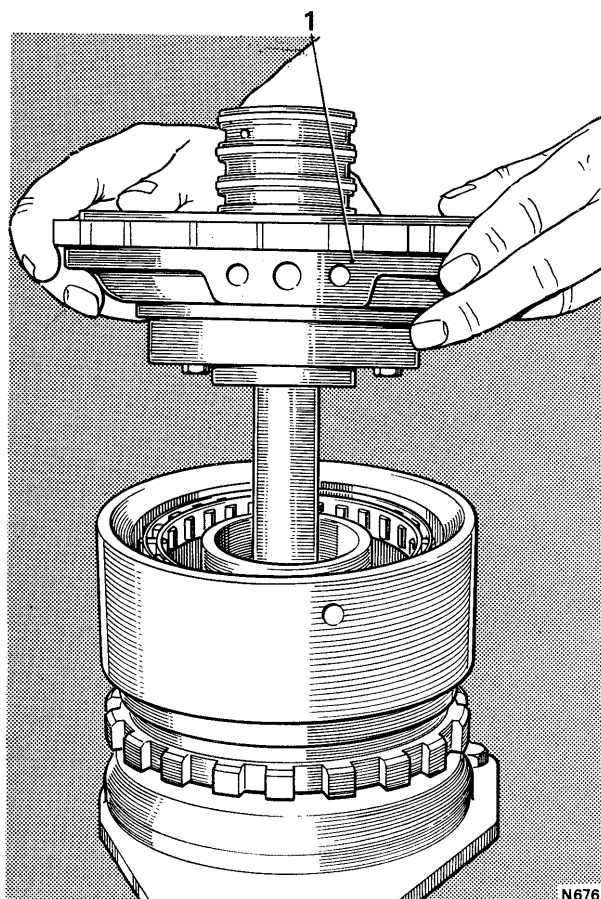


FIG. T262 REMOVING THE CENTRE SUPPORT ASSEMBLY

1 Centre support

Drive range—Third gear

Forward clutch applied, direct clutch applied, intermediate clutch applied, roller clutch ineffective, front band released, intermediate roller ineffective, rear band released.

In direct drive, engine torque is transmitted to the converter, then through the forward clutch to the mainshaft and the rear internal gear (see Fig. T259). Because the direct clutch is applied, equal power is transmitted also to the sun gear shaft and the sun gear. Since both the sun gear and the internal gears are now turning at the same speed, the planetary gear set is essentially locked and turns as one unit in direct drive (ratio 1 : 1).

Reverse

Forward clutch released, direct clutch applied, intermediate clutch released, roller clutch ineffective, front band released, intermediate roller clutch ineffective, rear band applied.

In Reverse, the direct clutch is applied to transmit turbine torque from the forward clutch drum to the sun gear shaft and sun gear (see Fig. T260). The rear band is applied; this prevents the reaction carrier from

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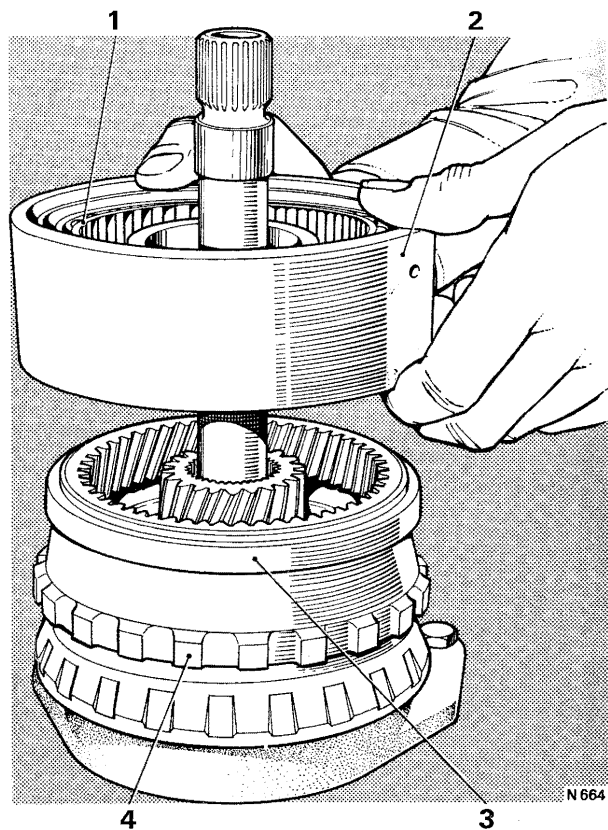


FIG. T263 REMOVING THE REACTION CARRIER AND REAR SPRAG ASSEMBLY

- 1 Sprag assembly
- 2 Reaction carrier
- 3 Gear ring
- 4 Output carrier

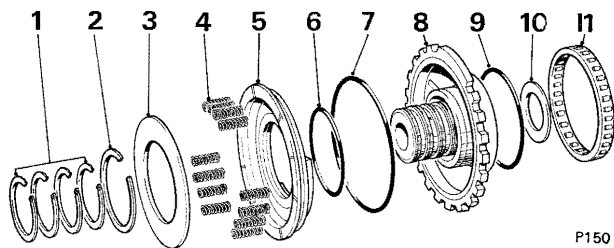


FIG. T264 CENTRE SUPPORT — EXPLODED

- 1 Teflon oil seal rings
- 2 Snap ring
- 3 Intermediate clutch spring retainer
- 4 Intermediate clutch release springs
- 5 Intermediate clutch piston
- 6 Intermediate clutch inner seal
- 7 Intermediate clutch outer seal
- 8 Centre support assembly
- 9 Support to case spacer
- 10 Thrust washer
- 11 Roller assembly

turning clockwise. Clockwise torque to the sun gear causes the front pinions and front internal gear to turn anti-clockwise in reduction. The front internal gear is directly connected to the output shaft, thus providing the reverse output gear ratio of approximately 2 : 1. The reverse torque multiplication at stall (converter and gear ratios) is approximately 4 : 1.

Intermediate clutch, gear unit, centre support and reaction carrier—To remove

Before the intermediate clutch, gear unit and their associated parts can be removed, the transmission must be removed from the car.

Remove the following units.

1. Sump, strainer and intake pipe assembly.
2. Control valve unit.
3. Rear servo.
4. Control valve spacer, check balls and front servo.
5. Oil pump.
6. Turbine shaft, forward clutch, direct clutch, sun gear shaft and front band.
7. Remove the centre support bolt from the transmission case. This is the socket-headed cap screw located in the lower face of the transmission case at the rear of the control valve unit oil passages.
8. Remove the snap ring which secures the intermediate clutch back plate.
9. Remove the back plate then withdraw the three composition plates and the three steel plates.
10. Using a pair of long-nose pliers remove the snap ring which retains the centre support in the case.
11. Fit tool RH 7962 (J-21795) onto the end of the mainshaft so that the tangs engage in the groove in the shaft.
12. Tighten the screw on the tool to secure the tool on the shaft and to prevent movement of the rearmost sprag during the removal of the gear unit.
13. Obtain a length of tube of suitable diameter which will fit over the output shaft and can be used as a handle. This will prevent damage to the case bush when removing the gear unit, centre support and reaction carrier.

Note Slightly slacken the transmission holding fixture pivot pin so that the gear unit assembly does not bind when it is being removed from the case.

14. With the transmission case in a horizontal position, move the complete assembly toward the front of the case to facilitate the subsequent removal.
15. Carefully withdraw the complete assembly from the case.

Caution Do not drop or bump the assembly in the transmission casing during the removal operation. This could result in damage to the output shaft bush in the case as well as to the assembly itself.

16. Remove the output shaft thrust washer from either the output shaft or the case.
17. Using adapter RH 7960 (J-21364) in the rear unit holding fixture RH 7959 (J-6116), fit the gear unit assembly into the holding fixture with the mainshaft pointing upward (see Fig. T261); remove the tool RH 7962 (J-21795).
18. Remove the rear unit selective washer from the transmission case.
19. Remove the support to case spacer.
20. Remove the rear band assembly. To facilitate removal, rotate the band lugs away from the pins and pull the band assembly out of transmission case.
21. Remove the centre support assembly from the reaction carrier (see Fig. T262).
22. Withdraw the centre support to reaction carrier thrust washer.

Note The thrust washer and the race may have adhered to the back of the centre support. If so, remove them from the centre support.

23. Remove the reaction carrier and roller clutch assembly from the output carrier (see Fig. T263); remove the roller clutch assembly from the reaction carrier.

Centre support and intermediate clutch piston—To dismantle

1. Remove the four oil seal rings from the centre support (see the exploded view in Fig. T264); discard the rings.

Note From Transmission Serial Number 70-RR-2106 and onwards, a 'Teflon' oil sealing ring is fitted into the ring groove at the base of the centre support tower. On these later centre supports remove only the three cast iron oil sealing rings.

2. Using clutch spring compressor RH 7965 (J-4670) and rear clutch spring compressor RH 7967 (J-6129), compress the springs then remove the snap ring (see Fig. T265).

3. Remove the tools then remove the spring retainer and the clutch release springs.

4. Remove the intermediate clutch piston from the centre support.

5. Remove and discard the inner and outer seals from the clutch piston.

Note Do not remove the three setscrews which secure the roller clutch inner race to the centre support.

Centre support and intermediate clutch piston—To inspect

1. Wash all parts in clean paraffin (kerosene) then dry with compressed air.
2. Examine the roller clutch inner race for scratches and indentations. Ensure that the lubrication hole is clear.

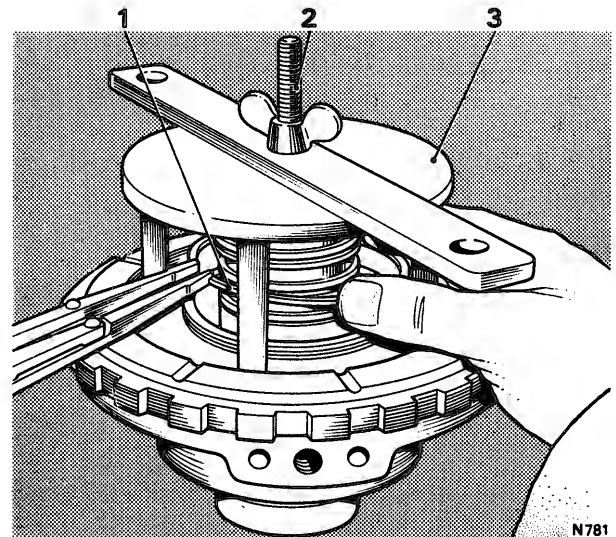


FIG. T265 REMOVING AND FITTING THE INTERMEDIATE CLUTCH PISTON SNAP RING

- 1 Snap ring
- 2 Rear clutch spring compressor
- 3 Clutch spring compressor

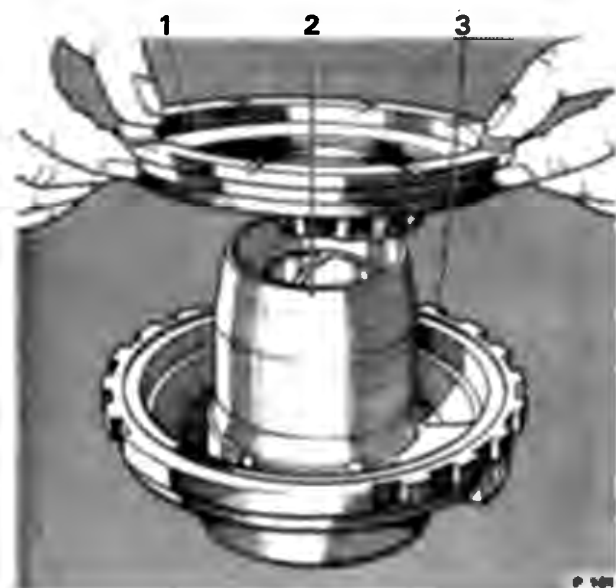


FIG. T266 FITTING THE INTERMEDIATE CLUTCH PISTON

- 1 Intermediate clutch piston
- 2 Guide sleeve
- 3 Centre support

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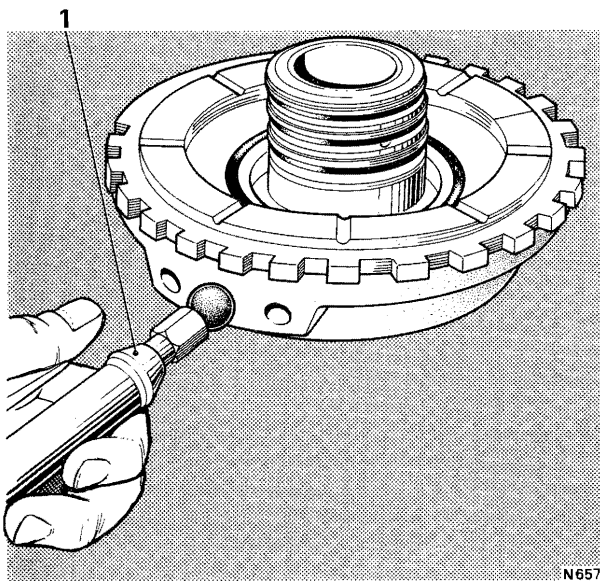


FIG. T267 AIR TESTING THE INTERMEDIATE CLUTCH

1 Air line nozzle

3. Examine the bush for scoring or wear.
4. Ensure that the oil ring grooves are clean and are not damaged.
5. Air test the lubrication passages to ensure that they are clear and are not interconnected.
6. Examine the piston bore in the centre support for scratches or damage.
7. Examine the piston seal grooves for damage and ensure that they are clean.
8. Examine the piston for cracks or porosity.
9. Examine the springs for collapsed coils or signs of distortion. Check the spring length against that of a new spring before deciding whether to renew the complete set of springs.

Centre support and intermediate clutch piston—To assemble

1. Lubricate a new inner and a new outer seal with clean transmission fluid. Lubricate the seal grooves in the intermediate clutch piston and fit the seals with the lips facing away from the spring pockets.
2. Fit the intermediate clutch inner seal protector RH 7969 (J-21363) over the centre support hub.
3. Fit the intermediate clutch piston as shown in Figure T266. Ensure that it seats fully in the centre support.
4. Fit the three clutch release springs into the pockets in the clutch piston.
5. Position the spring retainer centrally over the springs.
6. Using clutch spring compressor RH 7965 (J-4670) in conjunction with rear clutch spring

compressor RH 7967 (J-6129) compress the spring retainer, ensuring that the retainer does not catch in the snap ring groove. Fit the snap ring then remove the tools.

Transmissions prior to Serial Number 70-RR 2106

7. Fit four new oil sealing rings onto the centre support; interlock the ends of the rings.

Note **Transmission Serial Number 70-RR-2106** and onwards, fit three new oil sealing rings onto the centre support and interlock the end of the rings. If the 'Teflon' oil sealing ring requires replacement, fit a fourth cast iron oil sealing ring.

8. Air test the operation of the intermediate clutch piston. Apply an air pressure of approximately 70 lb/sq.in. (4,92 kg/sq.cm.) through the centre oil feed hole to actuate the clutch piston (*see Fig. T267*); the piston should be heard and felt to move.

Gear unit—To dismantle

1. Using adapter RH 7960 (J-21364) in rear unit holding fixture RH 7959 (J-6116), fit the gear unit into the holding fixture with the output shaft pointing downward. An exploded view of the gear unit is shown in Figure T268.

2. Remove the centre support-to-sun gear races and thrust bearing. The outer race may have been removed with the centre support.

3. Remove the sun gear from the output carrier assembly.

Remove the reaction carrier to output carrier thrust washer and front internal gear ring.

4. Invert the gear unit in the holding fixture so that the mainshaft is pointing downward.

5. Remove the snap ring which retains the output shaft in the output carrier; remove the output shaft.

6. Remove the thrust bearing and races from the rear internal gear.

7. Withdraw the rear internal gear and mainshaft from the output carrier; remove the thrust bearing and races from the inner face of the rear internal gear.

8. Remove the circlip from the end of the mainshaft then remove the rear internal gear.

9. Remove the output carrier from the holding fixture.

Output shaft—To inspect

1. Wash the output shaft in clean paraffin (kerosene) then dry off with compressed air.

Examine the bushing for wear.

2. Examine the bearing and thrust washer faces for damage.

3. Examine the governor drive gear for rough or damaged teeth.

4. Examine the splines for damage.

5. Check the orificed cup plug in the lubrication passage. Ensure that the orifice is clear (*see Fig. T269*).

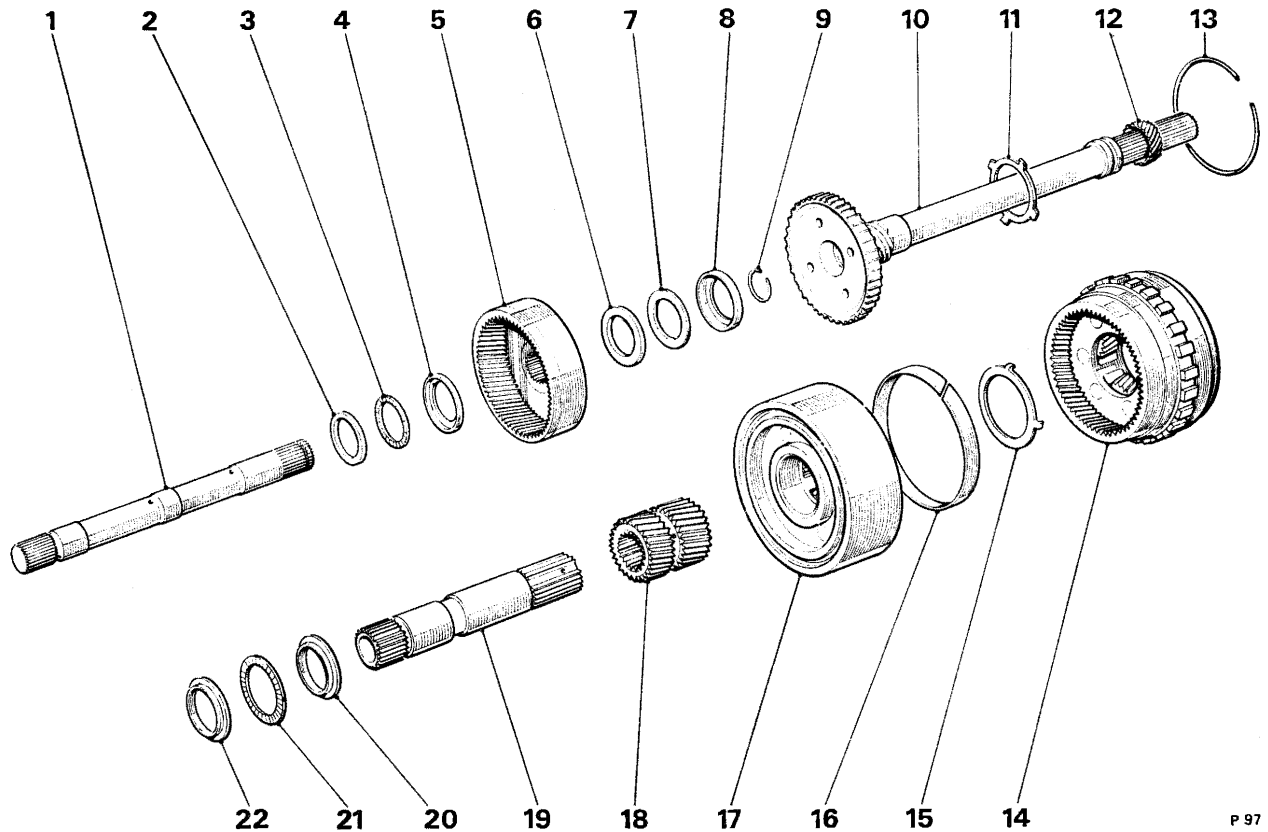


FIG. T268 GEAR UNIT—EXPLODED

- 1 Mainshaft
- 2 I/D flanged race
- 3 Thrust bearing
- 4 O/D flanged race
- 5 Rear internal gear
- 6 I/D flanged race
- 7 Thrust bearing
- 8 O/D flanged race

- 9 Snap ring
- 10 Output shaft
- 11 Flanged thrust washer
- 12 Speedometer drive gear
- 13 Snap ring
- 14 Output carrier assembly

- 15 Thrust washer
- 16 Front internal gearing
- 17 Reaction carrier assembly
- 18 Sun gear
- 19 Sun gear shaft
- 20 I/D flanged race
- 21 Thrust bearing
- 22 I/D flanged race

6. Examine the driving teeth for damage.
7. Examine the speedometer drive gear for rough or damaged teeth. If a gear is badly worn or damaged it can be renewed as follows.

Speedometer drive gear—To remove

Note A nylon speedometer drive gear is installed **only** at the factory. All replacement drive gears are manufactured from steel.

1. If a **nylon gear** is fitted to the shaft, depress the retaining clip and slide the gear off the output shaft (see Fig. T270).
2. If a **steel gear** is fitted to the shaft, install the

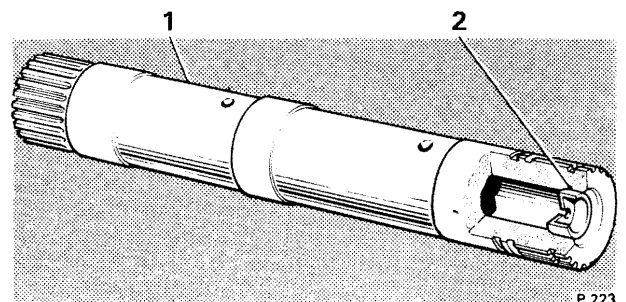


FIG. T269 MAINSHAFT AND PLUG ASSEMBLY

- 1 Mainshaft
- 2 Orifice cup plug

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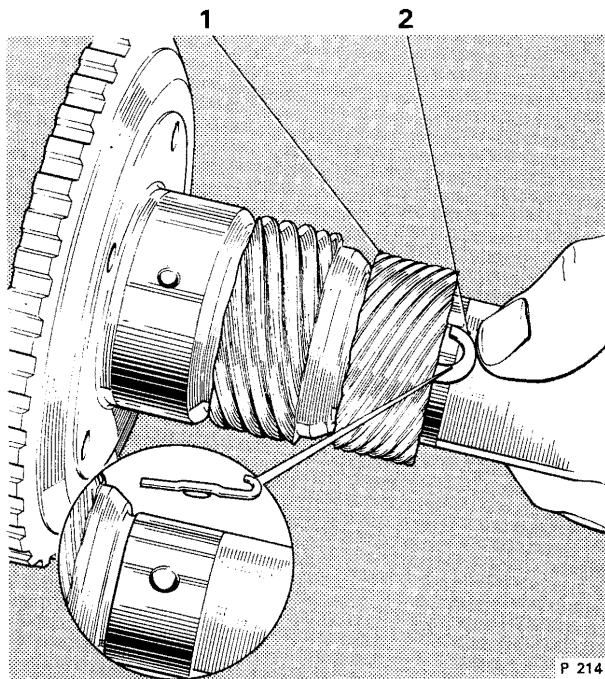


FIG. T270 REMOVING NYLON SPEEDOMETER DRIVE GEAR

- 1 Nylon gear
- 2 Retaining clip

speedometer drive gear remover J-21427 with pulley puller RH 7791 (J-8433) and attach using bolts J-21797 onto the output shaft, so that the puller bolt indexes with the end of the shaft.

3. The flat face of the remover tool should be under the front face of the drive gear (see Fig. T271).

4. Tighten the bolt on the puller until the gear is free on the shaft.

5. Remove the tools and the gear from the shaft.

Speedometer drive gear—To fit

1. To fit a nylon gear, (see note under *Speedometer drive gear — To remove*) align the slot in the speedometer drive gear with the retaining clip and install the drive gear (see Fig. T272).

2. To fit a steel gear, lightly lubricate the bore of the gear then fit it over the output shaft.

3. Support the output shaft and drive the new steel gear into position on the shaft using a suitable length of tube and a mallet.

Caution Use a tube which fits closely over the output shaft. The ends of the tube must be square with the bore. Ensure that the end of the tube which contacts the gear is smooth and free from burrs.

4. Any contact with the gear teeth as the gear is driven into position will result in damage to the gear.

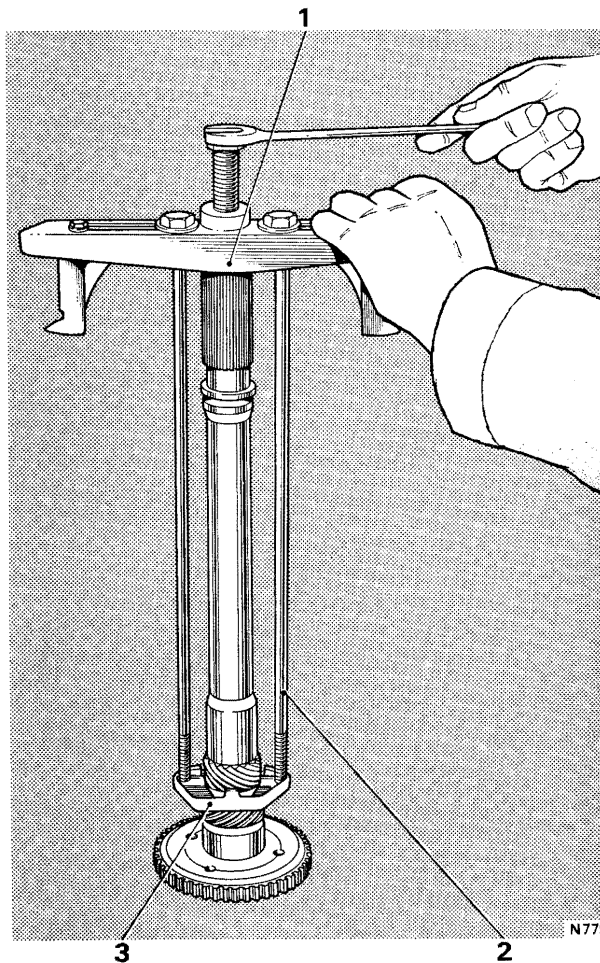


FIG. T271 REMOVING A STEEL SPEEDOMETER DRIVE GEAR

- 1 Pulley remover
- 2 Removal bolts
- 3 Drive gear extractor

5. Drive the gear down the shaft until the distance from the rear face of the gear to the end of the output shaft measures 15.00 in. (38.1 cm.) (see Fig. T273).

Mainshaft—To inspect

1. Wash the mainshaft in clean paraffin (kerosene) then dry with compressed air.

2. Examine the shaft for cracks or distortion.

3. Examine the splines for damage.

4. Examine the ground journals for scratches or damage.

5. Examine the snap ring groove for damage.

6. Examine for an orificed cup plug in the end of the mainshaft.

7. If a cup plug is fitted to the mainshaft, remove with a 0.25 in. (6.35 mm.) diameter rod 12.00 in. (30.48 cm.) long.

8. The deletion of the cup plug improves the flow of lubricant.

Rear internal gear and sun gear—To inspect

1. Wash the rear internal gear and the sun gear in clean paraffin (kerosene) then dry with compressed air.
2. Examine all the gear teeth for wear or damage.
3. Examine the splines for damage.
4. Examine the gears for cracks.

Output carrier assembly—To inspect

1. Wash the output carrier assembly in clean paraffin (kerosene) then dry with compressed air.
2. Examine the front internal gear for damaged teeth.
3. Examine the pinion gears for damage, rough bearings or excessive side movement.
4. Check the end float of the pinions with the aid of a feeler gauge (see Fig. T273). The end float should be between 0.009 in. and 0.024 in. (0,228 mm. and 0,610 mm.).
5. Examine the parking gear lugs for cracks or damage.
6. Examine for damage the splines which drive the output shaft.
7. Examine the front internal gear ring for flaking or cracks.

Reaction carrier assembly—To inspect

1. Examine the surface on which the rear band applies, for signs of burning or scoring.
2. Examine the sprag outer race or roller clutch outer cam, for scoring or wear.

Note The normal wear pattern on an inner or outer race may tend to make the races look worse than they are. Do not discard the races unless the track is pitted, scored or uneven.

3. Examine the thrust washer surfaces for signs of scoring or wear.
4. Examine the bush for damage. If the bush is damaged, the carrier must be renewed.
5. Examine the pinion gears for damage, rough bearings, or excessive side movement.
6. Check the pinion end float. This should be between 0.009 in. and 0.024 in. (0,228 mm. and 0,610 mm.).

Pinion gears—To renew (reaction and output carrier assemblies)

Should the pinion gears need renewing, proceed as follows.

Note If it is necessary to replace the pinion gear pinion washer, pinion pin or needle bearing roller always consult the appropriate service literature to ascertain that the correct parts are to be fitted.

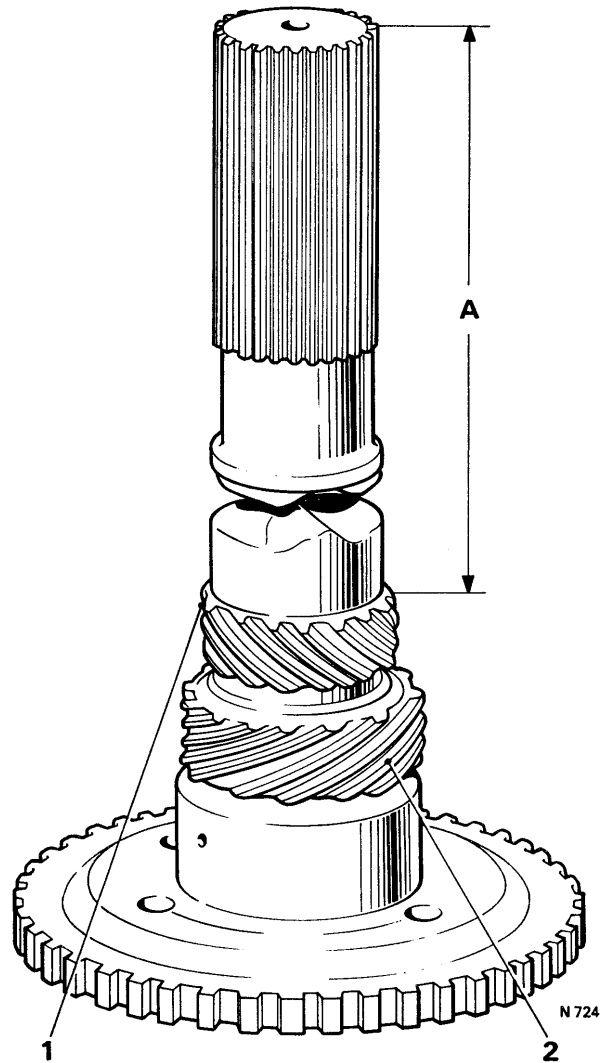


FIG. T272 SPEEDOMETER DRIVING GEAR—FITTED

- 1 Speedometer driving gear
2 Governor driving gear
A 15.00 in. (38,1 cm.)

A change in the outside diameter of the pinion pin has taken place, this also effects the parts listed above. When measuring the diameter of a pin, measure near the end.

Early type — 0.3928 in. to 0.3930 in.
(9,97 mm. to 9,98 mm.)

Later type — 0.4340 in. to 0.4342 in.
(11,02 mm. to 11,03 mm.)

Carrier assemblies with larger pins are interchangeable with carrier assemblies having smaller pins.

1. Support the carrier assembly on its **front** face.
2. Using a 0.50 in. (12,7 mm.) diameter drill remove the stake marks from the end of the pinion pin(s). Ensure that the drill does not remove any

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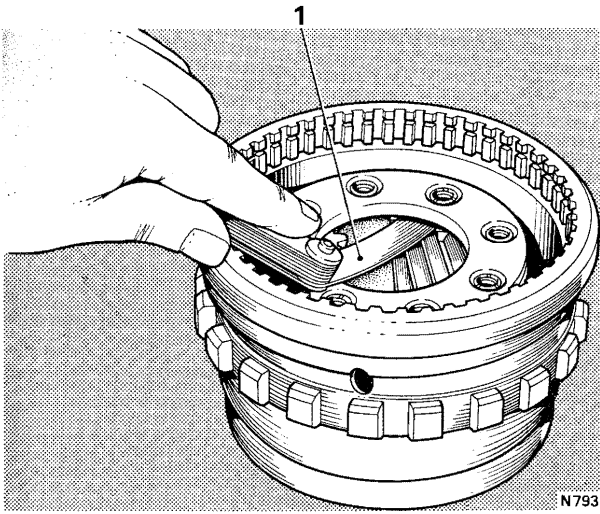


FIG. T273 CHECKING OUTPUT CARRIER PINION END FLOAT

1 0.009 in. to 0.024 in. (2,29 mm. to 6,1 mm.)

metal from the carrier as this will weaken the component and could result in a failure.

3. Using a tapered punch, drive or press the pinions out of the carrier.

4. Remove the punch, gears, thrust washers and needle roller bearings.

5. Examine the pinion thrust faces in the pinion gear pockets for burrs and stone off as necessary. Thoroughly wash and dry the carrier.

6. Ensure that the new gears are clean and free from burrs then fit the needle bearings into each pinion gear. Use petroleum jelly to retain the bearings and

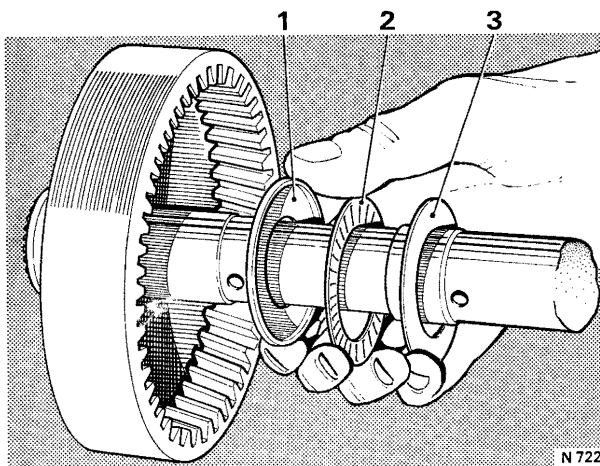


FIG. T274 FITTING RACES AND THRUST BEARINGS TO INNER FACE OF REAR INTERNAL GEAR

- 1 O/D flanged race
- 2 Thrust bearing
- 3 I/D flanged race

use a pinion pin as a guide when fitting the bearings.

7. Fit a bronze and a steel thrust washer on each side of the pinion gear with the steel washer next to the gear (see exploded view in Fig. T274). Hold the washers in place with a smear of petroleum jelly.

8. Fit the pinion gear assembly into position in the carrier, then fit a pilot pin through the rear face of the assembly to centralise and hold the parts in position.

9. Drive a new pinion pin into position from the front, rotating the pinion whilst the pin is being driven in.

10. Ensure that the headed end of the pin is flush or below the face of the carrier.

11. Secure the punch in a bench vice so that it can be used as an anvil.

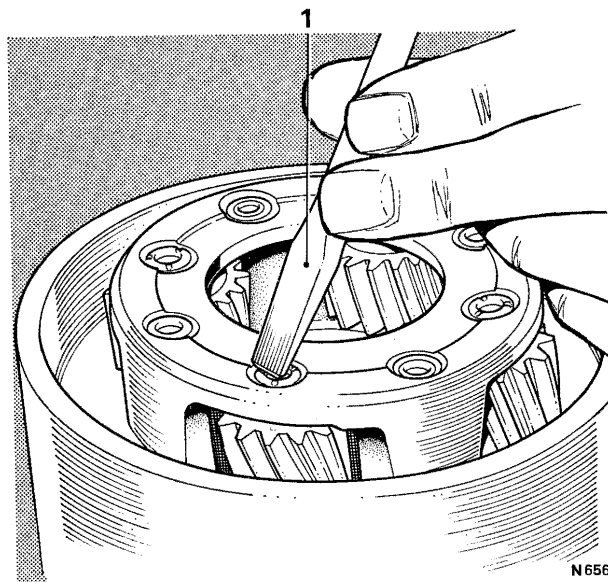


FIG. T275 STAKING A PINION PIN

- 1 Blunt chisel

12. Support the carrier with the head of the pin resting on the punch then, using a chisel with a radiused end stake the opposite end of the pin in three places (see Fig. T275).

Note Both ends of the pin must lie below the face of the carrier, otherwise a foul may occur between the pin and the adjacent component.

Repeat the fitting procedure for the remaining pins.

Rear roller assembly—To inspect

If a sprag clutch is fitted in place of a roller clutch proceed as follows:

1. Wash the assembly in clean paraffin (kerosene) then dry with compressed air.
2. Examine the roller for damaged members.
3. Examine the roller cage and retaining spring for damage.

Roller clutch assembly—To inspect

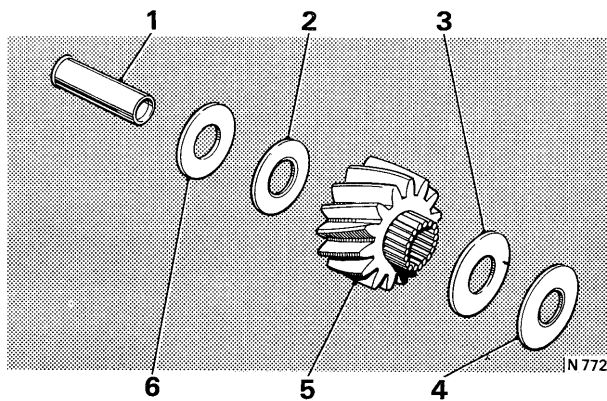
If a roller clutch is fitted in place of a sprag clutch proceed as follows:

1. Inspect the roller clutch for damaged rollers or springs.
2. Inspect the roller clutch cage for damage.

Note If the later type roller clutch parts require replacement and the components are not available, consult the latest applicable service literature regarding the fitting of the earlier type of sprag clutch.

Clutch plates and rear band—To inspect

1. Examine the condition of the composition plates.
2. Check that the composition material has not

**FIG. T276 PLANET PINION GEAR—EXPLODED**

- 1 Pinion pin
- 2 Steel washer
- 3 Steel washer
- 4 Bronze washer
- 5 Planet pinion
- 6 Bronze washer

lifted or flaked. If the plates are black, burned or shiny they should be renewed.

3. Examine the condition of the reaction (steel) plates. Check for scores or damage. The plates are normally matt grey in colour. If they are burned or distorted they must be renewed.

4. Examine the rear band for cracks or distortion.
5. Examine the ends of the band for damage at the anchor lugs and the apply lug.
6. Examine the lining for cracks, flaking and burning.
7. Ensure that the lining is secured to the band.

Gear unit and centre support—To assemble

1. Ensure that all parts are clean. Lightly lubricate with clean transmission fluid all bushes, journals, gears, bearings and sprag races.

2. Fit the rear internal gear onto the mainshaft, circlip groove end; fit the circlip.

3. Fit the races and thrust bearing onto the inner face of the rear internal gear, retaining them with a smear of petroleum jelly.

4. Fit the large diameter race first with the flange uppermost (see Fig. T276).

5. Fit the thrust bearing into the race.

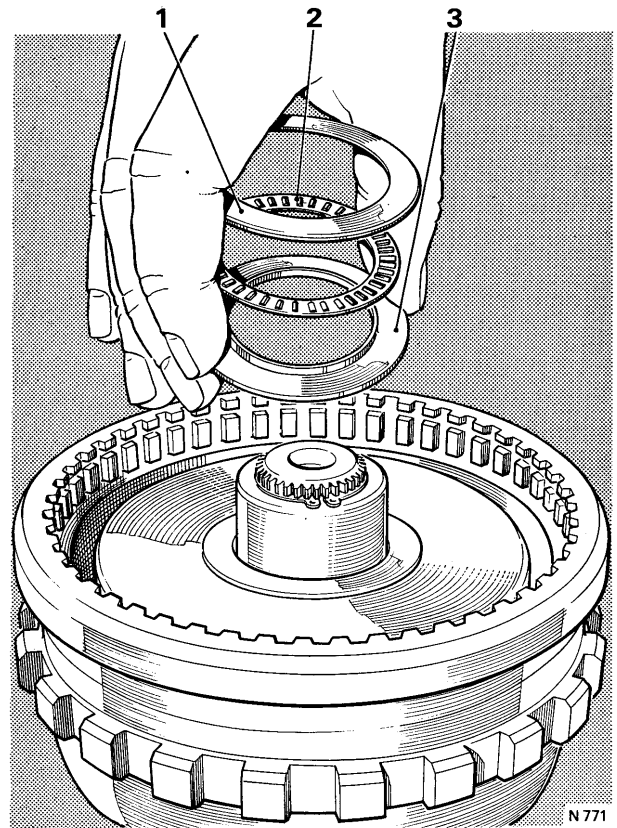
6. Fit the smaller diameter race over the bearing with the inner flange toward the bearing.

7. Ensure that the pinion gears are adequately lubricated then fit the output carrier onto the mainshaft so that the pinion gears mesh with the rear internal gear.

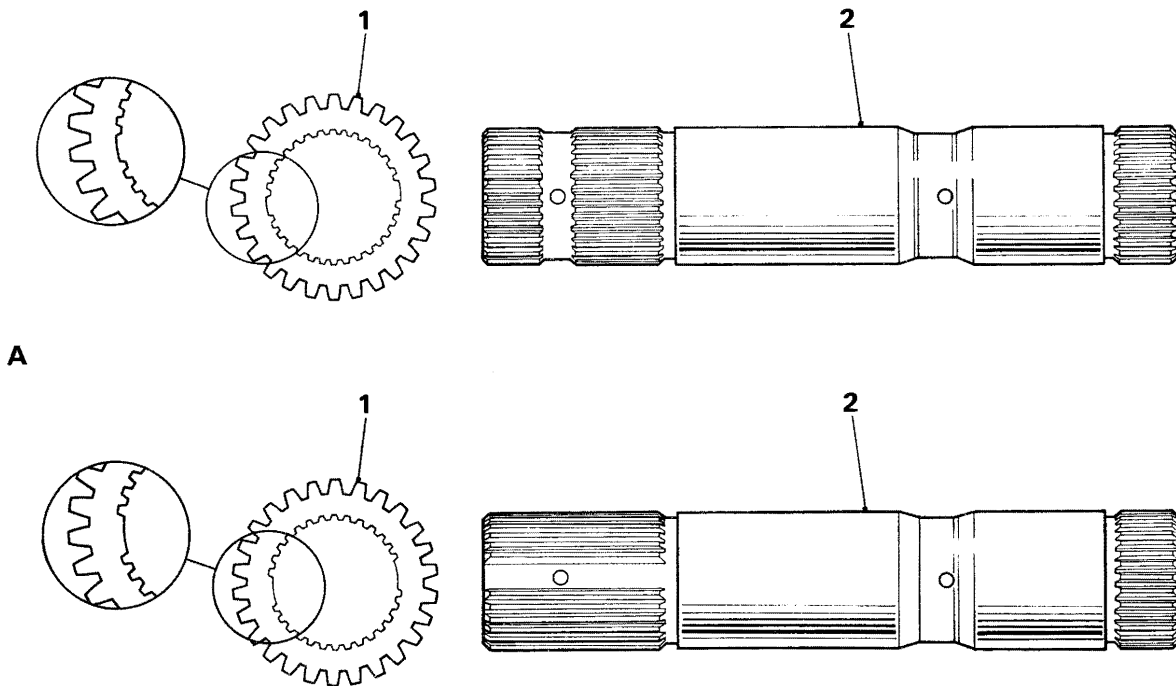
8. Fit the assembly into the rear unit holding fixture RH 7959 (J-6116) with the mainshaft pointing downward. Take care not to damage the shaft.

9. Fit the races and thrust bearing onto the outer face of the rear internal gear, retaining them with a smear of petroleum jelly. The small diameter (flanged I/D) race must be fitted first with the flange uppermost (see Fig. T277).

10. Fit the thrust bearing into the race.

**FIG. T277 FITTING RACES AND THRUST BEARINGS TO OUTER FACE OF REAR INTERNAL GEAR**

- 1 O/D flanged race
- 2 Thrust bearing
- 3 I/D flanged race



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FIG. T278 IDENTIFICATION OF SUN GEAR AND SHAFT

- A** Later design
- B** Earlier design
- 1** Sun gear
- 2** Sun gear shaft

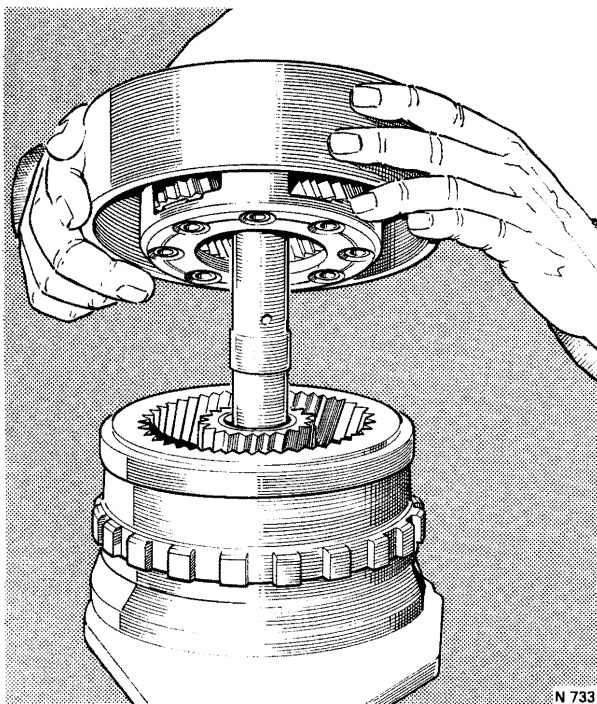


FIG. T281 FITTING THE REACTION CARRIER TO THE OUTPUT CARRIER

11. Fit the large diameter (flanged O/D) race against the bearing with the flange cup over the bearing.
12. Fit the output shaft into the output carrier and fit the snap ring with the chamfer uppermost.
13. Fit a new 'O' ring to the output shaft.
14. Invert the assembly in the holding fixture so that the output shaft points downward.
15. Smear the tab side of the thrust washer with petroleum jelly then fit the washer into the output carrier so that the bent tabs engage in the tab pockets.
16. Fit the sun gear (see Fig. T278); ensure that the end with the chamfered inside diameter faces down.
17. Fit the sun gear shaft (see Fig. T278) with the longer of the splined ends lowermost.
18. A new design of sun gear and shaft was introduced on **Transmission Serial Number RR-71-1287** and onwards (see Fig. T278 for identification). The old sun gear will only fit onto the old shaft but the new sun gear will fit either the new or old shaft. (refer to the latest applicable service literature).
19. Fit the ring over the output carrier.
20. Ensure that the reaction carrier pinion gears are adequately lubricated then fit the reaction carrier onto the output carrier as shown in Figure T279; mesh the pinion gears with the front internal gear.

Note When a new output carrier and/or reaction carrier is being installed and the front internal gear ring prevents assembly of the carriers, replace the front internal gear ring with the service ring.

The front internal gear ring is a selective fit at the factory but not in service.

21. Fit the large diameter (flanged O/D) race onto the sun gear with the flange facing against the sun gear shaft.

22. Fit the thrust bearing onto the race.

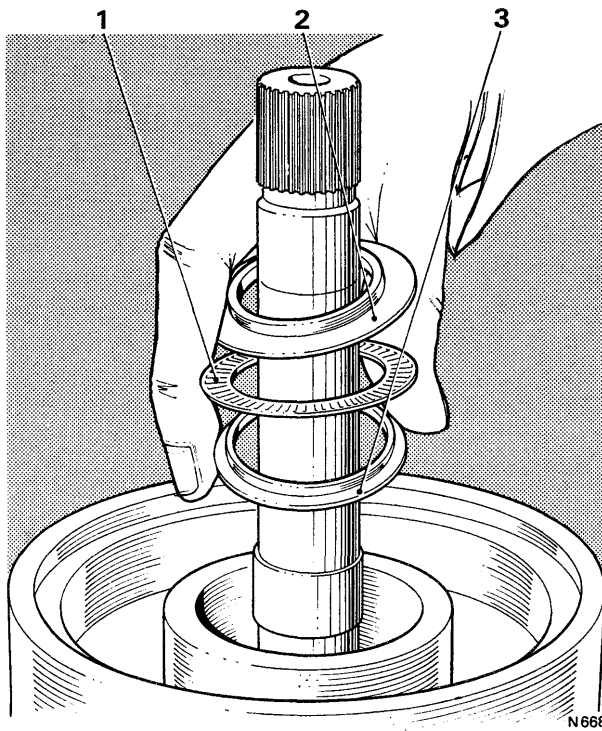


FIG. T282 FITTING RACES AND THRUST BEARINGS TO SUN GEAR

- 1 Thrust bearing
- 2 I/D flanged race
- 3 I/D flanged race

23. Smear the small diameter race with petroleum jelly then fit the race onto the centre support with the flange as shown in Figure T280.

24. Smear the bronze thrust washer with petroleum jelly then fit the washer into the recess in the centre support.

Transmissions with a sprag clutch

25. Using the rear sprag fitting tool RH 7971 (J-21367), fit the rear sprag assembly onto the centre support inner race with the bronze drag strip uppermost (see Fig. T281).

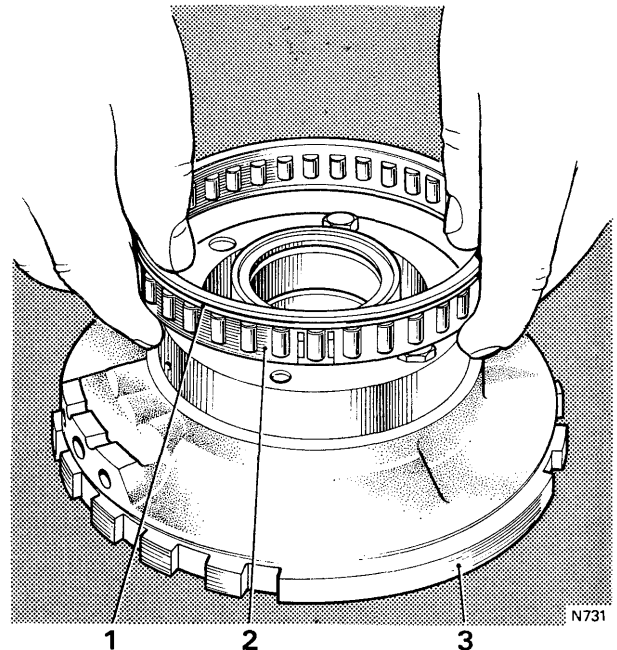


FIG. T281 FITTING THE REAR SPRAG TO THE CENTRE SUPPORT (SPRAG CLUTCH)

- 1 Sprag ridge uppermost
- 2 Sprag assembly
- 3 Centre support assembly

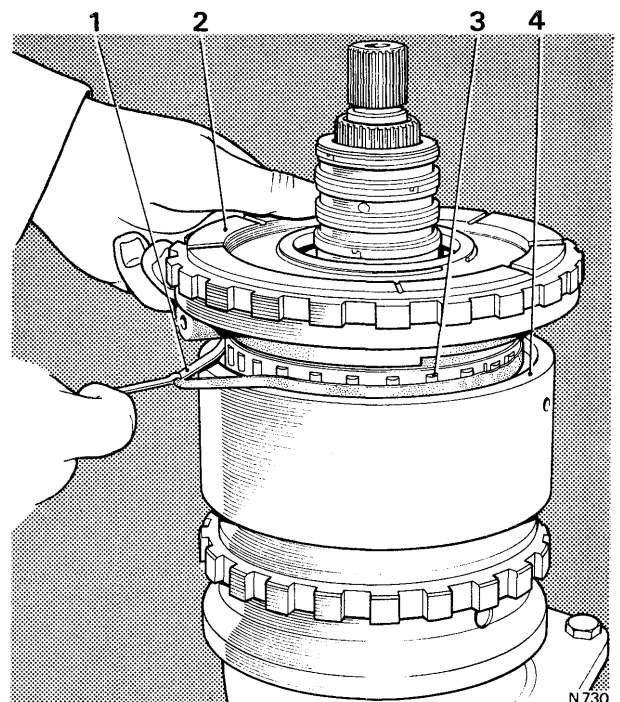


FIG. T282 FITTING THE CENTRE SUPPORT TO THE REACTION CARRIER (SPRAG CLUTCH)

- 1 Rubber band
- 2 Central support
- 3 Sprag
- 4 Reaction carrier

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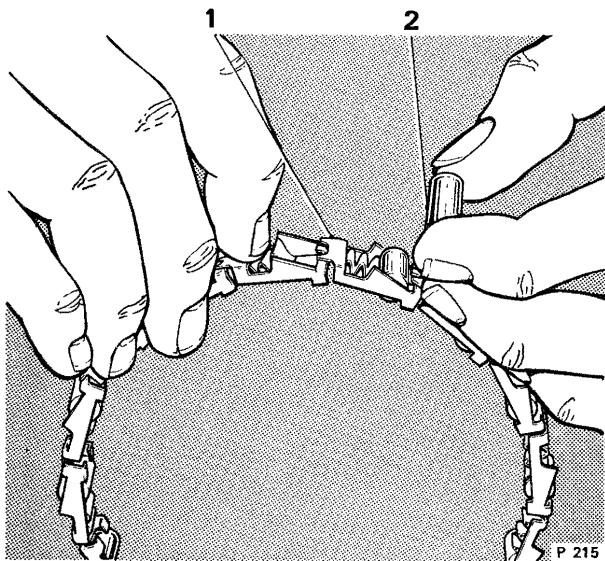


FIG. T283 FITTING A ROLLER TO THE ROLLER CLUTCH CAGE (ROLLER CLUTCH)

- 1 Cage
- 2 Roller

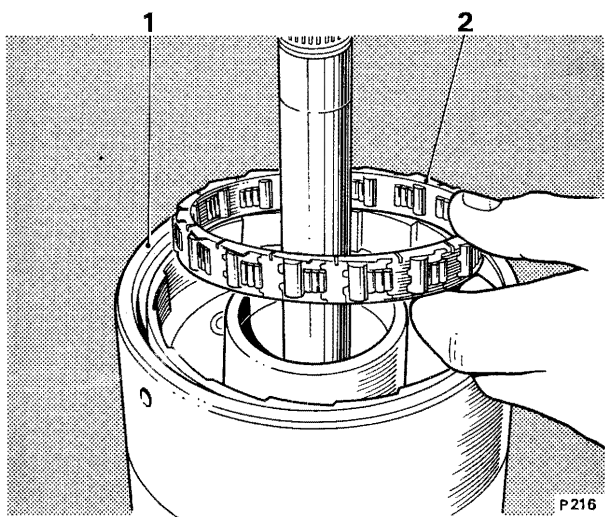


FIG. T284 FITTING THE ROLLER CLUTCH ASSEMBLY TO THE REACTION CARRIER (ROLLER CLUTCH)

- 1 Reaction carrier
- 2 Roller clutch assembly

Note The rear sprag fitting tool **must** be used to prevent hidden damage to the soft, bronze drag strips.

26. Fit the centre support and sprag assembly into the sprag outer race in the reaction carrier as follows.
27. Fit a strong rubber band around the outside diameter of the sprag assembly to hold the sprags in place.
28. Start the sprag assembly into the outer race, ensuring that all the sprags are inside the outer race. When this is done, cut or stretch the rubber band to remove it (*see Fig. T282*) then complete the procedure by pressing on the centre support.

Note With the reaction carrier held, the centre support should turn **anti-clockwise only**.

Transmissions with a roller clutch

29. Fit the rollers that may have come out of the roller clutch cage, by compressing the energising spring with the forefinger and inserting the roller from the outside (*see Fig. T283*).

Note Ensure that the energising springs are not distorted and that the curved end leaf of the springs are positioned against the rollers.

30. Fit the roller clutch assembly into the reaction carrier (*see Fig. T284*).
31. Fit the centre support assembly into the roller clutch fitted into the reaction carrier (*see Fig. T285*).

Note With the reaction carrier held, the centre support should turn **anti-clockwise only**.

All Transmissions

32. Fit the tool RH 7970 (J-21365) onto the end of the mainshaft so that the tangs engage the groove in the shaft.
33. Tighten the screw on the tool to secure the tool on the shaft and to prevent movement of the clutch assembly when the gear unit assembly is fitted.
34. Remove the gear unit from the holding fixture and lay it on its side.
35. Fit the thrust washer on the rear face of the output shaft with the bent tabs in the tab pockets. Retain the thrust washer with a smear of petroleum jelly.

Intermediate clutch gear unit, centre support and reaction carrier—To fit

1. Fit the rear band assembly into the transmission case so that the band lugs engage with the anchor pins (*see Fig. T286*).
2. Inspect the support to case spacer for burrs or raised edges, remove with a stone or fine emery cloth. Ensure that the spacer is clean.
3. Fit the support to case spacer against the shoulder at the bottom of the case splines and the gap located adjacent to the band anchor pin (*see Fig. T287*).

Note Do not confuse this spacer [0.040 in. (1,016 mm.) thick and with both sides flat] with either the centre support to case snap ring (one side bevelled) or the backing plate to case snap ring [0.093 in. (2,362 mm.) thick with both sides flat].

4. Fit the previously selected rear unit adjusting washer (see 'Rear unit end float — To check', in Section T21) into the slots provided inside the rear of the transmission case; retain the washer with a smear of petroleum jelly.

5. Fit the transmission case into the holding fixture (if it has been removed). Do not over-tighten the fixture side pivot pin as this will cause binding when the gear unit is fitted.

6. Fit over the output shaft the same length of tube that was used to remove the unit. It can then be used as a handle to facilitate the fitting of the assembled gear unit. It will also prevent the output shaft splines from damaging the bush in the case.

Caution Do not drop or bump the assembly in the transmission case during the fitting procedure. This could result in damage to the output shaft case bush as well as to the assembly itself.

7. Fit the gear unit with the centre support and the reaction carrier. Align the slots then carefully guide the assembly horizontally into the transmission case making certain that the centre support bolt hole is properly aligned with the hole in the case.

8. Position the transmission vertically with the front end of the case uppermost. Remove tool RH 7970 (J-21365).

9. Lubricate the centre support retaining snap ring with clean transmission fluid then fit the snap ring into the transmission case with the bevelled side uppermost and the flat side against the centre support; position the gap adjacent to the front band anchor pin.

10. Expand the snap ring until the centre support is against the shoulder of the case

11. Fit the case to centre support bolt.

Note To correct carry out this operation, it will be necessary to produce a locating tool and then to proceed as follows.

12. Produce the locating tool from 0.375 in. (0,95 cm.) diameter, cold roll steel or from a screwdriver with a 0.375 in. (0,95 cm.) diameter shank. The stock should be approximately 12.00 in. (30,5 cm.) long. Grind the stock to a blunt point, tapering it 0.875 in. (2,22 cm.) from the end of the bar to a 0.125 in. (0,32 cm.) diameter at the end.

13. Bend the bar to a 45° angle 2.50 in. (6,35 cm.) from the pointed end (see Fig. T288).

14. Place the centre support locating tool into the direct clutch passage in the case, with the handle of the tool pointing to the right as viewed from the front of

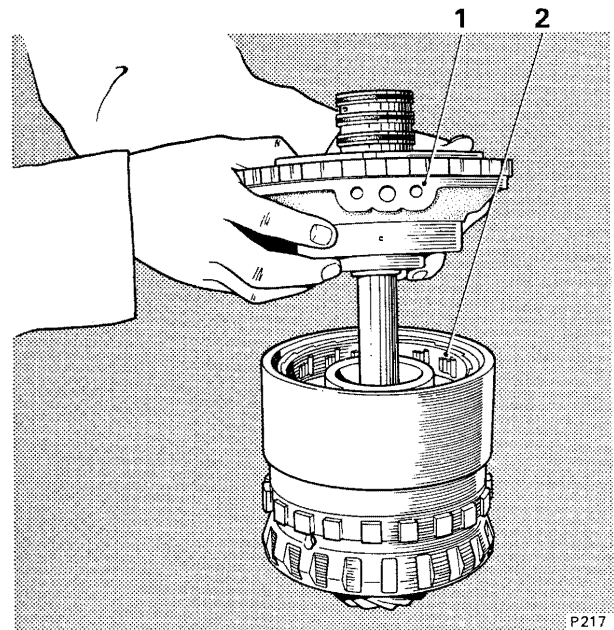


FIG. T285 FITTING THE CENTRE SUPPORT INTO THE REACTION CARRIER (ROLLER CLUTCH)

- 1 Centre support
- 2 Roller clutch

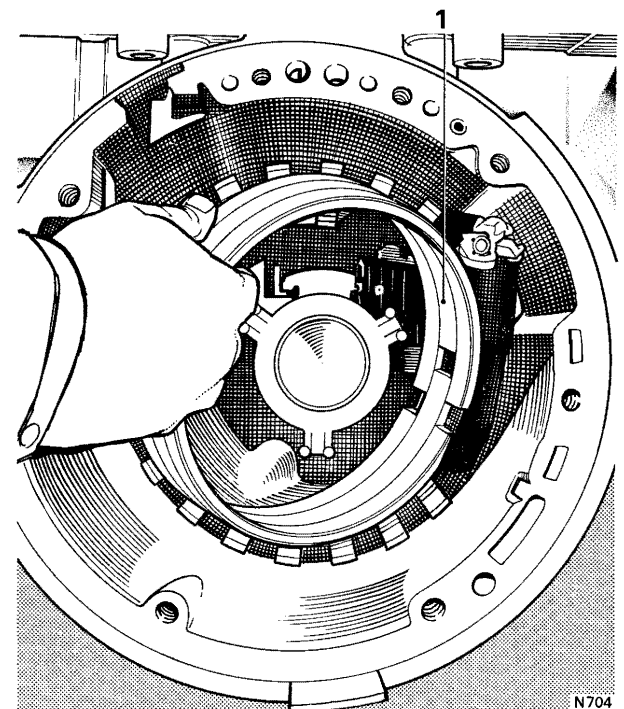
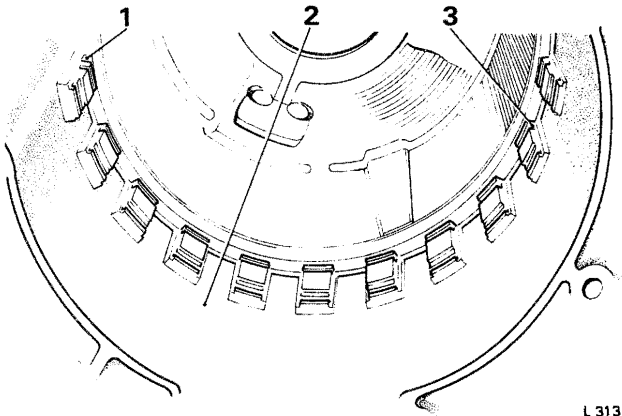


FIG. T286 FITTING THE REAR BAND

- 1 Rear band

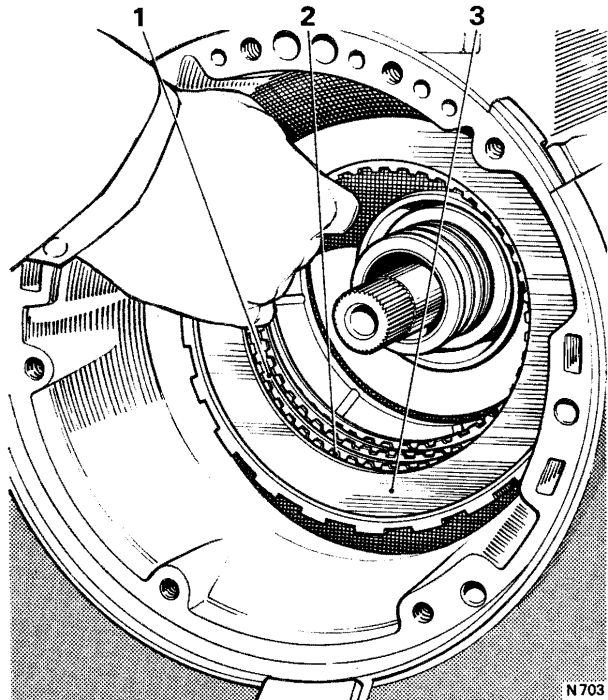
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FIG. T287 FITTING THE INTERMEDIATE CLUTCH PLATES

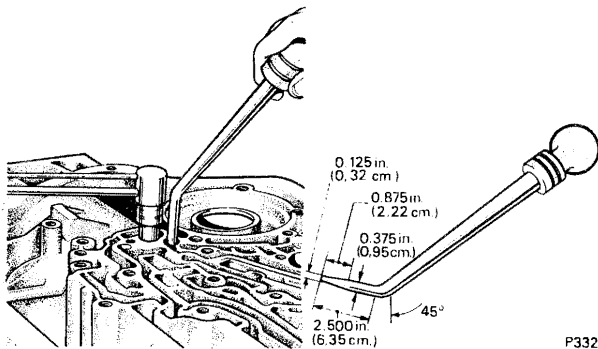
- 1 Steel plate (3)
- 2 Composition plate
- 3 Back plate



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FIG. T289 FITTING THE INTERMEDIATE CLUTCH PLATES

- 1 Steel plate
- 2 Composition plate
- 3 Back plate



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FIG. T288 LOCATING CENTRE SUPPORT

the transmission and parallel to the bell housing mounting face.

15. Apply pressure downward on the tool handle which will tend to rotate the centre support anti-clockwise as viewed from the front of the transmission.
16. While holding the centre support firmly anti-clockwise against the case splines, torque the case to centre support bolt to 23 lbs. ft. (3,2 kg.m.).

Note When using the locating tool, take care not to raise burrs on the case valve body mounting face.

17. Lubricate the three steel and three composition clutch plates with clean transmission fluid then fit the clutch plates. Commence with a steel plate then fit alternate composition and steel plates, finishing with a composition plate (*see Fig. T289*).
18. Fit the intermediate clutch back plate with the machined face against the clutch plate.
19. Fit the large snap ring, ensuring that the ring gap faces the opposite side to the front band anchor pin.
20. Check the rear unit end float.

Section T23 TRANSMISSION CASE

The transmission case is an alloy die casting comprising the housing for the main transmission components. It also forms the bell housing which encloses the torque converter.

The lower inner face of the case forms part of the hydraulic passages onto which the control valve unit fits. A bore in the rear of the case contains a bush in which the output shaft runs. A machined face at the front of the case accepts the oil pump and contains oil passages which convey transmission fluid from the pump to several points in the case.

Transmission case—To inspect

1. When the transmission has been completely dismantled, the case should be thoroughly washed in clean paraffin (kerosene) then dried with compressed air.
2. Ensure that all the oil passages are flushed out.
3. Take care not to raise burrs on the ends of the passages.

Note If the case assembly requires replacement and contains the centre support which has the centre support to case spacer fitted, ensure the spacer is removed from the old case and installed in the new case.

External leaks

Determine the exact source of the leak and use the approved epoxy repair procedure for minor porosity.

Internal leaks

1. Inspect the case assembly for internal porosity or cross channel leaks in the valve body face passages.

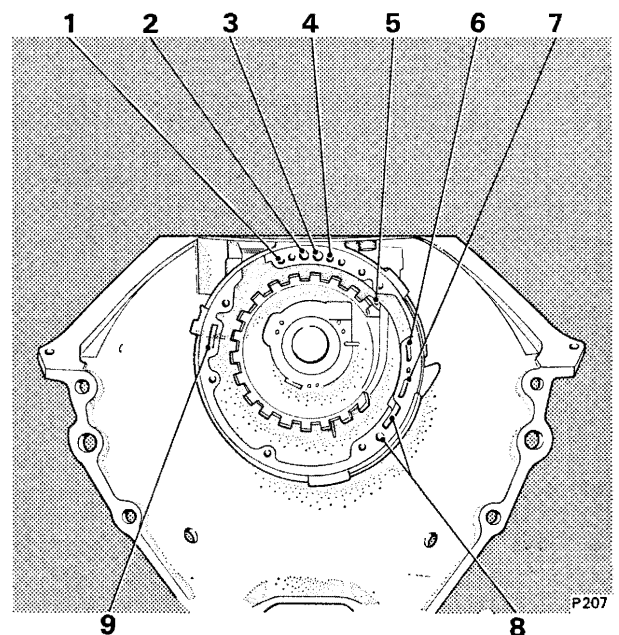


FIG. T290 TRANSMISSION CASE OIL PASSAGES

- 1 Reverse
- 2 Line
- 3 Drive
- 4 Modulator or Intermediate
- 5 Intermediate clutch cup plug
- 6 To cooler
- 7 Cooler return
- 8 Vent
- 9 Pump intake

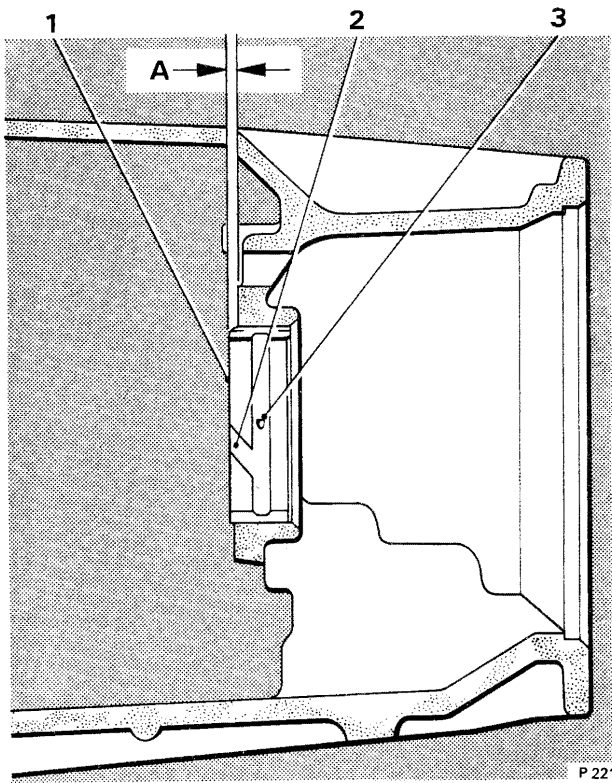


FIG. T291 FITTING A NEW CASE BUSH

- 1 Bush (GM 8623941)
- 2 Stake mark
- 3 Bush to be fitted with oil groove in direction shown
- A 0.040 in. to 0.055 in. (1,016 mm. to 1,307 mm.)

2. Inspect for porosity or defects in the modulator valve bore, case intake bore and pump case face.
3. If internal leakage is confirmed from any of the foregoing points, fit a new case.
4. During internal inspection of the case also check for a loose or missing intermediate clutch cup plug, for identification refer to Figure T290; if necessary, fit a new plug.

External damage

External damage is usually caused by handling, road hazards or converter to flex-plate bolts becoming loose as a result of incorrect fitting. When external damage is evident such as described in the foregoing sentence, fit a new case.

Internal damage

If the internal damage is due to the incorrect installation of the spacer and/or the snap rings resulting in damage to the snap ring grooves, fit a new case and ensure that the snap rings are assembled in their correct location.

High oil pressure can also result in internal damage, if this is the cause fit a new case and rectify the pro-

blem (usually the trouble can be located in the pressure regulator valve system).

Internal inspection of the case may also reveal that fretting or peening on the shoulder at the bottom of the case splines has taken place; if this condition is any more than the very slightest, fit a Centre Support Service Package. Changing the transmission for this condition is not usually considered necessary.

If the case bushing is found to be worn or scored fit new bushing (see Fig. T291).

Inspect the case for stripped threads in the bolt holes and where possible 'Heli-Coil' the damaged bolt hole(s) (see Fig. T292 and 'Heli-Coil' Information Chart).

Repair procedure for minor case porosity

1. Proceed with the repair by bringing the transmission fluid up to the operating temperature 82°C. (180°F.).
2. Locate the source of the oil leak.
3. Thoroughly clean the area to be repaired with cleaning solvent and a brush; dry-off with compressed air. A clean, dry soldering acid brush may be used to clean the area and also apply the epoxy cement.
4. Following the manufacturer's instructions, mix a sufficient amount of epoxy cement, such as 3 M — Scotch Weld — 2216 or equivalent, to carry out the necessary repair.

Note Observe the manufacturer's cautions in handling.

5. While the transmission is still at operating temperature, apply epoxy cement to the area under repair. Ensure that the area is completely covered.
6. If 3M — Scotch Weld — 2216 has been used allow 1 hour to pass before starting the engine; equivalent epoxy cements may take longer to cure, always check the manufacturer's instructions.
7. Finally, bring the transmission fluid up to the normal operating temperature of 82°C. (180°F.) and check the transmission for leaks.

Intermediate clutch plug—To fit

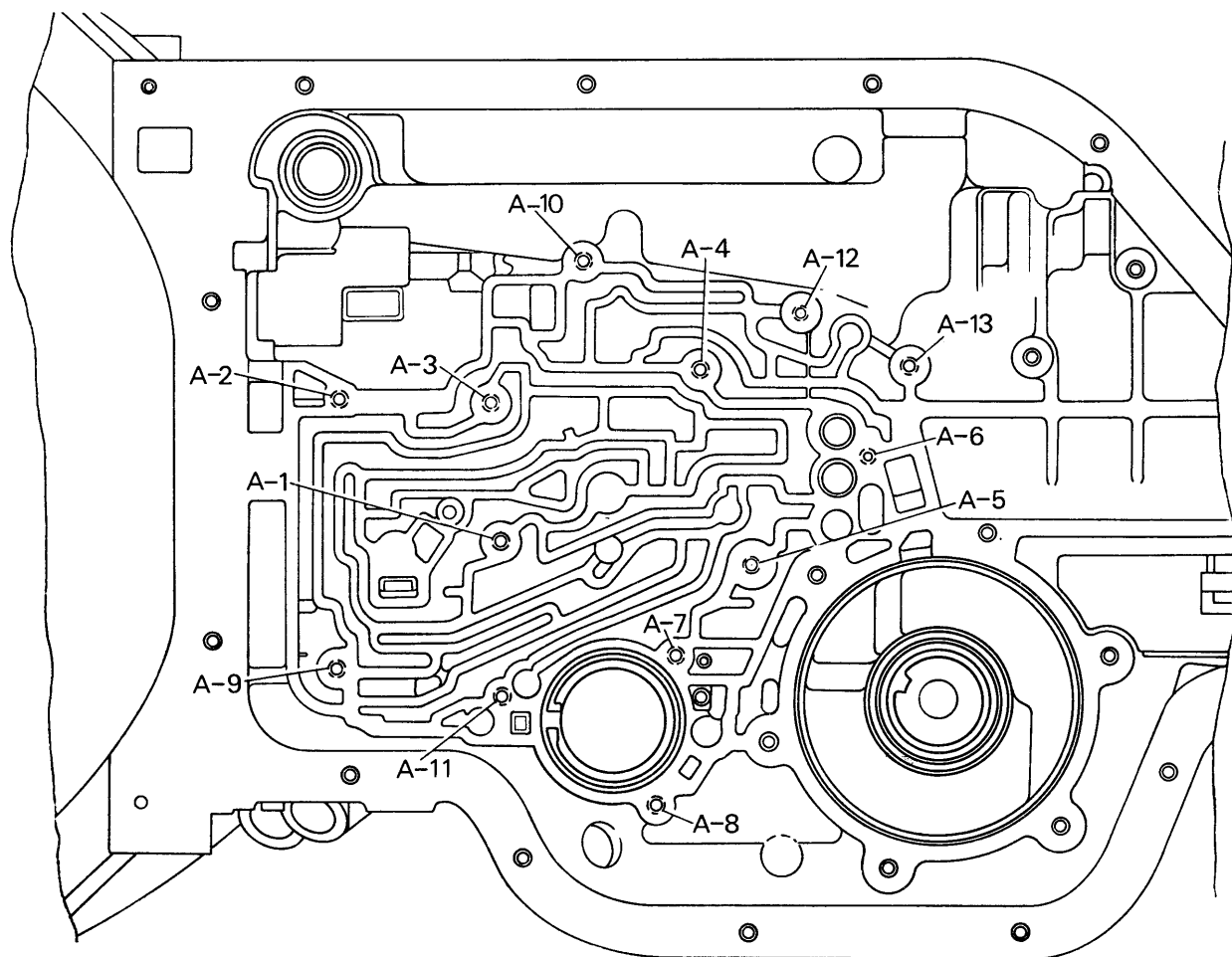
1. Place the transmission case in the holding fixture and position with the front end facing up.
2. Ensure that the intermediate clutch cup plug hole is thoroughly clean and enter the intermediate clutch cup plug into the hole open end out. Drive the plug into the case until it is flush or slightly below the top of the hole using a 0.375 in. (9,525 mm.) diameter rod 10.00 in. (25,40 cm.) long.

Note Ensure that the rod used is large enough to locate on the lip edge of the plug and **not** the bottom of the plug.

3. Stake the plug securely in the case.

Case bushing—To remove

1. To remove the case bushing, support the case and using tool J-21465-8 with driver handle J-8092 (or J-8400-1) remove the bush.



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FIG. T292 HELI-COIL IDENTIFICATION—VIEW OF UNDERSIDE OF TRANSMISSION CASE

Case bushing—To fit

1. Support the transmission case and using tool J-21465-9, drive handle J-8092 and extension J-21465-13. Press or drive the bush into the case until 0.040 in. (1,016 mm.) to 0.055 in. (1,307 mm.) above the selective thrust washer-face (see Fig. T291).

Note Ensure that the bushing is fitted with the lubrication passage facing the front of the transmission case.

2. Stake the bushing with tool J-21465-0.
3. The stake marks to be inside the lubrication grooves.

Heli-Coils

Before commencing these operations always refer to Figure T292 and the 'Heli-Coil' Information Chart,

for correct drill and tap sizes.

1. Shield the area around the hole to be heli-coiled, this will contain any small particles of metal.
2. Drill out the old threads and clean any particles from the hole.

Note Drill out only to the depth of the original hole. When drilling hole A-4 (see Fig. T292), the drill may go through to the inside of the case; located just behind this hole are the intermediate clutch splines. If the hole goes through, the burrs **must** be removed from the clutch splines.

3. Tap the hole with the **heli-coil tap**.
4. Fit the standard insert (STI) heli-coil.
5. Remove the shields and **ensure that all particles of metal, etc. are removed.**

Heli-Coil Information for Torque Converter Transmission

Transmission Out of Vehicle and Partially or Completely Dismantled.

Location	Hole No.	Drill size	Tap size	Heli-Coil size
Pump to Case	All	0.328 in. (8,334 mm.)	5/16-18 UNC-2B	5/16-18 STI-NC
Valve Body to Case	A-1 through A-4 (See Fig. T292)	0.328 in. (8,334 mm.)	5/16-18 UNC-2B	5/16-18 STI-NC
Valve Body to Case	A-5 and A-6 (See Fig. T292)	0.266 in. (6,747 mm.)	1/4-20 UNC-2B	1/4-20 STI-NC
Converter To Flex-Plate	All	0,391 in. (9,922 mm.)	3/8-16 UNC-2B	3/8-16 STI-NC

Transmission in Vehicle and Partially Dismantled.

Location	Hole No.	Drill size	Tap size	Heli-Coil size
Case Extension to Case	All	0.391 in. (9,922 mm.)	3/8-16 UNC-2B	3/8-16 STI-NC
Governor Cover to Case	All	0.328 in. (8,334 mm.)	5/16-18 UNC-2B	5/16-18 STI-NC
Modulator Retainer to Case	—	0.328 in. (8,334 mm.)	5/16-18 UNC-2B	5/16-18 STI-NC

Location	Hole No.	Drill size	Tap size	Heli-Coil size
Speedometer Driven Gear Assembly to Case	—	0.328 in. (8,334 mm.)	5/16-18 UNC-2B	5/16-18 STI-NC
Oil Pan to Case	All	0.328 in. (8,334 mm.)	5/16-18 UNC-2B	5/16-18 STI-NC
Rear Servo Cover to Case	All	0.328 in. (8,334 mm.)	5/16-18 UNC-2B	5/16-18 STI-NC
Parking Brake Bracket to Case	All	0.328 in. (8,334 mm.)	5/16-18 UNC-2B	5/16-18 STI-NC
Valve Body to Case	A-7 through A-10 (See Fig. T292)	0.328 in. (8,334 mm.)	5/16-18 UNC-2B	5/16-18 STI-NC
Valve Body to Case	A-11 (See Fig. T292)	0.266 in. (6,747 mm.)	1/4-20 UNC-2B	1/4-20 STI-NC
Solenoid to Case	A-12 and A-13 (See Fig. T292)	0.266 in. (6,747 mm.)	1/4-20 UNC-2B	1/4-20 STI-NC

Section T24

WORKSHOP TOOLS

The following is a list of special tools to be used when servicing the Automatic Transmission. General tools are not included as it is felt that these will be available locally.

<i>Tool Number</i>	<i>Description</i>	
RH 7949 (J-21409)	Forward and direct clutch piston fitting tool.	This tool enables the forward and direct clutch piston outer seal to enter the clutch drum easily and without damage to the seal.
J-21427	Speedometer drive gear removal tool.	This tool, when used in conjunction with J-21797 and J-8433 enables the speedometer driving gear to be removed from the output shaft.
J-21797	Speedometer drive gear removal bolt (2 off).	See previous description.
RH 7791 (J-8433)	Pulley extractor.	See previous description.
RH 7962 (J-21795)	Gear assembly removal and fitting adapter.	This tool must be used whenever the gear assembly is removed or fitted. It fits onto the end of the mainshaft and when the centre screw is tightened, prevents the rear sprag from moving.
RH 7955 (J-8763)	Transmission holding fixture.	This fixture accepts the transmission case and, when used in conjunction with base RH 7956 (J-3289-20), enables the transmission to be dismantled and assembled at a workable height and in the most convenient position.
RH 7956 (J-3289-20)	Base — holding fixture.	See previous description.
RH 7954 (J-21359)	Pump oil seal inserting tool.	This tool facilitates the fitting of the oil pump seal with the pump either fitted to or removed from the transmission.
J-21368	Pump body and cover alignment band.	This band ensures accurate alignment between the pump cover and the body whilst the securing setscrews are tightened.
RH 7969 (J-21363)	Intermediate clutch inner seal protector.	The seal protector fits over the centre support hub and ensures that the intermediate clutch piston inner seal is not damaged as the piston is fitted.

Chapter T

Workshop Tools — continued

<i>Tool Number</i>	<i>Description</i>	
RH 7964 (J-21360)	Pump by-pass valve seat fitting tool.	This tool is a punch which should be used when fitting a new by-pass valve seat.
RH 7957 (J-21370)	Band apply pin selector gauge (use J-21370-5 pin).	This gauge must be used, in conjunction with pin J-21370-5, to select the correct band apply pin in the rear servo.
RH 7971 (J-21367)	Rear sprag fitting tool.	This tool fits over the hub of the centre support and abuts the sprag inner race. The tool must be used when fitting the sprag to guard against damage to the soft bronze drag strips on the sprag itself.
RH 7952 (J-21366)	Converter retaining clamp.	This is a clamp which bolts onto the front face of the transmission case and prevents the torque converter from moving whilst the transmission is being handled.
RH 7968 (J-21362)	Forward and direct clutch inner seal protector.	This tool fits over the hub of the forward clutch and the direct clutch and protects the piston inner seal whilst the piston is being fitted.
RH 7963 (J-21361)	Pump by-pass valve seat remover.	When used in conjunction with slide hammer RH 7958 (J-6125), this tool will extract the by-pass valve seat from the oil pump.
RH 7966 (J-21664)	Clutch spring compressor adapter.	This adapter, when used in conjunction with RH 7965 (J-4670) — clutch spring compressor — facilitates the compressing of both the forward and direct clutch springs. The tool should be used when removing or fitting the clutch spring retainer snap ring.
RH 7965 (J-4670)	Clutch spring compressor.	See previous description.
RH 7674	Circlip and snap ring pliers.	By utilising the various nose pieces this tool can be used for the removal and fitting of the various circlip and snap rings in the transmission and electric actuator.
RH 7961 (J-21885)	Control valve accumulator piston fitting tool.	This tool is in the form of a clamp and facilitates the fitting of the accumulator spring and piston.
RH 7954 (J-21369)	Converter leak test fixture.	This fixture can be fitted to the neck of the torque converter and, when air pressure is applied to the valve, enables the converter to be pressure tested to check for leaks.
RH 7958 (J-6125)	Slide hammer assemblies.	The slide hammers have various uses when overhauling the transmission and are recommended when removing the oil pump.
RH 7950 (J-5154)	Rear extension oil seal fitting tool.	This tool should be used to fit a new oil seal to the rear extension. It can be used to fit a seal when the transmission is fitted to the car.
RH 7960 (J-21364)	Rear unit holding fixture adapter.	This adapter, when used in conjunction with rear unit holding fixture J-6116 will hold the rear unit whilst it is being dismantled or assembled.
RH 7959 (J-6116)	Rear unit holding fixture.	See previous description.
R 5244	Oil pressure gauge.	When coupled to the transmission main line oil feed, the gauge enables the oil pressure to be checked with the car either stationary or moving during a road test.
RH 7967 (J-6129)	Rear clutch spring compressor.	When used in conjunction with tools J-4670 — compressor and J-21664 — adapter the tool will facilitate the removal and fitting of the direct clutch housing snap ring.
RH 7841	Roll pin insertion and extraction tool.	The roll pin can be easily fitted to and removed from the brake drum and worm shaft with the aid of this tool.
RH 7843	Compressor — actuating lever spring.	This tool fits onto the electric gearchange actuator and will compress the actuating lever spring to facilitate removal of the retaining pin.
RH 7914	Adapter — main line oil pressure tapping to gauge.	The adapter screws into the main line blanking plug orifice in the left-hand side of the transmission and accepts the oil pressure gauge pipe (use with R 5244).

Workshop Tools — continued

Tool Number

R 5280	Adapter — air checking.	Rubber-nosed adapter for use when air testing.
RH 7951 (J-21477)	Wrench — oil cooler pipe.	This wrench is used in conjunction with a ratchet spanner (slackening) or torque spanner (tightening).
RH 7970 (J-21365)	Retainer — rear sprag.	This tool is fitted to the mainshaft to prevent movement of the rear sprag when the gear unit assembly is fitted.
J-21465-8	Removal fitting tool — case bush.	This tool with J-8092 is for removing and fitting the transmission case bushing.
RH 7794 (J-8092)	Universal handle.	See previous description.
J-21465-9	Adapter ring — case bush.	Used for fitting the new case bushing.
J-21465-10	Staking tool — case bush.	Used for staking bushing in transmission casing.
J-21465-13	Extension — case bush.	Used for fitting the new case bushing.



Workshop Manual

**Rolls-Royce Silver Shadow
(including Long Wheelbase Saloon)
Rolls-Royce Corniche
Bentley T Series
and Bentley Corniche**

Up to and including car serial number 30000

Volume 4

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Chapter U

EMISSION CONTROL SYSTEMS

Chapter U

EMISSION CONTROL SYSTEMS

PART 1

Chapter U - Part 1 contains information which is applicable to cars fitted with Emission Control Systems and manufactured during the years 1967 to 1972 inclusive.

SECTION		PAGE
U1	Exhaust Emission Control System	U3
U2	Fuel Evaporation Emission Control System	U11
U3	The Carburettors and Automatic Choke System	U21
U4	Ignition System, Distributor, Ignition Coil and Sparking Plugs	U49
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INTRODUCTION

This Chapter has been written specifically for cars fitted with Exhaust Emission Control and Fuel Evaporation Emission Control Systems to meet North American regulations.

It is important therefore that Service Personnel fully understand the contents of this Chapter so that the special servicing can be correctly carried out.

Throughout **Chapter U** reference is made to **EARLY**, **LATER** and **CURRENT** cars, the Car Serial Numbers to which these classifications apply are as follows:

- EARLY CARS** All cars prior to Car Serial Number SRX 9001
- LATER CARS**
- (a) **Cars other than Long Wheelbase**
 Car Serial Number SRX 9001 up to SRA 12030
 Including—SRX 12046 SRX 12062
 Excluding—DRA 11808 DRA 11880
 DRA 11809 DRA 11908
 DRA 11839 DRA 11912
 DRA 11841 DRA 11935
 DRA 11875 DRA 11936
 DRA 11879 CRA 11941
 CRA 12025 DRA 12018
 DRA 12022 DRA 12026
- (b) **Long Wheelbase cars**
 Car Serial Number LRX 9069 up to LRA 11922.
 Including—LRX 11923
- CURRENT CARS**
- (a) **Cars other than Long Wheelbase**
 Car Serial Number SRA 12030 and onwards
 Including—DRA 11808 DRA 11880
 DRA 11809 DRA 11908
 DRA 11839 DRA 11912
 DRA 11841 DRA 11935
 DRA 11875 DRA 11936
 DRA 11879 CRA 11941
 CRA 12025 DRA 12018
 DRA 12022 DRA 12026
 Excluding—SRX 12046 SRX 12062
- (b) **Long Wheelbase cars**
 Car Serial Number LRA 11922 and onwards
 Excluding—LRX 11923

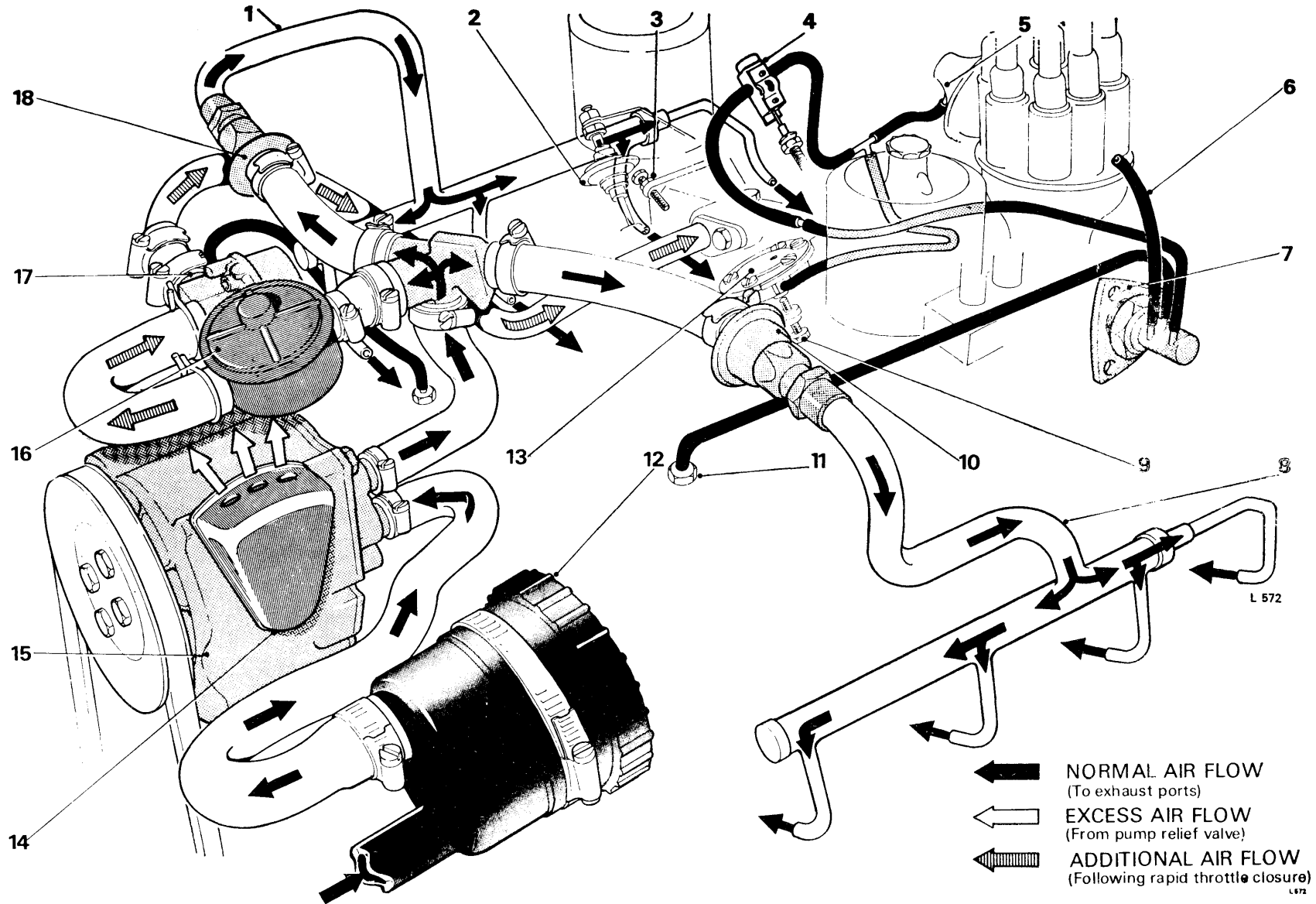


Fig. U1 EXHAUST EMISSION CONTROL SYSTEM AND IGNITION CONTROL SYSTEM

- | | | | |
|------------------------------|------------------------------|------------------------------------|--------------------------------------|
| 1 'A' bank air manifold | 6 Vent to air trunking | 11 Inlet manifold vacuum tapping | 14 Air pump relief valve silencer |
| 2 Throttle damper | 7 Thermal vacuum switch | 12 Air pump intake silencer/filter | 15 Air pump |
| 3 Fixed throttle stop screw | 8 'B' bank air manifold | 13 Throttle stop vacuum actuator | 16 Pressure control valve |
| 4 Vacuum retard tap | 9 Vacuum throttle stop screw | | 17 Deceleration control (gulp) valve |
| 5 Distributor retard capsule | 10 Check valve | | 18 Check valve |

Chapter U

Secton U1

EXHAUST EMISSION CONTROL SYSTEM

The Exhaust Emission Control System is designed to reduce the Carbon Monoxide and unburnt Hydrocarbon content in the exhaust gases to comply with U.S. Federal and California Emission Control regulations.

This system does not reduce the risk of inhaling exhaust gases in a confined area.

Air injection system – Description

Air from the atmosphere is drawn into the air pump through an intake silencer/filter. From the pump, the air passes through the check valves to the air manifolds then into the exhaust ports at a point just above the exhaust valve heads. This air combines with the exhaust gases from the combustion chamber and completes the oxidation of some of the unburnt gases. The discharge then passes along the exhaust system to atmosphere.

Air pump

Rotary vane air pump belt driven from the coolant pump.

Air pump relief valve

A relief valve is located in the discharge cavity of the air pump. This valve allows pump outlet air to by-pass the air injection system when the check valves are closed at high engine speeds or load, thus preventing damage to the pump and excessively high exhaust temperatures under extreme operating conditions.

Check valves

Check valves are fitted to the air manifolds to prevent the backflow of exhaust gases into the air lines or air pump. The valves operate when the exhaust back pressure exceeds the pump delivery pressure at high speed and load or in the case of failure of an air pump driving belt.

Gulp valve (anti-backfire valve)

The gulp valve which is triggered off by manifold depression allows a measured gulp of air from the pump discharge line to enter the inlet manifold following a rapid throttle closure. If air did not pass into the air manifold under these conditions, the mixture would be too rich to burn in the combustion chambers and would pass into the exhaust ports where it would combine with the injected air and when ignited produce severe backfiring.

Pressure control valve (P.C.V.)

At engine idling speed, i.e. when the air pump delivery pressure is low, the P.C.V. is closed preventing air from the pump discharge line passing into the gulp valve. This is necessary since inlet manifold depression at idle approaches the overrun figure and could trigger off the gulp valve and so cause uneven idling. On engine overrun, the air pressure from the pump opens the P.C.V. and allows air to pass to the gulp valve.

Chapter U

Throttle damper

The throttle damper prevents rapid throttle closure which would suddenly drop the intake manifold pressure causing vaporisation of fuel from the manifold walls and produce a sudden increase in mixture strength.

Air silencer/filter – To clean

1. Unscrew the end cap from the silencer/filter, then remove the filter element (*see Fig. U6*).
2. Wash in paraffin to remove any dirt. After washing, dip the element in clean engine oil then squeeze to remove excess oil. Fit the element and end cap.

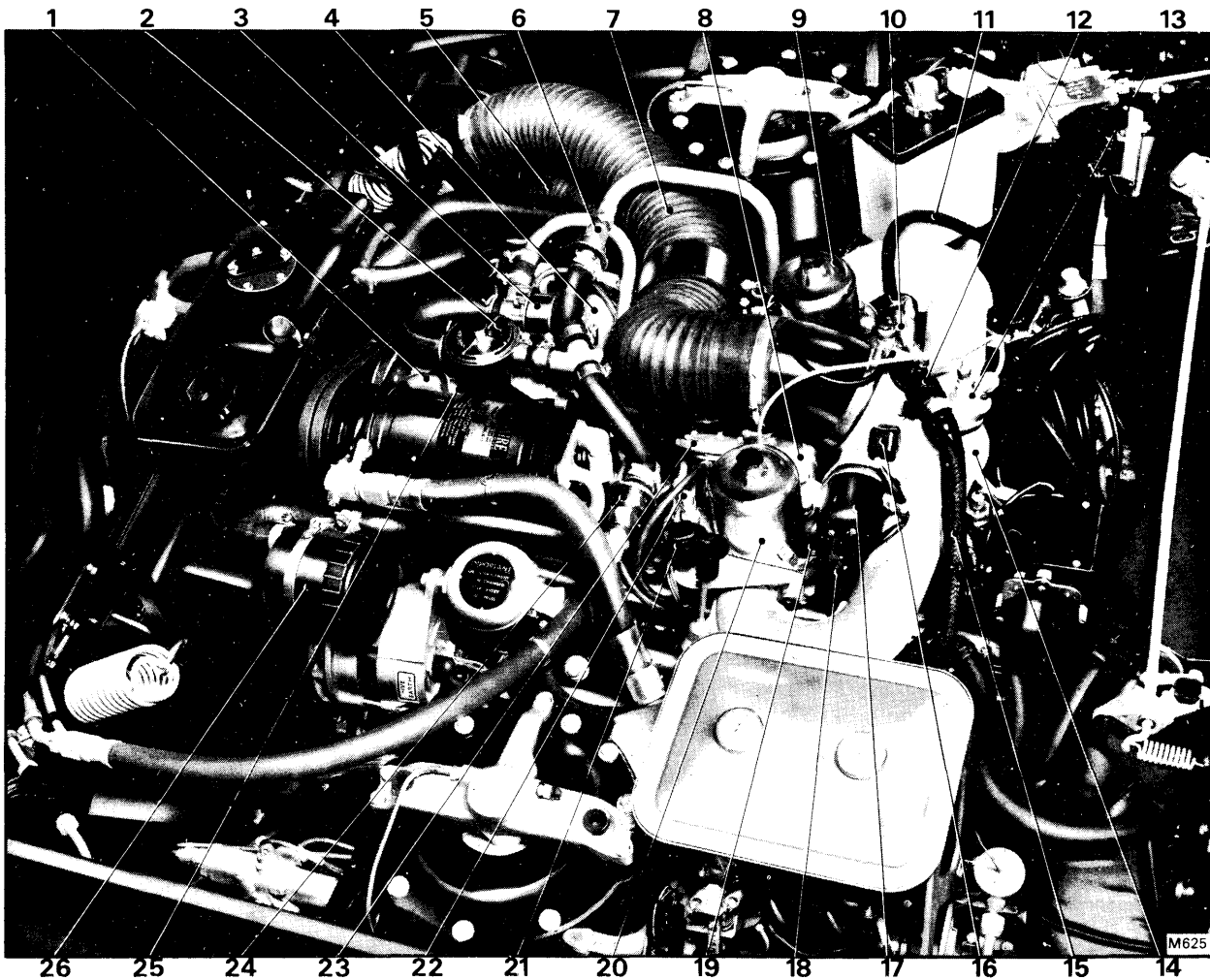


Fig. U2 VIEW INSIDE ENGINE COMPARTMENT (Early Cars)

- | | | |
|--|---|-------------------------------------|
| 1 Air injection pump relief valve silencer | 11 Hose to filter | 19 Carburetter jet adjusting screw |
| 2 Control valve | 12 Crankcase breather pipe connection | 20 'B' bank carburetter |
| 3 Gulp Valve | 13 Weaker cut-off valve | 21 Refrigeration fast-idle solenoid |
| 4 Thermostat elbow | 14 Choke butterfly housing | 22 Float chamber pressure tapping |
| 5 Hose—hot air scoop | 15 Choke stove pipe (passing air to exhaust manifold) | 23 Refrigeration vacuum unit |
| 6 Check valve | 16 Choke solenoid | 24 Check valve |
| 7 Air intake hose | 17 Choke thermo-coil housing | 25 Air injection pump |
| 8 Carburetter 'Tee' piece | 18 Choke stove pipe (passing heated air to thermo-coil) | 26 Air injection pump filter |
| 9 'A' bank carburetter | | |
| 10 Weakening device | | |

Air injection pump belt - To set

Refer to Chapter L—Engine Cooling System.

**Air injection pump (Saginaw 300-S-8)
- To remove**

1. Disconnect the battery.
2. Remove the two setscrews securing the gulp valve mounting bracket to the thermostat housing.
3. Detach the small rubber tube which fits between the manifold pipe and the gulp valve.
4. Slacken the two worm drive clips adjacent to the gulp valve. Slide the hose off the gulp valve.

5. Slacken the worm drive clip adjacent to the control valve. Disconnect the hose from the valve, then remove the gulp valve and control valve together with the hose connecting the two valves.

6. Slacken the worm drive clip securing the pump delivery hose to the pump; detach the hose from the pump.

7. Slacken the worm drive clip securing the hose to the air intake connection; detach the hose from the pump.

8. Slacken the two bolts on the pump belt adjustment strut; remove the upper bolt.

9. Slacken the remaining mounting bolt and allow the pump to move downward to remove any belt tension.

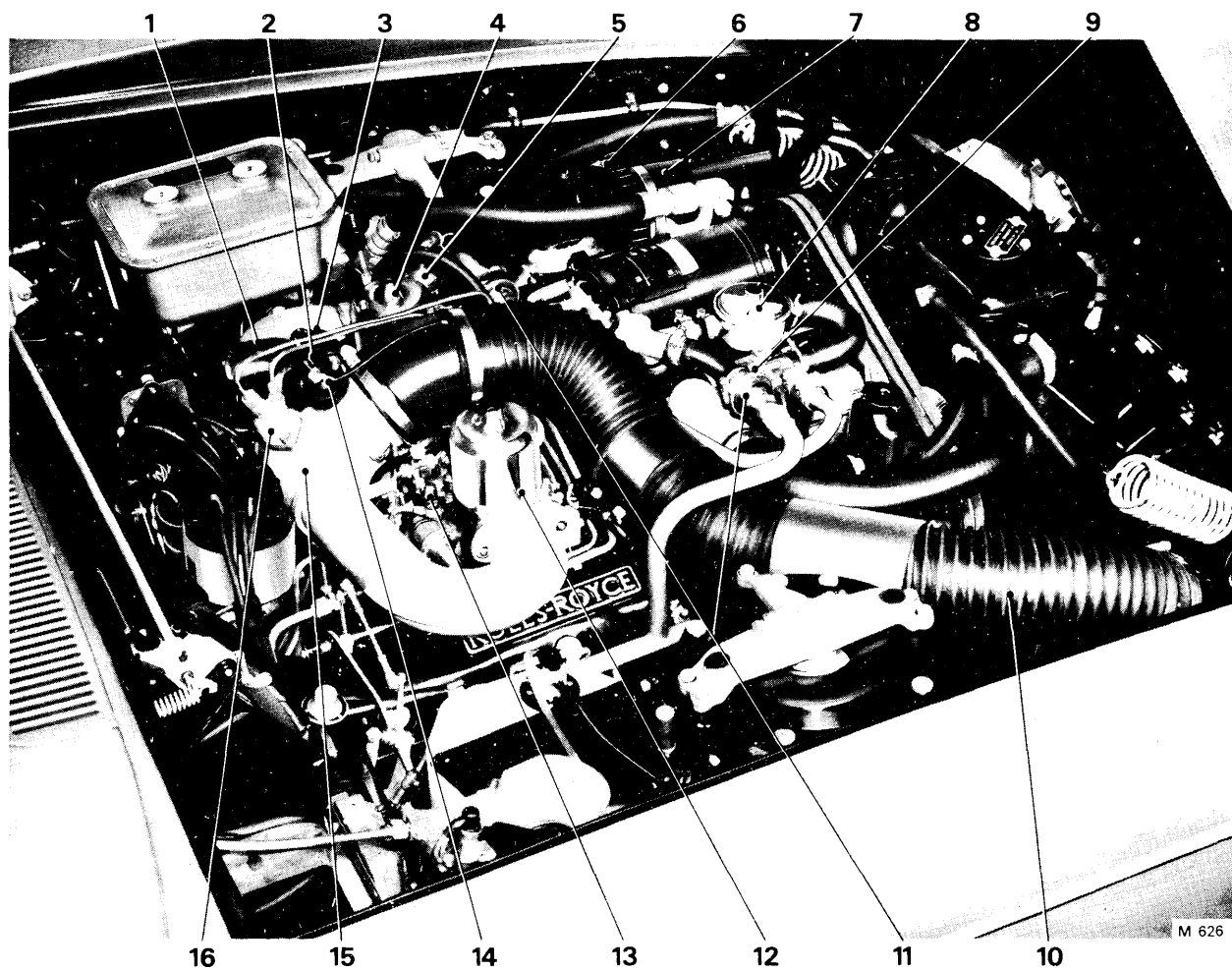


Fig. U3 VIEW INSIDE ENGINE COMPARTMENT (Later Cars)

- | | | |
|--|-----------------------------|---------------------------------------|
| 1 Choke stove pipe (passing air to exhaust manifold) | 7 Air injection pump filter | 12 'A' bank carburetter |
| 2 Choke solenoid | 8 Control valve | 13 Float Chamber Pressure Tapping |
| 3 Choke thermo-coil housing | 9 Gulp valve | 14 Crankcase breather pipe connection |
| 4 'B' bank carburetter | 10 Air intake hose | 15 Choke butterfly housing |
| 5 Float chamber vent valve | 11 Check valves | 16 Weakener cut-off valve |
| 6 Weakener filter | | |

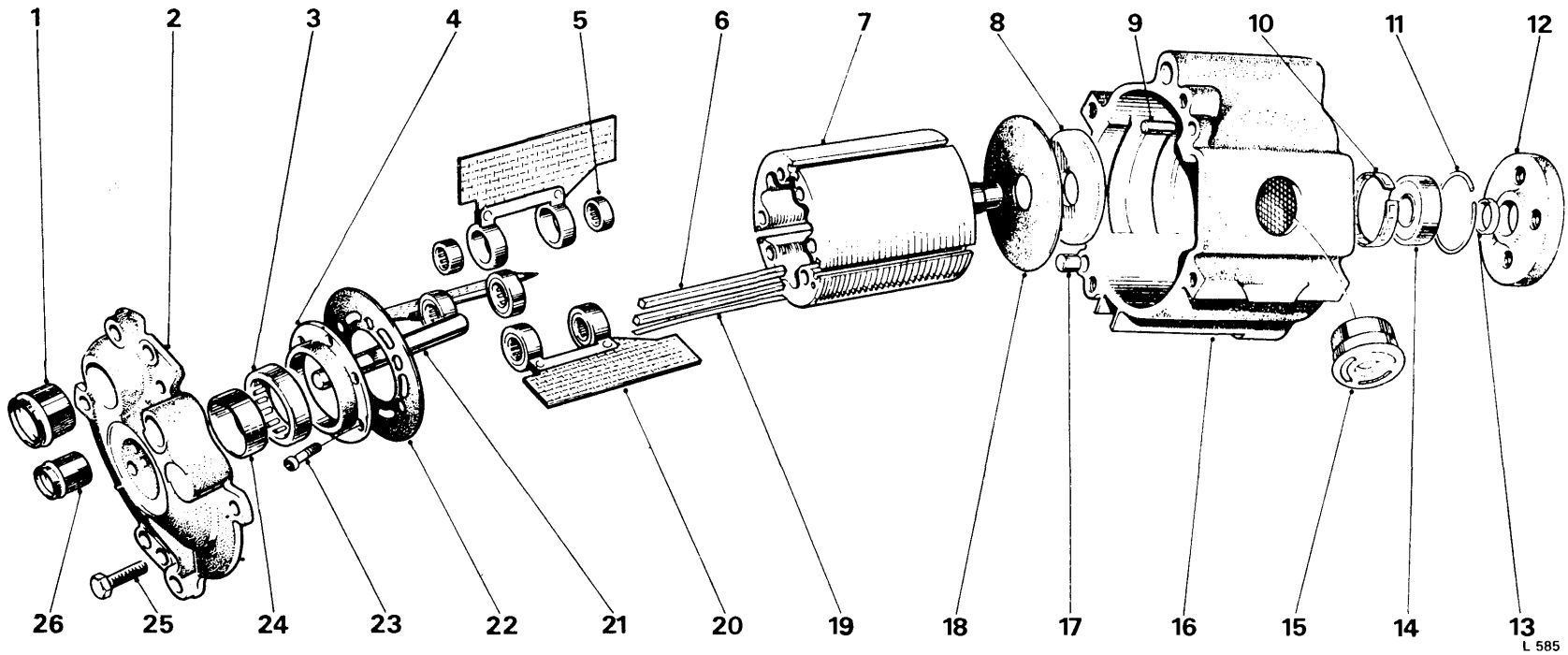


Fig. U4 AIR PUMP

- 1** Intake tube
- 2** Housing cover
- 3** Bearing race
- 4** Rotor ring
- 5** Vane bearing
- 6** Shoes
- 7** Rotor

- 8** Rotor ring
- 9** Dowel
- 10** Tolerance ring
- 11** Snap ring
- 12** Hub
- 13** Spacer

- 14** Front bearing
- 15** Relief valve
- 16** Housing
- 17** Dowel
- 18** Front seal
- 19** Shoe spring

- 20** Vane
- 21** Pivot pin
- 22** Rear seal
- 23** Rotor ring screws
- 24** Bearing inner race
- 25** Housing cover setscrew
- 26** Exhaust tube

L 585

10. Remove the belt; if difficulty is experienced, the pulley should be removed by removing the four setscrews securing it in position.

11. Support the air injection pump, remove the remaining bolt then lift the pump clear of the engine.

Air injection pump – To dismantle (see Fig. U4)

1. Support the drive hub in a soft jawed vice and remove the four housing cover bolts; do not clamp on the aluminium housing.

2. Remove the housing end cover by tapping the cover lightly with a soft headed mallet on alternate sides.

3. Remove the six socket headed screws from the rotor ring.

4. Remove the rotor ring and the carbon seal; discard the carbon seal.

5. Clean the bearing in petroleum solvent.

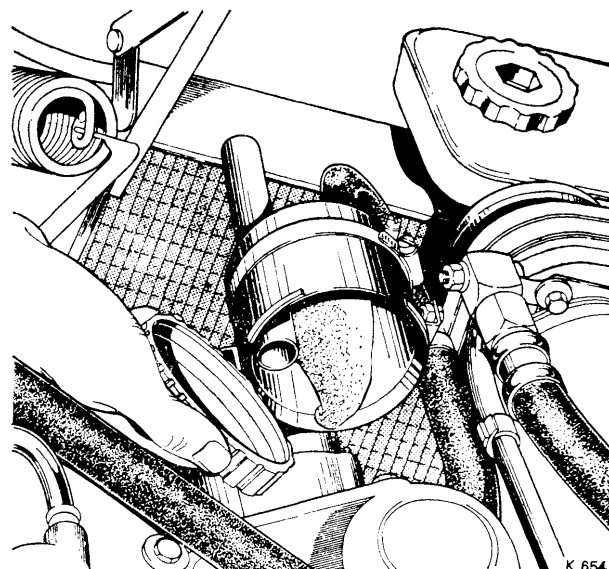


Fig. U6
REMOVING THE AIR SILENCER/FILTER
ELEMENT

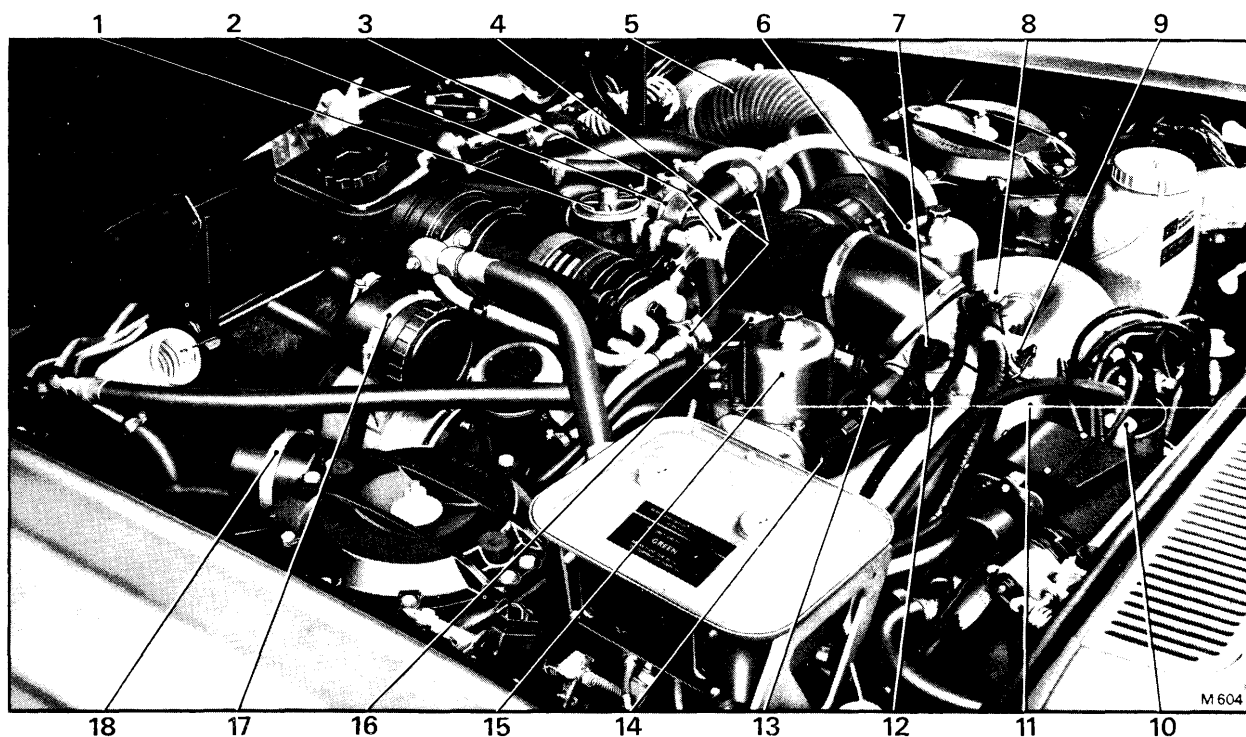


Fig. U5 VIEW INSIDE ENGINE COMPARTMENT (Current Cars)

- | | |
|---|---|
| 1 Control valve | 11 Choke butterfly housing |
| 2 Gulp valve | 12 Choke stove pipe (passing air to exhaust manifold) |
| 3 Thermostat elbow | 13 Choke thermo-coil housing |
| 4 Check valves | 14 Choke stove pipe (passing heated air to thermo-coil) |
| 5 Air intake hose | 15 'B' bank carburetter |
| 6 'A' bank carburetter | 16 Throttle stop vacuum actuator |
| 7 Choke solenoid | 17 Air injection pump filter |
| 8 Crankcase breather pipe connection | 18 Weaker filter |
| 9 Bi-metal switch | |
| 10 Fuel receiver and float chamber vent valve | |

Chapter U

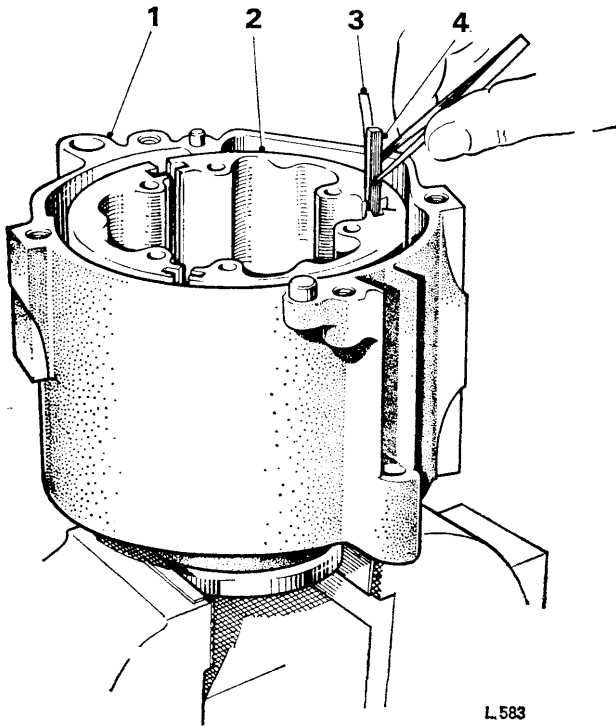


Fig. U7 METHOD OF REMOVING CARBON SHOES

- | | |
|-----------|---------------|
| 1 Housing | 3 Shoe spring |
| 2 Rotor | 4 Carbon shoe |

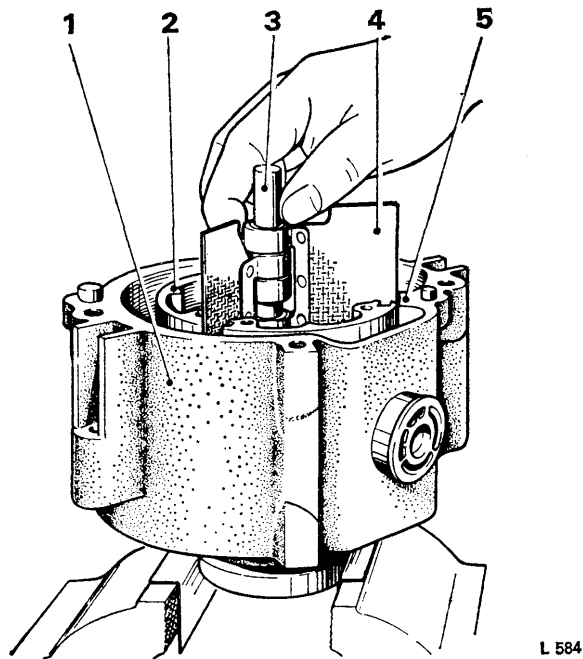


Fig. U8 POSITIONING OF VANES IN ROTOR

- | |
|----------------|
| 1 Casing |
| 2 Rotor |
| 3 Assembly pin |
| 4 Vane |
| 5 Stripper |

6. Inspect the bearing and if it is in good condition, thoroughly dry then lubricate with SSG Code 5124 grease.

7. Withdraw the vanes from the rotor.

8. Clean the vane bearings in petroleum solvent.

9. Inspect the bearings and if they are in good condition, thoroughly dry and lubricate the bearings with SSG 5124 grease.

10. Carefully remove the carbon shoes with tweezers and remove the shoe springs (see Fig. U7).

11. Press the rear bearing out of its ring, ensuring that adequate support is given to avoid distortion.

12. Using a suitable extractor and bridge piece, remove the relief valve from the housing.

Note No further dismantling of the pump should be attempted as the rotor and housing are matched parts.

Air injection pump – To assemble

1. Fit the relief valve into the housing bore. Using a protective plate over the relief valve, tap the valve with a hammer until it is felt to abut the seat in the housing; care should be taken during this operation to ensure that the housing is not distorted.

2. Fit the vanes onto an assembly pin (see Fig. U9), thoroughly lubricating each bearing with SSG Code 5124 grease.

3. Work the grease well into each bearing to ensure adequate lubrication.

4. Clamp the pump drive hub in a vice then fit the vanes into the rotor, ensuring that one vane is positioned adjacent to the stripper as shown in Figure U8.

Note Do not remove the assembly pin until later.

5. Fit a carbon shoe to each side of every vane, ensuring that the shoes are fitted with their bearing surface adjacent to the vanes and with the radiused point of contact toward the outside diameter of the rotor.

6. Fit the three shoe springs into each of the deepest shoe slots, ensuring that the curved portion of each spring is nearest to the shoe. Push the springs flush with or beneath the rotor surface.

7. Press the rear rotor bearing into the ring until the bearing is 0.031 in. (0.794 mm.) below the surface of the ring. Press the lettered end only of the bearing ensuring that adequate support is given to the ring to prevent distortion.

8. Thoroughly lubricate the bearing with SSG Code 5124 grease, working the grease well into the bearing to ensure adequate lubrication.

9. Fit the carbon ring and a new carbon seal onto the rotor end.

10. Apply a suitable thread locking compound to the socket headed cap screws then secure the rotor ring to the rotor; torque tighten the screws to between 30 lb. in. and 40 lb. in. (0,35 kg.m. and 0,456 kg.m.).

11. Remove the assembly pin from the vanes and start the end cover into position. Move the cover radially until the pivot pin is located in the vane bearings.

12. Fit the end cover retaining screws then progressively torque tighten the screws to between 10 lb. ft. and 16 lb. ft. (1,38 kg.m. and 2,21 kg.m.).

Air injection pump - To fit

Fit the air pump by reversing the procedure given for dismantling noting the following points.

1. The belt tension should be set as described in Chapter L.

2. If the pulley was removed, it should be fitted using the original setscrews as longer screws may foul the pump casing and cause damage.

Air injection equipment - General fitting instructions

The removal and fitting procedure for the remaining air injection equipment is straight-forward provided that the following points are observed.

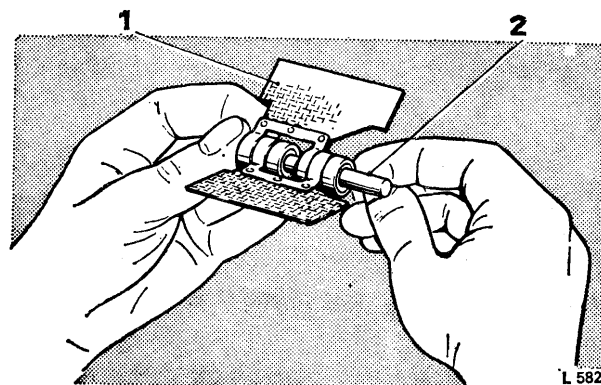


Fig. U9 VANE MOUNTED ON ASSEMBLY PIN

1 Vane

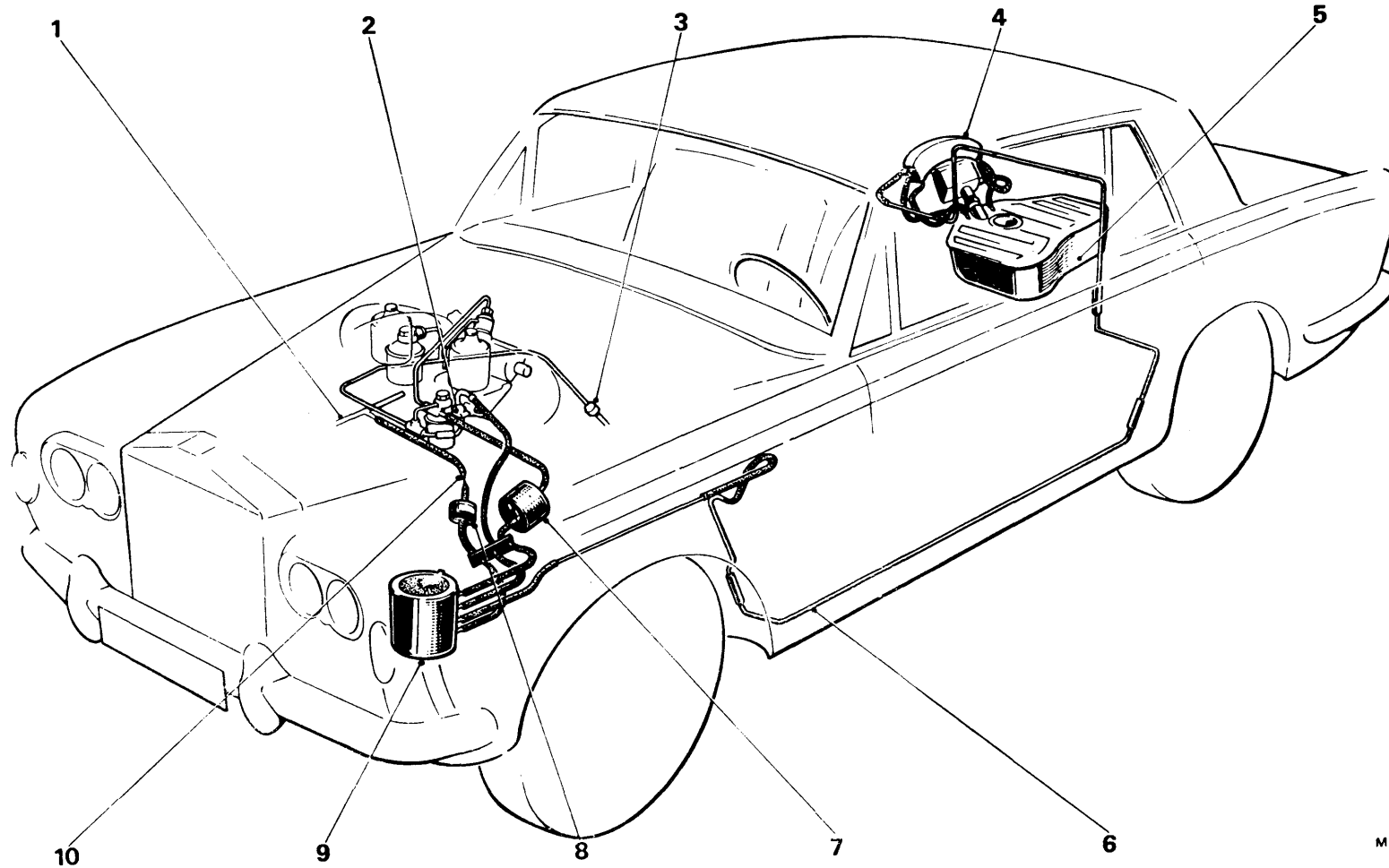
2 Pin

1. Rubber 'O' rings which are removed during dismantling should be discarded and new ones fitted.

2. The special wire hose clips securing the gulp valve and P.C.V. should be discarded once removed and new ones fitted; the tool number of the pliers for fitting these clips is (RH 8090).

3. If any of the valves are found to be damaged or faulty in service they should be renewed.

4. Any rubber hoses which appear to have deteriorated should be renewed.



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Fig. U10 FUEL EVAPORATION EMISSION CONTROL SYSTEM - GENERAL VIEW (Later Cars)

- | | | | |
|---|---|----|-----------------------------------|
| 1 | Gulp valve pipe | 6 | Fuel vapour line |
| 2 | Float chamber vent valve | 7 | Weakener filter |
| 3 | Float chamber drain valve | 8 | Purge line filter |
| 4 | Fuel trap assembly | 9 | Evaporation loss control canister |
| 5 | Fuel tank including vent pipes and expansion tank | 10 | Purge line restrictor |

Section U2

FUEL EVAPORATION EMISSION CONTROL SYSTEM

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In order to comply with regulations governing the emission of fuel vapour in the United States of America and Canada, an efficient Fuel Evaporation Emission Control System has been designed and is fitted to cars from Car Serial Number SRX 9001.

Modifications to the Fuel Evaporation Emission Control System have been incorporated to comply with the regulations governing cars produced after 1971. Therefore, all cars manufactured in 1972 and onwards, are fitted with this later system.

Both systems are described and illustrated in this Chapter.

The Fuel Evaporation Emission Control System eliminates direct venting of the fuel tank and carburettors, thus preventing the release of unburnt hydrocarbons into the atmosphere.

Fuel vapours are collected from the fuel tank and carburettors and stored in an activated charcoal canister. The canister is purged whenever the engine is running and the stored fuel vapours are extracted from the charcoal and burnt in the engine.

A diagrammatic illustration of the system can be seen in Figures U10 and U12.

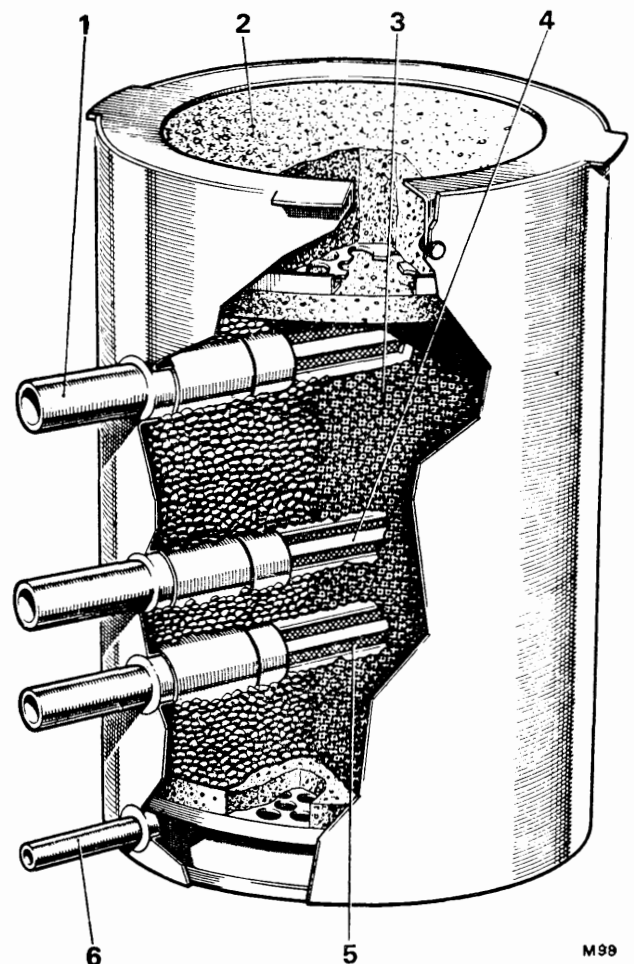
The engine compartment components are clearly shown in Figures U13 and U14 and the fuel tank components in Figure U17.

Fuel evaporation loss control canister

The large centre section of the canister contains the dust free activated carbon and accommodates nylon filter connectors which connect the canister to the various fuel vapour emission sources on the car (i.e. the carburettor weakener unit, float chamber vent and fuel tank vent).

The function of the activated carbon is to absorb and retain fuel vapour from the carburettor float chambers and fuel tank.

At either end of this section of the canister are thin discs of polyurethane filter.



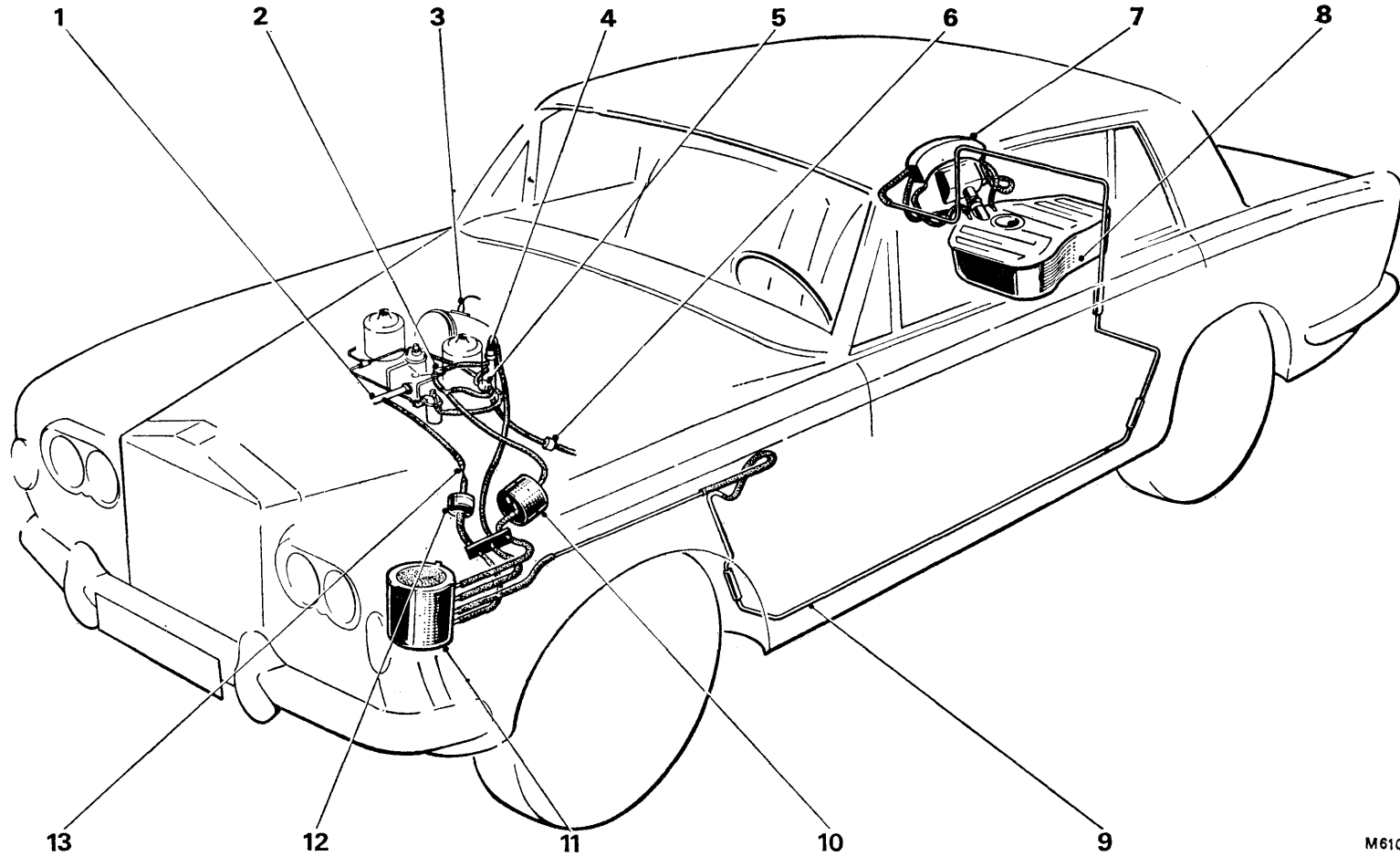
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Fig. U11 FUEL EVAPORATION LOSS CONTROL CANISTER

- 1 Weakener connection
- 2 Polyurethane filter
- 3 Carbon
- 4 Float chamber vent connection
- 5 Fuel tank vent connection
- 6 Purge line connection

(Revised January 1972)

T.S.D. 2476



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Fig. U12 FUEL EVAPORATION EMISSION CONTROL SYSTEM - GENERAL VIEW (Current Cars)

- | | | |
|----------------------------------|---|--------------------------------------|
| 1 Gulp valve pipe | 6 Float chamber drain valve | 10 Weaker filter |
| 2 Weakening device | 7 Fuel trap assembly | 11 Evaporation loss control canister |
| 3 Bi-metal switch | 8 Fuel tank including vent pipes and expansion tank | 12 Purge line filter |
| 4 Float chamber vent valve | 9 Fuel vapour line | 13 Purge line restrictor |
| 5 Weakening device cut-off valve | | |

The lower compartment of the canister is the purge chamber and is connected to the engine induction system via the purge line filter and line restrictor. It is operative whenever the engine is running, and its function is to draw air through the carbon, extracting the fuel vapour for consumption in the engine. The upper section of the canister is open to the atmosphere and houses a polyurethane foam filter to ensure that the air drawn through the carbon is clean.

Polyurethane foam filter element - To renew

It is not necessary to remove the canister from the car in order to extract the polyurethane foam filter element. A detachable cover is situated in the left-hand valance, adjacent to the blower motor resistances (see Fig. U 15).

1. Unscrew the four screws retaining the access cover, lift off the cover and withdraw the filter element from the top of the canister.

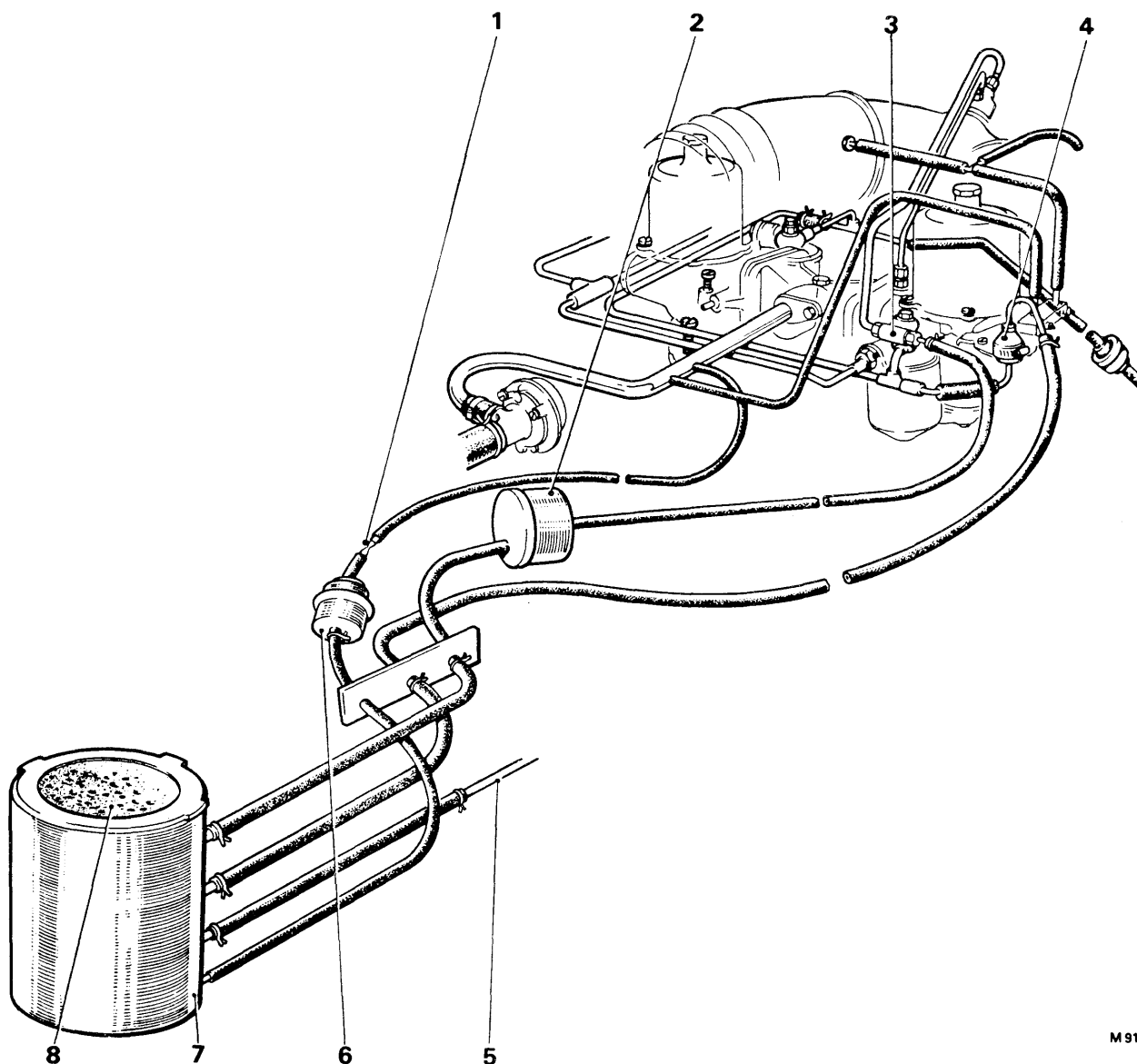


Fig. U13 FUEL EVAPORATION EMISSION CONTROL SYSTEM - ENGINE COMPARTMENT FITTINGS (Later Cars)

- | | | | | | |
|---|-----------------------|---|--------------------------|---|--|
| 1 | Purge line restrictor | 4 | Float chamber vent valve | 7 | Evaporation loss control canister |
| 2 | Weaker filter | 5 | Vent from fuel trap | 8 | Evaporation loss control canister polyurethane foam filter |
| 3 | Weaker unit | 6 | Purge line filter | | |

Chapter U

When fitting a new filter element, ensure that it is correctly positioned inside the retaining rim of the canister. Fit the access cover and tighten the setscrews.

**Fuel evaporation loss control canister
- To remove**

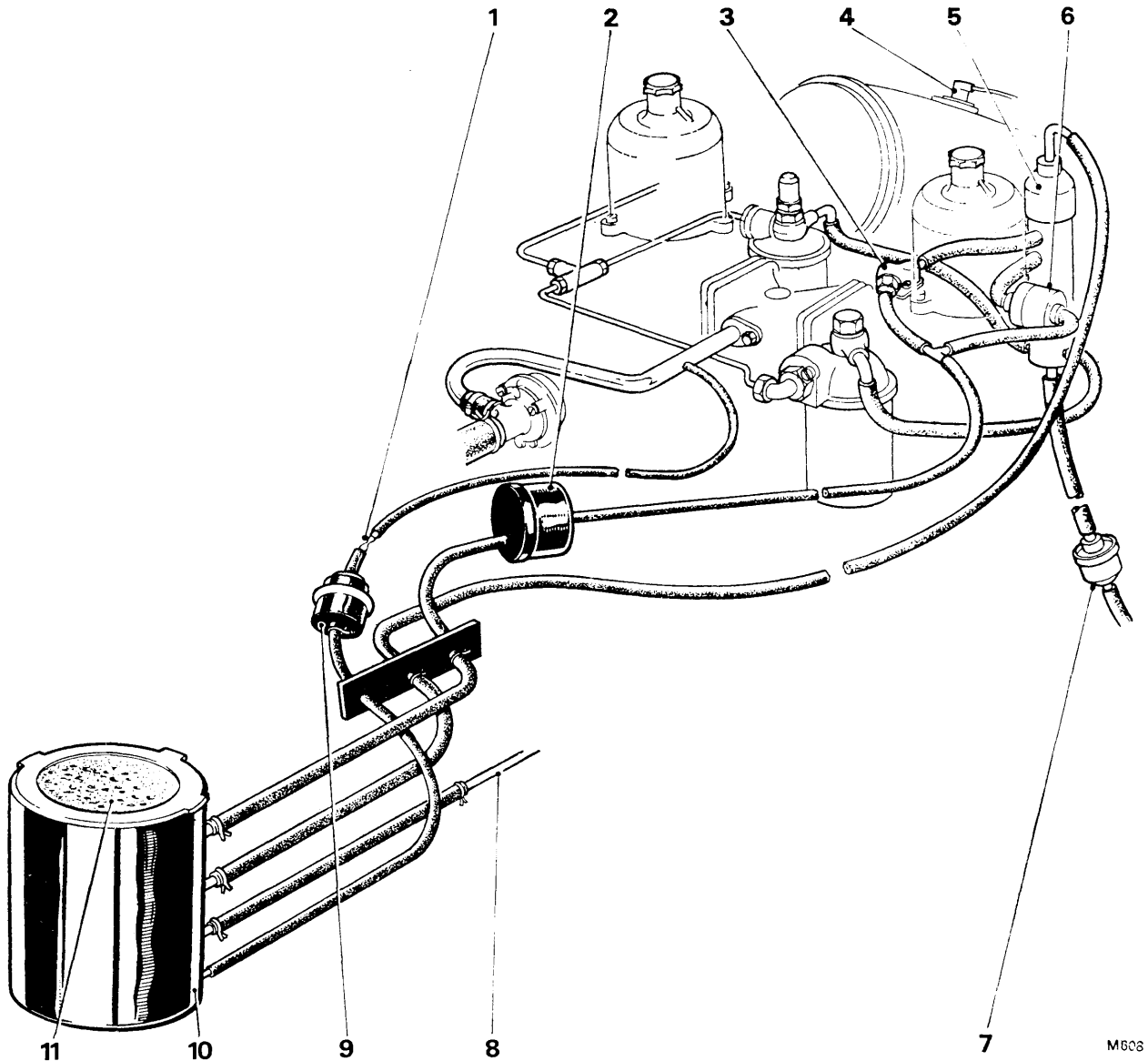
The canister is mounted under the left-hand front wing and is removed as follows.

1. Remove the front left-hand road wheel as described in Chapter R—Wheel—To remove.

Note Left-hand front is determined when viewed from the driver's seat.

2. Position suitable stands under the raised portion of the car as a safety precaution.

3. Remove the front section of the underwing sheet by unscrewing the 7/16 in. A/F nut and bolt, and the 16 small screws situated around the sheet.



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Fig. U14 FUEL EVAPORATION EMISSION CONTROL SYSTEM - ENGINE COMPARTMENT FITTINGS (Current Cars)

- | | | |
|--|-----------------------------|---|
| 1 Purge line restrictor | 6 Weakener cut-off valve | 9 Purge line filter |
| 2 Weakener filter | 7 Float chamber drain valve | 10 Evaporation loss control canister |
| 3 Weakener unit | 8 Vent from fuel trap | 11 Evaporation loss control canister polyurethane foam filter |
| 4 Bi-metal switch | | |
| 5 Fuel receiver and float vent valve chamber | | |

4. The canister will be clearly visible.

5. Using special pliers (RH 8090), remove the steel retaining clips and detach the four rubber hoses connected to the canister.

6. Raise the bonnet.

7. Inside the engine compartment adjacent to the blower motor resistances (see Fig. U15), locate the six 7/16 in. A/F setscrews. Unscrew the lower four setscrews and withdraw the canister from beneath the wing.

Fuel evaporation loss control canister – To fit

Fit the canister by reversing the procedure described for removal, noting the following points.

1. Ensure that the rubber hoses are in a good condition and new hose retaining clips are used.

2. Ensure that the underwing sheet is sealed with Bostik Sealing Compound 771.

Purge line

The purge line consists of a rubber hose, passing from the lowest connection on the canister through the valance junction piece to the gulp air pipe situated between the gulp valve and carburetter 'Tee' piece. Incorporated into this hose is the purge line filter and restrictor.

When the engine is running, air drawn through the canister filter and carbon picks up the stored fuel vapours and passes them via the hose, to the induction manifold. The restrictor in the line controls the flow rate at between 50 cu. ft. per hr. and 70 cu. ft. per hr. to maintain carburetter metering accuracy and the paper element line filter is fitted to prevent blockage of the restrictor.

Purge line filter – To remove

1. Using special pliers (RH 8090) remove the two steel retaining clips (if fitted) situated on either side of the unit.

2. Slacken the 2 B.A. setscrew which secures the nylon retaining clip.

3. Withdraw the component from the clip.

Purge line filter – To fit

Fit the purge line filter by reversing the procedure given for removal noting the following points.

1. Ensure that the rubber hoses are in a good condition and new hose retaining clips are used (if fitted).

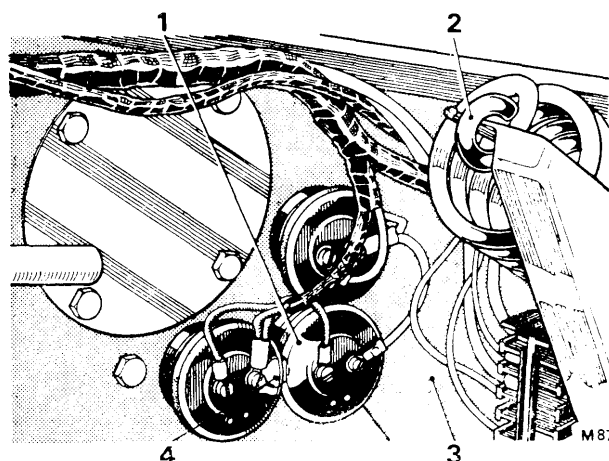


Fig. U15 SETSCREWS SECURING CONTROL CANISTER AND ACCESS COVER

- 1 Blower motor resistances
- 2 Bonnet hinge spring
- 3 Valance
- 4 Securing setscrew (hidden by blower motor resistances)

Purge line restrictor – To remove

1. Hold the restrictor firmly and slide the rubber hosing from both ends.

Purge line restrictor – To fit

Fit the restrictor by reversing the procedure given for removal, noting the following point.

1. Ensure that the purge line restrictor is fitted into the line correctly. This can be determined by comparing the diameters of the restrictor ends with those of the rubber hoses.

Weakener line

The weakener line connects the weakener unit with the evaporation loss control canister (see Figs. U13 and U14). With the engine running under light throttle opening a depression is created in this line, so allowing air to pass from the canister to the weakener unit.

A filter incorporated in the line prevents blockage of the weakener unit.

During 'hot soak' conditions fuel vapour can pass along this pipe from the float chamber to be stored in the carbon filled canister.

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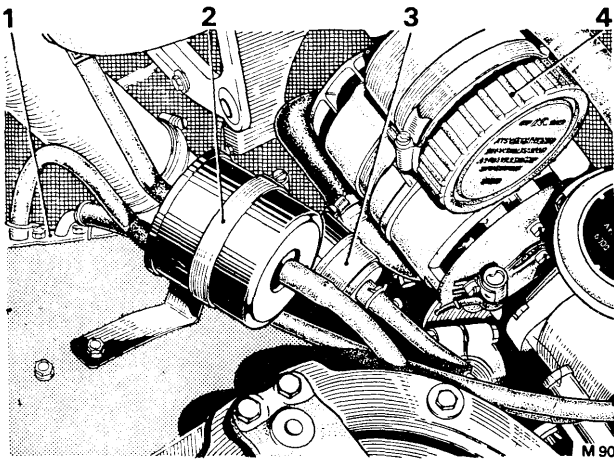


Fig. U16 POSITION OF MIXTURE WEAKENING DEVICE FILTER AND PURGE LINE FILTER (Later and Current Cars)

- 1 Connections through valve to the fuel evaporation loss control canister
- 2 Fuel mixture weakening device filter
- 3 Purge line filter
- 4 Air injection system intake filter

Weakener filter – To remove

1. Remove the steel clips (if fitted) from the inlet and outlet hoses using special pliers (RH 8090).
2. Slacken the worm drive clip which retains the weakener filter to the bracket.
3. Withdraw the filter.

Weakener filter – To fit

Fit the weakener filter by reversing the procedure given for its removal noting the following points.

1. Ensure that the rubber hoses are in good condition.
2. If clips have been fitted previously, ensure that new clips are fitted.
3. Ensure that the inlet pipe for the unit which is off-set from the centre is facing the front of the car and is in its lowest position (see Figs. U13 and U14).

Float chamber vent line

The carburettor float chambers are vented to the evaporation loss control canister through the float chamber vent line (see Figs. U13 and U14). Incorporated in the line is a non-return valve which maintains a depression in the float chamber during light throttle operation.

The vent valve cannot be serviced and if its operation is suspect a new vent valve should be fitted.

Float chamber vent valve – To remove

On later cars, see page U1—Introduction.

1. Remove the rubber hose from both the inlet and outlet connections.
2. Slacken the worm drive clip which secures the vent valve to its mounting bracket.
3. Remove the vent valve.

Float chamber vent valve – To fit

Fit the vent valve by reversing the procedure given for its removal noting the following point.

1. Ensure that the inlet and outlet connections of the vent valve are positioned so that the rubber hoses can be connected.

Float chamber vent valve – To remove

On current cars, see page U1—Introduction.

1. Remove the rubber hose connection.
2. Withdraw and discard the retaining split pin.
3. Withdraw the vent valve from the top of the fuel receiver.

Float chamber vent valve – To fit

Fit the vent valve by reversing the procedure given for its removal noting the following points.

1. Ensure that the rubber 'O' ring at the top of the fuel receiver is in good condition, renew if the slightest doubt exists.
2. Use a new split pin to retain the vent valve in position.

Fuel receiver

On Current cars, see page U1—Introduction.

The fuel receiver is situated adjacent to the ignition distributor and coil (see Fig. U30).

The unit should not require removal under normal circumstances. However, should the need arise the ignition distributor, coil and weakener cut-off solenoid valve should all be removed before unscrewing the two $\frac{1}{2}$ in. A/F setscrews which secure the fuel receiver bracket in position.

Fuel tank assembly

The fuel tank assembly consists of the fuel tank, expansion tank and fuel trap assembly (see Fig. U17).

The fuel tank is vented from three positions to a fuel trap assembly which is mounted above the fuel

filler. One vent is from the fuel filler neck and the other two vents from the fuel tank.

From the fuel trap, a vent line passes under the floor of the car to the evaporation loss control canister.

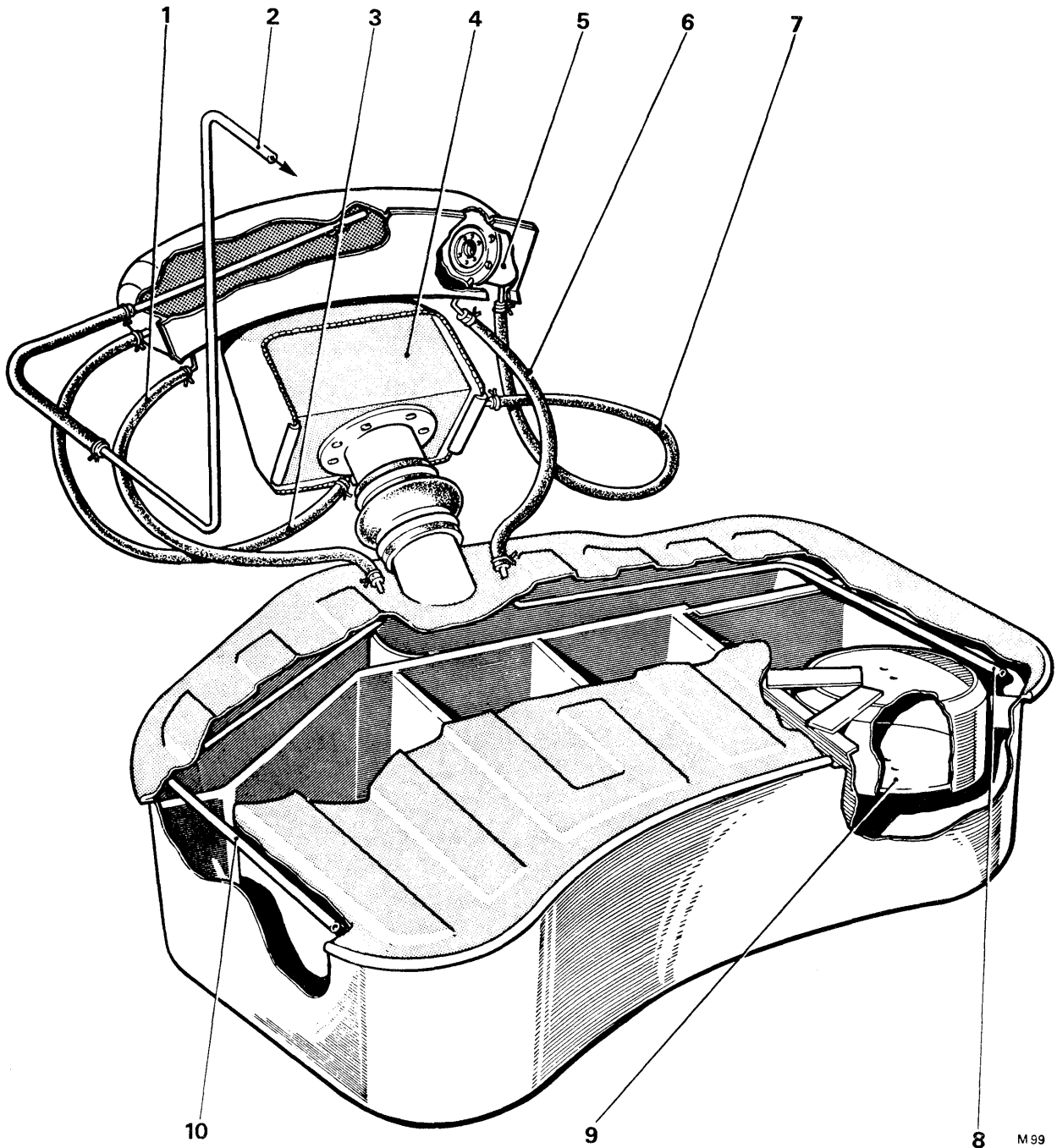


Fig. U17 FUEL EVAPORATION EMISSION CONTROL SYSTEM - FUEL TANK

- | | | | | | |
|---|---|---|----------------------------------|----|----------------|
| 1 | Fuel trap drain | 4 | Fuel filler box | 7 | Valve vent |
| 2 | Connection to evaporation loss control canister | 5 | Combined relief and vacuum valve | 8 | Vent pipe |
| 3 | Filler neck vent | 6 | Fuel trap drain | 9 | Expansion tank |
| | | | | 10 | Vent pipe |

Chapter U

Fuel tank

The fuel tank (*see Fig. U17*) is similar to that fitted to standard cars, except that two vent pipes, 0.375 in. (9,525 mm.) diameter, are rigidly attached to the underside of the fuel tank top plate. The open ends of the vents terminate inside the tank at the front and rear. The outer ends of the two vent pipes terminate adjacent to the fuel filler neck.

A 5.5 Imp. pts. (3,125 litres, 6.7 U.S. pts.) capacity expansion tank situated within the main fuel tank inhibits complete filling and provides additional fuel expansion volume to contend with extreme temperature conditions.

When a vehicle is being filled with fuel, automatic cut-off could completely fill the tank leaving only the filler neck, vent connector pipes and fuel trap to accommodate the expansion of the fuel. The expansion tank is situated in the upper part of the fuel tank and as the fuel level rises above the lower part of the expansion tank it flows inside through the two small holes in the base. Two additional holes in the top of the expansion tank allow air to escape.

At normal rates of filling it takes approximately 3 minutes to fill an empty tank whereas it takes approximately 9 minutes for the levels in both the main and expansion tanks to stabilise. After this time the main tank will have transferred 5.5 Imp. pts. (3,125 litres, 6.7 U.S. pts.) to the expansion tank leaving the equivalent air space in the main tank for expansion.

Fuel tank – To remove

To remove the fuel tank proceed as described in Section K1—Fuel System (Early cars) noting that Operation 6 should be omitted and Operation 6 as follows should be carried out.

6. Using a pair of special pliers (RH 8090), remove the steel clips from the two rubber hoses situated one on either side of the fuel filler neck.

Withdraw the rubber hoses from the pipes.

Fuel tank – To fit

Fit the fuel tank by reversing the procedure given for its removal noting the following points.

1. Ensure that the two rubber vent hoses are in good condition.

2. New steel clips should be used to secure the rubber vent hoses to the metal pipes on either side of the filler neck base.

Fuel trap assembly

The fuel trap (*see Fig. U17*) has a capacity of 3.25 Imp. pts. (1,87 litres, 4.00 U.S. pts.).

The fuel trap acts as a liquid separator and prevents liquid fuel from being transferred to the control canister under severe driving manoeuvres when the fuel tank is full or during expansion of the fuel at high ambient temperatures.

The tank vent pipes are fed to the lower ends of the banana-shaped fuel trap. These pipes also serve as drain pipes for any fuel in the trap.

The filler tube is vented into the forward end of the fuel trap.

An outlet pipe is attached to the interior of the fuel trap and the other end is connected via metal and rubber pipes to the evaporation loss control canister.

A combined relief and vacuum valve in the fuel trap prevents any excessive pressure build-up due to vaporisation, or depression as the fuel is consumed, should the vent line to the evaporation loss control canister become blocked.

Fuel trap assembly – To remove

1. Disconnect the battery.
2. Remove the carpet and underlay in the luggage compartment.
3. Remove the tool kit (*see Chapter R—Wheels and Tyres, Fig. R10*).
4. Remove the fuel filler door release ring.
5. Unscrew the five 'Phillips' headed screws from the side carpet; four secure the brackets retaining the tool kit and the fifth is positioned at the front of the side carpet.
6. Release the 'Tenax' clip situated adjacent to the rear lamps access point.
7. Remove the side carpet and the carpet covering the fuel filler neck.
8. Using special pliers (RH 8090) remove the steel clips from the rubber hoses. Withdraw the hoses from their respective pipes.
9. Unscrew and remove the three 2 B.A. setscrews securing the fuel trap assembly.
10. Slowly move the fuel trap rearward and downward until the lower end can be turned into the luggage compartment and the assembly withdrawn from the car.

Fuel trap assembly – To fit

Fit the fuel trap assembly by reversing the procedure given for its removal noting the following points.

1. Ensure that the rubber hose connections are in good condition.
2. Ensure that new steel retaining clips are used.

**Fuel trap relief and vacuum valve
- To remove**

1. Remove the fuel trap assembly as described in Fuel trap assembly—To remove.
2. Unscrew the retaining setscrews, taking care not to lose the washers.
3. Withdraw the relief and vacuum valve.

Fuel trap relief and vacuum valve - To fit

Fit the relief and vacuum valve by reversing the procedure given for its removal, noting the following points.

1. Ensure that the joint faces of the relief and vacuum valve and fuel trap assembly are clean and in good condition.
2. Fit a new gasket.

Section U3

THE CARBURETTORS AND AUTOMATIC CHOKE SYSTEM

CARBURETTORS

Data

Carburettors	Two S.U. HD8 diaphragm type
Choke size	2.00 in. (5,08 cm.)
Jet size— fixed needle type	0.125 in. (3,175 mm.)
Jet size— spring loaded needle type	0.100 in. (2,44 mm.)
Jet needle— fixed type	UVU
Jet needle— spring loaded type ..	BAE
Carburettor— air valve piston spring	Red/Blue

Description

Two S.U. HD8 diaphragm carburettors with 2.00 in. (5,08 cm.) choke bores are fitted to the engine on a central 'Tee' piece which is mounted over an eight branch induction manifold (see Figs. U18, U19 and U20).

This type of carburettor automatically adjusts both its choke and jet area to meet the demand of the engine which is dependent on engine speed and loading. As air is drawn through the carburettor, the piston acting as an obstruction will cause a depression to be formed in the area between the throttle and the piston. This depression is communicated by means of transfer holes in the base of the piston to the area above the piston, causing an upward force to be imposed on the piston. The piston will rise in response to this force relieving the depression in the area between the piston

and the throttle as it does so until a point is reached where the force acting on the piston is balanced by the weight of the piston and the load exerted by the piston spring.

Early carburettors are fitted with a fixed main jet needle and the jet is biased in relation to the needle. On later carburettors, a spring-loaded jet needle is fitted which is biased down stream and operates in a reduced diameter main jet; this jet does not require centralising.

The carburettor is fitted with a synthetic rubber diaphragm which is clamped in position by the jet and jet return spring cup. The diaphragm is in turn secured at its outer edge between the diaphragm housing and the main jet well. The carburettor is fitted with a nylon block in the jet well and a nylon feed tube from the float chamber to prevent vaporisation of the fuel. This assembly is known as the anti-boiling device.

The jet is fed through its lower end from the main jet well, its movement being controlled by the jet return spring and the jet adjusting screw which actuates a rocking lever. This lever raises or lowers the jet as required and so controls the mixture. Turning the adjusting screw clockwise (inwards) lowers the jet and enrichens the mixture; turning the screw anti-clockwise (outwards) weakens the mixture.

The carburettors are balanced by adjustable volume screws which control the mixture output of the carburettors relative to each other under idling conditions.

Slow running speed is adjusted by means of the throttle stop screw, and is finally carried out after the carburettors have been tuned. The throttle stop screw is locked into position by a lock-nut.

Chapter U

CARBURETTOR MIXTURE WEAKENING DEVICE

Introduction

An engine normally requires a richer mixture when running at full load than it does under cruising

conditions. Normally the S.U. carburettors achieve this automatically due to the pulsating nature of the air flow at full load as compared with the steady flow when cruising with the throttles partly shut. This effect, known as mixture ratio spread, is also contrived by the design of the air intake and induction passages.

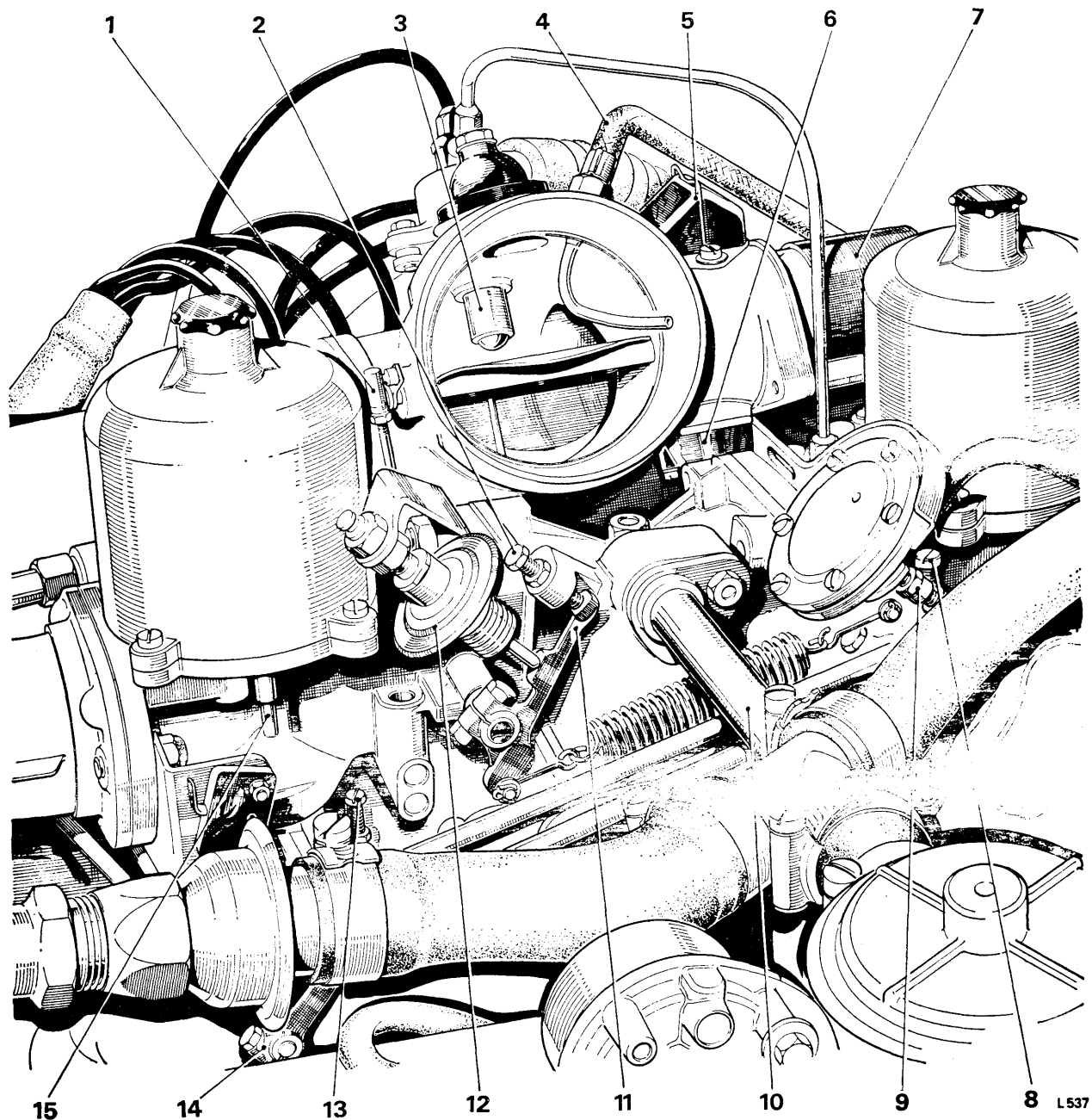


Fig. U18 VIEW OF CARBURETTORS (Early Cars)

- | | |
|---|---|
| 1 'Fast-idle' linkage | 9 Refrigeration fast-idle adjusting screw |
| 2 Fixed throttle stop screw | 10 Air injection pipe |
| 3 Thermostat-weakening device cut-off valve | 11 'A' bank butterfly lever |
| 4 Choke stove pipe | 12 Throttle damper |
| 5 Choke solenoid | 13 Jet adjusting screw |
| 6 Kick-diaphragm housing | 14 Carburettor control linkage |
| 7 Bi-metal coil housing | 15 Piston lift pin |
| 8 Carburettor volume screw | |

However, for optimum exhaust emission control a greater mixture ratio spread than can be met by the above factors is required. Therefore a weakening device is fitted.

Description

The rate of fuel discharge from the main jet is governed by the difference in air pressure between that existing over the fuel in the float chamber and that over the main jet.

The weakening device is fitted to the system in the following positions.

Prior to Car Serial Number SRX 9001. Attached to the 'A' bank float chamber lid (see Fig. U21).

On later cars, see page U1—Introduction. Attached to the 'B' bank float chamber lid.

On Current cars, see page U1—Introduction. Attached directly to the 'B' bank carburetter (see Fig. U23).

The weakening device is designed to reduce the air pressure (i.e. to create a depression) in the float chamber when the throttle is partly closed, thereby reducing the rate of fuel discharge from the jet. The lid is otherwise sealed by a gasket between the lid and the bowl.

On cars prior to Car Serial Number SRX 9001 and later cars, see page U1—Introduction. The weakening device consists of a venturi and a calibrated air bleed. The end containing the venturi is connected by pipes via the weakening device cut-off valve to a drilling in the 'B' bank carburetter body close to the edge of the throttle butterfly valve. The end containing the air bleed is connected to an air intake filter by a flexible rubber tube. A central drilling in the weakening device communicates with the float chamber. The depression existing in one float chamber is communicated to the other by means of a pressure balance pipe.

On current cars, see page U1—Introduction. The weakening device consists of a housing containing a venturi at one end which is pressed into a drilling in the carburetter body close to the edge of the throttle butterfly. The other end contains a pre-set air bleed and is connected to the weakener filter by means of a flexible hose. The central passage communicates via pipes with the float chambers.

On cars from Car Serial Number SRX 9001 and onwards to obtain adequate float chamber venting to cope with hot soak conditions there is an additional vent from the float chambers. This vent incorporates a low pressure non-return valve to maintain a float chamber depression under normal operation conditions.

On all cars, a petrol spill pipe incorporating a relief valve is fitted to the pressure balance pipe to provide an outlet for excess petrol in the unlikely event of a float chamber needle sticking.

Operation Idling

With the throttle in the normal idling position, the drilling in the carburetter body emerges upstream of the throttle butterfly and is only subjected to the slight depression exerted in that condition. This produces a small flow of air through the venturi but the effect on float chamber air pressure is small.

Full throttle

As with the idling position, the depression produced is slight and will have a negligible effect on air pressure in the float chamber. This small difference is compensated for in the design of the jet needle.

Cruising

With the throttle partly open, the weakener drilling is on the engine side of the throttle butterfly and the high manifold depression causes air to be drawn through the venturi. The size of the venturi is chosen so that the velocity will reach a maximum value which remains substantially constant once a pre-determined manifold depression figure has been reached.

The air bleed orifice controls the flow of air into the weakener and therefore the float chamber depression. The actual value of the float chamber depression reaches a maximum at the same time as the air velocity attains its maximum value.

Low temperatures

To improve engine starting when the engine temperature is below 16°C. (60°F.), a cut-off valve is incorporated in the weakening device suction line.

On cars prior to Car Serial Number SRX 9001 and later cars, see page U1—Introduction, the cut-off valve is closed at temperatures below 18°C. (64°F.) thus preventing any signal passing between the weakening device and 'B' bank carburetter.

On current cars, see page U1—Introduction, the cut-off valve switch opens the cut-off valve at temperatures below 16°C. (60°F.).

On all cars the action of the cut-off valve at the temperature quoted ensures that no depression occurs in the float chambers to weaken the mixture whilst the engine is warming up.

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On cars prior to Car Serial Number SRX 9001 and later cars, see page U1—Introduction, a wax element thermostat responding to air temperature in the choke butterfly housing operates a cut-off valve in the weaker vacuum line.

On current cars, see page U1—Introduction, a bi-metal switch activates a solenoid valve which vents the float chamber to atmosphere via the evaporation loss control canister and renders the weakener inoperative.

**Hot idle mixture compensator valve
(if fitted)**

At high ambient temperatures the idle quality deteriorates after prolonged periods of idling unless a mixture compensator valve is fitted. The compensator assembly incorporates two bi-metallic valves which meter a small quantity of air, controlled by the inlet air temperature, to a point in the induction system down stream of the carburetter throttle valves. This has the

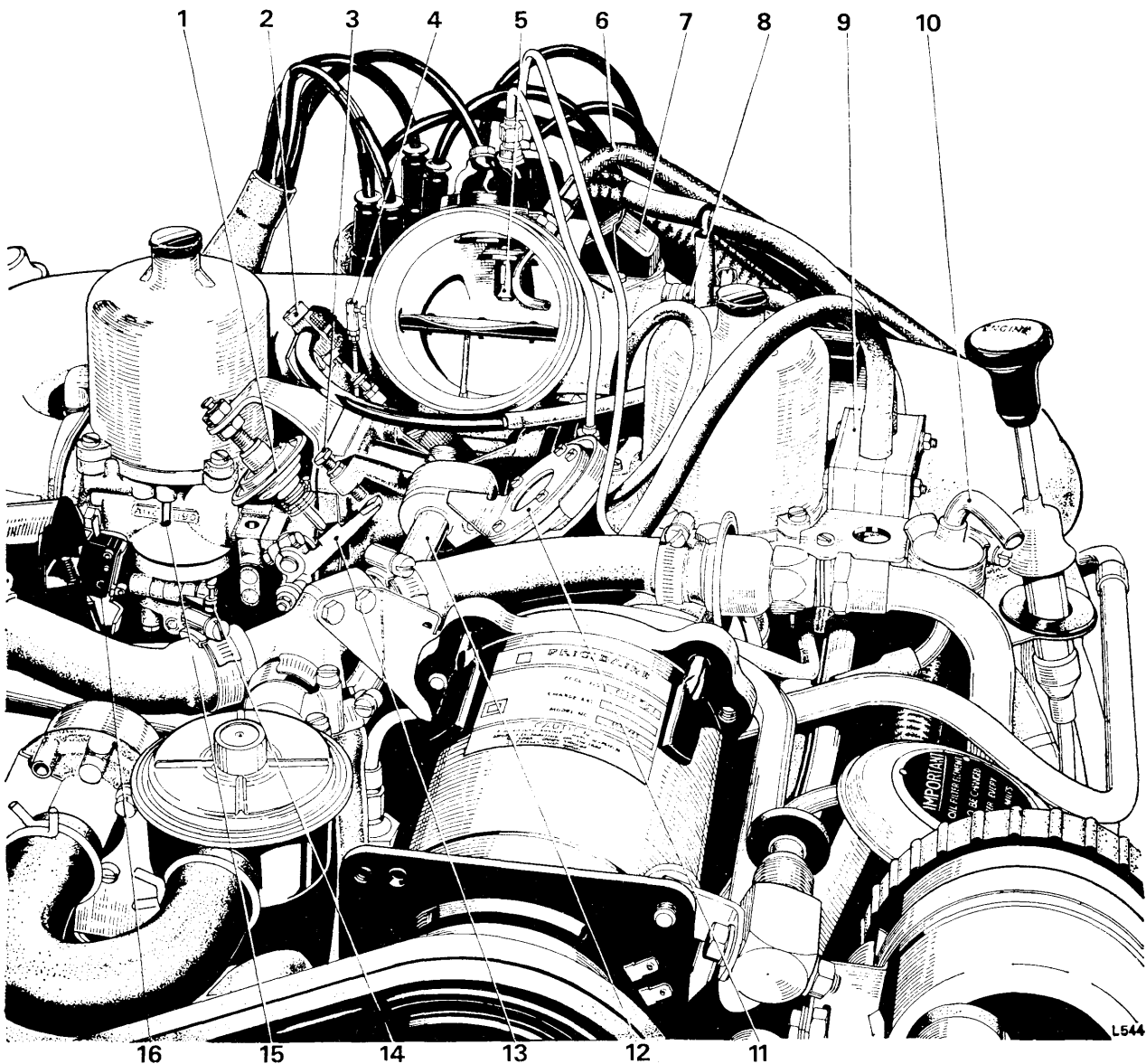


Fig. U19 VIEW OF CARBURETTERS (Later Cars)

- | | |
|---|----------------------------------|
| 1 Throttle damper | 9 Hot idle compensator valve |
| 2 Vacuum retard tap | 10 Float chamber vent valve |
| 3 Fixed throttle stop screw | 11 Throttle stop vacuum actuator |
| 4 'Fast-idle' linkage | 12 Air injection pipe |
| 5 Thermostat-weakening device cut-off valve | 13 'A' bank butterfly lever |
| 6 Choke stove pipe | 14 Jet adjusting screw |
| 7 Choke solenoid | 15 Piston lift pin |
| 8 Bi-metal coil housing | 16 Kick-down micro-switch |

dual effect of weakening the mixture and increasing the mass flow, thereby raising the idle speed slightly, and restoring normal idle speed.

On cars prior to Car Serial Number SRX 9001 and later cars, see page U1—Introduction, a separate unit is mounted on 'B' bank carburetter.

On current cars, see page U1—Introduction, the unit is integral with the choke housing.

Hot air intake

Air is drawn into the hot air intake from over the exhaust manifold and is then passed through the air silencer/filter. This permits the use of leaner mixtures under normal operating conditions together with a quickly opening automatic choke. The hose which connects the intake to air filter/silencer is shown in Figures U2 and U3.

Float chamber pressure tapping

On cars prior to Car Serial Number SRX 9001 a pressure tapping fitted to the 'B' bank float chamber lid enables the depression in the float chambers to be checked.

From car Serial Number SRX 9001 and onwards the pressure tapping is fitted to the 'A' bank float chamber lid.

OVERHAUL

Carburetters – To remove (see Figs. U2 and U18)

The following procedure applies to cars prior to Car Serial Number SRX 9001.

1. Disconnect the battery.
2. If a hot idle compensator valve is fitted remove the rubber pipe connected to the air intake rubber elbow, also the rubber pipe connected to the gulp valve to 'Tee' piece pipe.
3. Disconnect the hose from the air silencer and butterfly housing; remove the hose together with the bonding cable earth strip.
4. Move the spring clip away from the choke solenoid cover then disconnect the wires noting which terminal each wire was removed from to ensure correct assembly.
5. Disconnect the two rubber tubes which are connected to the refrigeration solenoid noting their respective connection for correct assembly.

6. Disconnect the wiring to the refrigeration solenoid noting the colour of wiring to ensure correct assembly.

7. Remove the engine oil dipstick.

8. Remove the split pin, washers and swivel pin, securing the throttle linkage to the fore and aft manifold shaft lever; this connection is adjacent to the 'A' bank carburetter.

9. Disconnect the petrol spill pipe at the union adjacent to the distributor.

10. Disconnect the main fuel feed pipe.

11. Disconnect the choke stove inlet pipe from the choke housing.

12. Remove the three small screws securing the small end cover to the bi-metal coil cover then withdraw the cover along the choke stove pipe to reveal the pipe connection. Disconnect the choke stove suction pipe.

13. Remove the crankcase breather pipe from the choke butterfly housing; withdraw the housing from the end of the pipe.

14. Disconnect the hose from the carburetter weakening device and discard the retaining clip.

15. Remove the pipe fitted between the gulp valve and the carburetter 'Tee' piece.

16. Remove the two wires connected to the kick-down micro-switch noting their respective position to ensure that they are connected correctly on assembly.

17. Remove the air horns, the choke butterfly housing, the carburetters and the 'Tee' piece as a complete assembly. This assembly is secured to the induction manifold by a setscrew, location being provided by two dowel pins.

18. Slacken the pinch bolt and remove the 'fast-idle' lever from the 'A' bank carburetter butterfly spindle (see Chapter K).

19. Remove the three setscrews and bolt securing the air horns to the carburetters; remove the kick-down switch, refrigeration 'fast-idle' solenoid and the hot idle compensator valve (if fitted) together with their brackets.

20. Remove the air horns.

21. Remove the petrol feed pipes from the float chambers.

22. Remove the weakening device pipes.

23. Disconnect the carburetter spill pipe from the two float chambers.

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24. Remove the float chamber lids and floats keeping them with their respective banks.

25. Remove the nut securing the throttle damper to its bracket; remove the damper.

26. Remove the throttle spring.

27. Completely remove the two pinch bolts securing the levers to the 'A' and 'B' bank carburetter butterfly valve spindles; remove the levers.

28. Remove the nuts securing both carburetters to the 'Tee' piece; remove the carburetters.

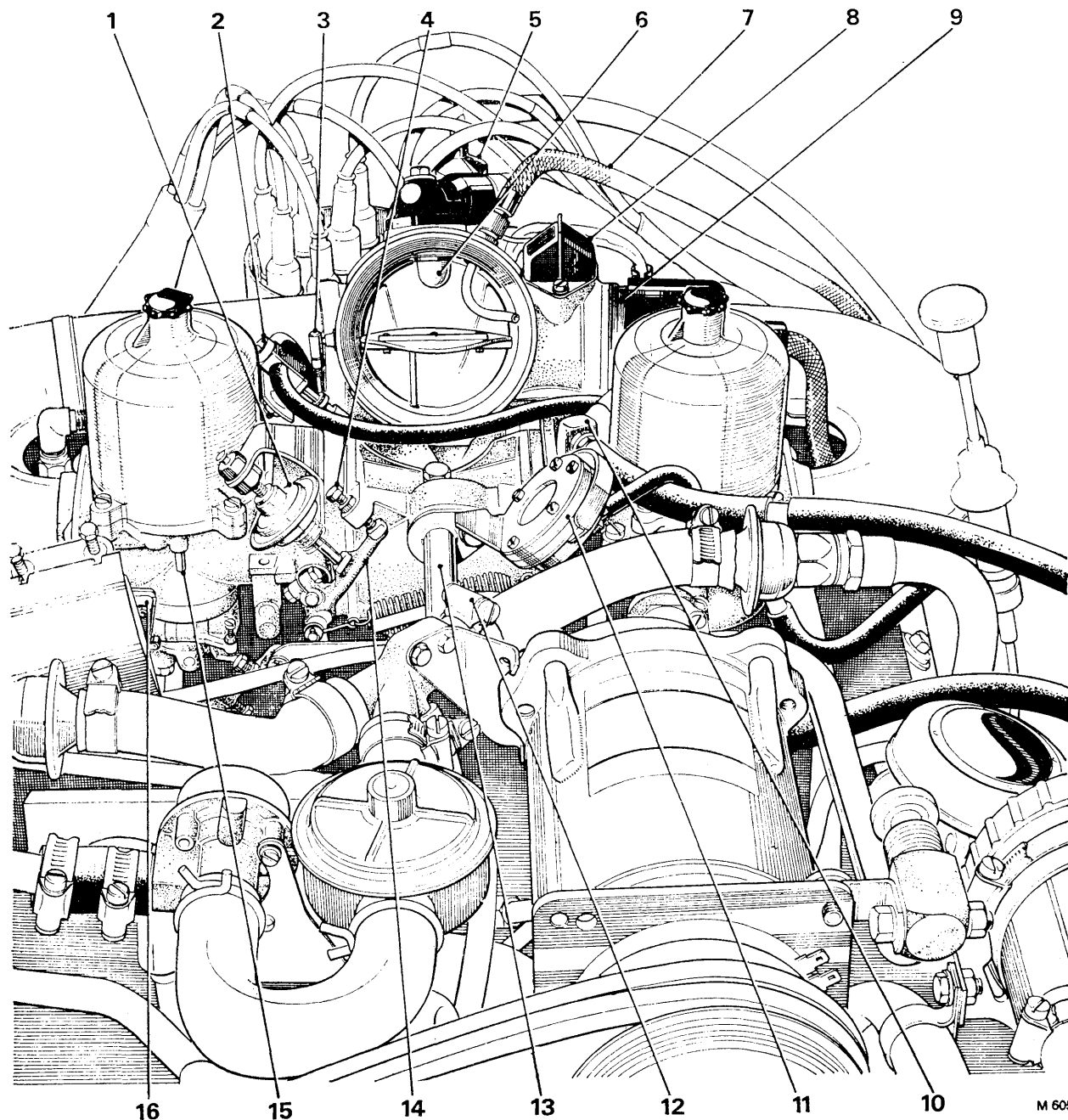


Fig. U20 VIEW OF CARBURETTERS (Current Cars)

- | | | | |
|---|--|----|---|
| 1 | Throttle damper | 10 | Weakening device |
| 2 | Vacuum retard tap | 11 | Throttle stop vacuum actuator |
| 3 | 'Fast-idle' linkage | 12 | Worm Drive clip—correctly positioned to avoid possible foul with air hose |
| 4 | Fixed throttle stop screw | 13 | Air injection pipe |
| 5 | Fuel receiver and float chamber vent valve | 14 | 'A' bank butterfly lever |
| 6 | Bi-metal switch | 15 | Piston lift pin |
| 7 | Choke stove pipe | 16 | Kick-down micro-switch |
| 8 | Choke solenoid | | |
| 9 | Bi-metal coil housing | | |

Carburetters – To remove (see Figs. U3 and U19)

The following procedure applies to all cars from Car Serial Number SRX 9001 and onwards.

To avoid confusion on assembly, it is recommended that when the various rubber pipes and hoses are removed they are labelled.

1. Disconnect the battery.
 2. Disconnect the rubber pipe connected to the choke butterfly housing rubber elbow.
 3. Separate the thermal vacuum switch rubber pipe at the 'Tee' piece.
 4. Remove the crankcase breather pipe from the choke butterfly housing; withdraw the housing from the end of the pipe.
 5. Remove the air hose steady bracket noting that the small bracket retaining the kick-down micro-switch wire is retained by one screw.
 6. Disconnect the hose from the air silencer and butterfly housing; remove the hose together with the bonding cable earth strip.
 7. Move the spring clip from the choke solenoid cover, then disconnect the wires noting the terminal from which each wire was removed to avoid incorrect assembly.
 8. Remove the engine oil dipstick.
 9. Remove the split pin, washers and swivel pin securing the throttle linkage to the fore and aft manifold shaft lever; this connection is adjacent to the 'A' bank carburetter.
 10. Unscrew the worm drive clip from the hose adjacent to the distributor; remove the hose.
 11. Disconnect the main fuel feed pipe.
 12. Disconnect the choke stove pipe from the choke butterfly housing.
 13. Remove the three screws securing the small end cover to the bi-metal coil cover then withdraw the cover along the choke stove pipe to reveal the pipe connection. Disconnect the choke stove pipe.
 14. Disconnect the hose(s) from the carburetter weakening device and discard the retaining clip (if fitted).
- On current cars**, see page U1—Introduction, also disconnect the hoses from the float chamber vents, remove the weakener to vent canister pipe, thermal vacuum switch pipe and the weakener to filter pipe.
15. Disconnect the two rubber pipes connected to the gulp valve to carburetter 'Tee' piece pipe.

16. Remove the pipe connected to the throttle stop vacuum actuator.

17. Remove the setscrew securing the throttle stop vacuum actuator bracket and the gulp valve to carburetter 'Tee' piece pipe. Also remove the top two nuts securing the 'B' bank carburetter and the throttle stop vacuum actuator bracket. Remove the throttle stop vacuum actuator together with its bracket.

18. Remove the pipe fitted between the gulp valve and the carburetter 'Tee' piece.

19. Remove the two wires connected to the kick-down micro-switch noting their respective position to avoid incorrect assembly.

On current cars, see page U1—Introduction, also remove the electrical connection of the weakener cut-off bi-metal switch thermostat unit.

20. **On later cars**, see page U1—Introduction. Disconnect the hose connected to the float chamber vent valve. Discard the clip.

21. Disconnect the vacuum retard rubber pipe connected to the distributor.

22. Separate the rubber pipes from either side of the vacuum retard tap.

23. Remove the air horns, choke butterfly housing, carburetters and 'Tee' piece as a complete assembly. This assembly is secured to the induction manifold by a setscrew and located by two dowel pins.

24. Slacken the pinch bolt and remove the 'fast-idle' lever from the 'A' bank carburetter butterfly spindle (see Chapter K).

25. **On later cars**, see page U1—Introduction. Disconnect the rubber hose situated between the petrol spill pipe and the float chamber vent valve. Remove the vent valve.

26. Remove the three setscrews, and the nut and bolt securing the air horns to the carburetters; remove the hot idle compensator valve, kick-down micro-switch and the retard tap together with their brackets.

27. Remove the air horns.

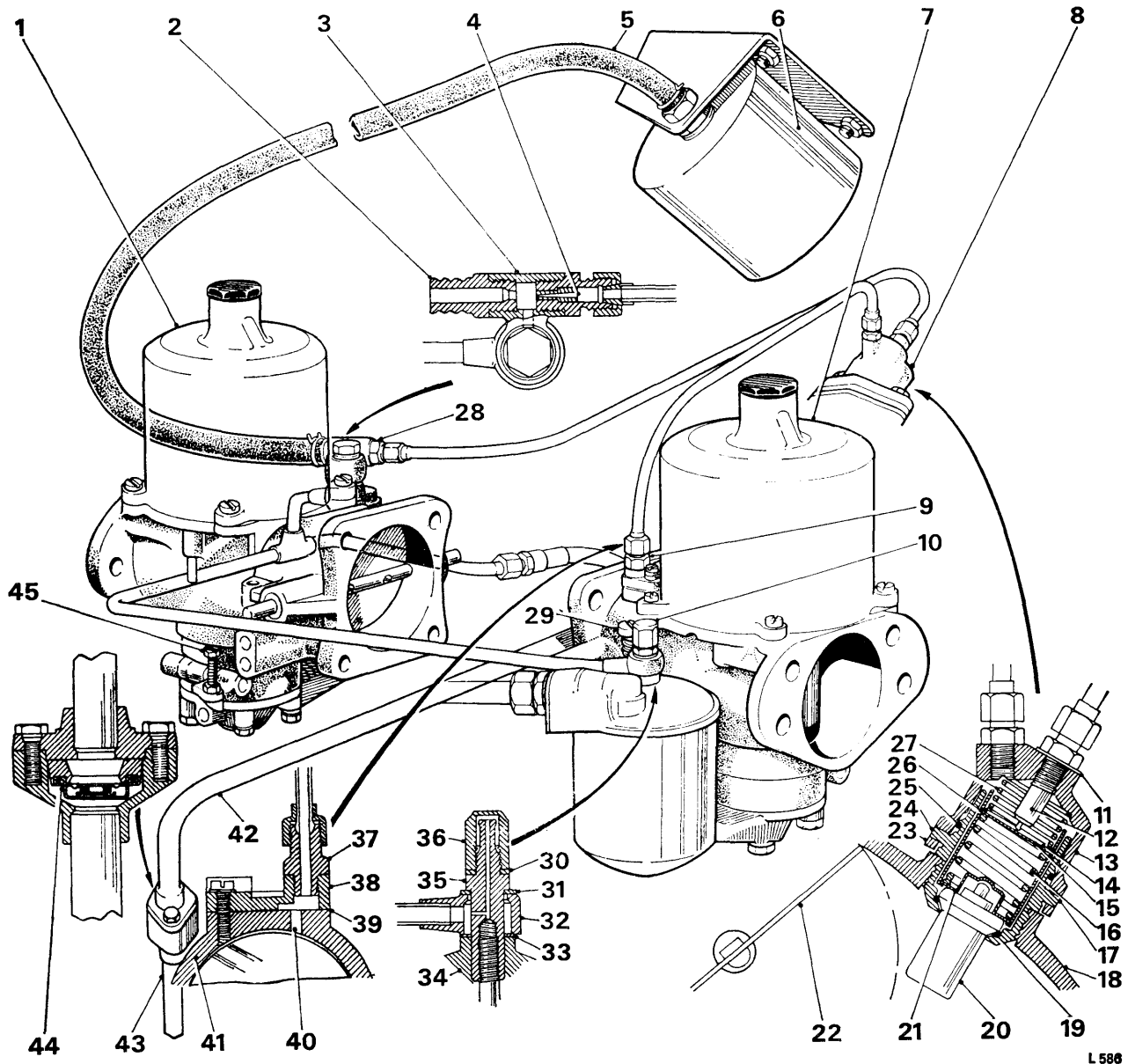
28. Disconnect the petrol feed pipe from the float chambers.

29. **On later cars**, see page U1—Introduction. Remove the weakening device pipes.

30. Disconnect the carburetter spill pipe from the two float chambers.

31. Remove the float chamber lids and floats keeping them in their respective banks.

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Fig. U21 CARBURETTER WEAKENING DEVICE (Early Cars)

- | | | |
|-------------------------------------|-------------------------|-----------------------------------|
| 1 'A' bank carburetter | 16 Spring | 31 Fibre washer |
| 2 Air bleed | 17 Joint | 32 Banjo connection |
| 3 Body | 18 Choke housing | 33 Fibre washer |
| 4 Venturi | 19 Rubber 'O' ring | 34 Float chamber lid |
| 5 Hose | 20 Thermostat element | 35 Pressure tapping body |
| 6 Filter | 21 Load transfer washer | 36 Cap |
| 7 'B' bank carburetter | 22 Choke butterfly | 37 Union |
| 8 Weakening device cut-off valve | 23 Locking plate | 38 Plate |
| 9 Pressure sensing fitting | 24 Valve body | 39 Joint |
| 10 Float chamber depression tapping | 25 Rubber 'O' ring | 40 Pressure sensing drilling |
| 11 Adjusting washer | 26 Piston | 41 Carburetter body |
| 12 Valve | 27 Spring | 42 Petrol spill pipe (upper part) |
| 13 Valve cap | 28 Weakening device | 43 Petrol spill pipe (lower part) |
| 14 Circlip | 29 Volume screw | 44 One way valve |
| 15 Disc | 30 Washer | 45 Jet adjusting screw |

32. Remove the nut securing the throttle damper to its bracket; remove the damper.

33. Remove the throttle spring.

34. Completely remove the two pinch bolts securing the levers to the 'A' and 'B' bank carburetter butterfly valve spindles; remove the levers.

35. Remove the nuts securing both carburetters to the 'Tee' piece; remove the carburetters together with the throttle damper bracket adjacent to 'A' bank carburetter.

Carburetters – To dismantle

1. Thoroughly clean the outside of the carburetters.

Important

Certain special parts are used for exhaust emission control carburetters and in some cases they differ from parts used for standard carburetters only in their dimensional tolerances, therefore when renewing parts ensure that the correct replacements are fitted (*see Parts List T.S.D. 2201*).

Parts from the two carburetters should not be interchanged. To prevent this, the parts as they are removed from each carburetter, should be placed in two boxes, one marked 'A' bank and the other 'B' bank.

2. **On current cars**, see page U1—Introduction. Unscrew and remove the two weakener unit retaining screws; withdraw the weakener unit.

3. Unscrew and remove the damper and washer.

4. Remove the suction chamber retaining screws and remove the chamber without tilting it.

5. Remove the piston spring.

6. Carefully lift out the piston and needle assembly. Empty the damper oil from the piston rod.

For carburetters fitted with a fixed needle and bias jet, carry out Operation 7 (see Fig. K17 in Chapter K).

7. Remove the needle locking screw and withdraw the needle. If it cannot easily be removed, first tap the needle inwards then pull outwards. Do not bend the needle.

If excessive force is required to remove the needle it should be discarded and a new one fitted.

For carburetters fitted with a spring loaded needle and centralised jet carry out Operations 8 and 9 (see Fig. U27).

8. Remove the needle guide locking screw from the piston then withdraw the needle assembly taking care not to bend the needle.

9. Withdraw the needle guide from the needle and remove the spring.

Note The flanged collar pressed onto the jet needle is pre-set at the factory and must not be disturbed.

10. Mark the relative position of the float chamber, jet housing and carburetter body. Unscrew the float chamber screws, holding the float chamber against the pressure of the jet spring. Carefully detach the float chamber (*see Fig. K13 in Chapter K*).

11. Lift off the jet housing. Withdraw the jet assembly and jet spring.

12. Using a ring spanner remove the jet locking nut together with the jet bearing and lock-washer; discard the lock-washer.

Note Lock-washers are not fitted to carburetters with a spring loaded needle.

13. **Cars prior to Car Serial Number SRX 9001.** Unscrew the petrol inlet union from the float chamber lid, remove the union and aluminium washer; extract the filter and spring assembly.

Cars from Car Serial Number SRX 9001. Unscrew the two screws securing the fuel inlet union to the float chamber lid. Withdraw the union together with the spring, spring retainer and paper filter element.

14. Push out the float lever hinge pin from the end opposite to the serrations. Detach the lever.

15. Extract the float needle from its seating and unscrew the seating from the lid using a box spanner. Do not distort the seating.

16. Invert the chamber to remove the float.

17. Close the throttle and mark the relative positions of the throttle butterfly valve and the carburetter flange.

18. Slacken and remove the butterfly valve from its slot in the throttle spindle. The butterfly valve is oval and will jam if care is not taken.

19. Slide out the spindle from its bearing.

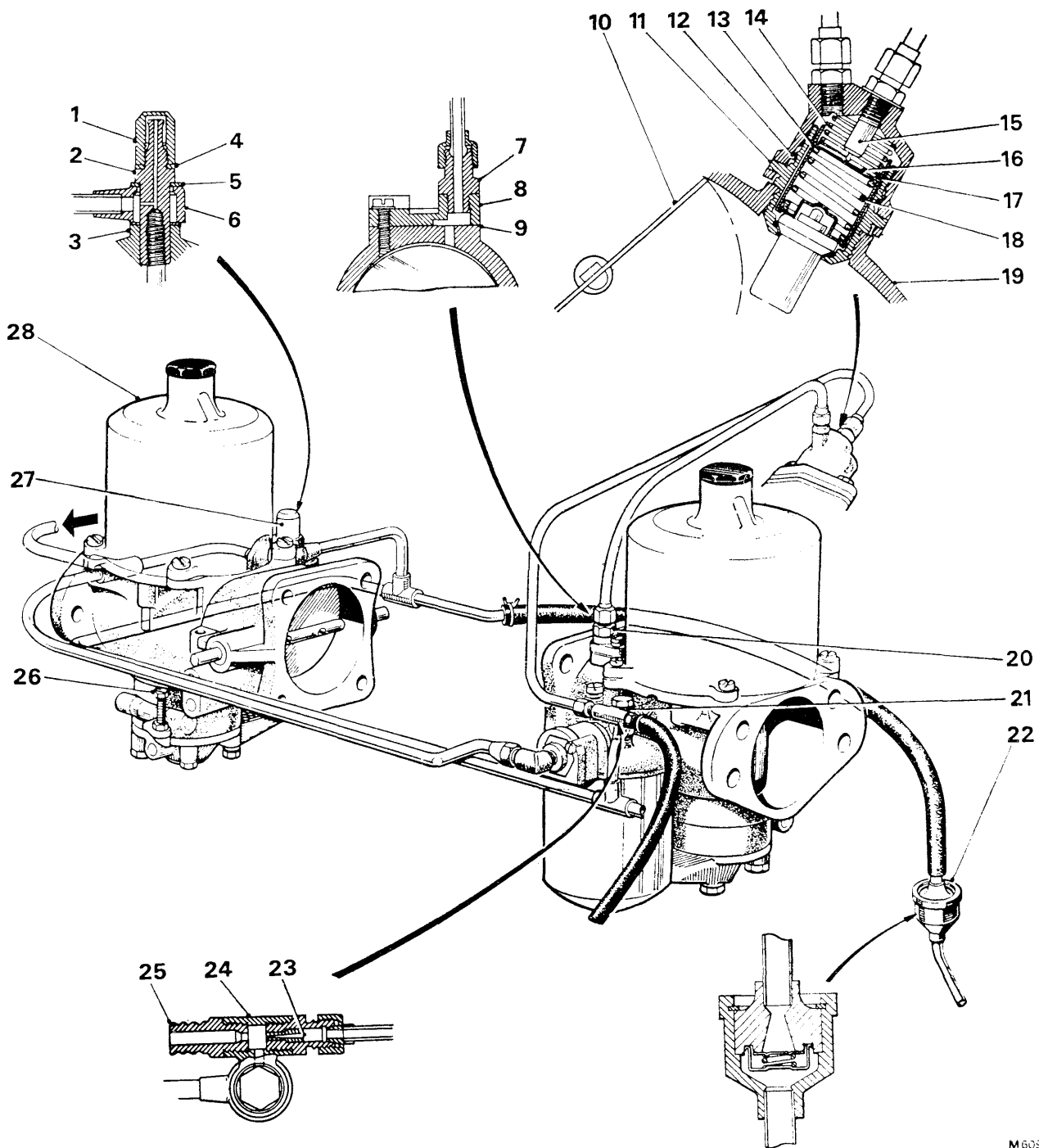
20. **Cars prior to Car Serial Number SRX 9001.** The throttle spindle sealing glands should not be removed as servicing is not required.

Cars from Car Serial Number SRX 9001. Remove the two rubber seals from the throttle spindle bore.

21. Unscrew and remove the slow-running valve complete with spring, seal and brass washer.

22. **On later cars**, see page U1—Introduction. Remove the two screws and shakeproof washers retaining the vacuum weakening device take-off plate and union. Lift off the plate and gasket.

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Fig. U22 CARBURETTER WEAKENING DEVICE (Later Cars)

- | | | |
|-------------------------|--------------------|-------------------------------------|
| 1 Cap | 11 Valve body | 20 Pressure sensing fitting |
| 2 Pressure tapping body | 12 Rubber 'O' ring | 21 Weakening device |
| 3 Float chamber cover | 13 Piston | 22 Drain valve |
| 4 Washer | 14 Spring | 23 Venturi |
| 5 Fibre washer | 15 Valve | 24 Body |
| 6 Banjo connection | 16 Disc | 25 Air bleed |
| 7 Union | 17 Circlip | 26 Jet adjusting screw |
| 8 Plate | 18 Spring | 27 Float chamber depression tapping |
| 9 Joint | 19 Choke housing | 28 'A' bank carburetter |

23. Remove the piston lifting pin by extracting the circlip from its groove with the pin pressed upwards.

24. Withdraw the pin downwards.

Carburetters – To assemble

1. Check that all the passages in the carburetter body are free from any obstruction.

2. **Cars prior to Car Serial Number SRX 9001 and later cars**, see page U1—Introduction. Check to ensure that the vacuum weakening device take-off plate is not obstructed.

Fit the plate together with a new gasket then secure the plate to the carburetter body using two screws.

3. **On current cars**, see page U1—Introduction. Ensure that the venturi pressed into the carburetter body is not damaged. Fit the weakener unit together with a new gasket to the carburetter body using two screws.

4. Examine the butterfly valve spindle for scoring or signs of wear.

5. Fit the spindle in its bearings and check for slack in the bearings and freedom of operation.

6. Fit the throttle butterfly valve to the slot in the butterfly valve spindle in the position marked during dismantling. The countersunk ends of the screw holes in the spindle must face outwards towards the flange of the carburetter body. Fit two new retaining screws but do not tighten.

7. Adjust the butterfly valve until it closes fully. Check this visually, then tighten the screws. Spread the split ends of the screws sufficiently to prevent turning.

8. **Cars from Car Serial Number SRX 9001**. Using tool (RH 8383) fit the seals to each end of the shaft. Ensure that the concave end of the seals enters the bores first.

9. Examine the slow running valve seal for serviceability.

10. Check that the concave face of the brass washer is towards the seal.

11. Fit the valve assembly.

12. Fit the piston lifting pin, spring, rubber washer, plain washer and circlip.

13. Examine the float needle and seating for damage or wear.

14. Screw the seating into the float chamber lid but do not overtighten.

15. Fit the needle to the seating, coned end first.

16. Using light finger pressure to hold the needle against its seating, test the assembly for leaks with an air pressure line. The pressure should be approximately 5 lb/sq. in. (0,35 kg/sq. cm.).

17. Fit the float chamber lid lever and fit the hinge pin.

18. Check the float level.

With the needle on its seating, insert a 0.438 in. (11,11 mm.) diameter bar between the forked lever and the lip of the float chamber lid. The prongs of the lever should just rest on the bar (*see Chapter K*). If they do not, carefully bend the lever at the start of the pronged section until the correct setting is obtained.

19. Examine the piston rod and the outside surface of the piston for damage.

20. The piston assembly must be scrupulously clean. Use petrol or methylated spirits as a cleaning agent; do not use abrasives.

21. Clean inside the suction chamber and piston rod guide.

22. Fit the damper assembly and washer. Seal the transfer holes in the piston assembly with rubber plugs and fit the assembly to the suction chamber. Invert the complete assembly and check the time it takes for the suction chamber to fall away from the piston (*see Chapter K*). This should be between 5 and 7 seconds. Remove the plugs, damper assembly and washer.

For carburetters fitted with a biased jet and fixed needle carry out Operations 23 to 38 inclusive (*see Chapter K*).

23. Fit the needle to the piston assembly. The shoulder or lower edge of the groove must be level with the lower face of the piston rod; fit the locking screw and tighten.

24. Invert the suction chamber and spin the piston assembly inside it to check for concentricity of the needle.

25. Check that the piston key is secure in the carburetter body.

26. Fit the piston assembly to the body then fit the piston spring over the piston rod then fit the suction chamber taking care not to 'wind-up' the piston spring; fit and tighten the suction chamber retaining screws.

27. Fit the jet bearing, a new lock-washer and lock-nut; do not tighten the nut.

28. To bias the jet proceed as follows.

29. Feed the jet into the jet bearing ensuring that the two noughts on the diaphragm are towards the inlet flange.

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30. With the carburetter positioned with its inlet flange downwards, fit the jet biasing tool (RH 8089) into the damper tube at the top of the suction chamber and screw in until it is fully home (see Fig. U28). Screw the tool back until the arrow on the tool, points towards the inlet flange on the carburetter. **The tool and carburetter must remain in this position throughout the biasing operation.**

31. With the piston at the bottom of its travel (on the bridge) and the jet hard up against the jet bearing, slowly tighten the jet lock-nut. During the tightening operation, slide the jet back and forth in its bearing to ensure that it is not binding. It should be noted that the two noughts on the diaphragm should be positioned toward the inlet flange and the cut-outs aligned with

the four threaded holes in the carburetter body. If any tightness between the jet and bearing is detected, the jet lock-nut must be removed and a new lock-washer fitted then the operation repeated.

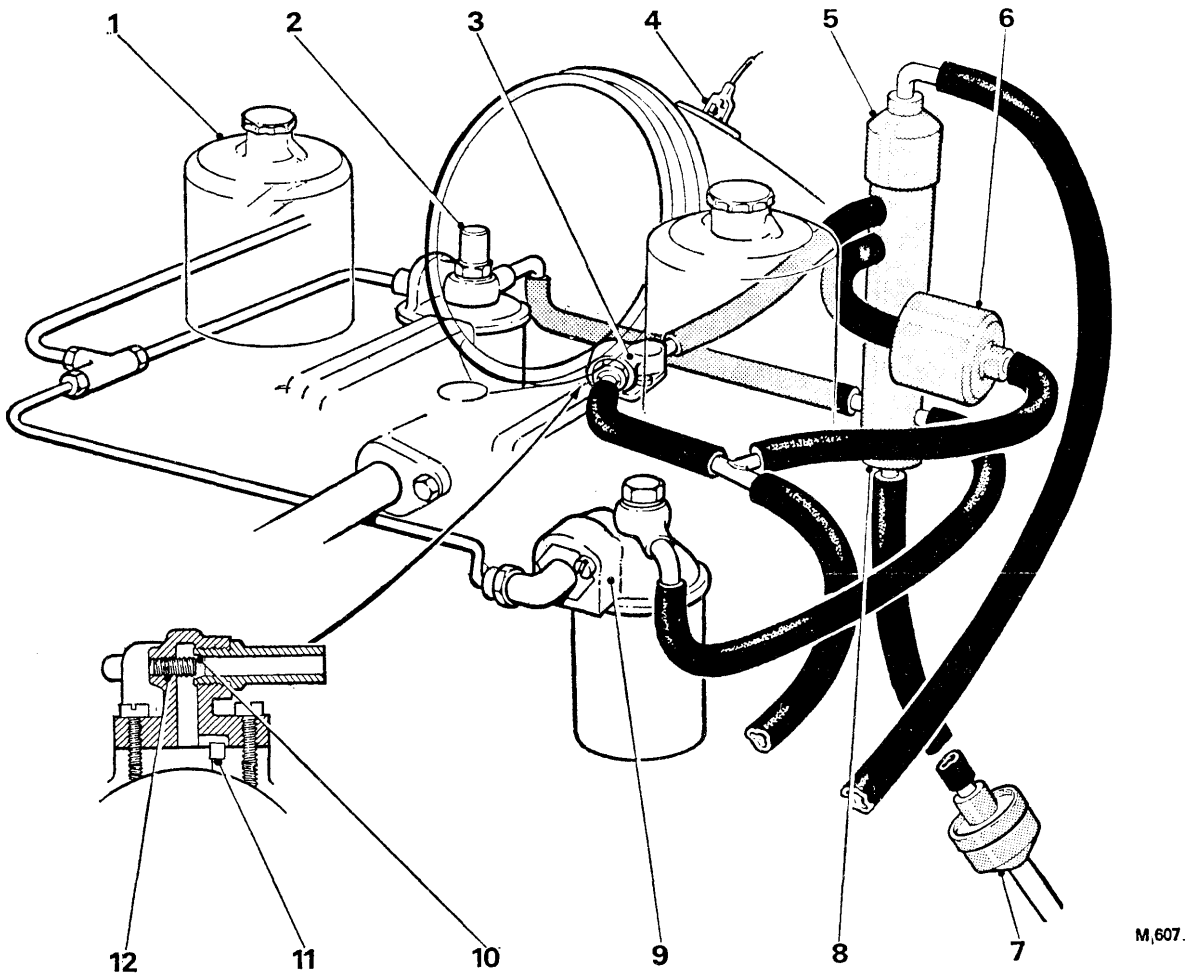
32. Remove the jet biasing tool.

Note Dealers may already possess this biasing tool as it is used by other British Motor Vehicle Manufacturers.

33. Remove the jet.

34. Remove the suction chamber, spring and piston.

35. Fit the jet housing, jet, jet spring and float chamber complete with anti-boiling device ensuring that the jet and diaphragm are kept in the correct



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Fig. U23 CARBURETTER WEAKENING DEVICE (Current Cars)

- | | |
|----------------------------------|--|
| 1 'A' bank carburetter | 7 Float chamber drain valve |
| 2 Float chamber pressure tapping | 8 Fuel receiver |
| 3 Weakening device | 9 Float chamber vent valve |
| 4 Bi-metal switch | 10 Bleed orifice |
| 5 Float chamber vent valve | 11 Venturi |
| 6 Weakening device cut-off valve | 12 Adjustment screw
(set during initial assembly) |

relationship to the body and that the raised edge of the diaphragm is located in the housing groove.

36. Before tightening the four screws securing the float chamber, ensure that the chamber is pushed toward the inlet flange of the carburetter. This is very important to prevent a foul with the throttle controls (see Chapter K Fig. 21, diagram C)

37. Set the jet flush with the bridge of the carburetter (see Chapter K) and turn the jet screw clockwise $2\frac{1}{2}$ turns.

38. Fit the piston assembly to the body, then fit the piston spring over the piston rod then fit the suction chamber taking care not to 'wind-up' the piston spring; fit and tighten the suction chamber retaining screws.

For carburetters fitted with a spring loaded needle and centralised jet carry out Operations 39 to 52 inclusive (see Fig. U27).

39. Fit the jet bearing and lock-nut; tighten the lock-nut.

40. Fit the jet housing, jet, jet spring and float chamber complete with anti-boiling device ensuring that the jet and diaphragm are kept in the correct relationship to the body and that the raised edge of the diaphragm is located in the housing groove.

41. Before tightening the four screws securing the float chamber, ensure that the chamber is pushed towards the inlet flange of the carburetter. This is very important to prevent a foul with the throttle controls (see Chapter K Fig. 21, diagram C); tighten the screws.

42. Check that the jet is not sticking in the guide. This can be carried out by moving the jet lever up and down.

43. Set the jet flush with the bridge of the carburetter and then turn the jet screw clockwise $2\frac{1}{2}$ turns.

44. Fit the spring onto the needle collar ensuring that the spring locates in the groove.

45. Fit the guide onto the needle so that the end with the indentation is towards the flange on the collar.

46. Fit the needle assembly and guide into the piston. The lower face of the guide must be flush with the face of the piston (for guidance refer to Fig. K17 in Chapter K) and the mark on the guide must be adjacent to the point mid-way between the two cutouts in the piston (see Fig. U27).

47. Fit and tighten a new guide locking screw to the piston.

48. Check that the piston key is secure in the carburetter body.

49. Fit the piston assembly to the carburetter body carefully guiding the needle into the jet.

50. Fit the piston spring over the piston rod.

51. Fit the suction chamber taking care not to 'wind-up' the piston spring; fit and tighten the suction chamber retaining screws.

52. Fit the piston damper and washer.

Carburetters – To fit

Fit the carburetters by reversing the procedure given for their removal noting the following points.

1. Fit new gaskets and washers to all joints.

2. Using pliers (RH 8090) renew the steel clips (if fitted) which secure the rubber hoses of the Evaporation Loss Control System on certain cars.

3. Examine the floats for damage or punctures; fit the floats to their respective float chamber.

4. Renew the lid gaskets.

5. Fit the gaskets to the lids then fit the lids to the chambers.

6. Secure the lids and pipes to the float chambers.

7. **Cars prior to Car Serial Number SRX 9001.** Clean the fuel filter assemblies and examine for damage; renew if necessary.

Cars from Car Serial Number SRX 9001. Examine the paper filter elements for cleanliness and damage; renew if necessary.

8. **Cars prior to Car Serial Number SRX 9001.** Fit the filters to the lid inlets, spring end leading; fit the unions and new aluminium washers.

Cars from Car Serial Number SRX 9001. Ensure that the 'O' ring on the petrol inlet unions are in good condition; renew if necessary. Fit the paper filter elements, spring retainers, springs and inlet unions to each float chamber lid. Secure the inlet unions with the retaining screws.

9. Fill the damper piston with an approved oil; the oil level should be approximately 0.5 in. (12.7 mm.) below the top of the piston rod. Do not overfill.

10. **Cars from Car Serial Number SRX 9001.** Check that the gap between the throttle stop vacuum actuator and the vacuum throttle stop screw is 0.070 in. (1.78 mm.).

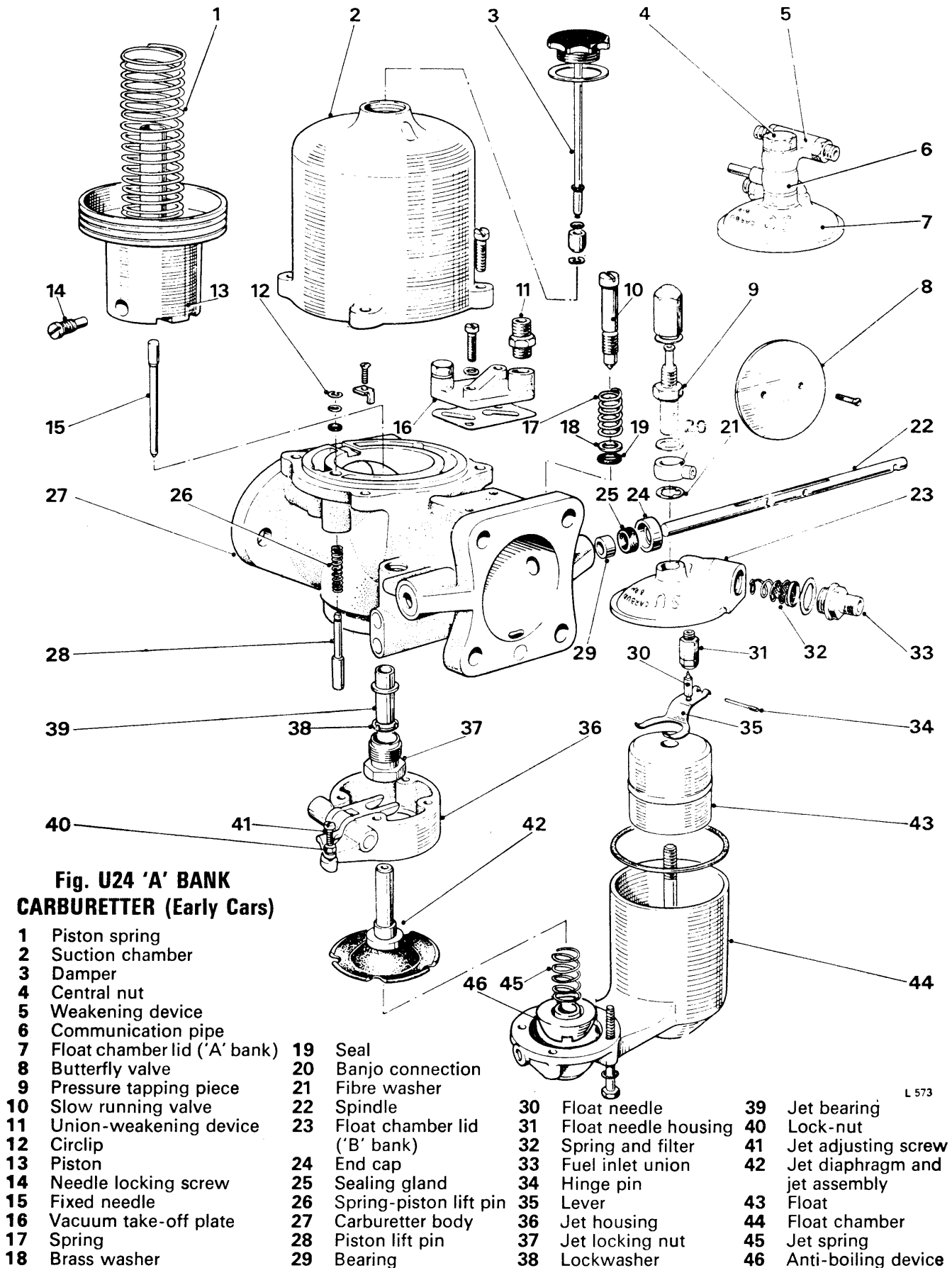
Fuel drain pipe – To remove

The following procedures apply to cars prior to Car Serial Number SRX 9001.

1. Separate the pipe at the valve housing flange, then remove the one way valve.

2. Detach the upper part of the pipe from the clip secured to the distributor pedestal securing setscrew.

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Note: Item 38 is not fitted to carburetters with a spring loaded needle. Also, item 15 shows the fixed needle. For spring loaded needle arrangements, refer to Figure U27.

3. Disconnect the fuel drain pipe at the union adjacent to the distributor; remove the upper part of the pipe.

4. Detach the lower part of the pipe from the clip secured to one of the starter motor mounting bolts; remove the pipe.

Fuel drain pipe – To fit

Fit the pipe by reversing the procedure given for its removal.

Fuel drain pipe – To remove

The following procedures apply to later cars, see page U1—Introduction.

1. Unscrew the worm drive clip situated above the float chamber drain valve.

2. Unscrew the worm drive clip from the hose adjacent to the distributor.

3. Detach the upper part of the hose.

4. Unscrew the worm drive clip situated below the float chamber drain valve.

5. Detach the hose from the float chamber drain valve noting that it is attached to the induction manifold fuel drain pipe.

6. If the float chamber drain valve is to be removed, unscrew the starter motor mounting bolt securing the valve bracket and remove the bracket together with the valve.

Note If a float chamber drain valve is faulty or damaged a new valve **must** be fitted.

Fuel drain pipe – To fit

Fit the pipe by reversing the procedure given for its removal.

Fuel drain pipe – To remove

The following procedures apply to current cars, see page U1—Introduction.

1. Release the two rubber retaining clips which hold the fuel drain hose in position.

2. Withdraw the lower end of the fuel drain hose from the float chamber drain valve.

Note A small quantity of fuel may be present in the fuel drain hose when it is withdrawn from the float drain valve.

3. Withdraw the upper end of the fuel drain hose from its connection at the bottom of the fuel receiver.

4. If the float chamber drain valve is to be removed, unscrew the $\frac{1}{2}$ in. A/F nut and withdraw the bolt

which retains the drain valve bracket to the engine mounting foot.

Note If a float chamber drain valve is faulty or damaged a new valve **must** be fitted.

Fuel drain pipe – To fit

Fit the pipe by reversing the procedure given for its removal.

Carburettors — To set

The following procedures apply to cars prior to Car Serial Number SRX 9001.

Having set the mechanical adjustments to the automatic choke (see Page U48 *Automatic Choke—To set*) set the carburettors by carrying out the following operations in the sequence given.

- A. Synchronise throttles and temporarily set idle screw.
- B. Set full throttle stop.
- C. Check linkage clearances.
- D. Tune carburettors.
- E. Set cold start 'fast-idle' (see Page U48—*Cold start 'fast-idle'—To check*).
- F. Set the throttle damper plunger.
- G. Set the kick-down micro-switch.
- H. Set the refrigeration 'fast-idle'.

Throttle synchronisation

Refer to Chapter K Section K4.

Full throttle stop

1. Adjust the full throttle stop screw so that it measures 0.350 in. (8.89 mm.) from the boss face (see Chapter K Fig. K21 diagram A).

2. Check that the clearance (x in Fig. K21 diagram A) between the fixed stop and the lever is correct. If the clearance is **less** than that specified, the throttle stop screw should be adjusted to give the correct clearance.

Linkage clearances – To check

Refer to Chapter K Section K4.

CARBURETTER TUNING

Preliminary checks

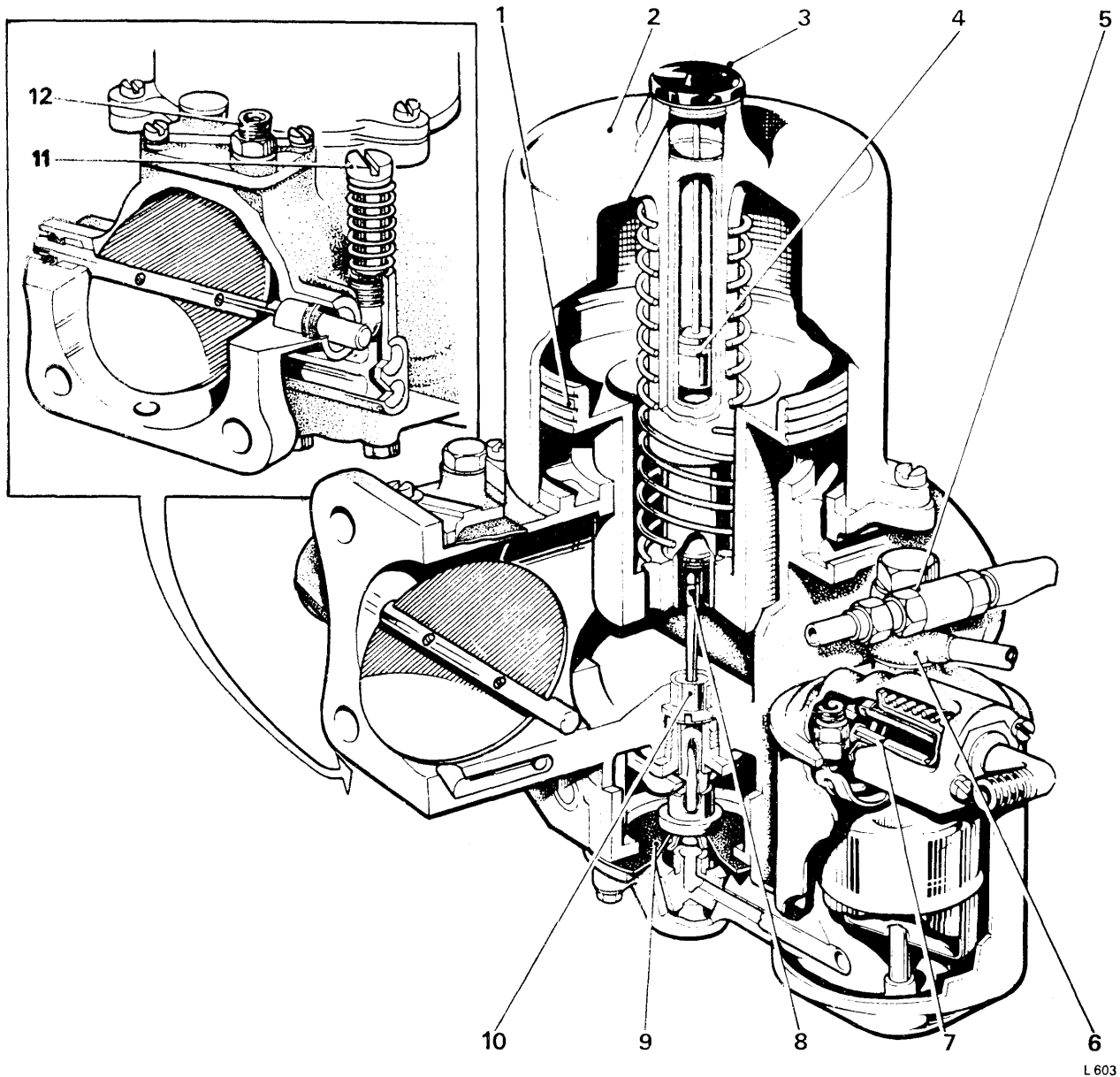
Before tuning the carburettors the following checks should be carried out.

Chapter U

1. Check the distributor contact point gaps; clean and re-set if necessary.
2. Check the ignition timing (*see Section U4*).
3. Check the the choke stove pipe is not obstructed.
4. Check that the entire induction system is completely free from air leaks.
5. Check the sparking plug gaps.

6. Check that the throttle butterfly valves are synchronised.

Note Jet and volume screws fitted to new carburetters may be streaked with paint. This signifies that the carburetters have been flow checked. However, once the carburetters are in service it is permissible to alter this setting should the need arise.



L 603

Fig. U25 'B' BANK CARBURETTER (Later Cars)

- | | | | |
|---|--------------------|----|------------------------|
| 1 | Air valve piston | 7 | Filter |
| 2 | Suction chamber | 8 | Needle |
| 3 | Damper cap | 9 | Diaphragm |
| 4 | Damper piston | 10 | Jet |
| 5 | Weakening device | 11 | Volume adjusting screw |
| 6 | Communication pipe | 12 | Union-weakening device |

Tuning conditions

To ensure that the engine temperature and mixture requirements are stabilised, tuning must be carried out in accordance with the following setting cycle.

1. Set the volume screws fully in, then back off $1\frac{1}{2}$ turns.
2. With the carburetter dampers, suction chambers, springs and pistons already removed to enable throttle synchronisation to be checked, set the main jet screws as follows.

Using spanner (RH 8050), slacken the carburetter jet screw lock-nuts then manipulate each screw until the jet in each carburetter body is level with its bridge piece (see Chapter K).

Screw down each jet screw $2\frac{1}{2}$ turns.

Fit the air valves pistons, springs and suction chambers in a clean dry condition then top-up each damper piston with the approved oil; the oil level should be approximately 0.5 in. (12.7 mm.) below the top of the piston rod; do not overfill.

It is important that each suction chamber and air valve piston should be fitted to the carburetter from which it was removed.

Do not fit the damper at this stage.

3. If a hot idle compensator valve is fitted remove the pipe from the hot idle compensator valve connection marked 'OUT'. Blank off the pipe.

4. Slacken the worm drive clip adjacent to each check valve then disconnect the hoses and temporarily seal the open ends of the check valves. Each blank should consist of a piece of rubber hose with one end sealed; the other end should be pushed over the end of the check valve.

Note Disconnecting the hoses at the check valves isolates the pump and renders the air injection system inoperative.

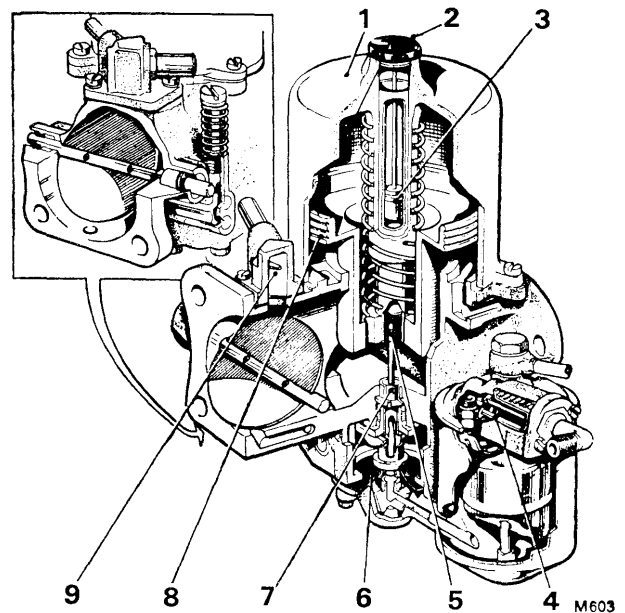
5. Connect a tachometer to the engine in accordance with the manufacturer's instructions.

6. Warm the engine at 'fast-idle' speed until normal operating temperature is attained. Preferably this should be carried out with the car standing in an ambient temperature of between 16°C. and 27°C. (60°F. and 80°F.). Run the engine for at least five minutes after the thermostat has opened; the thermostat opening point can be detected by a sudden rise in temperature of the thermostat elbow pipe.

During the warm-up period, Operations 7, 8 and 9 should be carried out.

7. Ensure that the refrigeration system is switched off.

8. Check that the choke butterfly valve is fully open by feeling the tension at the operating levers and



**Fig. U26 'B' BANK CARBURETTER
(Current Cars)**

- | | |
|---|------------------|
| 1 | Suction chamber |
| 2 | Damper cap |
| 3 | Damper piston |
| 4 | Filter |
| 5 | Needle |
| 6 | Diaphragm |
| 7 | Jet |
| 8 | Air valve piston |
| 9 | Weakening device |

hearing it snap back on its stop when any tension which has been applied, is released.

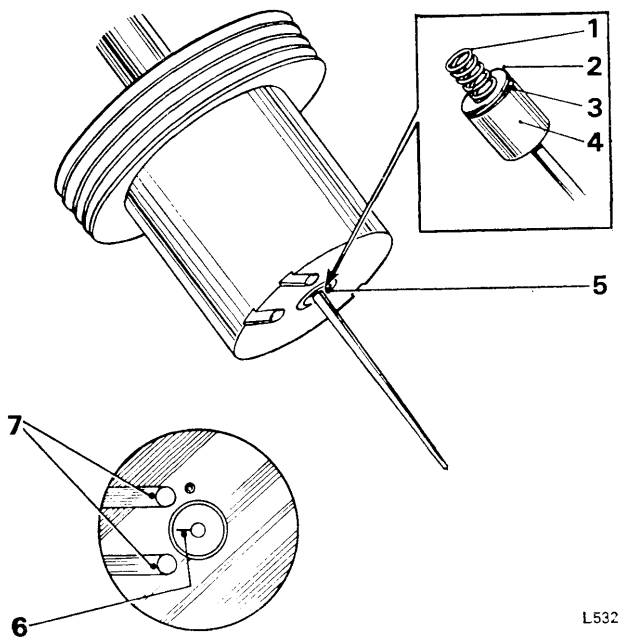
9. Remove the cap from the pressure tapping on the 'B' bank carburetter float chamber then connect a manometer capable of measuring 6 in. (15.24 cm.) of water level difference to the tapping (see Fig. U16).

10. Run the engine in Neutral at 2 000 r.p.m. for $\frac{1}{4}$ minute to purge the system. During this period check the manometer reading; this should show between 2.75 in. and 3.25 in. (6.99 cm. and 8.25 cm.) difference in water levels. If this reading is not readily attained the system should be checked as follows (also refer to Section U6).

A low or zero reading may be caused by:

- (a) An obstruction in one or more of the following:
 - The engine side of the weakener unit.
 - Weakener unit to weakener cut-off valve pipe.
 - Vacuum take-off plate to weakener cut-off valve pipe.
 - Vacuum take-off plate.
 - Pressure tapping on 'B' bank of carburetter float chamber.

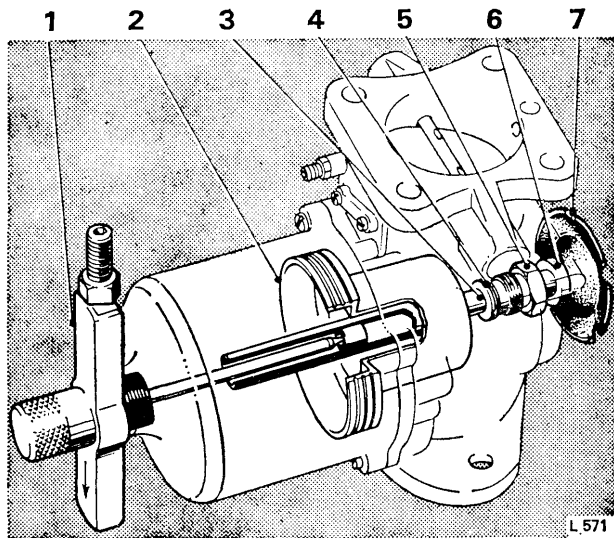
Chapter U



L532

Fig. U27 CORRECT POSITION OF SPRING LOADED NEEDLE

- 1 Spring
- 2 Collar
- 3 Indentation
- 4 Guide
- 5 Needle and guide position
- 6 Mark on guide
- 7 Transfer holes and cut-outs



L571

Fig. U28 POSITIONING JET USING BIASING TOOL

- 1 Biasing tool
- 2 Piston
- 3 Jet housing
- 4 Lockwasher
- 5 Locking nut
- 6 Jet
- 7 Noughts for correlation purposes on reverse side of diaphragm

- (b) An air leak at one or more of the following:
 - Float chamber lid joint.
 - Float chamber vent and drain pipes.
 - Weakener cut-off valve pipe unions.
 - Vacuum take-off plate flange on 'B' bank carburetter.
- (c) A dirty or faulty float chamber drain valve.
- (d) Low engine temperature, below 18°C. (64°F.) or a faulty weakener cut-off valve.

A high reading may be caused by:

- (a) An obstruction in the weakener air bleed orifice or the weakener hoses.
- (b) A fouled weakener filter.

Tuning Procedure

11. Tuning operations may now be commenced and must be carried out in the shortest time possible. If the time for setting exceeds a three minute period, open the throttle and run the engine at 2 000 r.p.m. for ¼ minute then resume tuning. Repeat this clearing operation if further periods of three minutes are exceeded.

Immediately after a clearing operation when the engine is at idle speed, the suction chamber should be tapped all the way round with a light weight, non-metallic instrument (e.g. the wooden handle of a screwdriver) to eliminate piston hysteresis (see Fig. U31).

12. Set the idle speed by adjusting the fixed throttle stop screw to between 550 r.p.m. and 600 r.p.m.

13. Run the engine at idle speed then balance the carburetters using the volume screws; the carburetters are balanced when the hiss heard at the small drilling in the neck of each suction chamber (see Fig. U31) is of equal intensity. A rubber or plastic tube of approximately 0.125 in. (3.17 mm.) diameter bore and 2 ft. (60.96 cm.) long should be used for this purpose. Fit the dampers.

14. Turn by equal amounts the jet adjusting screw on both carburetters, approximately ⅓ of a turn at a time until the fastest speed is recorded on the tachometer.

Note Turning the screw clockwise richens the mixture conversely turning the screw anti-clockwise weakens the mixture.

Turn both jet adjusting screws very slowly anti-clockwise (weaker) until the engine speed just commences to fall, then turn both jet adjusting screws ¼ turn clockwise (richer).

Tighten both jet adjusting screw lock-nuts using spanner (RH 8050).

15. Check the engine idle speed and if necessary adjust to between 550 r.p.m. and 600 r.p.m. using the fixed throttle stop screw.

16. Check that the carburetters are balanced by raising and releasing each carburetter piston lift pin in turn then comparing engine response. The carburetters are balanced if the response is the same for each carburetter. If the carburetters are not balanced repeat Operations 13, 14 and 15.

17. Ensure that the engine has run 25 minutes since the thermostat has opened (*see Operation 6*) then fit the probe of a C.O. meter into the exhaust pipe. The C.O. meter should be set in accordance with the manufacturer's instructions.

18. Purge the engine to 2 000 r.p.m. with no load for $\frac{1}{4}$ minute.

19. Idle the engine for the period stated by the C.O. meter manufacturer then check the exhaust emission on the C.O. meter; the correct reading should be between $5\frac{1}{2}\%$ and 6% .

If the C.O. meter reading is not within this limit, it is permissible to unlock the jet adjusting screws and turn them a maximum of $\frac{1}{8}$ of a turn either clockwise or anti-clockwise whichever is appropriate so that the correct reading is given on the meter. **Do not turn them in opposite directions** (i.e. richen one and weaken the other). Lock the jet adjusting screws.

20. Re-connect the check valve hoses.

21. If necessary again adjust the idle speed to between 550 r.p.m. and 600 r.p.m.

If the correct C.O. meter reading is unobtainable at this setting, **and settings have been carried out to the instructions given**, the carburetters should be removed from the engine and overhauled as described previously.

22. Re-connect the hoses to the hot idle compensator valve (if fitted).

23. Remove the C.O. meter and the manometer from the float chamber pressure tapping.

Fit the cap using a new washer.

Cold start 'fast-idle' – To set

Refer to Page U48.

Throttle damper plunger – To set

Refer to Chapter K Section K4.

Kick-down micro-switch – To set

Refer to Chapter K Section K4.

Refrigeration 'fast-idle' – To set

Refer to Chapter K Section K4.

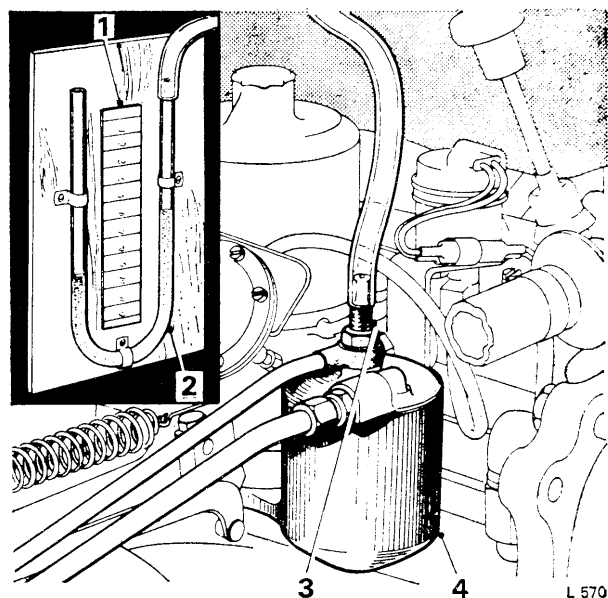


Fig. U29 CHECKING THE FLOAT CHAMBER DEPRESSION

- 1 Rule
- 2 Manometer
- 3 Pressure tapping
- 4 'B' bank float chamber

Carburetters — To set

The following procedures apply to later cars, see page U1—Introduction.

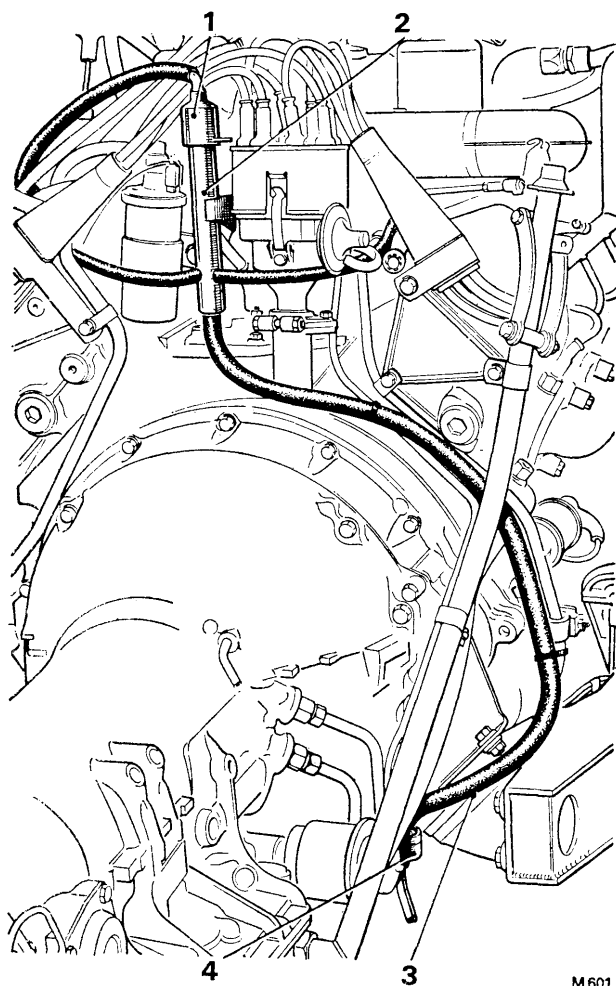
Having set the mechanical adjustments to the automatic choke (*see Page U48 Automatic Choke—To set*), set the carburetters by carrying out the following operations in the sequence given.

- A. Synchronise throttles and temporarily set idle speed.
- B. Set full throttle stop.
- C. Check linkage clearances.
- D. Tune carburetters.
- E. Set cold start 'fast-idle' (*see Page U48—Cold start 'fast-idle'—To set*).
- F. Set the throttle damper plunger.
- G. Set the kick-down micro-switch.

Throttle synchronisation

Refer to Chapter K Section K4.

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**Fig. U30 FUEL RECEIVER AND DRAIN LINE
(Current Cars)**

- 1 Float chamber vent valve
- 2 Fuel receiver
- 3 Drain line
- 4 Float chamber drain valve

Full throttle stop

1. Adjust the full throttle stop screw so that it measures 0.350 in. (8.89 mm.) from the boss face (see Chapter K Fig. K21 diagram A).

2. Check that the clearance (*x* in Fig. K21 diagram A) between the fixed stop and the lever is correct. If the clearance is *less* than that specified, adjust the throttle stop screw to give the correct clearance.

Linkage clearance – To check

Refer to Chapter K Section K4.

CARBURETTER TUNING Preliminary checks

Before tuning the carburetters the following checks should be carried out.

1. Check the distributor contact points gaps; clean and re-set if necessary. Renew the points if they are badly damaged.

2. Disconnect the vacuum pipe from the vacuum retard tap and blank off the connection at the tap. Adjust the fixed throttle screw to give an engine idle speed of 500 r.p.m. Using a dwell angle meter set the dwell angle to between 26° and 28° by means of the adjustment screw (see Figs. U37 and 38).

3. Check the ignition timing.

4. Check that the choke stove pipe is not obstructed.

5. Check that the entire induction system is completely free from air leaks.

6. If the Fuel Evaporation Emission Control System is fitted, check the purge flow rate.

7. Check the sparking plug gaps.

8. Check that the throttle butterfly valves are synchronised.

Note Jet and volume screws fitted to new carburetters may be streaked with paint. This signifies that the carburetters have been flow checked. However, once the carburetters are in service, it is permissible to alter this setting should the need arise.

Tuning conditions

To ensure that the engine temperature and mixture requirements are stabilised, tuning must be carried out in accordance with the following setting cycle.

1. Screw the volume screws fully in, then back off 1½ turns.

2. With the carburetter dampers, suction chambers, springs and pistons already removed to enable throttle synchronisation to be checked, set the main jet screws as follows.

Using spanner (RH 8050), slacken the carburetter jet screw lock-nut then manipulate each screw until the jet in each carburetter body is level with the bridge piece.

Screw down the jet screw 2½ turns.

Fit the air valve pistons, springs and suction chambers in a clean dry condition then top-up each damper piston with the approved oil; the oil level should be approximately 0.5 in. (12.7 mm.) below the top of the piston rod. Do not overfill.

It is important that each suction chamber and air valve piston should be returned to the carburettor from which it was removed.

Do not fit the damper at this stage.

3. Connect an electric impulse tachometer in accordance with the manufacturer's instructions.

4. Warm the engine at 'fast-idle' speed until normal operating temperature is attained. Run the engine for at least five minutes after the thermostat has opened; the thermostat opening point can be detected by a sudden rise in temperature of the thermostat elbow pipe.

Note It is important that engine tuning is carried out after the engine temperature has stabilised and at an ambient temperature of between 16°C. and 27°C. (60°F. and 80°F.).

During the warm-up period, Operations 5, 6 and 7 should be carried out.

5. Ensure that the refrigeration system is switched off.

6. Check that the choke butterfly valve is fully open by feeling the tension at the operating levers and hearing it snap back on its stop when any tension which has been applied is released.

7. Remove the cap from the pressure tapping on 'A' bank carburettor float chamber then connect a manometer to the tapping (*see Fig. U29*). The manometer must be capable of measuring 6 in. (15,24 cm.) of water level difference.

8. Run the engine in Neutral at 2 000 r.p.m. for $\frac{1}{4}$ minute to purge the system. During this period check the manometer reading; this reading should show between 2.75 in. and 3.25 in. (6,99 cm. and 8,25 cm.) difference in water level. If this reading is not readily attained check the system as follows.

A low or zero reading may be caused by:

- (a) An obstruction in one or more of the following:
 - The engine side of the weakener unit.
 - Weakener unit to weakener cut-off valve pipe.
 - Vacuum take-off plate to weakener cut-off valve pipe.
 - Vacuum take-off plate.
 - Pressure tapping on 'A' bank carburettor float chamber.
- (b) An air leak at one or more of the following:
 - Float chamber lid joint.
 - Float chamber vent and drain pipes.
 - Weakener cut-off valve pipe unions.
 - Vacuum take-off plate flange on 'B' bank carburettor.
- (c) A dirty or faulty float chamber vent valve or float chamber drain valve.

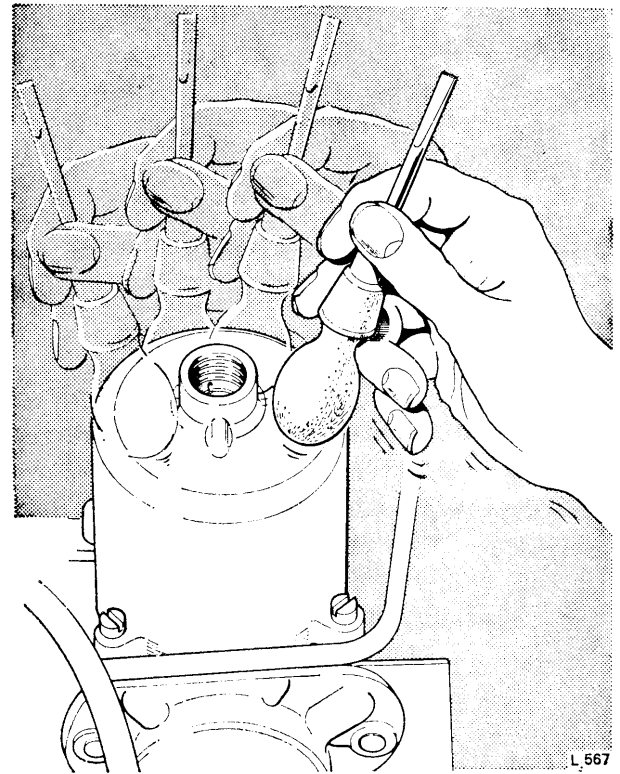


Fig. U31 TAPPING THE NECK OF THE SUCTION CHAMBER

- (d) Low engine temperature, below 18°C. (64°F.) or a faulty weakener cut-off valve.
- (e) Incorrect purge flow rate (less than 1 cu. ft./minute).

A high reading may be caused by:

- (a) An obstruction in the weakener air bleed orifice or the weakener hoses.
- (b) A foul in the weakener filter or evaporative loss control canister filter.
- (c) Incorrect connection of weakener hose to valance adapter or evaporative loss control canister.
- (d) Incorrect purge flow rate (greater than 1 cu. ft./minute).
- (e) Evaporative loss control canister obstructed.

9. Disconnect the vacuum pipe from the vacuum retard tap and blank off the connection on the tap. Also remove the pipe from the hot idle compensator valve connection marked 'OUT'. Blank off the pipe.

10. Slacken the worm drive clip adjacent to each check valve then disconnect the hoses and temporarily seal the open ends of the check valves. Each blank should consist of a piece of rubber hose with one end

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sealed; the other end should be pushed over the end of the check valves.

Note Disconnecting the hoses at the check valves isolates the pump and renders the air injection system inoperative.

Tuning procedure

11. Tuning operations may then be commenced and must be carried out in the shortest time possible. If the time for setting exceeds a three minute period, open the throttle and run the engine at 2 000 r.p.m. for $\frac{1}{4}$ minute then resume tuning. Repeat this clearing operation if further periods of three minutes are exceeded.

Immediately after a clearing operation when the engine is at idle speed, the suction chamber should be tapped all around to eliminate piston hysteresis (see Fig. U31). Use a light weight, non-metallic instrument (e.g. the wooden handle of a screwdriver).

12. Set the engine idle speed by adjusting the fixed throttle stop screw to 600 r.p.m.

13. Run the engine at idle speed then balance the carburetters using the volume screws; the carburetters are balanced when the hiss heard at the small drilling in the neck of each suction chamber is of equal intensity (see Fig. U31). A rubber or plastic tube of approximately 0.125 in. (3.17 mm.) diameter bore and 2 ft. (60.96 cm.) long should be used for this purpose. Fit the dampers.

14. Turn both jet adjusting screws by equal amounts in the same direction, approximately $\frac{1}{8}$ of a turn at a time until the maximum r.p.m. is recorded on the tachometer.

Note Turning the screw clockwise richens the mixture, conversely turning the screw anti-clockwise weakens the mixture.

15. Set the mixture balance on each carburetter individually using the jet adjusting screws approximately $\frac{1}{8}$ of a turn at a time in either direction until maximum r.p.m. is obtained.

16. Turn the jet adjusting screws anti-clockwise by equal amounts (weaker mixture) until the engine speed just begins to fall, then turn both adjusting screws $\frac{1}{8}$ of a turn clockwise and tighten both jet adjusting screw lock-nuts using spanner (RH 8050).

17. Check the engine idle speed and if necessary re-adjust to 600 r.p.m. using the fixed throttle stop screw.

18. Check that the Carburetters are balanced by raising and releasing each carburetter piston lift pin in turn then comparing the engine response. The carburetters are balanced if the response is the same for each carburetter. If the carburetters are not

balanced repeat Operations 13 to 17 inclusive until a satisfactory balance is obtained.

19. Purge the engine at 2 000 r.p.m. in Neutral for a period of $\frac{1}{4}$ minute (see Operation 8).

20. Ensure that the engine has run a minimum period of 25 minutes since the thermostat has opened (see Operation 4) then fit the probe of a C.O. meter into the exhaust pipe. The C.O. meter should be set in accordance with the manufacturer's instructions.

Note Suitable C.O. meters are:

1. Horiba Mexa 200
2. Bosch Model Efaw 109

21. Idle the engine until a steady C.O. reading is obtained (minimum time $\frac{1}{2}$ minute) then check the exhaust emission on the C.O. meter; the correct reading should be between 5 $\frac{1}{2}$ % and 6%.

If the C.O. meter reading is not within this limit, it is permissible to unlock the jet adjusting screws and turn them a maximum of $\frac{1}{8}$ of a turn either clockwise or anti-clockwise whichever is necessary to give the correct reading on the meter. **Do not turn them in the opposite directions** (i.e. richen one and weaken the other). Lock the jet adjusting screws.

If the correct C.O. meter reading is unobtainable at this setting, **and settings have been carried out to the instructions given**, the carburetters should be removed from the engine and overhauled as described previously.

22. Remove the C.O. meter and manometer from the float chamber pressure tapping.

Fit the cap to the pressure tapping using a new washer.

23. Remove the blanks and re-connect the check valve hoses.

24. Set the engine idle speed to 680 r.p.m. using the fixed throttle stop screw and tighten the lock-nut.

25. Connect the vacuum hose to the vacuum retard tap.

26. Check the engine idle speed and using the vacuum throttle stop screw, reset to 600 r.p.m. if necessary.

27. Re-connect the hoses to the hot idle compensator valve.

Cold start 'fast-idle' - To set

Refer to Page U48.

Throttle damper plunger - To set

Refer to Chapter K Section K4.

Kick-down micro-switch - To set

Refer to Chapter K Section K4.

Carburetters — To set

The following procedures apply to current cars, see page U1—Introduction.

The carburetters fitted to these cars are adjusted at the factory using special equipment to ensure that their settings comply with the current emission control regulations.

Under normal circumstances the carburetters should not require adjustment in service.

If however, adjustment is found necessary due to inadvertent disturbance or replacement of a component, proceed as follows.

Having set the mechanical adjustments to the automatic choke (see Page U48 *Automatic Choke—To set*), set the carburetters by carrying out the following operations in the sequence given.

- A. Synchronise throttles and temporarily set engine idle speed.
- B. Set full throttle stop.
- C. Check linkage clearances.
- D. Tune carburetters.
- E. Set cold start 'fast-idle' (see Page U48—*Cold start 'fast-idle'—To set*).
- F. Set the throttle damper plunger.
- G. Set the kick-down micro switch.

Throttle synchronisation

Refer to Chapter K Section K4.

Ensure that when the throttles are synchronised the eccentric adjuster is in the upper mid-way position this will allow for adjustment of the eccentric in either direction at a later stage of setting the carburetters.

Full throttle stop

1. Adjust the full throttle stop screw so that it measures 0.350 in. (8.89 mm.) from the boss face (see Chapter K, Fig. K21 diagram A).

2. Check that the clearance (x in Fig. K21 diagram A) between the fixed stop and the lever is correct. If the clearance is less than that specified, adjust the throttle stop screw to give the correct clearance.

Linkage clearance — To check

Refer to Chapter K Section K4.

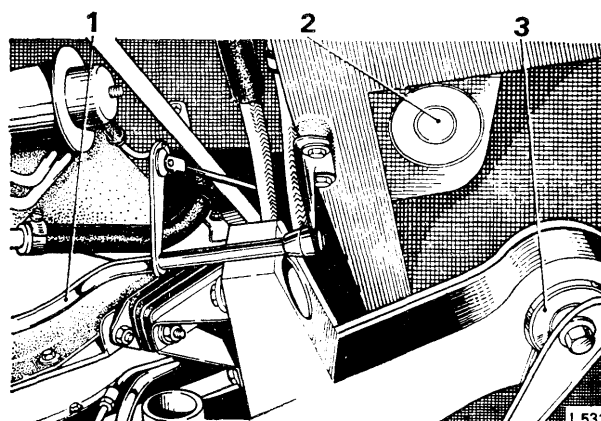


Fig. U32 POSITION OF MIXTURE WEAKENING DEVICE FILTER (Early Cars)

- 1 Accelerator pedal linkage
- 2 Fuel weakening device filter
- 3 Front sub-frame right-hand rear mounting

CARBURETTER TUNING

Preliminary checks

Before tuning the carburetters the following checks should be carried out.

Ensure that the vehicle is in Neutral and that the gear range actuator thermal cut-out has been removed from the main fusebox.

1. Check the condition of the spark plugs.
2. Check the condition of the distributor contact breaker points.
3. Check the ignition timing (see Section U4).
4. Check the flow through the choke stove pipe (see *Automatic choke stove pipe—To check*).
5. Check the purge line flow rate.
6. Ensure that the air conditioning system is switched off.
7. Start the engine and warm up; allow to run for at least 5 minutes after the thermostat has opened.
8. Stop the engine, ensure that the choke butterfly valve is fully open and the choke 'fast-idle' off.
9. Connect an electric impulse tachometer in accordance with manufacturer's instructions.
10. Remove the cap from the pressure tapping on 'B' bank carburetter float chamber, connect to the tapping a manometer capable of measuring 6 in. (15.24 cm.) of water.
11. Run the engine in Neutral at 2000 r.p.m. until a steady reading is obtained on the manometer, an acceptable reading is between 3 in. and 3.5 in. (7.62 cm. and 8.89 cm.).

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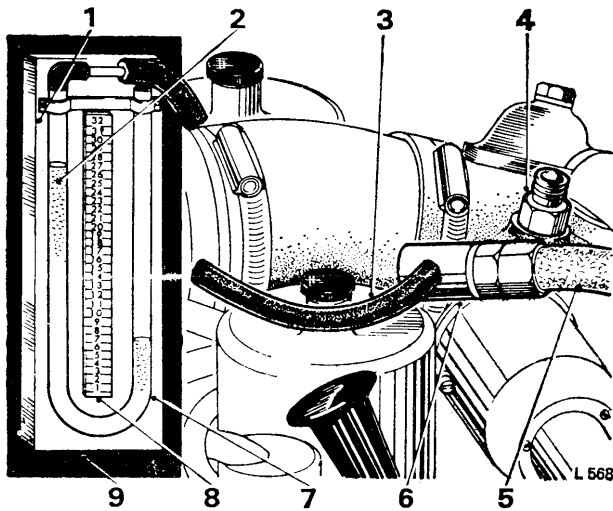


Fig. U33 CHECKING THE CHOKE STOVE PIPE DEPRESSION

- 1 Wooden board
- 2 Water
- 3 Rubber tube
- 4 Union-choke stove pipe connection
- 5 Choke stove pipe
- 6 Calibrated orifice
- 7 Polythene tube
- 8 Scale
- 9 Manometer

If the correct reading is not obtained, connect the manometer directly onto the weakener unit (i.e. in place of the hose to the evaporation loss control canister. **A correct reading at the weakener unit but a low reading at the float chamber tapping may be caused by:**

- (a) An obstruction in one or more of the following:
 - Weakener venturi
 - Hoses from the weakener to the fuel receiver.
 - Hoses from the float chamber to the fuel receiver.
- (b) An air leak at one or more of the following:
 - Float chamber lid joint.
 - Float chamber vent and drain hoses.
 - Weakener solenoid hose connections.
 - Weakener tapping flange on 'B' bank carburetter.
- (c) A dirty or faulty float chamber vent valve or drain valve.
- (d) A low engine temperature below 16°C. (60°F.), a faulty weakener solenoid valve or cut-out switch.
- (e) An incorrect purge flow rate (less than 50 cu. ft./hr.).

If the reading at the weakener unit is high, it may be caused by:

- (a) An obstruction in the weakener bleed orifice or the weakener hoses.
- (b) A fouled weakener filter or evaporation loss control canister filter.
- (c) An incorrect connection of the weakener hose to the valance connection or evaporation loss control canister filter.
- (d) An incorrect purge flow rate (exceeding 70 cu. ft./hr.).
- (e) Evaporation loss control canister obstructed.

If the float chamber depression is still incorrect after carrying out all the above checks, then the correct depression of 3.25 in. (8.26 cm.) of water may be set by turning the socket head adjustment screw (see Fig. U23) on the mixture weakening device. Turning the adjustment screw clockwise increases the depression.

Remove the manometer from the weakener unit and connect the hose from the evaporation loss control canister.

Important Connect the manometer to the float chamber pressure tapping and finally check the reading at this point.

The adjustment screw is locked in position with 'Casco', therefore if adjustment is made the screw must again be locked in position by applying a coating of 'Casco' to the screw threads.

12. Raise the engine speed slowly, noting the manometer and tachometer readings. The maximum steady manometer reading should be obtained between 1 500 r.p.m. and 1 900 r.p.m. If the maximum depression occurs below 1 500 r.p.m. it is permissible to screw out the idle bleed screws by equal amounts up to a maximum of 2½ turns, to obtain the speed.

13. Stop the engine. Disconnect the distributor vacuum hose from the vacuum retard tap. Blank off the tap connection.

14. Remove air intake trunk and blank off the hot idle mixture compensator feed (see Fig. U34). Fit the air intake trunk.

15. Remove the air hoses from the check valves and fit blanks to the valves.

It is important to carry out Operation 14 ensuring that the check valves are blanked off.

16. Top-up both carburetter dampers with approved oil. The oil level should be approximately 0.50 in. (12.7 mm.) below the top of the piston rod.

Remove the cap from the pressure tapping on A bank carburetter to render the weakener inoperative.

Tuning procedure

Tuning operations may now be commenced and must be carried out in the shortest possible time.

If the tuning time exceeds a three minute period open the throttle and run the engine at 2 000 r.p.m. for $\frac{1}{4}$ minute then resume tuning. Repeat this clearing operation if further periods of three minutes are exceeded.

After each clearing operation when the engine is at idle speed, the suction chamber should be tapped all the way round with a light weight non-metallic instrument (e.g. the wooden handle of a screwdriver) to eliminate piston hysteresis (see Fig. U31).

17. Start and run the engine until the normal temperature is obtained and the automatic choke is off.

18. Set the engine idle speed by adjusting the fixed throttle stop screw to 600 r.p.m.

19. Purge the engine at 2 000 r.p.m. for $\frac{1}{4}$ minute.

20. Ensure that the engine has run for a minimum of 25 minutes after the thermostat has opened.

Fit the probe of the C.O. meter into the exhaust pipe in accordance with the manufacturer's instructions.

Note A suitable C.O. meter is a Non-Dispersive Infra Red type of analyser such as:

1. Horiba Mexa 200

21. Idle the engine until a steady C.O. reading is obtained (minimum time $\frac{1}{2}$ minute) then check the exhaust emission on the C.O. meter; the correct reading should be between $5\frac{1}{2}\%$ and 6% .

If the C.O. meter reading is not within this limit, proceed with the tuning as follows.

Air flow balance

22. Remove the air valve dampers and check if the carburetters are balanced for air flow by listening to the hiss from the small drilling in the neck of each suction chamber. The carburetters are balanced when the hiss from each suction chamber is of equal intensity. A rubber or plastic tube of 0.125 in. (3,175 mm.) bore 2 ft. (0,610 m.) long may be used for this purpose.

23. Balance the air flow through the carburetters by adjusting the eccentric pivot. Fit the dampers.

Mixture balance

Fully raise each piston lift pin in turn, if the mixture balance is correct the response will be the same for each carburetter.

24. To set the mixture balance slacken the jet adjusting screw lock-nuts using spanner (RH 8050).

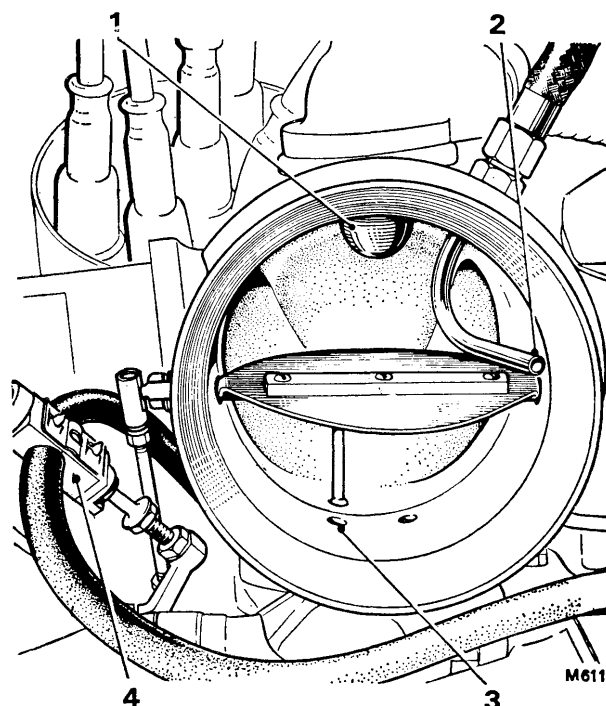


Fig. U34 HOT IDLE MIXTURE COMPENSATOR FEED (Current Cars)

- 1 Bi-metal switch
- 2 Choke stove pipe feed
- 3 Hot idle mixture compensator feed
- 4 Vacuum retard tap

25. Turn **both** jet adjusting screws equal amounts in the same direction ($\frac{1}{8}$ of a turn at a time), until the maximum r.p.m. is obtained.

Note Turning the screws clockwise richens the mixture and turning the screws anti-clockwise weakens the mixture.

26. Set the mixture balance by turning the jet adjusting screws **individually** by approximately $\frac{1}{8}$ of a turn at a time in either direction until maximum r.p.m. is obtained.

27. Turn **both** jet adjusting screws equal amounts anti-clockwise until the engine speed just begins to fall, then turn both adjusting screws $\frac{1}{8}$ turn clockwise and tighten the lock-nuts.

28. Check that the engine idle speed is 600 r.p.m., adjust the fixed throttle stop screw to obtain this figure.

Mixture strength

When both the air flow (volume) and mixture balance are satisfactory proceed to set the mixture strength.

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29. Slacken the jet adjusting screw lock-nuts.
30. Turn both jet adjusting screws equal amounts in the same direction (up to a maximum of $\frac{1}{4}$ turn) until the C.O. meter reading of $5\frac{1}{2}\%$ to 6% is obtained.
Note Turning the screws clockwise richens the mixture and turning the screws anti-clockwise weakens the mixture.
31. Tighten the lock-nuts.
32. Check that the engine idle speed is 600 r.p.m., adjust the fixed throttle stop screw to obtain this figure.
33. Check the mixture balance, adjust if necessary.
34. Remove the C.O. meter. Fit the cap to the pressure tapping using a new washer.
35. Remove blanks and re-connect the check valve air hoses.
36. Set the engine idle speed to 680 r.p.m. by adjusting the fixed throttle stop screw. Tighten the lock-nut.
37. Connect the distributor vacuum hose to the vacuum retard tap.
38. Check that the engine idle speed is 600 r.p.m., if necessary, adjust the vacuum throttle stop screw to obtain this figure.
39. Remove the blank from the integral hot idle compensator valve.
40. Stop the engine and fit the gear range actuator thermal cut-out to the main fusebox.

Cold start 'fast-idle' – To set

Refer to Page U48. Fast-idle to be set with the cap on 'A' bank float chamber removed, this renders the weakener system inoperative.

Throttle damper plunger – To set

On current cars, see page U1—Introduction.

1. Move the cold start 'fast-idle' to its off position.
2. Move the 'A' bank throttle stop to its closed throttle position.
3. Slacken both nuts securing the throttle damper to its bracket. Back off the nuts until they are well clear of the bracket.
4. Press the damper towards the 'A' bank throttle lever until the damper is fully compressed and the lever is just clear of the throttle stop screw.
5. Screw the lower securing nut until it is 0.050 in. (1.27 mm.) clear of the underside of the bracket. Release the damper and tighten the upper securing nut.

6. Ensure that the damper spindle is resting on the centre of the throttle lever pad.

Kick-down micro-switch – To set

Refer to Chapter K Section K4.

Mixture weakening device fittings – To remove

On cars prior to Car Serial Number SRX 9001 and later cars, see page U1—Introduction

1. Disconnect and remove the pipes fitted to the carburetter float chambers, choke housing and carburetter butterfly housing connections, also disconnect the hose fitted to the weakening device; discard the clip.

2. Using spanner (RH 8087), remove the weakener cut-off valve assembly; do not dismantle the assembly.

Note The weakener cut-off valve assembly has a critical setting to ensure that the valve operates at very precise temperatures; therefore the assembly must not be dismantled. If the assembly is not operating correctly or if the wax capsule requires renewing, renew the complete assembly.

3. Remove the two screws securing the vacuum take-off plate to the 'B' bank butterfly housing; remove the plate and gasket.

4. **Cars prior to Car Serial Number SRX 9001.** To remove the weakener filter unit (*see Fig. U32*), grasp the unit in both hands and unscrew the unit by turning it anti-clockwise; take care not to lose the dished spring washer fitted between the container and adaptor.

Using pliers (RH 8090), remove the steel clip (if fitted) securing the rubber hose to the filter connection; detach the hose. Discard the steel clip.

On later cars, see page U1—Introduction. Using pliers (RH 8090), remove the steel clips (if fitted) securing the inlet and outlet hoses fitted to each end of the filter unit; detach the hoses. Discard the clips.

To remove the filter unit (*see Fig. U16*), slacken the worm drive clip securing the filter unit to its mounting bracket. Withdraw the filter unit from the securing clip.

Note The filter units are sealed and no attempt should be made to clean the elements.

Mixture weakening device fittings – To fit

Fit the weakening device fittings by reversing the procedures given for removal noting the following points.

1. Ensure that all pipes are in good condition.
2. Renew all sealing washers.
3. Renew all steel clips.
4. **Cars prior to Car Serial Number SRX 9001.**

Fit the dished part of the filter washer towards the filter container.

5. **On later cars**, see page U1—Introduction. It is essential that when fitting the filter unit, the inlet pipe which is off-set from the centre, is situated in its lowest position. If the filter is not fitted in this position it is possible for it to become obstructed by an accumulation of fuel.

Mixture weakening device fittings – To remove

On current cars, see page U1—Introduction.

1. Disconnect and remove all hoses fitted to the weakening device, weakener filter, weakener cut-off valve, fuel receiver, float chambers, float chamber vent valve and float chamber drain valve. As each hose is disconnected the open end of the unit should be blanked off and the hose labelled for identification.

2. Remove the **float chamber vent valve** by removing the retaining split pin and withdraw the valve from the top of the fuel receiver, note the rubber sealing ring around the top of the fuel receiver.

3. Remove the **float chamber drain valve** by unscrewing the nut and withdrawing the bolt from the engine mounting foot. Withdraw the valve.

4. Remove the **weakener cut-off valve** by unscrewing the two securing screws and nuts, one situated above and one below the valve. Disconnect the two electrical connections.

5. The **fuel receiver** should not under normal circumstances require removal, however, if the necessity arises proceed by removing the ignition distributor and coil; collect the distance pieces as the coil is withdrawn. Remove the weakener cut-off valve as described previously. Unscrew and remove the two bracket retaining setscrews. Withdraw the bracket and fuel receiver.

6. Remove the weakener cut-off valve **temperature switch** situated in the butterfly housing by disconnecting the electrical connection and unscrewing the three retaining screws. Withdraw the unit.

The above units mentioned in Operations 2 to 6 inclusive must not be dismantled, if any have suspect or faulty operation the unit must be discarded and a new one fitted.

7. Remove the **mixture weakening device** from 'B' bank carburetter by unscrewing the $\frac{1}{2}$ in. A/F connection from the weakening device; unscrew the two retaining screws and withdraw the unit.

8. Remove the **weakener filter** by slackening the worm drive clip which retains the filter to the bracket; withdraw the filter.

9. Before removing the **purge line filter** remove the two steel retaining clips situated one on either side of the unit with the special pliers (RH 8090). Slacken the 2 B.A. setscrew which secures the retaining clip. Withdraw the filter from the clip.

Note The filter units are sealed and no attempt should be made to clean the elements.

Mixture weakening device fittings – To fit

Fit the weakening device fittings by reversing the procedure given for removal, noting the following points.

1. Ensure that all hoses and pipes are in a good condition and not obstructed.
2. Renew all sealing washers and gaskets.
3. Renew all steel clips (where fitted).
4. It is essential that when fitting the weakener filter the inlet pipe which is off-set from the centre is facing the front of the car and is in its lowest position.

Hot air scoop – To remove

1. Slacken the worm drive clip securing the rubber hose to the hot air scoop. The hose which connects the intake to the air filter/silencer is shown in Figure U2.

2. Remove the two wing nuts securing the scoop to the body; remove the scoop.

Hot air scoop – To fit

Fit the scoop by reversing the procedure given for removal.

Automatic choke stove pipe – To check

To check the stove pipe for any blockage, carry out the following procedure.

1. Disconnect the choke stove pipe at its choke butterfly housing connection.
2. Connect the calibrated orifice (RH 8095) to the open end of the choke stove pipe, then connect a manometer capable of measuring 25 in. (63.50 cm.) of water level difference to the orifice (see Fig. U33).

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3. Run the engine until it reaches normal operating temperature then allow the engine to idle and observe the depression shown by the manometer reading. The correct reading should be between 16 in. and 20 in. (40,64 cm. and 50,80 cm.).

4. If the level difference is less than 16 in. (40,64 cm.), examine the pipe and remove any blockage. After removing the blockage, again check the manometer reading.

5. Remove the manometer and connect the choke stove pipe to the choke housing.

AUTOMATIC CHOKE – TO SET Adjustment to kick diaphragm

Refer to Chapter K Section K4.

Adjustment of the kick-gap

Refer to Chapter K Section K4.

Solenoid air gap

Refer to Chapter K Section K4.

Solenoid lever spring tension

Refer to Chapter K Section K4.

'Fast-idle' cam and vacuum retard tap

Refer to Chapter K Section K4.

Thermocoil

Refer to Chapter K Section K4.

Cold start 'fast-idle' – To check (see Chapter K Fig. K21 diagram D)

1. Set the cold start, 'fast-idle' speed with the engine at normal operating temperature.

2. With the engine stopped, depress the accelerator from within the bonnet and simultaneously close the choke butterfly against spring pressure by hand. Release the accelerator, so allowing the 'fast-idle' cam to turn, then release the choke butterfly, allowing the 'fast-idle' adjusting screw to rest on the high step of the cam; this will set the throttles in the cold start position.

3. Ensure that the gear range selector lever is in the Neutral 'N' position and that the handbrake is applied.

4. Remove the gear range actuator thermal cut-out from the main fusebox.

On current cars, see page U1—Introduction remove the cap from the pressure tapping on 'A' bank float chamber to render the weakener inoperative.

5. Start the engine.

6. Check to see that the 'fast-idle' adjusting screw is resting on the high step of the cam, unscrew the lock-nut and adjust the 'fast-idle' screw to set the engine speed at 2 000 r.p.m.; tighten the lock-nut, and check to ensure that the engine speed is still at 2 000 r.p.m. By slightly opening the throttles the cam will fall away; on releasing the throttles the engine will assume normal idling speed.

7. Stop the engine.

8. Fit the gear range actuator thermal cut-out to the mainfuse box.

Section U4

IGNITION SYSTEM, DISTRIBUTOR, IGNITION COIL AND SPARKING PLUGS

The following procedures apply to cars prior to Car Serial Number SRX 9001.

Data

Ignition timing T.D.C. at 500 r.p.m. (using stroboscope) in Neutral.

For all other information refer to Chapter A—General Information.

Contact points – To clean and adjust

Refer to Chapter M—Electrical System.

Ignition – To time (using a stroboscope)

1. Run the engine until the normal operating temperature is obtained and the automatic choke is off.

2. Stop the engine.

3. Check that the octane selector is set to the 'A' mark on the scale (see Fig. U35) and adjust if necessary. Adjustment is carried out by slackening the octane selector adjusting screw lock-nut (9) and turning the adjusting screw (10). If adjustment has been necessary, the octane selector should **not** be re-set to its original position unless inferior fuels are being used thus causing cylinder detonation during heavy engine load.

Note (a) Inferior fuels should only be used as a last resort; revert to the correct fuel as soon as possible and re-adjust the octane selector to its correct position.

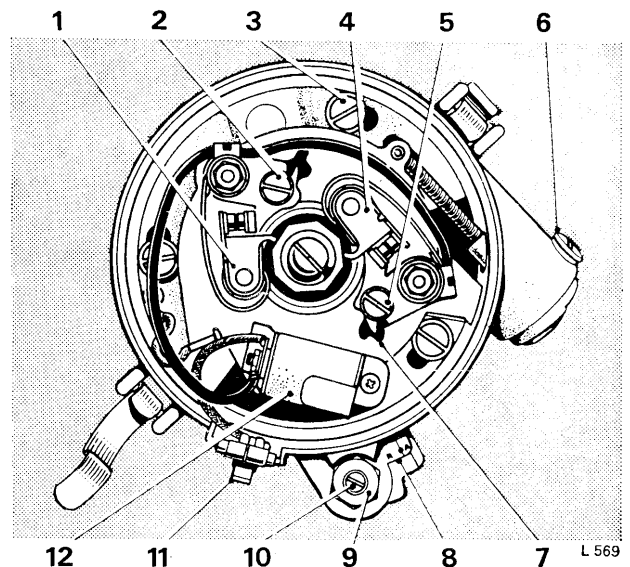


Fig. U35 INTERNAL VIEW OF DISTRIBUTOR
(Early Cars)

- 1 Break contact breaker
- 2 Fixed contact plate securing screw
- 3 Contact breaker housing securing screw
- 4 Make contact breaker
- 5 Fixed contact plate securing screw
- 6 Vacuum unit securing screw
- 7 Contact breaker gap adjusting slot
- 8 Octane selector
- 9 Octane selector adjusting screw lock-nut
- 10 Octane selector adjusting screw
- 11 L.T. terminal
- 12 Capacitor

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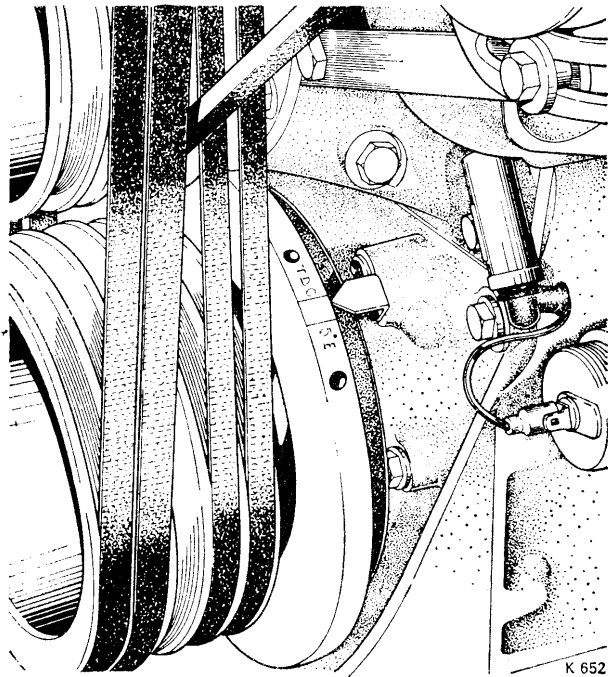


Fig. U36 CRANKSHAFT DAMPER TIMING MARKS

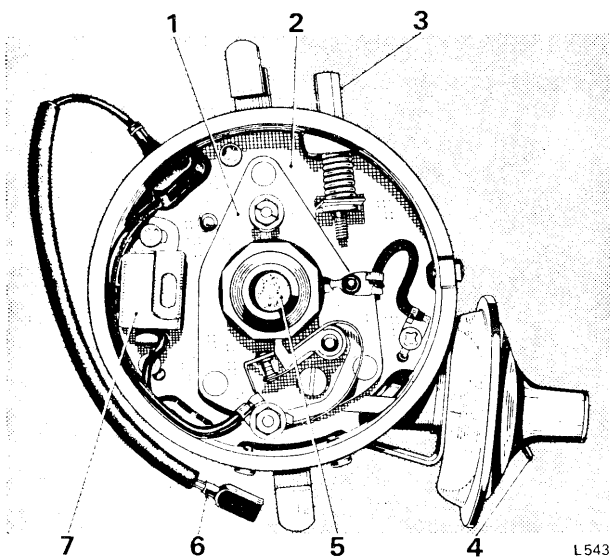


Fig. U37 INTERNAL VIEW OF DISTRIBUTOR (Later Cars)

- 1 Contact breaker bearing plate
- 2 Contact breaker base plate
- 3 Dwell angle adjuster
- 4 Vacuum retard connection
- 5 Felt pad
- 6 Low tension lead
- 7 Capacitor

(b) Ignition timing is carried out on A1 cylinder and should be set to T.D.C. The 'A' and 'B' bank sides of the engine are the left-hand and right-hand sides respectively when viewed from the front of the engine. The cylinders are numbered from the front of the engine.

4. Connect a stroboscope and an electric impulse tachometer to the ignition system as described in the manufacturer's instructions.

5. Start the engine then adjust the fixed throttle stop screw to give an idle speed of 500 r.p.m.

6. Direct the flashing light of the timer onto the crankshaft damper timing marks and timing pointer (see Fig. U36).

7. Check and adjust the ignition timing if necessary (i.e. T.D.C.).

8. To adjust the timing, release the clamp screw on the distributor and rotate the head of the distributor in the appropriate direction until the correct timing is obtained. Clockwise rotation of the distributor head advances the ignition and conversely anticlockwise rotation retards the ignition. After adjustment has been carried out, tighten the clamp screw and again check the timing to ensure that it has not altered whilst tightening the clamp screw.

9. Adjust the throttle stop screw to give an idle speed of between 550 r.p.m. and 600 r.p.m.

10. Switch off the ignition.

11. Remove the tachometer and stroboscopic timing equipment.

Coil

Refer to Chapter M—Electrical System.

Sparking plugs

Refer to Chapter M—Electrical System.

Distributor overhaul

Refer to Chapter M—Electrical System.

The following procedures apply to later cars (see Fig. U37 for distributor identification).

In addition to the normal centrifugal advance, the ignition distributor is fitted with a vacuum retard mechanism.

A throttle operated tap controls the vacuum applied to the distributor, retarding the ignition timing at idle and over-run speeds for improved exhaust emission control.

A thermal vacuum switch is fitted to prevent engine

overheating during prolonged idling. This switch interrupts the vacuum line to the throttle operated tap when a predetermined coolant temperature is reached. The thermal vacuum switch de-activates the vacuum retard mechanism and advances the ignition timing to the normal setting.

A vacuum actuated throttle stop is fitted to prevent an excessive increase in idle speed. When idling at normal temperatures a depression is applied to both the distributor retard capsule and the throttle stop vacuum actuator. (The throttle stop vacuum actuator controls the idle speed). Both the retard capsule and the vacuum throttle stop are de-activated simultaneously when the throttle vacuum switch operates at high coolant temperatures. This permits the carburetter throttles to close until the throttle lever contacts the fixed throttle stop. The fixed throttle stop is set to maintain the normal idle speed.

Data

Ignition timing T.D.C. (static) 5° B.T.D.C. at 800 r.p.m. (using stroboscope) in Neutral with the vacuum retard disconnected.

For all other information refer to Chapter A—General Information.

Contact points – To clean and adjust

Refer to Chapter M—Electrical System.

Ignition – To time (using a stroboscope)

1. Run the engine until the normal operating temperature is obtained and the automatic choke is off.

2. Stop the engine.

Note Ignition timing is carried out on A1 cylinder and should be set to 5° B.T.D.C. A1 cylinder is the front cylinder on the left-hand side when viewed from the front of the engine.

3. Disconnect the vacuum pipe from the vacuum retard tap and blank off the connection at the tap.

4. Connect a stroboscope and an electric impulse tachometer to the ignition system as described in the manufacturer's instructions.

5. Start the engine and adjust the fixed throttle stop screw to give an idle speed of 800 r.p.m.

Note The speed of 800 r.p.m. must be set by approach from a higher speed.

6. Direct the flashing light of the stroboscope onto the crankshaft damper timing marks and timing pointer; the pointer is positioned on the right-hand side of the crankshaft damper when viewed from the front of the engine (see Fig. U36).

7. Check and if necessary adjust the ignition timing (i.e. 5° B.T.D.C.).

8. To adjust the timing, release the clamp screw on the distributor and rotate the head of the distributor in the appropriate direction until the correct timing is obtained. Clockwise rotation of the distributor head advances the ignition and conversely anti-clockwise rotation retards the ignition. After adjustment has been carried out tighten the clamp screw and again check the ignition timing to ensure that it has not altered whilst tightening the clamp screw.

9. Connect the vacuum pipe to the vacuum retard tap.

10. Adjust the vacuum throttle stop screw to give an engine idle speed of 600 r.p.m.

11. Check the operation of the vacuum retard tap and reset if necessary (see *Vacuum retard tap—To set*).

12. Switch off the ignition.

13. Remove the tachometer and stroboscopic timing equipment.

Vacuum retard tap – To set

1. Connect an electric impulse tachometer to the ignition system as described in the manufacturer's instructions.

2. Disconnect the vacuum line at the distributor retard connection and insert a vacuum gauge capable of measuring between Zero and 30 in. Hg. into the line, retaining the connection to the distributor.

3. Start and run the engine until the normal operating temperature is obtained and the automatic choke is off.

4. Set the vacuum retard tap (see Fig. U39) using the adjusting screw. Adjust the screw until the tap closes at the minimum throttle opening consistent with maintaining 14 in. Hg. at the distributor with the engine idling at 600 r.p.m.

5. Remove the vacuum gauge and connect the vacuum line to the distributor. Check and if necessary, using the vacuum throttle stop screw, re-adjust the idle speed to 600 r.p.m.

6. Switch off the ignition.

7. Remove the tachometer.

Coil

Refer to Chapter M.—Electrical System.

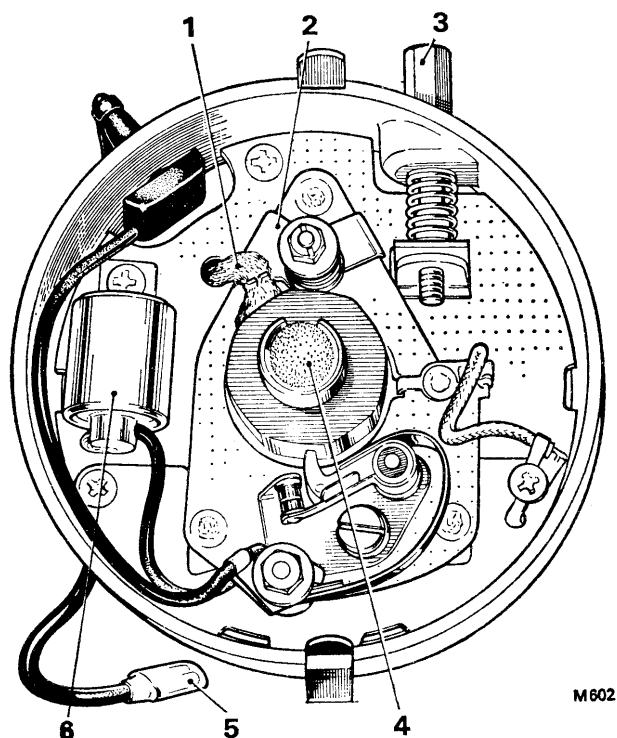
Sparking plugs

Refer to Chapter M—Electrical System.

Distributor overhaul

Refer to Chapter M—Electrical System.

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**Fig. U38 INTERNAL VIEW OF DISTRIBUTOR
(Current Cars)**

- 1 Felt lubrication pad
- 2 Contact breaker bearing plate
- 3 Dwell angle adjuster
- 4 Felt lubrication pad
- 5 Low tension lead
- 6 Capacitor

The following procedures apply to current cars (see Fig. U38 for distributor identification).

In addition to the normal centrifugal advance, the ignition distributor is fitted with a vacuum retard timing control.

A throttle operated tap controls the vacuum applied to the distributor, retarding the ignition timing at idle and over-run speeds for improved exhaust emission control.

A thermal vacuum switch is fitted to prevent engine overheating during prolonged idling. This switch interrupts the vacuum line to the throttle operated tap when a predetermined coolant temperature is reached. The thermal vacuum switch deactivates the vacuum retard mechanism and advances the ignition timing to the normal setting.

A vacuum actuated throttle stop is fitted to prevent an excessive increase in idle speed. When idling at normal temperatures a depression is applied to both

the distributor retard capsule and the throttle stop vacuum actuator. (The throttle stop vacuum actuator controls the idle speed). Both the retard capsule and the vacuum throttle stop are de-activated simultaneously when the throttle vacuum switch operates at high coolant temperatures. This permits the carburettor throttles to close until the throttle lever contacts the fixed throttle stop. The fixed throttle stop is set to maintain the normal idle speed.

Data

Ignition timing	...	T.D.C. (Static) 5° B.T.D.C. at 800 r.p.m. (stroboscopic) in Neutral with vacuum retard disconnected. (approach 800 r.p.m. from a higher speed).
Make and type	...	Lucas 35 D8. Eight lobe cam with single large contact breaker.
Rotation	Anti-clockwise, viewed from the top.
Advance mechanism		Automatic centrifugal advance with built-in vacuum retard timing control.
Note Vacuum control fitted to exhaust emission control engines only.		
Firing order	A1, B1, A4, B4, B2, A3, B3, A2.
Dwell angle	26° to 28°.
Contact arm spring pressure	18 oz. to 24 oz. (510 gm. to 680 gm.).
Condenser capacity	0.18 mfd. to 0.25 mfd.
Drive	Through camshaft skew gears.

Contact points – To adjust

Refer to Chapter M—Electrical System.

Ignition – To time (using a stroboscope)

The timing of the ignition is carried out on A1 cylinder (left-hand front cylinder as viewed from the front of the engine).

1. Check the condition of the contact breaker points and set the gap to a nominal 0.014 in. to 0.016 in. (0,356 mm. to 0,406 mm.). Fit new points if necessary.

2. Start the engine and run until normal operating temperature is obtained. Ensure that the choke fast-idle is off.

3. Stop the engine, disconnect the distributor vacuum pipe from the vacuum retard tap and blank off the connection on the tap.

4. Connect a stroboscope and impulse tachometer in accordance with the manufacturer's instructions.

5. Start the engine and set the speed to 800 r.p.m. by means of the fixed throttle stop screw. Ensure that the adjustment screw is clear of the throttle stop vacuum unit.

Note The speed of 800 r.p.m. must be set by approach from a higher speed.

6. Using a dwell meter set the dwell angle to within limits of 26° and 28° by means of the adjusting screw (see Fig. U38).

Note To remove any backlash from the distributor mechanism finally set the dwell angle by approaching from a minimum of 32° .

7. Direct the stroboscope light onto the crankshaft damper and timing pointer. Slacken the distributor clamp bolt and adjust the distributor to set the timing at 5° B.T.D.C. Tighten the clamp bolt and check that the timing is still 5° B.T.D.C.

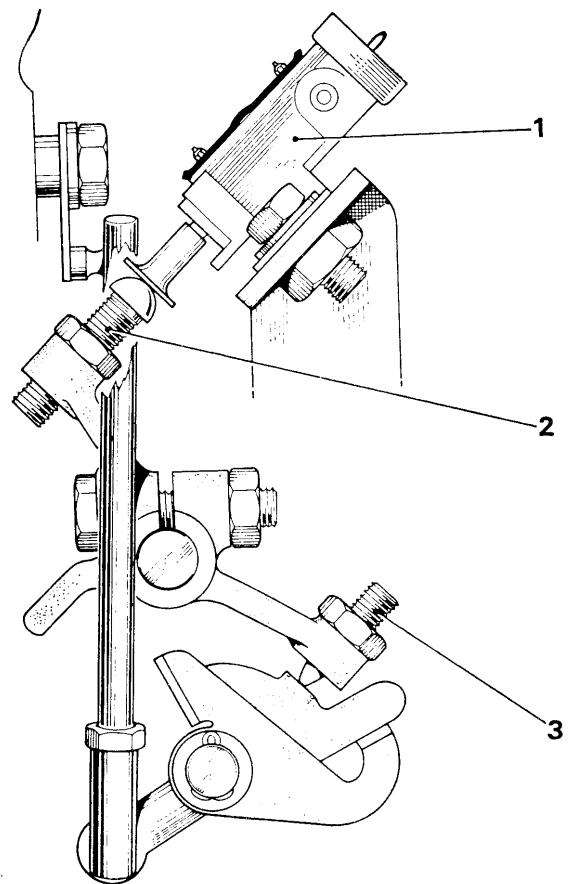
8. Set the engine idle speed to 680 r.p.m. by adjusting the fixed throttle stop screw.

9. Connect the vacuum pipe to the vacuum retard tap.

10. Adjust the engine idle speed to 600 r.p.m. using the throttle stop vacuum unit adjusting screw, tighten the lock-nut.

11. Disconnect the vacuum line at the distributor retard capsule and 'Tee' in a vacuum gauge (0-30 in. Hg.) to the line; retain the connection to the distributor.

12. Set the vacuum retard tap by means of adjusting the screw, item 2 in Figure U39, so that the tap



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Fig. U39 VACUUM RETARD TAP ADJUSTMENT

- 1 Vacuum retard tap
- 2 Vacuum retard tap adjusting screw
- 3 Fast-idle adjusting screw

closes at the minimum throttle opening consistent with maintaining 14 in. Hg. minimum at the distributor when the engine is idling.

13. Reconnect the vacuum line to the distributor, check and re-adjust idle speed of necessary using the throttle stop vacuum unit adjusting screw.

Section U5

PERIODIC LUBRICATION AND MAINTENANCE

The 'Essential' maintenance which is listed in the following schedules is the minimum servicing which must be carried out at the appropriate distance/time intervals, in order to comply with the Rolls-Royce Motors Limited warranty and the U.S. Federal and California Emission Regulations.

The 'Preventive' maintenance listed, is aimed at securing the maximum life and efficiency for the vehicle and will be carried out on request.

ESSENTIAL MAINTENANCE

This schedule is applicable to cars prior to Car Serial Number SRX 9001 and later cars, see page U1—Introduction.

INITIAL SERVICE

This service will be carried out by the Dealer after the first 3 000 miles or 3 months whichever is the earlier. **Items marked * will be carried out free of charge.**

**INITIAL 3 000 MILES OR 3 MONTHS
WHICHEVER IS THE EARLIER****Engine**

Change engine oil.

Torque converter transmission

Check the fluid level and top-up if necessary, check the level with the engine running.

Engine cooling system

Tighten all coolant hose worm drive clips.

***Air injection pump**

Check the tension of the pump driving belt.

***Ignition system**

Check the distributor contact breaker gaps and adjust if necessary. Check the ignition timing and adjust if necessary.

***Choke stove pipe**

Check the depression in the choke stove pipe.

***Carburettors**

Check the oil level in the air valve dampers and top-up if necessary. Check the tightness of the float chamber covers.

Check float chamber depression. Check the exhaust C.O. emission and if necessary reset carburetter balance, mixture strength and idle speed. Check and if necessary reset the cold start fast-idle speed.

**EVERY 3 000 MILES OR 3 MONTHS
WHICHEVER IS THE EARLIER****Engine**

If the car is used for constant stop-start operation, change the engine oil.

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EVERY 6 000 MILES OR 6 MONTHS WHICHEVER IS THE EARLIER

Engine

Change the engine oil and renew the oil filter element.

Brakes

Inspect the brake pad linings for wear, including the handbrake pads. When renewing the footbrake pads examine the condition of the dust excluders on the calipers. Although it is normally recommended that the face of the footbrake pad should not be less than 0.125 in. (3,2 mm.) from the back-plate, the mechanic should be able to determine, through experience, whether or not the brake pad linings are of sufficient thickness to satisfactorily complete 6 000 miles to the next service. Should the lining back-plate ever contact the brake disc, the resultant damage will necessitate renewal of the disc. Manually adjust the handbrake pads. Inspect all 'Bundy' brake pipes and connections for signs of corrosion.

Check the following level

Check the fluid level of the torque converter transmission and top-up if necessary.

EVERY 12 000 MILES OR 12 MONTHS WHICHEVER IS THE EARLIER

Engine

Change the engine oil and renew the oil filter element.

Torque converter transmission

Drain the transmission sump and refill with an approved fluid.

Brakes

Inspect the brake pad linings for wear, including the handbrake pads. When renewing the footbrake pads, examine the condition of the dust excluders on the calipers. Although it is normally recommended that the face of the footbrake pad should not be less than 0.125 in. (3,2 mm.) from the back-plate, the mechanic should be able to determine, through experience, whether or not the brake pad linings are of sufficient thickness to satisfactorily complete 6 000 miles to the next service. Should the lining back-plate ever contact the brake disc, the resultant damage will necessitate the renewal of the disc. Manually adjust the handbrake pads. Inspect all 'Bundy' brake pipes and connections for signs of corrosion.

Ignition system

Renew the sparking plugs, ensuring that the gaps are set to between 0.023 in. and 0.028 in. (0,58 mm. and 0,71 mm.). Lubricate the distributor spindle, automatic advance mechanism and the shaft bearings with engine oil. Smear the distributor cam with the approved grease. Renew the contact breaker points and set the gaps. Check the ignition timing and reset if necessary.

Crankcase breather system

Remove and clean the gauze flame traps in the crankcase breather tube and also clean the adaptor in the choke butterfly housing.

Air injection pump belt tension

Check the tension of the belt driving the air injection pump.

Air injection pump intake filter

Remove and clean the intake filter element.

Air injection system

Check the system for leaks and correct functioning; renew any defective items.

Carburettors

Clean the air valves in the carburettors. Check the oil level in the air valve dampers and top-up if necessary. Ensure that the float chamber lids are securely tightened. Remove the inlet unions from the float chambers and clean the filters. Reset the carburetter balance and engine idle speed. Check the cold start idle speed (and also the idle speed with the refrigeration system operating, if fitted); reset if necessary.

Steering mechanism

Lubricate the six grease nipples with the approved grease.

Air silencer/filter

Clean and oil the wire mesh filter elements (if fitted) or renew the paper filter elements (if fitted).

Check the following oil level

Check the oil level in the final drive unit and top-up if necessary.

**EVERY 24 000 MILES OR 2 YEARS
WHICHEVER IS THE EARLIER**

Air injection pump intake filter

Remove and clean the intake filter element.

Air injection system

Check the system for leaks and correct functioning; renew any defective items.

Fuel evaporation emission control canister

Renew the foam filter element in the canister.

**Fuel evaporation emission control
purge line filter**

Fit a new purge line filter.

Carburettor mixture weakening device

Renew the air filter element for the fuel mixture weakening device.

Carburetters

Clean the air valves in the carburetters. Ensure that the float chamber lids are securely tightened. Check the oil level in the air valve dampers. Remove the inlet unions from the float chambers and clean the filters. Reset carburettor balance and engine idle speed. Check the cold start idle speed (and also the idle speed with the refrigeration system operating, if fitted); reset if necessary.

Air silencer/filter

Clean and oil the wire mesh filter elements (if fitted) or renew the paper filter elements (if fitted).

Steering mechanism

Lubricate the six grease nipples with the approved grease.

Final drive unit

Drain when hot and refill with an approved oil.

Chapter U

PREVENTIVE MAINTENANCE

This schedule is applicable to Cars prior to Car Serial Number SRX 9001 and later cars, see page U1—Introduction.

INITIAL SERVICE

This service should be carried out by the Dealer after the first 3 000 miles or 3 months whichever is the earlier.

INITIAL 3 000 MILES OR 3 MONTHS WHICHEVER IS THE EARLIER

Belt tension

Check the tension of the belts driving the following. Fan and steering pump, generator or alternator, and the refrigeration compressor (if fitted).

Steering pump

Check the level of the fluid in the power steering pump reservoir and top-up as required.

EVERY 6 000 MILES OR 6 MONTHS WHICHEVER IS THE EARLIER

Belt tension

Check the tension of the belts driving the following. Fan and steering pump, generator or alternator and the refrigeration compressor (if fitted). Renew any belts which show signs of wear.

Ignition system

Clean the sparking plugs and set the gaps to between 0.023 in. and 0.028 in. (0,58 mm. and 0,71 mm.). Test the sparking plugs. Lubricate the distributor spindle, automatic advance mechanism and shaft bearings with engine oil. Smear the contact breaker cam with the specified grease. Clean and check the contact breaker gaps and reset if necessary. Check, and if necessary, reset the ignition timing.

Control linkages

Apply a few drops of engine oil to the accelerator linkage and to the gear range selector controls adjacent to the transmission casing.

Carburettors

Check the oil level in the air valve dampers and top-up

if necessary.

Electrical system

Ensure that all lamps, instruments and air conditioning controls are operating satisfactorily.

Check the following levels and pressures

Check the fluid level in the power steering pump reservoir and top-up if necessary.

Check the level and specific gravity of the engine coolant and correct if necessary.

Run the engine for four minutes then check the hydraulic reservoir fluid levels; top-up if necessary with the specified fluid.

Check the level of electrolyte in the battery and top-up with distilled water if necessary.

Check the tyre pressures and adjust if necessary.

EVERY 12 000 MILES OR 12 MONTHS WHICHEVER IS THE EARLIER

Belt tension

Check the tension of the belts driving the following. Fan and steering pump, generator or alternator and the refrigeration compressor (if fitted). Renew any belts which show signs of wear.

Control linkages

Apply a few drops of engine oil to the accelerator linkage and to the gear range selector controls adjacent to the transmission casing.

Handbrake linkage

Lubricate the pivot pins and pulleys in the handbrake system with the approved grease.

Spare wheel

Lubricate the spare wheel lowering bolt and mechanism.

Electrical system

Ensure that all lamps, instruments and air conditioning controls are operating satisfactorily.

Check the following levels and pressures

Check the fluid level in the power steering pump reservoir and top-up if necessary.

Check the level and specific gravity of the engine coolant and correct if necessary.

Check the fluid level in the steering idler box damper and top-up if necessary.

Check the level of electrolyte in the battery and top-up with distilled water if necessary.

Run the engine for four minutes then check the hydraulic fluid levels; top-up if necessary.

Check the tyre pressures and adjust if necessary.

EVERY 24 000 MILES OR 2 YEARS WHICHEVER IS THE EARLIER

Control linkages

Apply a few drops of engine oil to the accelerator linkage and to the gear range selector controls adjacent to the transmission casing.

Steering pump (Holbourn Eaton)

Renew the filter element in the pump reservoir.

Fuelpumps

Remove the fuel pump from the car and test on the bench. Fit a new pump unit if the performance is below the specified level (refer to Chapter K—Fuel System of this Workshop Manual T.S.D. 2476).

Handbrake linkage

Lubricate the pivot pins and pulleys in the handbrake system with the approved grease. On cars with exposed front cables, dismantle the pulley housings and pack with approved grease.

Spare wheel

Lubricate the spare wheel lowering bolt and mechanism.

Electrical system

Ensure that all lamps, instruments and air conditioning controls are operating satisfactorily.

Alternator (if fitted)

Examine the slip rings and brushes for wear and check the brushes for freedom of movement in their holders (refer to Chapter M—The Electrical Section of this Workshop Manual T.S.D. 2476).

Generator (if fitted)

Examine the commutator and brushes for wear and the brushes for freedom of movement in their holders (refer to Chapter M—The Electrical Section of this Workshop Manual T.S.D. 2476).

Fuel tank

Remove the drain plug and allow any accumulated water to drain away. Refit the drain plug and add four S.B.N. Inhibitors to the fuel tank.

Fuel filter

Renew the main line filter element and clean the filter bowl.

Height control mechanism

Disconnect the control valve linkage ball joints. Clean, grease and refit the ball joints.

Rear wheel drive-shafts

Lubricate the rear wheel drive-shaft outer universal couplings with an approved grease.

Check the following levels and pressures

Check the fluid level in the power steering pump reservoir and top-up if necessary.

Check the level and specific gravity of the engine coolant and correct if necessary.

Check the level of electrolyte in the battery and top-up with distilled water if necessary.

Check the fluid level in the steering idler box damper and top-up if necessary.

Run the engine for four minutes then check the hydraulic reservoir fluid levels; top-up if necessary.

On Convertible cars, check the fluid level in the hood mechanism reservoir and top-up if necessary.

Check the tyre pressures and adjust if necessary.

SEASONAL SCHEDULES EVERY 12 MONTHS

Engine cooling system

Drain the coolant from the radiator and the engine crankcase. Clean any debris from the surfaces of the

Chapter U

refrigeration condenser and radiator matrices by reverse flushing with a hose. This should be carried out just prior to the Autumn. Fill the system with the correct anti-freeze mixture. (refer to *Chapter L—The Engine Cooling System of this Workshop Manual T.S.D. 2476*).

Air conditioning system

Ensure that the foam filter element fitted to the scuttle intake grille is free from obstruction. On Long Wheelbase cars fitted with a centre division, check that the foam filter element fitted to the intake grille in the rear decking panel is free from obstruction.

Refrigeration system (if fitted)

These operations should be carried out only by an experienced refrigeration engineer.

Check that the refrigeration system is functioning correctly. If necessary, top-up the system with refrigerant. If loss of refrigerant is evident, check the system for leakage. Visually check the refrigeration compressor for oil leakage, if oil leakage is apparent check the oil level and top-up if necessary. In the event of a major oil loss check and repair before topping-up (refer to *Chapter C—Air Conditioning of this Workshop Manual T.S.D. 2476*).

Body

Check that the body drain holes are free from foreign matter.

EVERY 2 YEARS

In addition to the 12 monthly schedule, carry out the following.

Engine cooling system

Drain the coolant from the radiator and engine crankcase. Thoroughly reverse flush the coolant passages with a continuous flow of water. Change the coolant hoses where necessary. Fit a new engine coolant thermostat. Fill the system with the correct anti-freeze mixture.

SERVICE RECOMMENDATIONS BRAKE AND HYDRAULIC SYSTEM COMPONENTS

48 000 miles

At this mileage and under normal motoring conditions it is recommended that the following servicing is carried out.

Renew the following flexible high pressure hoses; the front and rear brake pumps to accumulator hoses, the front and rear accumulator to frame hoses. Examine the sub-frame to brake caliper hoses for chafing or surface cracking; renew if necessary. Renew the disc brake caliper seals, the deceleration conscious pressure limiting valve seals and the master cylinder seals. Completely drain the fluid from the hydraulic circuits and then fill with Castrol-Girling Brake Fluid Green. This fluid exceeds specification S.A.E. J 1703b in many respects. Bleed the braking systems and automatic height control system.

96 000 miles

At this mileage and under normal motoring conditions it is recommended that the following servicing is carried out.

Renew all the flexible hoses to the braking systems and the automatic height control system. Renew the disc brakes caliper seals, the deceleration conscious pressure limiting valve seals and the master cylinder seals. Completely drain the fluid from the hydraulic circuits and then fill with Castrol-Girling Brake Fluid Green. This fluid exceeds specifications S.A.E. J 1703b in many respects. Bleed the braking systems and automatic height control system.

SPECIAL PRECAUTIONS

Should the car be used in very cold temperatures, drain the engine sump when thoroughly warm and also drain the carburetter air valve dampers. The engine sump and carburetter air valve dampers should then be filled with oil having the following viscosity.

For constant temperatures of between 0°C. and -23°C. (32°F and -10°F.), use a 10W/30 grade oil.

For constant temperatures of -23°C. (-10°F.) and below, use a 5W/20 grade oil.

ESSENTIAL MAINTENANCE

This schedule is applicable to current cars, see page U1—Introduction.

INITIAL SERVICE

This service will be carried out by the Dealer after the first 3 000 miles or 3 months whichever is the earlier. **Items marked * will be carried out free of charge.**

INITIAL 3 000 MILES OR 3 MONTHS SERVICE WHICHEVER IS THE EARLIER***Air injection pump**

Check belt tension and reset if necessary.

***Automatic choke**

Check the flow through the choke stove pipe, and check for correct operation.

***Carburettors**

Check oil level in air valve dampers and if necessary top-up to correct level. Check tightness of float chamber covers. Check float chamber depression. Check and if necessary reset the idle speed. Check and if necessary reset the choke fast-idle speed.

***Fuel evaporation emission control system**

Check the purge rate; this should be between 50 c.f.h. and 70 c.f.h. at 600 r.p.m. in neutral. Pressure test the fuel tank and evaporative loss line and if necessary rectify any leaks.

***Ignition system**

Check distributor dwell angle and adjust if necessary. Correct dwell angle is 26° to 28°. Check ignition timing using stroboscope and reset if necessary; timing should be 5° B.T.D.C. at 800 r.p.m. with vacuum retard disconnected. Check operation of vacuum retard tap and reset if necessary.

Cooling system

Tighten worm-drive clips of all coolant hoses.

Engine

Change engine oil.

Torque control transmission

Check fluid level and top-up if necessary.

EVERY 3 000 MILES OR 3 MONTHS WHICHEVER IS THE EARLIER**Engine**

If the car is used for constant stop/start operation, change the engine oil.

EVERY 6 000 MILES OR 6 MONTHS WHICHEVER IS THE EARLIER**Engine**

Change engine oil and renew oil filter element.

Torque converter transmission

Check fluid level and top-up if necessary.

Brakes

Inspect footbrake and handbrake pad linings. When changing footbrake pads examine condition of dust excluders on calipers. Manually adjust the handbrake pads. Inspect pipes and connections.

EVERY 12 000 MILES OR 12 MONTHS SERVICE WHICHEVER IS THE EARLIER**Air injection pump**

Check tension of pump pulley driving belt. Remove and clean pump intake filter element.

Air injection system

Check air injection system for leaks and correct functioning. Renew any defective items.

Carburettors

Top-up oil level in air valve dampers. Check tightness of float chamber covers. Check float chamber depression. Check and if necessary reset the idle speed. Check and if necessary, reset choke idle speed.

Engine breather system

Remove and clean gauze flame traps in the crankcase breather tube. Clean the adaptor in choke butterfly housing.

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Fuel evaporation emission control system

Renew the foam filter element in the evaporation loss control canister.

Ignition system

Renew the sparking plugs ensuring that the gaps are set correctly. Renew contact breaker points and set dwell angle. Correct dwell angle is 26° to 28°. Replace distributor lubrication pad. Lubricate distributor spindle, automatic advance mechanism and shaft bearings with engine oil. Check ignition timing using stroboscope and reset if necessary; timing should be 5° B.T.D.C. at 800 r.p.m. with the vacuum retard disconnected.

Air silencer

Clean and oil the wire mesh filter elements.

Brakes

Inspect footbrake and handbrake pad linings. When changing footbrake pads examine condition of dust excluders on calipers. Manually adjust handbrake pads. Inspect pipes and connections.

Engine

Change engine oil and renew oil filter element.

Final drive unit

Check oil level and top-up if necessary.

Steering mechanism

Lubricate mechanism at the six grease nipples.

Torque converter transmission

Renew transmission fluid.

**EVERY 18 000 MILES OR 18 MONTHS
SERVICE WHICHEVER IS THE EARLIER**

Engine

Change engine oil and renew oil filter element.

Torque converter transmission

Check fluid level and top-up if necessary.

Brakes

Inspect footbrake and handbrake pad linings. When changing footbrake pads examine condition of dust excluders on calipers. Manually adjust the handbrake pads. Inspect pipes and connections.

**EVERY 24 000 MILES OR 2 YEARS
SERVICE WHICHEVER IS THE EARLIER**

Air injection pump

Check tension of pump pulley driving belt. Remove and clean pump intake filter element.

Air injection system

Check air injection system for leaks and correct functioning. Renew any defective items.

Carburettors

Clean air valves. Top-up oil level in air valve dampers. Check tightness of float chamber covers. Check float chamber depression. Check and if necessary, reset the idle speed. Check and if necessary, reset choke idle speed.

Carburetter mixture weakening device

Renew air filter element for the carburetter mixture weakening device.

Choke stove pipe

Check the flow through the choke stove pipe and check the system for correct functioning.

Engine breather system

Remove and clean gauze flame traps in crankcase breather tube. Clean the adaptor in choke butterfly housing.

Fuel evaporation emission control system

Renew the foam filter element in the evaporation loss control canister. Check the purge rate; this should be between 50 c.f.h. and 70 c.f.h. at 600 r.p.m. in neutral. Renew the purge line filter if necessary.

Ignition system

Renew the sparking plugs ensuring that the gaps are set correctly. Renew contact breaker points and set

dwel angle. Correct dwel angle is 26° to 28°. Replace distributor lubrication pad. Lubricate distributor spindle, automatic advance mechanism and shaft bearings with engine oil. Check ignition timing using stroboscope and reset if necessary; timing should be 5° B.T.D.C. at 800 r.p.m. with the vacuum retard disconnected.

Air silencer

Clean and oil the wire mesh filter elements.

Brakes

Inspect footbrake and handbrake pad linings. When changing footbrake pads examine condition of dust excluders on calipers. Manually adjust handbrake pads. Inspect pipes and connections.

Engine

Change engine oil and renew oil filter element.

Final drive unit

Change Oil.

Steering mechanism

Lubricate mechanism at the six grease nipples.

Torque converter transmission

Change transmission fluid after initial 24 000 miles/2 years whichever is the earlier, renew intake strainer.

Chapter U

PREVENTIVE MAINTENANCE

This schedule is applicable to current cars, see page U1—Introduction

INITIAL SERVICE

This service should be carried out by the Dealer after the first 3 000 miles or 3 months whichever is earlier.

Belt tension

Check the tension of the belts driving the following fan and steering pump, alternator and refrigeration compressor. Adjust the belt tension as necessary.

Steering pump

Check the oil level in the reservoir; top-up if necessary.

EVERY 6 000 MILES OR 6 MONTHS WHICHEVER IS EARLIER

Air silencer

Remove and clean the wire mesh filter elements.

Carburettors

Check the oil level in the air valve dampers and top-up if necessary.

Ignition system

Check the distributor dwell angle and adjust if necessary.

Check the ignition timing using a stroboscope and adjust if necessary.

Steering pump

Check for leaks. If necessary top-up the level in the steering pump reservoir.

Belt tension

Check the tension of the belts driving the following fan and steering pump, alternator and refrigeration compressor. Renew any belts which show signs of wear.

Control linkages

Apply a few drops of engine oil to the accelerator linkage and to the gear range selector controls adjacent to the transmission casing.

Electrical system

Ensure that all lamps, instruments and air conditioning controls are operating satisfactorily.

Check the following levels and pressures

Run the engine for four minutes then check the hydraulic reservoir fluid levels; top-up if necessary with the specified fluid.

Check the level of electrolyte in the battery and top-up with distilled water if necessary.

Check the tyre pressures and adjust if necessary.

EVERY 12 000 MILES OR 12 MONTHS WHICHEVER IS THE EARLIER

Belt tension

Check the tension of the belts driving the following fan and steering pump, alternator and the refrigeration compressor. Renew any belts which show signs of wear.

Control linkage

Apply a few drops of engine oil to the accelerator linkage and to the gear range selector controls adjacent to the transmission casing.

Handbrake linkage

Lubricate the pivot pins and pulleys in the handbrake system with approved grease.

Spare wheel

Lubricate the spare wheel lowering bolt and mechanism.

Electrical system

Ensure that all lamps, instruments and air conditioning controls are operating satisfactorily.

Check the following levels and pressures

Check the fluid level in the power steering pump reservoir and top-up if necessary.

Check the level and specific gravity of the engine coolant and correct if necessary.

Check the fluid level in the steering idler box damper and top-up if necessary.

Check the level of electrolyte in the battery and top-up with distilled water if necessary.

Run the engine for four minutes then check the hydraulic fluid levels; top-up if necessary.

Check the tyre pressures and adjust if necessary.

EVERY 24 000 MILES OR 2 YEARS WHICHEVER IS THE EARLIER

Belt tension

Check the tension of the belts driving the following fan and steering pump, alternator and the refrigeration compressor.

Renew any belts which show signs of wear.

Alternator

Check the slip rings and the brushes for wear; also check the brushes for freedom in their holders.

Control linkage

Apply a few drops of engine oil to the accelerator linkage and to the gear range selector controls adjacent to the transmission casing.

Fuel pump

Remove the fuel pump from the car and test on the bench. Fit a new pump unit if the performance is below the specified level. (*refer to Chapter K—Fuel System of this Workshop Manual T.S.D. 2476.*)

Handbrake linkage

Lubricate the pivot pins and pulleys in the handbrake system with approved grease.

Spare wheel

Lubricate the spare wheel lowering bolt and mechanism.

Electrical system

Ensure that all lamps, instruments and air conditioning controls are operating satisfactorily.

Fuel tank

Remove the drain plug and allow any accumulated water to drain away. Fit the drain plug. Add four S.B.N. Inhibitors to the fuel tank.

Fuel filter

Renew the main line filter element and clean the filter bowl.

Height control mechanism

Disconnect the control valve linkage ball joints. Clean, grease and refit the ball joints.

Rear wheel drive-shaft

Lubricate the rear wheel drive-shaft outer universal couplings with an approved grease.

Check the following levels and pressures

Check the fluid level in the power steering pump reservoir and top-up if necessary.

Check the level and specific gravity of the engine coolant and correct if necessary.

Check the fluid level in the steering idler box damper and top-up if necessary.

Check the level of electrolyte in the battery and top-up with distilled water if necessary.

SEASONAL SCHEDULE EVERY 12 MONTHS

Engine cooling system

Drain the coolant from the radiator and the engine crankcase. Clean any debris from the surfaces of the refrigeration condenser and radiator matrices by reverse flushing with a hose. This should be carried out just prior to the Autumn. Fill the system with the correct anti-freeze mixture (*refer to Chapter L—Engine Cooling System of this Workshop Manual T.S.D. 2476.*)

Air conditioning system

Ensure that the foam filter element fitted to the scuttle intake grille is free from obstruction. On Long Wheelbase cars fitted with a centre division, check that the foam filter element fitted to the intake grille in the rear decking panel is free from obstruction.

Refrigeration system (if fitted)

These operations should be carried out only by an experienced refrigeration engineer.

Check that the refrigeration system is functioning correctly. If necessary, top-up the system with refrigerant. If loss of refrigerant is evident, check the system for leakage. Visually check the refrigerant compressor for oil leakage, if oil leakage is apparent check the oil level and top-up if necessary. In the event of a major oil loss check and repair before topping-up (*refer to Chapter C—Air Conditioning of this Workshop Manual T.S.D. 2476.*)

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Body

Check that the body drain holes are free from foreign matter.

EVERY 2 YEARS

In addition to the 12 monthly schedule, carry out the following.

Engine cooling system

Drain the coolant from the radiator and engine crankcase. Thoroughly reverse flush the coolant passages with a continuous flow of water. Change the coolant hoses where necessary. Fit a new engine coolant thermostat. Fill the system with the correct anti-freeze mixture.

SERVICE RECOMMENDATIONS BRAKE AND HYDRAULIC SYSTEM COMPONENTS

48 000 Miles

At this mileage and under normal motoring conditions it is recommended that the following servicing is carried out.

Renew the following flexible high pressure hoses; the front and rear brake pumps to accumulator hoses; the front and rear accumulator to frame hoses. Renew the disc brake caliper seals, the deceleration conscious pressure limiting valve seals, and the master cylinder seals. Completely drain the fluid from the hydraulic

circuits and then fill with Castrol-Girling Brake Fluid Green. This fluid exceeds specification S.A.E. J 1703b in many respects. Bleed the braking systems and automatic height control system.

96 000 Miles

At this mileage and under normal motoring conditions it is recommended that the following servicing is carried out.

Renew all the flexible hoses to the braking systems and the automatic height control system. Renew the disc brakes caliper seals, the deceleration conscious pressure limiting valve seals and the master cylinder seals. Completely drain the fluid from the hydraulic circuits and then fill with Castrol-Girling Brake Fluid Green. This fluid exceeds specification S.A.E. J 1703b in many respects. Bleed the braking systems and automatic height control system.

SPECIAL PRECAUTIONS

Should the car be used in very cold temperatures, drain the engine sump when thoroughly warm and also drain the carburetter air valve dampers. The engine sump and carburetter air valve dampers should then be filled with oil having the following viscosity.

For constant temperatures of between 0°C. and — 23°C. (32°F. and —10°F.), use a 10W/30 grade oil.

For constant temperatures of —23°C. (—10°F.) and below, use a 5W/20 grade oil.

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Section U6

FAULT DIAGNOSIS

(Revised January 1972)

SYMPTOM	POSSIBLE CAUSE	ACTION
<p>Exhaust Emission Control System</p> <p>1. Engine backfires on over-run.</p>	<p>1.(a) Pump drive belt slack.</p> <p>(b) Severe air leak in system probably between control valve and carburetter 'Tee' piece.</p> <p>(c) Control valve sticking in a closed position.</p> <p>(d) Gulp valve sticking in a closed position.</p> <p>(e) Faulty check valves.</p>	<p>1.(a) Tighten belt.</p> <p>(b) Check system for leaks. Air leaks in the pressure lines can be detected by carefully passing a hand over the pipework. If small leaks are suspected but cannot be located, soapy water should be spread over the pipework; air bubbles will then locate any leaks. Leaks in the lines subject to manifold depression can be detected by a whistling noise which is caused by the leak in the pipe.</p> <p>(c) Renew control valve.</p> <p>(d) (i) Check that the gulp valve is operating correctly. This may be carried out by running the engine at idle speed then disconnecting the small tube from the gulp valve; this tube senses manifold depression. Cover the now open end of the gulp valve connection with the thumb and note the response of the rubber pipe fitted between the control valve and gulp valve. If this tube tends to collapse and a clicking noise can be heard when the thumb is taken away from the connection then the gulp valve is operating satisfactorily. Fit the small rubber tube.</p> <p>(ii) Renew the gulp valve.</p> <p>(e) Run the engine at idle speed. If the valves are operating correctly they can usually be heard to 'flutter'. For a more definite check, remove the check valves and blow air through each valve; air should blow through the pump side only.</p>

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SYMPTOM	POSSIBLE CAUSE	ACTION
<p>Exhaust Emission Control System—continued 2. Excessive pump noise.</p>	<p>2.(a) Slack belt. (b) Loose air silencer. (c) Relief valve failure. (d) Damaged impeller vanes. (e) Rubbing vanes (an intermittent 'chirping' noise, noticeable mainly at low engine speed). (f) Worn bearing. Bearing noise is a rolling sound—noticeable at all speeds.</p>	<p>2.(a) Tighten belt. (b) Check the air silencer. If the silencer is not securely mounted, normal pump noise will be amplified. (c) (i) Check the relief valve. Relief valve failure will cause excessive noise. Failure has occurred if air escapes from the valve at engine idle speed. (ii) Plug air delivery pipe and check that the relief valve blows at 5 lb/sq. in. (0,351 kg/sq. cm.) when 'Neutral' is engaged on the gear selection quadrant. Renew relief valve if necessary. (d) Renew pump. If the vanes have obviously been damaged by exhaust heat, examine the check valves for correct operation. (e) (i) If the air pump has been in Service for some time, remove pump and determine the cause, e.g. worn bearings. (ii) If the air pump has been in Service for only a short period, the vanes should be allowed more running-in time before renewing any pump parts. (f) Renew pump.</p>
<p>3. Engine idles very roughly.</p>	<p>3.(a) Control valve sticking in open position. (b) Air leaks between control valve and carburetter 'Tee' piece.</p>	<p>3.(a) Renew control valve. (b) See Sympton 1 Action b.</p>
<p>4. Unsatisfactory running of the engine.</p>	<p>4.(a) Air silencer cleaner element choked.</p>	<p>4.(a) Remove and clean element.</p>
<p>Malfunctioning mixture weakening system. 5. High float chamber depression also spitting back in the carburetters.</p>	<p>5.(a) Weakening device filter blocked or blockage in rubber hose or bleed orifice. (b) Dislodged venturi in weakening device. Items (c), (d), (e) and (f) are applicable only when a Fuel Evaporation Emission Control System is fitted. (c) Evaporation loss control canister filter blocked. (d) Incorrect connection of weakener hose to valance adaptor or evaporation loss control canister. (e) Incorrect purge flow rate (greater than 1 cu. ft/minute). (f) Evaporation loss control canister obstructed.</p>	<p>5.(a) Renew filter or remove the blockage. (b) Renew the weaking device. (c) Renew filter or remove blockage. (d) Ensure connections are fitted correctly; rectify if necessary. (e) Renew purge line restrictor. (f) Remove obstruction.</p>

SYMPTOM	POSSIBLE CAUSE	ACTION
<p>6. Low float chamber depression also small increase in fuel consumption.</p>	<p>On cars prior to Car Serial Number SRX 9001 and later cars, see page U1—Introduction.</p> <p>6.(a) Blockage in engine side of weakening device.</p> <p>On current cars, see page U1—Introduction.</p> <p>6.(a) A blockage in the weakener venturi, the hose from the weakener to vent canister, or the hoses from the float chambers to fuel receiver.</p> <p>(b) Float chamber and weakening device air leaks.</p> <p>(c) Float chamber connection air leaks as far as and including the one way valve in the fuel drain pipe.</p> <p>(d) Engine intake air temperature below 16°C. (60°F.).</p> <p>(e) Inoperative weakener cut-off valve.</p> <p>(f) Leaks between weakening device and tapping in carburetter body; this will include the weakener cut-off valve.</p> <p>(g) Faulty cut-off valve.</p> <p>(h) A dirty or faulty float chamber drain valve.</p> <p>Items (i) and (j) are applicable only when a Fuel Evaporation Emission Control System is fitted.</p> <p>(i) A dirty or faulty float chamber vent valve.</p> <p>(j) Incorrect purge flow rate (less than 1 cu. ft./minute).</p>	<p>6.(a) Remove blockage.</p> <p>6.(a) Remove blockage.</p> <p>(b) Renew gaskets and washers. Ensure that both float chamber lids are tight also that all connections are tight.</p> <p>(c) Check that all pipe connections are tight and seating correctly. Check that the one way valve assembly is correctly seated also that it is tightly assembled.</p> <p>(d) Allow engine to warm up.</p> <p>(e) Renew valve.</p> <p>(f) Check and tighten any loose connections also check the condition of sealing washers and renew if necessary.</p> <p>(g) Disconnect the two pipes fitted to the cut-off valve then connect the pipes by fitting a small piece of thick-walled rubber tube over the two end nipples; a piece of tube similar to the type fitted to the refrigeration fast-idle solenoid would suffice. Run the engine and check the float chamber depression, if the depression is correct, the cut-off valve is faulty and should be renewed.</p> <p>(h) Remove blockage or renew valve.</p> <p>(i) Remove blockage or renew valve.</p> <p>(j) Remove any blockage in the purge line restrictor or renew the restrictor. Also remove any blockage in the purge line filter or the pipes situated between the gulp valve to carburetter 'Tee' piece pipe and evaporation loss control canister.</p>
<p>Carburetters</p> <p>7. Stalling, poor slow running, lack of power and high fuel consumption.</p>	<p>7.(a) Sticking carburetter piston caused by the needle bearing heavily on the jet.</p>	<p>7.(a) Remove the air cleaner trunk hose from the butterfly housing. A spring-loaded pin, located on the right-hand side of the suction chamber, is provided for lifting the piston (see Fig. U24 Item 28). Normally, when the engine is not running, the piston rests on the buffer pin in the base of the piston just above the bridge of the main carburetter body.</p> <p>Raise the piston to its highest position, against the resistance of the damper piston, then release it and check that it drops freely. If the downward movement of the piston is sluggish or if the piston does not readily leave the bridge of the carburetter, lower the main jet by pushing the mixture adjusting screw lever upwards and repeat the check on the piston.</p>

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SYMPTOM	POSSIBLE CAUSE	ACTION
<p>Carburetters—continued</p>	<p>(b) Sticking carburetter piston caused by a bent damper rod.</p> <p>(c) Sticking carburetter piston caused by dirt between the suction chamber and piston rod sticking in its bush.</p>	<p>The elimination of sticking by lowering the jet indicates that the needle is bent and bearing heavily on the jet. After lowering the jet, if the piston continues to stick it is probable that the piston is fouling the side of the suction chamber or that the piston rod is not free to move within its bush (refer to Action 7 (b)). On completion of these checks re-set and tune the carburetters.</p> <p>(b) Remove the oil cap and damper piston assembly and repeat the check for a sticking piston (see Action 7 (a)). If it is determined that the damper rod is bent, a new damper rod should be fitted and carburetter re-set.</p> <p>(c) Remove the suction chamber and damper piston assembly, then remove the air valve piston assembly. Clean the parts with clean petrol or methylated spirits and wipe dry with a clean lint free cloth. Apply a few drops of clean light oil to the piston rod. Fit the damper assembly and washer to the suction chamber. Seal the transfer holes in the piston assembly with rubber plugs and fit the assembly to the suction chamber. Invert the complete assembly and allow the suction chamber to fall away from the piston. Check the time it takes, which should be between 5 and 7 seconds; remove the plugs and damper assembly (see Fig. K16 in Chapter K). On no account should any attempt be made to increase the bore of the suction chamber, or to reduce the diameter of the enlarged part of the piston, as the maintenance of a limited clearance between these two parts is essential for the correct operation of the carburetter. If the needle is disturbed or renewed the carburetters must be reset and tuned.</p>
<p>8. Stalling</p>	<p>8.(a) Flooding of the float chamber or the jet.</p> <p>(b) Water or foreign matter in the float chamber.</p>	<p>8.(a) Examine the float to determine if it is punctured; renew if necessary. Examine the needle valve seating to ensure that it is clean and serviceable. Check that the float level is correct. Ensure that the cork gasket between the float chamber body and the lid is in good condition.</p> <p>(b) Remove the float chamber lid, then withdraw the float. Thoroughly clean the float chamber and the filter in the lid. If dirt is present in the float chamber, it is possible that the main jet may be choked. The following method should successfully clear a choked jet.</p> <p>(i) Remove the suction chamber and withdraw the piston assembly.</p> <p>(ii) Fit the suction chamber and seal the air intake.</p>

SYMPTOM	POSSIBLE CAUSE	ACTION
Carburettors—continued		<p>(iii) Disconnect the L.T. lead on the distributor then remove the thermal cut-out from the main fusebox (gear range selector lever to be in Neutral).</p> <p>(iv) Lower the jet to its bottom position by pushing the mixture adjusting screw lever upward, hold it in this position then proceed as described in Operation (v).</p> <p>(v) Rotate the engine by means of the starter motor. This should cause any foreign matter to be drawn out of the jet into the carburetter body.</p> <p>(vi) Should this fail to clear the blockage, remove and clean the jet, bearing in mind that all carburetter parts should be assembled in the same relative position from which they are removed.</p> <p>If globules of water are found in the carburettors, the fuel system should be cleaned thoroughly and the fuel tank drained in order to inspect the fuel for water content.</p> <p>On completion of this Operation, tune the carburettors.</p>
9. Engine stalls when idling or under light running conditions.	9. Providing that there is a good supply of fuel available at the float chamber inlet unions, it is possible that the float needle valve has stuck to its seating. This results from a gum deposit which forms in fuel system after prolonged storage of the fuel in the tank.	9. Remove the float chamber lid and withdraw the needle valve, then clean the valve and its seating with a clean cloth soaked in alcohol. Cleaning of the seat will be facilitated by wrapping the cloth around a thin piece of wood. Repeated trouble of this nature can only be rectified by completely dismantling and thoroughly cleaning the fuel system and tank.
10. Engine shows serious power loss evident at high speeds and loading.	10.(a) Insufficient delivery of fuel. (b) Ignition timing (c) Sparking plugs.	10.(a) Check the fuel pumps for adequate delivery and the filters in the system for cleanliness. (b) Check and reset if necessary. (c) Clean, set gap, test or renew.

Section U7

WORKSHOP TOOLS

Tool Number Description

RH 8050	Spanner—Carburetter Jet Screw
RH 8087	Spanner—Weakener Cut-off Valve
RH 8089	Jet Centring Tool
RH 8090	Pliers—Wire Hose Clips
RH 8095	Restrictor—Manometer Check—Choke Stove Pipe
RH 8382	Spanner—Distributor Dwell Angle
RH 8383	Positioning Tool—Throttle Spindle Seal

Chapter U

EMISSION CONTROL SYSTEMS PART 2

Chapter U - Part 2 contains information which is applicable to cars fitted with Emission Control Systems and manufactured during the year 1973.

Chapter U - Part 2 together with Supplement No. 2 (North America 1974) in Section U10 contains information which is applicable to cars fitted with Emission Control Systems and manufactured as 1974 model year cars.

SECTION		PAGE
U1	Exhaust Emission Control System	U 3
U2	Fuel Evaporation Emission Control System	U 9
U3	Crankcase Emission Control System	U 17
U4	Emission Control System (Electrical Components)	U 19
U5	The Carburettors and Automatic Choke System	U 23
U6	Ignition System, Distributor, Ignition Coil and Sparking Plugs	U 39
U7	Lubrication and Maintenance	U 43
U8	Fault Diagnosis	U 51
U9	Workshop Tools	U 53
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Important

Always consult Section U10 - Supplements, for information which is additional to that given in the Chapter.

INTRODUCTION

This Chapter has been written specifically for cars fitted with Emission Control Systems conforming to the U.S. Environmental Protection Agency regulations and to the California regulations applicable to 1973 model year new motor vehicles.

It is important therefore that Service Personnel fully understand the contents of this Chapter so that the special servicing can be correctly carried out.

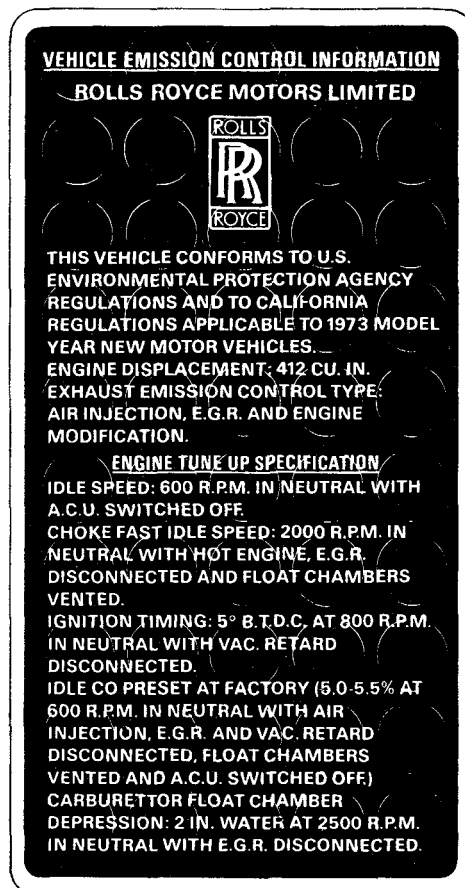
Rolls-Royce and Bentley motor cars conforming to the above regulations and produced during 1973 can be readily identified as follows.

1. Car Serial Number

A letter B as the last prefix letter of the Car Serial Number (e.g. SRB or LRB, etc.).

2. Emission Control Certification Label

A 1973 Emission Control Certification Label (illustrated below) fitted to the wing valance to the rear of the right-hand front suspension spring cover.



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EMISSION CONTROL CERTIFICATION LABEL

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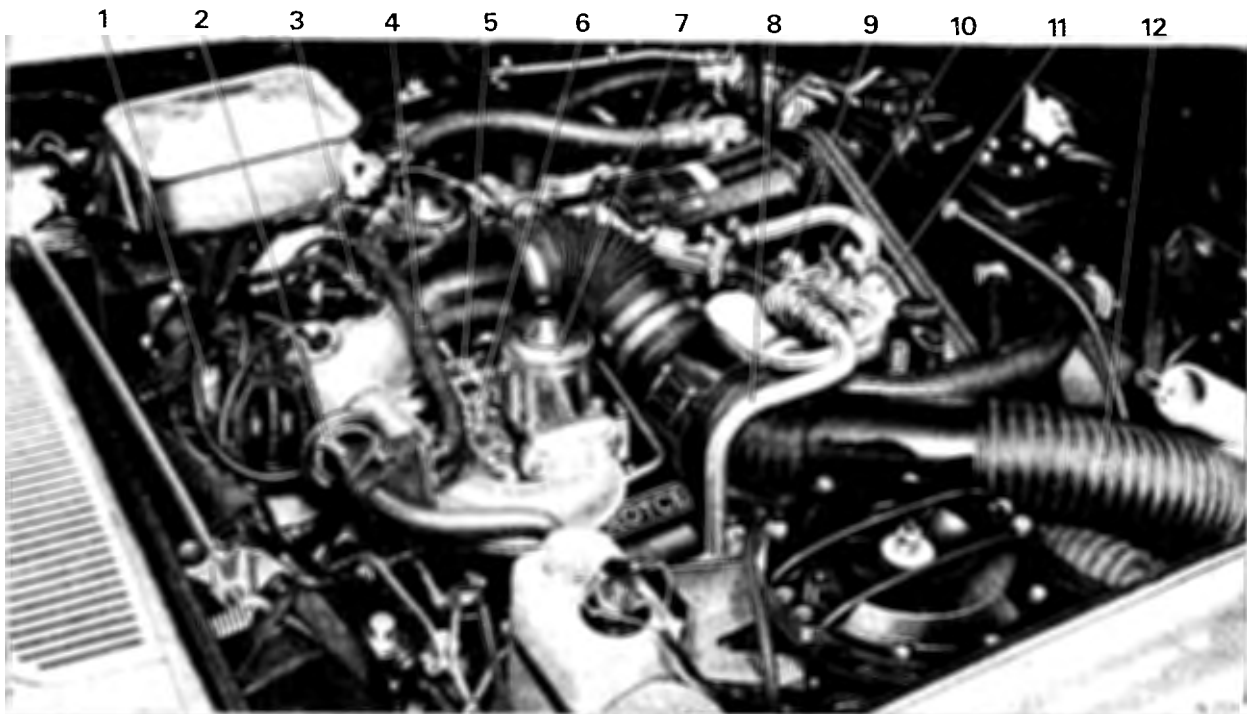


FIG. U1 VIEW INSIDE ENGINE COMPARTMENT (From Right-hand Side of Car)

- | | |
|--|-------------------------------------|
| 1 Fuel receiver and float chamber vent valve | 7 'A' bank carburetter |
| 2 Exhaust gas recirculation valve | 8 'A' bank air manifold |
| 3 Crankcase emission control pipe connection | 9 Deceleration control (gulp) valve |
| 4 Exhaust gas recirculation distribution pipes | 10 Check valve |
| 5 Vacuum retard tap | 11 Air pump |
| 6 Float chamber pressure tapping | 12 Air intake hose (engine) |

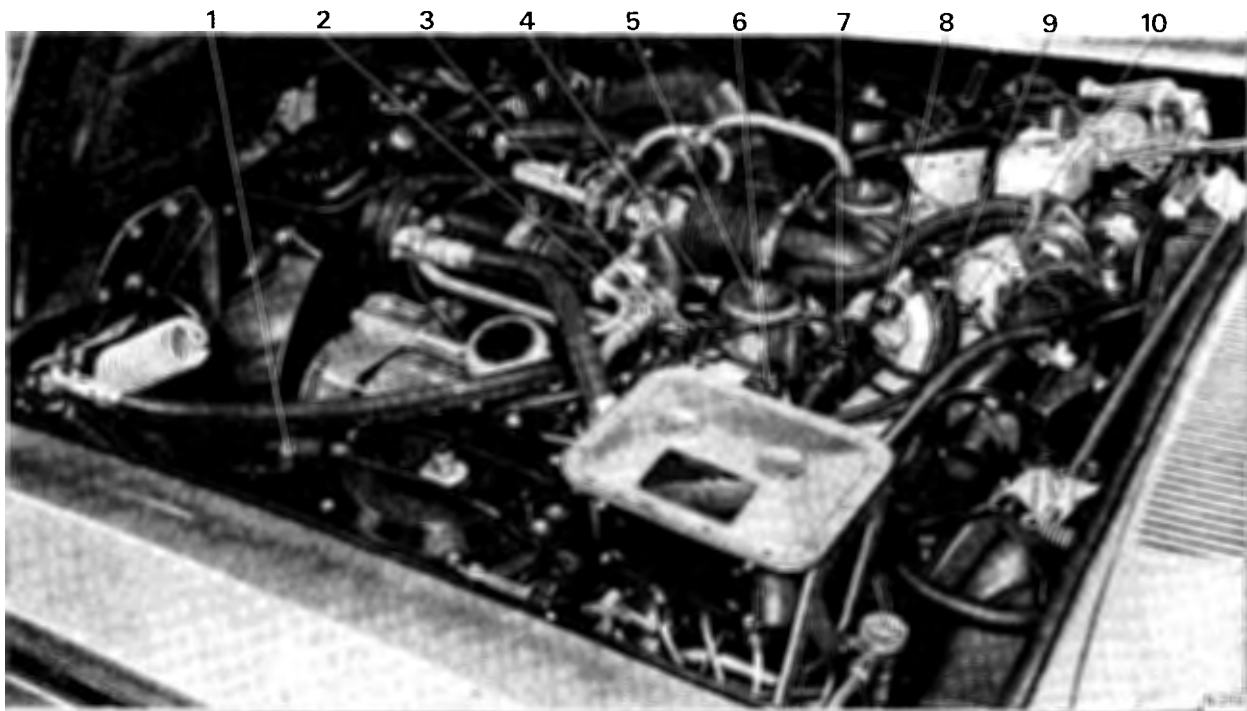


FIG. U2 VIEW INSIDE ENGINE COMPARTMENT (From Left-hand Side of Car)

- | | |
|---------------------------------|--|
| 1 Weakener filter | 6 Exhaust gas recirculation solenoid |
| 2 Check valve | 7 Choke thermo-coil housing |
| 3 Anti 'run-on' solenoid | 8 Choke solenoid |
| 4 Throttle stop vacuum actuator | 9 Choke stove pipe (passing air to exhaust manifold) |
| 5 'B' bank carburetter | 10 Weakener system cut-off switch |

Chapter U

Section U1

EXHAUST EMISSION CONTROL SYSTEM

Printed in Great Britain

January 1973

The Exhaust Emission Control System is designed to reduce the Carbon Monoxide unburnt Hydro-carbon and oxides of nitrogen content in the exhaust gases to comply with the current Emission Control regulations.

This system does not reduce the risk of inhaling exhaust gases in a confined area.

Air from the atmosphere is drawn into the engine-driven air pump through an intake filter. From the pump, the air passes through the check valves to the air manifolds then into the exhaust ports at a point just above the exhaust valve heads. This air combines with the exhaust gases discharged from the combustion chamber and completes the oxidation of most of the unburnt gases (*see Fig. U3*). The gases then pass through the exhaust system to atmosphere.

In addition, a small proportion of the exhaust gas from the 'A' bank exhaust manifold passes through a cooler and vacuum operated metering valve into the carburetter 'Tee' piece, just downstream of the throttles. The exhaust gas mixes with the inlet charge in the induction manifold and is distributed to the cylinders thus lowering the peak combustion temperature and reducing oxides of nitrogen emissions (*see Fig. U4*).

Air pump

A two-vane rotary air pump belt driven from the coolant pump.

Air pump relief valve

A relief valve is located in the discharge cavity of the air pump to permit the outlet air to by-pass the air injection system when the check valves are closed. The by-pass system prevents damage to the pump vanes and excessive exhaust temperatures under extreme operating conditions.

Check valves

Check valves are fitted to the air injection manifolds to prevent the backflow of exhaust gases into the air lines or air pump. The valves operate when the exhaust back pressure exceeds the pump delivery pressure at high speed and load or in the case of failure of an air pump driving belt.

Gulp valve (anti-backfire valve)

Following rapid throttle closure the inlet manifold pressure drops suddenly causing fuel to vapourise from the inlet manifold walls, resulting in a mixture which is too rich to burn in the cylinders. If this mixture was allowed to pass into the exhaust system it would combine with the injected air and cause severe backfiring. To prevent this, a gulp valve, triggered by manifold pressure, allows a measured gulp of air from the pump discharge line to enter the inlet manifold following rapid throttle closure; this results in a weaker mixture which is combustible in the cylinders.

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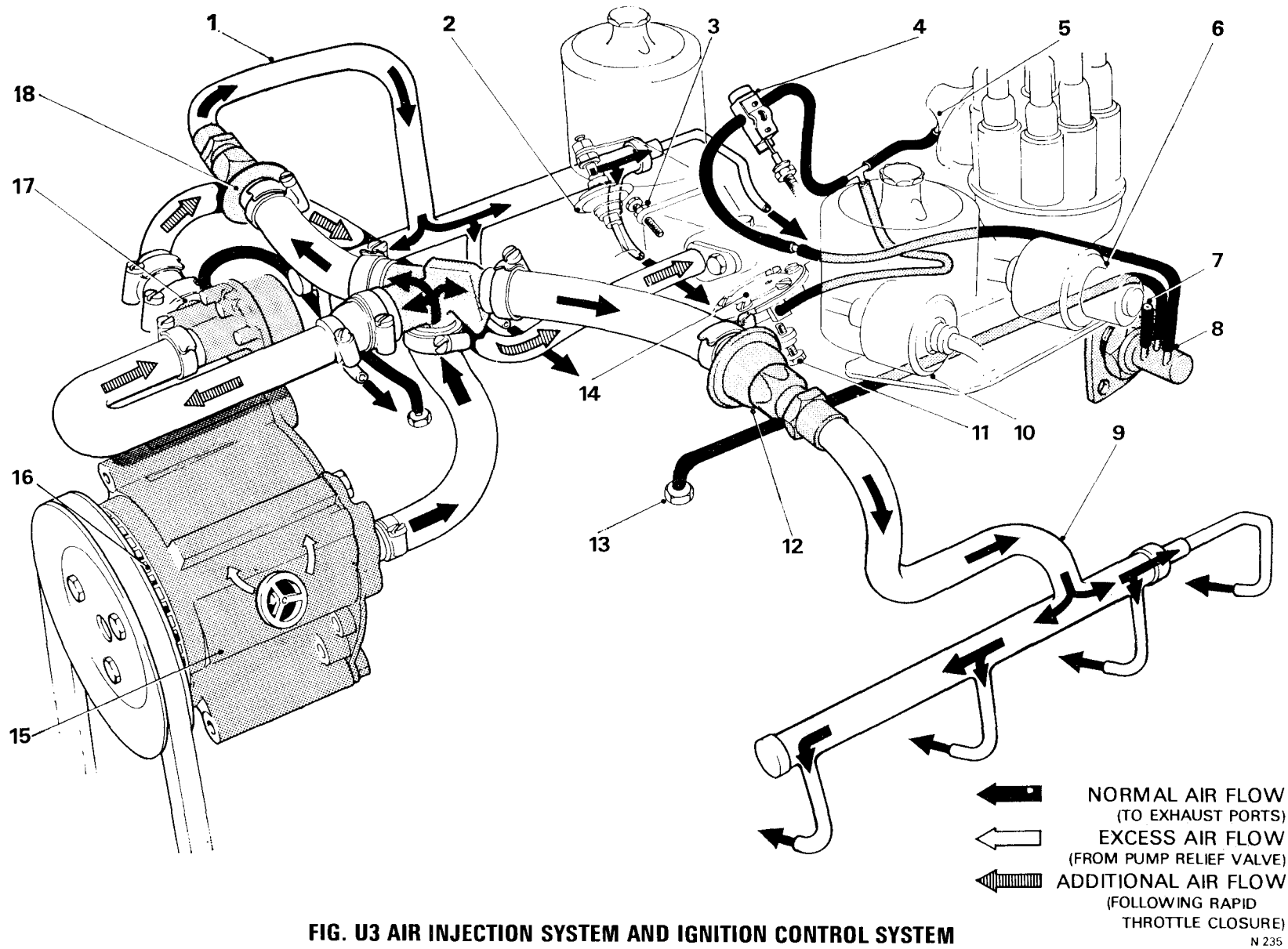


FIG. U3 AIR INJECTION SYSTEM AND IGNITION CONTROL SYSTEM

- 1 'A' bank air manifold
- 2 Throttle damper
- 3 Fixed throttle stop
- 4 Vacuum retard tap
- 5 Distributor retard capsule

- 6 Exhaust gas recirculation solenoid
- 7 Vent to air trunking
- 8 Thermal vacuum switch
- 9 'B' bank air manifold

- 10 Anti 'run-on' solenoid
- 11 Vacuum throttle stop screw
- 12 Check valve
- 13 Inlet manifold vacuum tapping
- 14 Throttle stop vacuum actuator

- 15 Air pump
- 16 Air pump intake
- 17 Deceleration control (gulp) valve
- 18 Check valve

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Throttle damper

The throttle damper prevents rapid throttle closure which would suddenly drop the intake manifold pressure causing vaporisation of fuel from the manifold walls and produce a sudden increase in mixture strength.

Air injection pump belt—To set

Refer to Chapter L—Engine Cooling System.

Air injection pump—To remove

1. Disconnect the battery.
 2. Ensure that all the open ends of hoses and pipes are masked-off immediately they are disconnected, to prevent the ingress of dirt, etc.
 3. Detach the small rubber tube which fits between the manifold pipe and the gulp valve.
 4. Slacken the two worm drive clips adjacent to the gulp valve, situated on the gulp valve to carburetter 'Tee' piece pipe.
- Slide the hose off the gulp valve.

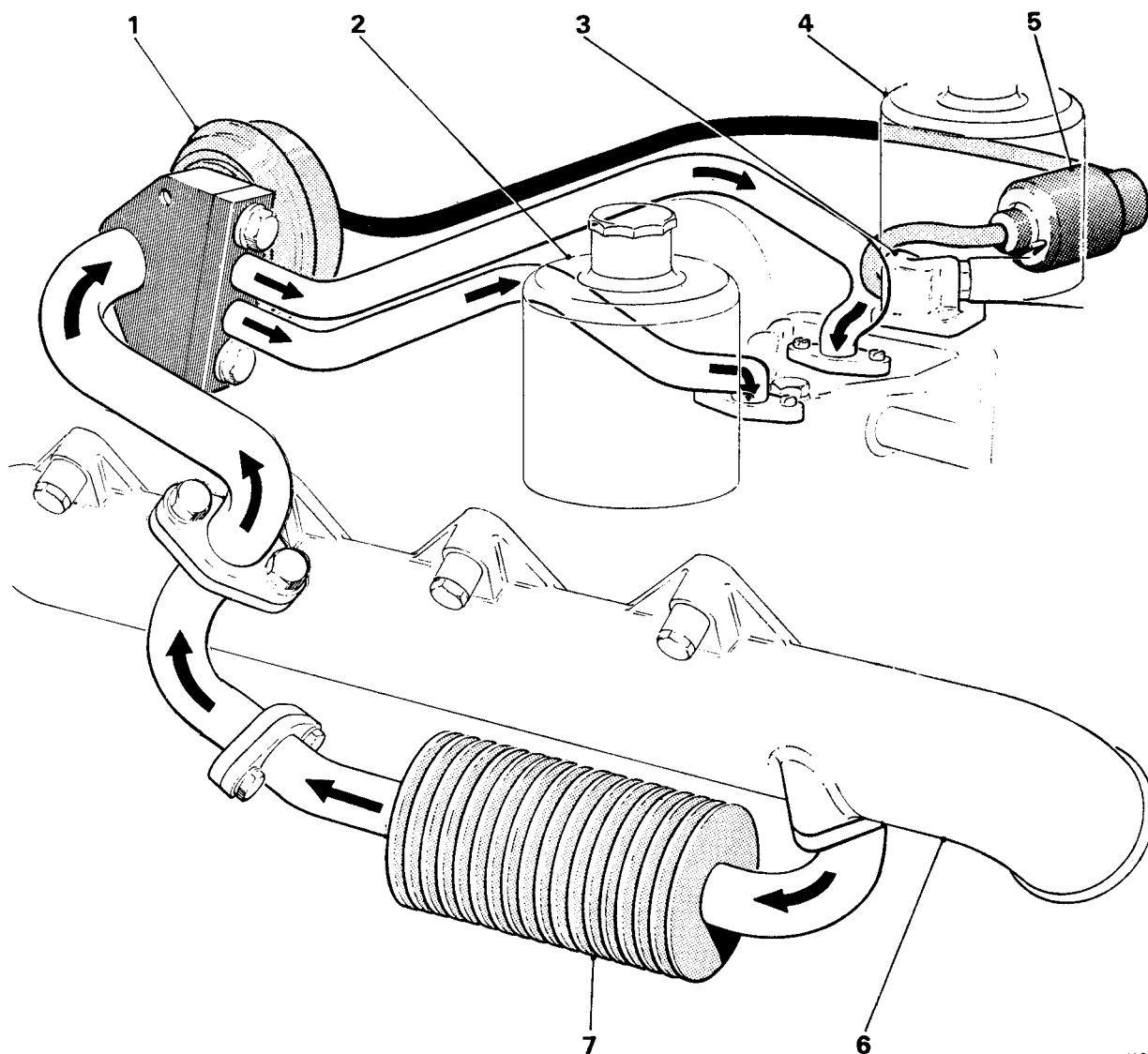


FIG. U4 EXHAUST GAS RECIRCULATION SYSTEM

- | | |
|-----------------------------------|--------------------------------------|
| 1 Exhaust gas recirculation valve | 5 Exhaust gas recirculation solenoid |
| 2 'A' bank carburetter | 6 'A' bank exhaust manifold |
| 3 Weakening device | 7 Cooler (exhaust gas recirculation) |
| 4 'B' bank carburetter | |

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5. Unscrew the two 'cheese-headed' screws securing the gulp valve to its mounting bracket on the thermostat housing.
6. Slacken the worm drive clip connecting the gulp valve 'U' pipe to the 4-way connector, at the connector end.
7. Withdraw the 'U' pipe and gulp valve from the 4-way connector.
8. Slacken the worm drive clip securing the pump delivery hose to the pump; detach the hose from the rear of the pump.
9. Slacken the two bolts on the pump belt adjustment strut; remove the upper bolt.
10. Slacken the remaining mounting bolt and allow the pump to move downward to remove any belt tension.
11. Remove the belt; if difficulty is experienced, the pulley should be removed by removing the three setscrews securing it in position.
12. Support the air injection pump, remove the remaining bolt then lift the pump clear of the engine.

Air injection pump—To fit

Fit the air pump by reversing the procedure given for dismantling noting the following points.

1. The belt tension should be set as described in Chapter L.
2. If the pulley was removed, it should be fitted using the original setscrews as longer screws may foul the pump casing and cause damage.

Air injection system—Leak check

Check the air injection system for air leaks by carrying out the following sequence of operations.

1. Ensure that the ignition is switched off.
2. Visually inspect the condition of all hoses, pipes and joints associated with the air injection system.
3. Ensure that all worm drive clips are tight.
4. Start the engine and listen carefully for any evidence of an air leak from the system.
5. If an air leak is suspected it is permissible to coat the component or hose with a soap solution; soap bubbles will confirm an air leak.

Air injection system—Fault diagnosis

To diagnose malfunctioning of the air injection system refer to **Section U8—Fault Diagnosis** of this Chapter.

Air injection equipment—General fitting instructions

The removal and fitting procedure for the remaining air injection equipment is straight-forward provided that the following points are observed.

1. The special wire hose clip securing the gulp valve should be discarded once removed and a new one fitted; the tool number of the pliers for fitting these clips is RH 8090.
2. If any of the valves are found to be damaged or faulty in service they should be renewed.
3. Any rubber hoses which appear to have deteriorated should be renewed.

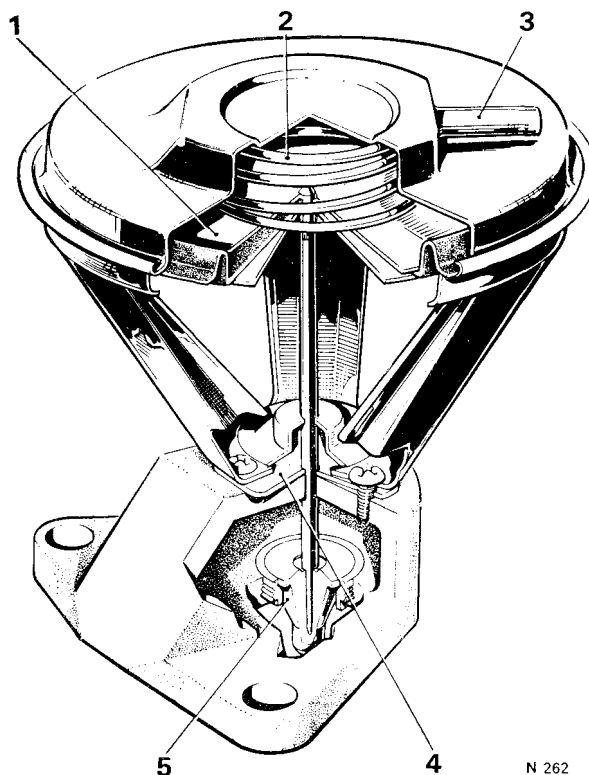


FIG. U5 EXHAUST GAS RECIRCULATION VALVE
 1 Rubber diaphragm 3 Vacuum connection
 2 Spring 4 Sealing washer
 5 Pintle

EXHAUST GAS RECIRCULATION SYSTEM

An illustration of the exhaust gas recirculation system can be seen in Figure U4 and details of the servicing requirements are given below.

Exhaust gas recirculation valve—To remove

1. Detach the small diameter rubber hose from the valve.

2. Using a $\frac{1}{2}$ in. A/F spanner unscrew and remove the two nuts and washers retaining the valve to the mounting flange.

3. Slacken the worm drive clip which secures the valve to the 'A' bank carburetter air horn.

4. Withdraw the valve and remove the gasket from the mounting flange face.

Exhaust gas recirculation valve—To fit

Fit the valve by reversing the procedure for removal, noting the following points.

1. Ensure that the valve pintle (*see Fig. U5*) is secure on the valve stem.

2. Ensure that the valve and mounting flange joint faces are clean and free from carbon deposits.

3. Always use a new mounting flange gasket.

Exhaust gas recirculation valve—To clean

1. Remove the valve as described in Exhaust gas recirculation valve — To remove.

2. Using a scraper, remove all carbon film from the valve and mounting flange faces; complete the operation with a wire brush.

3. Clean the carbon from the valve using a wire brush fitted into a portable drill. Take care not to damage the valve seating area.

4. Thoroughly blow out the valve with compressed air to ensure that all loose carbon particles are removed.

5. Upon completion of the cleaning operations, fit the valve to the engine mounting flange as described in Exhaust gas recirculation valve — To fit.

Exhaust gas recirculation valve—To check

1. Connect an electric impulse tachometer to the engine in accordance with the manufacturer's instructions.

2. Ensure that the handbrake is firmly applied and that the gear range selector is in the Neutral position.

3. Start the engine and run until normal operating temperature is attained.

4. Allow engine to return to the idle speed.

5. Increase the engine speed slowly noting the operation of the exhaust gas recirculation valve.

6. When the engine speed has reached 2 000 r.p.m. the exhaust gas recirculation valve should have moved from the closed position to the open position.

If the valve has moved to the open position, stop the engine, and remove the tachometer as the test is complete. If however, the valve has not moved to the open position proceed as follows.

7. Stop engine.

8. Disconnect the small diameter rubber hose from the exhaust gas recirculation valve and connect to a suitable vacuum gauge (0 to 10 in. Hg.).

9. Remove the pressure tapping from 'A' bank carburetter float chamber to vent the float chambers to atmosphere.

10. Start the engine.

11. Run at 2 000 r.p.m. and check on the vacuum gauge that the exhaust gas recirculation valve signal strength is between 2.0 in. Hg. and 5.5 in. Hg.

12. Stop engine.

Possible causes of low signal strength are given in Section U5 — The Carburetters and Automatic Choke System.

If the signal strength is within the specified limits but the exhaust gas recirculation system does not function correctly proceed as follows.

13. Fit the small diameter rubber hose to the exhaust gas recirculation valve and disconnect the other end of the hose from the exhaust gas recirculation valve cut-off solenoid vent.

14. Apply a vacuum of 3.5 in. Hg. to 4.5 in. Hg. to the open end of the hose and check to ensure this vacuum does not leak away.

Exhaust gas recirculation distribution pipes—To remove

1. Unscrew the worm drive clip and withdraw the air intake hose from the choke butterfly housing; suitably cover the open choke butterfly housing.

2. Using a $\frac{7}{16}$ in. A/F spanner unscrew and remove the two nuts and washers securing the distribution pipes to the mounting flange (*see Fig. U2*).

3. Free the joint face and discard the gasket.

4. Support the weight of the distribution pipes.

5. Unscrew and remove the four 2 B.A. setscrews and washers securing the two distribution pipe flanges to the carburetter 'Tee' piece.

6. Withdraw the distribution pipes and discard the gaskets.

Exhaust gas recirculation distribution pipes—To fit

Fit the distribution pipes by reversing the procedure given for removal, noting the following points.

1. Ensure that all joint faces are clean and free from carbon deposits.

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2. Always fit new gaskets.
3. Coat the joint faces and gaskets at the carburetter 'Tee' piece with 'Wellseal'.
4. Ensure that the cover is removed from the choke butterfly housing before the air intake hose is fitted.

Exhaust gas recirculation distribution pipes—To clean

1. Remove the distribution pipes as described in Exhaust gas recirculation distribution pipes — To remove.
2. With a pointed scraper clean as much carbon deposit as possible from inside the distribution pipes and the joint faces. Particular attention should be given to the carburetter end of the pipes, because the majority of the carbon deposit will be found in this area.
3. Using wire brushes complete the cleaning operation on the distribution pipes.
4. With a pointed scraper remove the carbon deposits from the carburetter 'Tee' piece connection orifices.
5. Before fitting the distribution pipes thoroughly blow-out the pipes and carburetter 'Tee' piece connections with compressed air.
6. Fit the distribution pipes as described in Exhaust gas recirculation distribution pipes — To fit.

Section U2

FUEL EVAPORATION EMISSION CONTROL SYSTEM

Printed in Great Britain

January 1973

In order to comply with regulations governing the emission of fuel vapour in the United States of America and Canada, an efficient Fuel Evaporation Emission Control System has been designed and is fitted to cars produced during 1973.

The Fuel Evaporation Emission Control System eliminates direct venting of the fuel tank and carburetters, thus preventing the release of unburnt hydro-carbons into the atmosphere.

Fuel vapours are collected from the fuel tank and carburetters and stored in an activated charcoal canister. The canister is purged whenever the engine is running and the stored fuel vapours are extracted from the charcoal and burnt in the engine.

A diagrammatic illustration of the system can be seen in Figure U7.

The engine compartment components are clearly shown in Figure U8 and the fuel tank components in Figure U11.

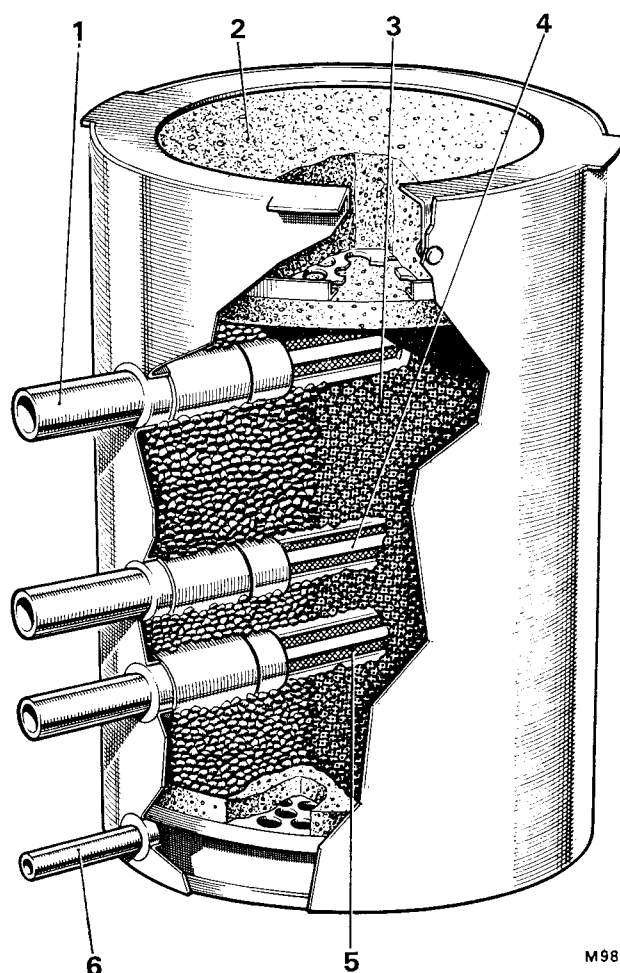
Fuel evaporation loss control canister

The large centre section of the canister contains the dust-free activated carbon and accommodates nylon filter connectors which connect the canister to the various fuel vapour emission sources on the car (i.e. the carburetter weakener unit, float chamber vent and fuel tank vent).

The function of the activated carbon is to absorb and retain fuel vapour from the carburetter float chambers and fuel tank.

At either end of this section of the canister are thin discs of polyurethane filter.

The lower compartment of the canister is the purge chamber and is connected to the engine induction system via the purge line filter and line restrictor. It is operative whenever the engine is running, and its function is to draw air through the carbon, extracting the fuel vapour for consumption in the engine. The upper section of the canister is open to the atmosphere

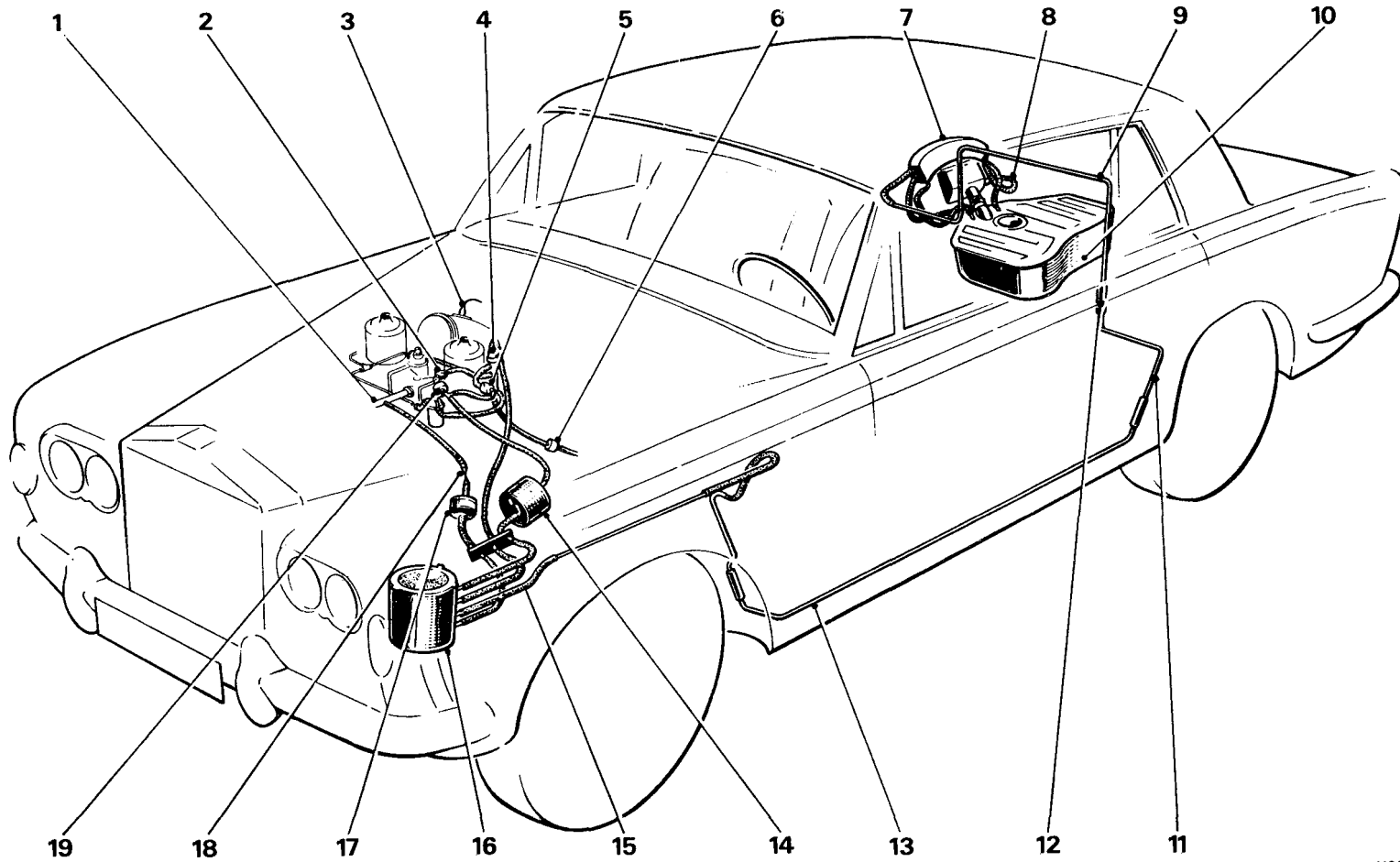


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FIG. U6 FUEL EVAPORATION LOSS CONTROL CANISTER

- 1 Weakener connection
- 2 Polyurethane filter
- 3 Carbon
- 4 Float chamber vent connection
- 5 Fuel tank vent connection
- 6 Purge line connection

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FIG. U7 FUEL EVAPORATION EMISSION CONTROL SYSTEM—GENERAL VIEW

- | | | |
|----------------------------------|-------------------------------------|--------------------------------------|
| 1 Gulp valve pipe | 8 Relief valve hose | 14 Weaker filter |
| 2 Weakening device | 9 Luggage compartment pipe | 15 Canister to wing hose |
| 3 Bi-metal switch | 10 Fuel tank assembly | 16 Evaporation loss control canister |
| 4 Float chamber vent valve | 11 Luggage compartment to sill pipe | 17 Purge line filter |
| 5 Weakening device cut-off valve | 12 Vent pipe hose | 18 Purge line restrictor |
| 6 Float chamber drain valve | 13 Fuel vapour line | 19 Anti 'run-on' solenoid |
| 7 Fuel trap assembly | | |

and houses a polyurethane foam filter to ensure that the air drawn through the carbon is clean.

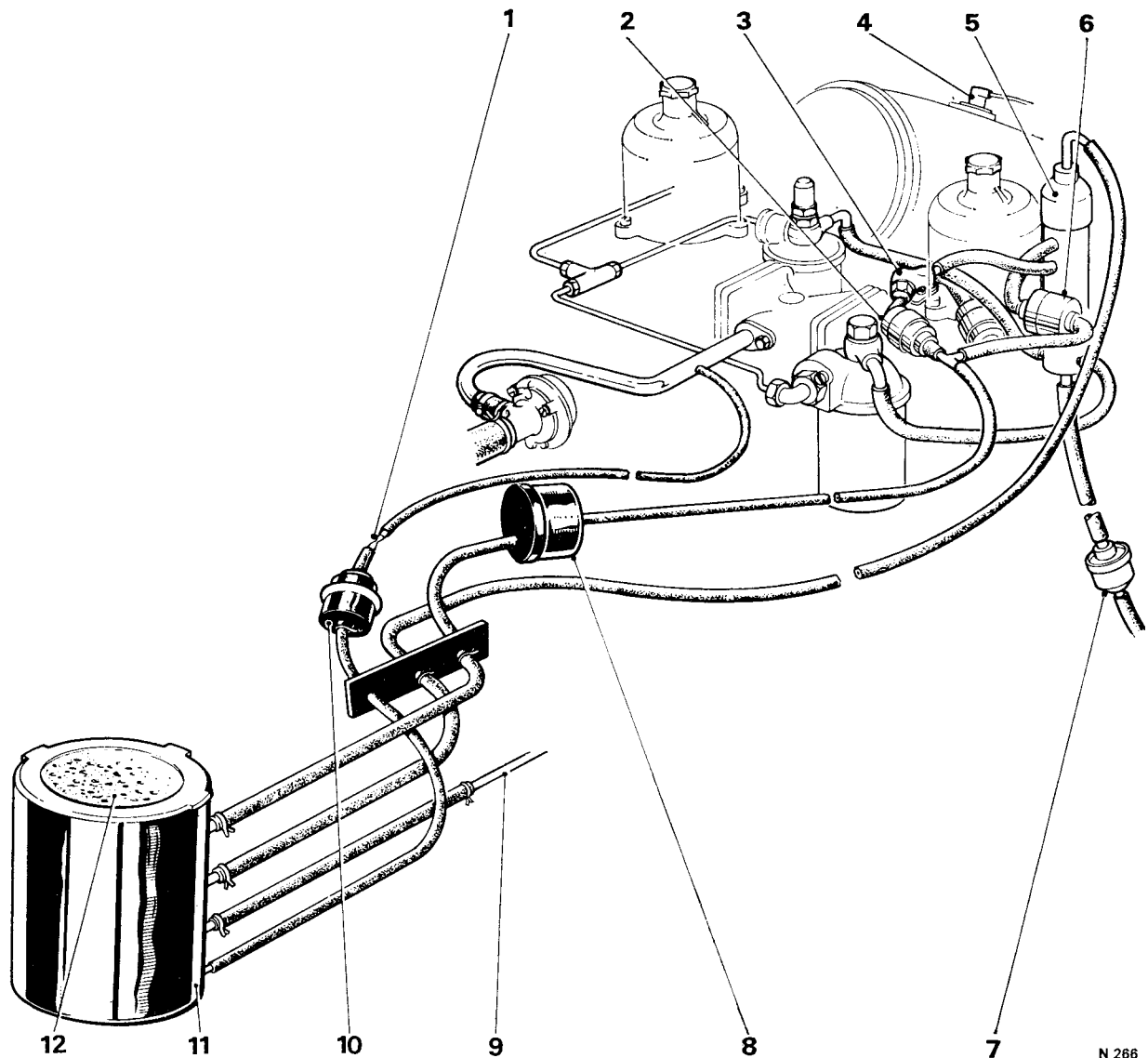
Polyurethane foam filter element—To renew

It is not necessary to remove the canister from the car in order to extract the polyurethane foam filter element. A detachable cover is situated in the left-hand

valance, adjacent to the blower motor resistances (see Fig. U9).

1. Unscrew the four screws retaining the access cover, lift off the cover and withdraw the filter element from the top of the canister.

When fitting a new filter element, ensure that it is correctly positioned inside the retaining rim of the canister. Fit the access cover and tighten the setscrews.



**FIG. U8 FUEL EMISSION CONTROL SYSTEM—
ENGINE COMPARTMENT FITTINGS**

- | | |
|--|--------------------------------------|
| 1 Purge line restrictor | 7 Float chamber drain valve |
| 2 Anti 'run-on' solenoid | 8 Weakener filter |
| 3 Weakener unit | 9 Vent from fuel trap |
| 4 Bi-metal switch | 10 Purge line filter |
| 5 Fuel receiver and float chamber vent valve | 11 Evaporation loss control canister |
| 6 Weakener cut-off valve | 12 Polyurethane filter |

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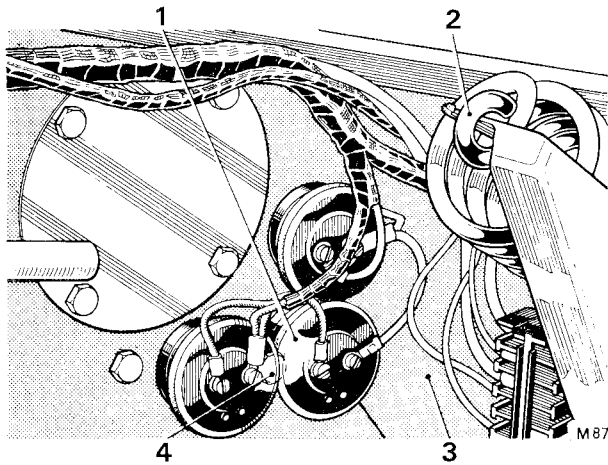


FIG. U9 SETSCREWS SECURING CONTROL CANISTER AND ACCESS COVER

- 1 Blower motor resistances
- 2 Bonnet hinge spring
- 3 Valance
- 4 Securing setscrew (hidden by blower motor resistances)

**Fuel evaporation loss control canister
—To remove**

The canister is mounted under the left-hand front wing and is removed as follows.

1. Remove the front left-hand road wheel as described in Chapter R—Wheel—To remove.

Note Left-hand front is determined when viewed from the driver's seat.

2. Position suitable stands under the raised portion of the car as a safety precaution.

3. Remove the front section of the underwing sheet by unscrewing the $\frac{7}{16}$ in. A/F nut and bolt, and the 16 small screws situated around the sheet.

4. The canister will be clearly visible.

5. Using special pliers (RH 8090), remove the steel retaining clips and detach the four rubber hoses connected to the canister.

6. Inside the engine compartment adjacent to the blower motor resistances (*see Fig. U9*), locate the six $\frac{7}{16}$ in. A/F setscrews. Unscrew the lower four setscrews and withdraw the canister from beneath the wing.

**Fuel evaporation loss control canister
—To fit**

Fit the canister by reversing the procedure described for removal, noting the following points.

1. Ensure that the rubber hoses are in a good condition and new hose retaining clips are used.

2. Ensure that the underwing sheet is sealed with Bostik Sealing Compound 771.

Purge line

The purge line consists of a rubber hose, passing from the lowest connection on the canister through the valance junction piece to the gulp air pipe situated between the gulp valve and carburetter 'Tee' piece. Incorporated into this hose is the purge line filter and restrictor.

When the engine is running, air drawn through the canister filter and carbon picks up the stored fuel vapours and passes them via the hose, to the induction manifold. The restrictor in the line controls the flow rate at between 50 cu. ft. per hr. and 70 cu. ft. per hr. to maintain carburetter metering accuracy and the paper element line filter is fitted to prevent blockage of the restrictor.

Purge line filter—To remove

1. Using special pliers (RH 8090) remove the two steel retaining clips (if fitted) situated on either side of the unit.

2. Slacken the 2 B.A. setscrew which secures the nylon retaining clip.

3. Withdraw the component from the clip.

Purge line filter—To fit

Fit the purge line filter by reversing the procedure given for removal noting the following points.

1. Ensure that the rubber hoses are in a good condition and new hose retaining clips are used.

*** Purge flow rate—To check**

Check the purge flow rate as follows.

1. Disconnect the hose from the engine side of the purge line filter and insert a flowmeter and stand assembly (RH 8725) in to the line. The flowmeter is a rotameter type capable of measuring 50/70 cu. ft./hr. Pressure drop across the meter is not to exceed 2 in. Hg.

2. Check the flowmeter reading with the engine idling. The flow reading should be between 50 cu. ft./hr. and 70 cu. ft./hr.

3. If the flow is incorrect fit a new restrictor and repeat Operation 2.

4. Remove the flowmeter and reconnect the hose to the purge line filter.

Purge line restrictor—To remove

1. Hold the restrictor firmly and slide the rubber hosing from both ends.

Purge line restrictor—To fit

Fit the restrictor by reversing the procedure given for removal, noting the following point.

1. Ensure that the purge line restrictor is fitted into the line correctly. This can be determined by comparing the diameters of the restrictor ends with those of the rubber hoses.

Weakener line

The weakener line connects the weakener unit with the evaporation loss control canister (see Fig. U8). With the engine running under light throttle opening a depression is created in this line, so allowing air to pass from the canister to the weakener unit.

A filter incorporated in the line prevents blockage of the weakener unit.

During 'hot soak' conditions fuel vapour can pass along this pipe from the float chamber to be stored in the carbon filled canister.

Weakener filter—To remove

1. Slacken the worm drive clip which retains the weakener filter to the bracket.
2. Withdraw the filter.

Weakener filter—To fit

Fit the weakener filter by reversing the procedure given for its removal noting the following points.

1. Ensure that the rubber hoses are in good condition.
2. If clips have been fitted previously, ensure that new clips are fitted.
3. Ensure that the inlet pipe for the unit which is off-set from the centre is facing the front of the car and is in its lowest position (see Fig. U8).

Float chamber vent line

The carburettor float chambers are vented to the evaporation loss control canister through the float chamber vent line (see Fig. U8). Incorporated in the line is a non-return valve which maintains a depression in the float chamber during light throttle operation.

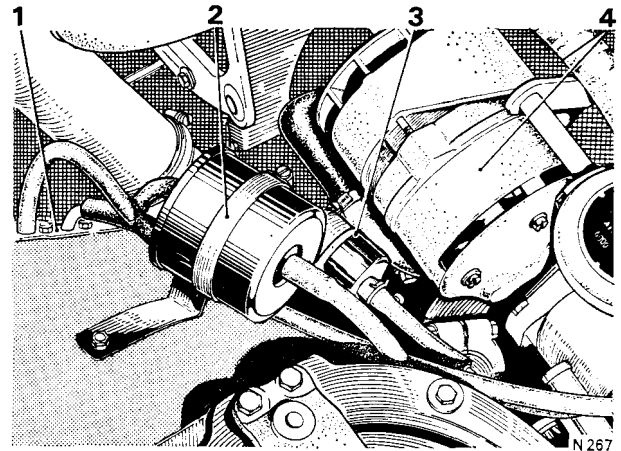


FIG. U10 POSITION OF MIXTURE WEAKENING DEVICE FILTER AND PURGE LINE FILTER

- 1 Connections through valve to the fuel evaporation loss control canister
- 2 Fuel mixture weakening device filter
- 3 Purge line filter
- 4 Alternator

The vent valve cannot be serviced and if its operation is suspect a new vent valve should be fitted.

Float chamber vent valve—To remove

1. Remove the rubber hose connection.
2. Withdraw and discard the retaining split pin.
3. Withdraw the vent valve from the top of the fuel receiver.

Float chamber vent valve—To fit

Fit the vent valve by reversing the procedure given for its removal noting the following points.

1. Ensure that the rubber 'O' ring at the top of the fuel receiver is in good condition, renew if the slightest doubt exists.
2. Use a new split pin to retain the vent valve in position.

Fuel receiver

The fuel receiver is situated adjacent to the ignition distributor and coil (see Fig. U23).

The unit should not require removal under normal circumstances. However, should the need arise the ignition distributor, coil and weakener cut-off solenoid valve should all be removed before unscrewing the two $\frac{1}{2}$ in. A/F setscrews which secure the fuel receiver bracket in position.

Chapter U

Fuel tank assembly

The fuel tank assembly consists of the fuel tank, expansion tank and fuel trap assembly (see Fig. U11).

The fuel tank is vented from three positions to a fuel trap assembly which is mounted above the fuel

filler. One vent is from the fuel filler neck and the other two vents from the fuel tank.

From the fuel trap, a vent line passes under the floor of the car to the evaporation loss control canister.

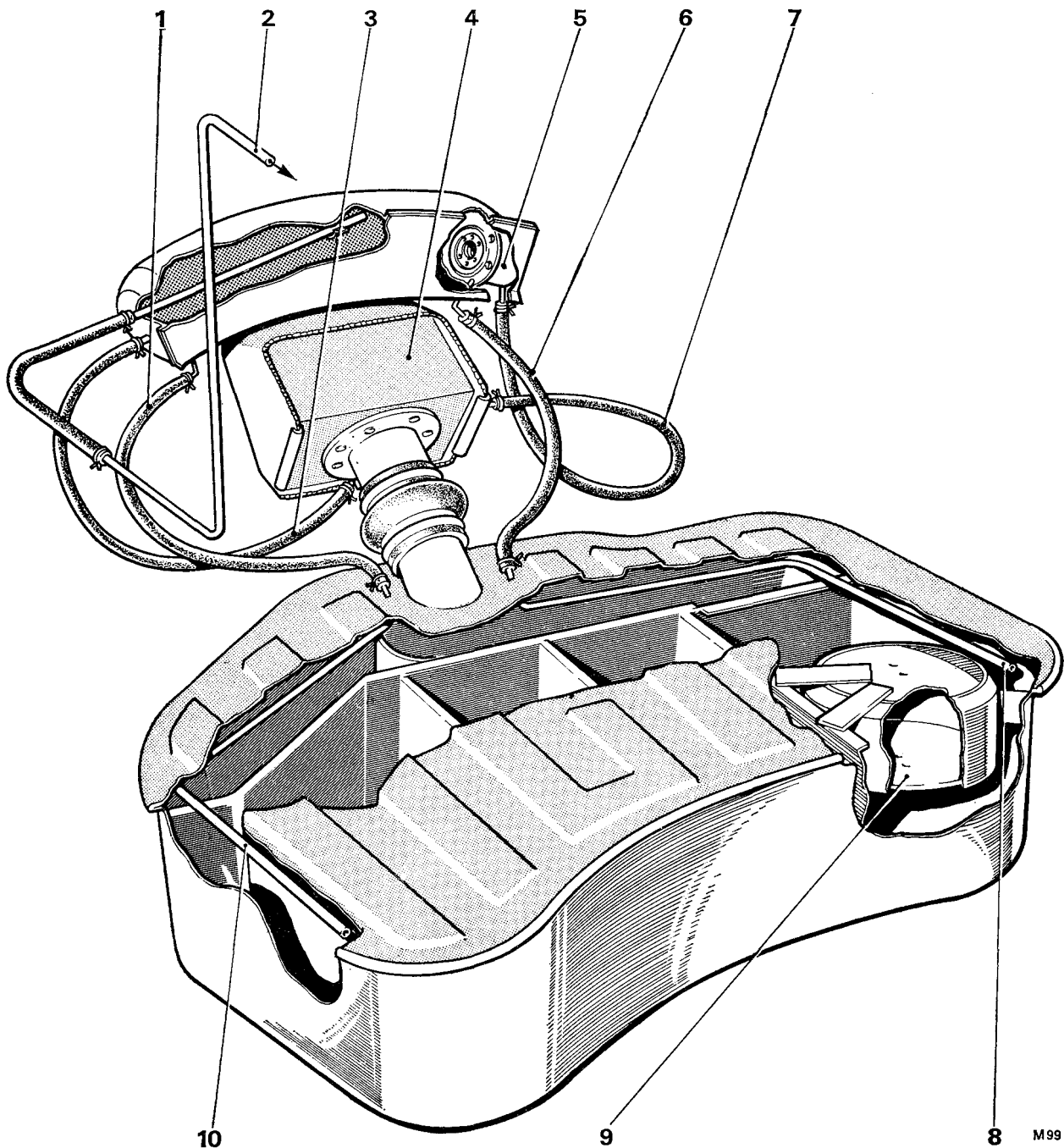


FIG. U11 FUEL EVAPORATION EMISSION CONTROL SYSTEM—FUEL TANK

- | | | |
|---|------------------------------------|-------------------|
| 1 Fuel trap drain | 4 Fuel filler box | 6 Fuel trap drain |
| 2 Connection to evaporation loss control canister | 5 Combined relief and vacuum valve | 7 Valve vent |
| 3 Filler vent neck | | 8 Vent pipe |
| | | 9 Expansion tank |
| | | 10 Vent pipe |

Fuel tank

The fuel tank (*see Fig. U11*) is similar to that fitted to standard cars, except that two vent pipes, 0.375 in. (9.525 mm.) diameter, are rigidly attached to the underside of the fuel tank top plate. The open ends of the vents terminate inside the tank at the front and rear. The outer ends of the two vent pipes terminate adjacent to the fuel filler neck.

A 6.7 U.S. pt. (5.5 Imp. pt., 3,125 litres) capacity expansion tank situated within the main fuel tank inhibits complete filling and provides additional fuel expansion volume to contend with extreme temperature conditions.

When a vehicle is being filled with fuel, automatic cut-off could completely fill the tank leaving only the filler neck, vent connector pipes and fuel trap to accommodate the expansion of the fuel. The expansion tank is situated in the upper part of the fuel tank and as the fuel level rises above the lower part of the expansion tank it flows inside through the two small holes in the base. Two additional holes in the top of the expansion tank allow air to escape.

At normal rates of filling it takes approximately 3 minutes to fill an empty tank whereas it takes approximately 9 minutes for the levels in both the main and expansion tanks to stabilise. After this time the main tank will have transferred 6.7 U.S. pt. (5.5 Imp. pt., 3,125 litres) to the expansion tank leaving the equivalent air space in the main tank for expansion.

Fuel tank—To remove

To remove the fuel tank proceed as described in Section K1—Fuel System (Early cars) noting that Operation 6 should be omitted and Operation 6 as follows should be carried out.

6. Using a pair of special pliers (RH 8090), remove the steel clips from the two rubber hoses situated one on either side of the fuel filler neck.

Withdraw the rubber hoses from the pipes.

Fuel tank—To fit

Note Prior to assembly, apply 'Hylomar' sealing compound to the fuel tank filler head union and tube assembly. Also spray 'Hylomar' on both sides of the fuel tank level unit joint.

Fit the fuel tank by reversing the procedure given for its removal noting the following points.

1. Ensure that the two rubber vent hoses are in good condition.
2. New steel clips should be used to secure the rubber vent hoses to the metal pipes on either side of the filler neck base.

Fuel trap assembly

The fuel trap (*see Fig. U11*) has a capacity of 4.00 U.S. pt. (3.25 Imp. pt., 1,87 litres).

The fuel trap acts as a liquid separator and prevents liquid fuel from being transferred to the control canister under severe driving manoeuvres when the fuel tank is full or during expansion of the fuel at high ambient temperatures.

The tank vent pipes are fed to the lower ends of the banana-shaped fuel trap. These pipes also serve as drain pipes for any fuel in the trap.

The filler tube is vented into the forward end of the fuel trap.

An outlet pipe is attached to the interior of the fuel trap and the other end is connected via metal and rubber pipes to the evaporation loss control canister.

A combined relief and vacuum valve in the fuel trap prevents any excessive pressure build-up due to vaporisation, or depression as the fuel is consumed, should the vent line to the evaporation loss control canister become blocked.

Fuel trap assembly—To remove

1. Disconnect the battery.
2. Remove the carpet and underlay in the luggage compartment.
3. Remove the tool kit (*see Chapter R—Wheels and Tyres, Fig. R10*).
4. Remove the fuel filler door release ring.
5. Unscrew the five 'Phillips' headed screws from the side carpet; four secure the brackets retaining the tool kit and the fifth is positioned at the front of the side carpet.
6. Release the 'Tenax' clip situated adjacent to the rear lamps access point.
7. Remove the side carpet and the carpet covering the fuel filler neck.
8. Using special pliers (RH 8090) remove the steel clips from the rubber hoses. Withdraw the hoses from their respective pipes.
9. Unscrew and remove the three 2 B.A. setscrews securing the fuel trap assembly.
10. Slowly move the fuel trap rearward and downward until the lower end can be turned into the luggage compartment and the assembly withdrawn from the car.

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Fuel trap assembly—To fit

Fit the fuel trap assembly by reversing the procedure given for its removal noting the following points.

1. Ensure that the rubber hose connections are in good condition.
2. Ensure that new steel retaining clips are used.

Fuel trap relief and vacuum valve —To remove

1. Remove the fuel trap assembly as described in Fuel trap assembly—To remove.
2. Unscrew the retaining setscrews, taking care not to lose the washers.
3. Withdraw the relief and vacuum valve.

Fuel trap relief and vacuum valve—To fit

Fit the relief and vacuum valve by reversing the procedure given for its removal, noting the following points.

1. Ensure that the joint faces of the relief and vacuum valve and fuel trap assembly are clean and in good condition.
2. Fit a new gasket.

Fuel evaporation emission control system —To leak check

To test the fuel evaporation emission control system and pipes (i.e. fuel tank, fuel trap assembly and pipes, etc.) for leaks, proceed as follows.

1. Blank off the lower end of the relief valve hose (see Fig. U8 item 8).
2. Connect an air pressure supply (with a manometer tapping) to the lower end of the fuel trap to boot pipe (item 9) in place of the vent pipe hose (item 12).
3. Using a pressure regulator apply a pressure of 1.5 lb/sq. in. (41 ± 2 in. H₂O) to the system and close the pressure supply.
4. Check manometer after 5 minutes. If the level has fallen by more than 0.5 in. check all joints including petrol level transmitter to tank joint with soap solution.
5. After rectifying any leaks repeat the pressure test. When the system is satisfactory connect the fuel trap to boot pipe (item 9) and the boot to sill pipe (item 11) using the rubber vent pipe hose (item 12).
6. Detach the canister to wing hose (item 15) from the evaporation loss control canister and connect to the test equipment. Repeat Operation 3 to the same acceptance limits.
7. Rectify any leaks and repeat the pressure test. If the system is now satisfactory connect the canister to wing hose (item 15) to the evaporation loss control canister.

Section U3

CRANKCASE EMISSION CONTROL SYSTEM

Crankcase emissions are controlled by a recirculatory closed breather system (see Fig. U12).

An insulated draught tube connects the crankcase via the oil filler which is fitted with a sealed cap, to the choke housing upstream of both the choke butterfly and the carburetters. A flame trap capsule containing three wire mesh discs is fitted in a housing at the crankcase end of the draught tube. Engine emission (blow-by) is drawn into the induction system via the draught tube, due to the depression in the choke housing.

Maintenance

1. The flame trap fitted to the breather pipe should be cleaned in the following manner, at the mileage specified in Section U7.
2. Unscrew the setscrew securing the breather pipe connection to the oil filler pedestal; withdraw the connection from the pedestal (slight resistance may be felt due to the rubber 'O' ring connections).
3. Withdraw the connection from the pipe flange.
4. Wash the flame trap assembly in clean petrol, then dry with a high pressure air line. The flame trap

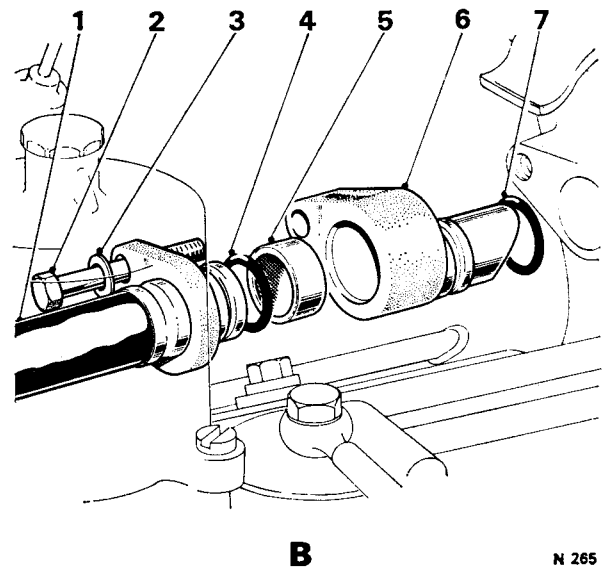
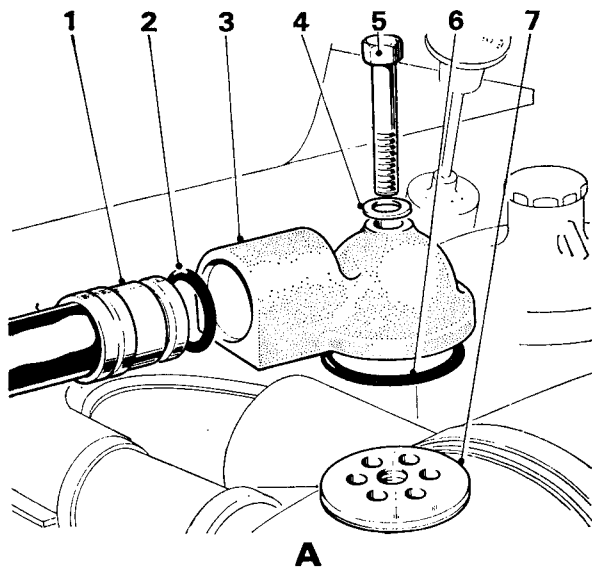


FIG. U12 EXPLODED VIEW OF CRANKCASE EMISSION CONTROL PIPE

Diagram A

- 1 Pipe
- 2 'O' ring
- 3 Connection
- 4 Washer
- 5 Setscrew
- 6 'O' ring
- 7 Adapter

Diagram B

- 1 Pipe
- 2 Setscrew
- 3 Washer
- 4 'O' ring
- 5 Flame trap
- 6 Connection
- 7 'O' ring

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assembly consists of either 6 separate gauzes or 3 gauzes crimped together as shown in Figure U12.

5. To clean the adapter fitted to the choke housing, remove the single setscrew from the breather pipe end connection and detach the pipe.

6. Clean the adapter fitted to the choke housing and ensure that the holes in the adapter are clear.

7. Assembly of the flame trap and breather pipe is in the reverse order, ensuring that the 'O' rings are in good condition.

Section U4

EMISSION CONTROL SYSTEMS (ELECTRICAL COMPONENTS)

The electrical components described in this section would normally appear in Chapter M — Electrical System, however, as they are only used in connection with the emission control systems it is thought more practical to include the information in this Chapter.

The components concerned are as follows.

- (i) The exhaust gas recirculation valve cut-in switch.
- (ii) The exhaust gas recirculation valve cut-off solenoid.
- (iii) The anti 'run-on' solenoid.
- (iv) The weakener cut-off solenoid valve.
- (v) The weakener cut-off solenoid switch.

Note The temperatures quoted throughout this section for the various switches are nominal operating temperatures and in service, a plus or minus tolerance of a few degrees may be found.

Exhaust gas recirculation cut-in switch —To remove

The bi-metal cut-in switch is situated in the engine coolant thermostat outlet elbow (see Fig. U13).

1. Remove the radiator filler cap and drain the engine coolant.
2. Disconnect the electrical lead.
3. Unscrew and remove the three 2 B.A. setscrews, spring washers and plain washers.
4. Free the joint and withdraw the cut-in switch.

Exhaust gas recirculation cut-in switch —To fit

Fit the cut-in switch by reversing the procedure given for removal, noting the following points.

1. Each setscrew has one spring and one plain washer.
2. The joint faces must be clean and a new gasket fitted.

Exhaust gas recirculation cut-in switch —To check

1. Disconnect the electrical connection from the switch connection.

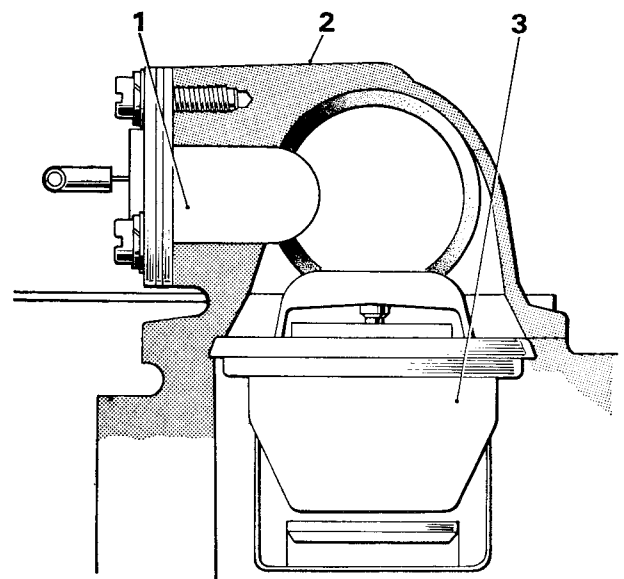


FIG. U13 EXHAUST GAS RECIRCULATION
CUT-IN SWITCH

- 1 Exhaust gas recirculation cut-in switch
- 2 Thermostat outlet elbow
- 3 Thermostat

2. Connect one side of a test lamp to the switch contact and the other side to a known good electrical supply (i.e. white wire connection on the ballast resistance).

3. Ensure that the engine is cold and switch on the ignition.

4. Check that the test lamp bulb is illuminated.

★5. Start and run the engine, as the coolant temperature rises to 14°C. (57°F.) the test lamp bulb should extinguish.

★6. Stop the engine and allow to cool, noting that as the coolant temperature drops to 12°C. (54°F.) the test lamp bulb again illuminates.

Note Do not leave the ignition switched on for long periods of time when the engine is not running.

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Exhaust gas recirculation cut-off solenoid —To remove

The cut-off solenoid is situated on a small platform adjacent to the 'B' bank carburetter. The exhaust gas recirculation cut-off solenoid is the solenoid fitted with the vent (i.e. the rearmost of the two solenoids on the platform).

1. Detach the electrical connections, noting the position of the connections to assist identification when assembling.
2. Unscrew the two 'cheese-headed' mounting screws and withdraw the solenoid.

Exhaust gas recirculation cut-off solenoid —To fit

Fit the cut-off solenoid by reversing the procedure given for removal.

Exhaust gas recirculation cut-off solenoid circuit wiring—To check

1. Connect a test lamp across the two Lucar connections to the solenoid.

Note Do not disconnect the two Lucar connections.

2. Ensure that the engine is cold.
3. Switch on the ignition and start the engine, noting that the bulb of the test lamp is illuminated.
- ★4. Start and run the engine, as the coolant temperature rises to 14°C. (57°F.) the test lamp bulb should extinguish.
- ★5. Stop the engine and allow to cool, noting that as the coolant temperature drops to 12°C. (54°F.) the test lamp bulb again illuminates.

Note Do not leave the ignition switched on for long periods of time when the engine is not running.

Exhaust gas recirculation cut-off solenoid —To check

1. Detach the solenoid hose at the weakener unit.
 2. Clean the end of the hose.
 3. Switch on the ignition.
- Note** Do not leave the ignition switched on for long periods of time when the engine is not running.
4. Place the hose in the mouth and apply suction.
 5. If the operation of the solenoid is correct note that the following conditions apply and connect the hose to the weakener.
 - (i) With an engine coolant temperature of below 14°C. (57°F.) sucking on the hose

should not prompt any movement of the exhaust gas recirculation valve.

Disconnect the hose from the exhaust gas recirculation valve. Clean the end of the hose, place in the mouth and blow; it should be possible to blow down this hose as the solenoid is vented to atmosphere. Connect the hose to the exhaust gas recirculation valve.

- (ii) With an engine coolant temperature of above 14°C. (57°F.) sucking on the hose from the weakener unit should move the exhaust gas recirculation valve.
- (iii) As the engine coolant temperature falls to 12°C. (54°F.) the conditions described in (i) should again apply.

6. If the operation of the solenoid is suspect, fit a new unit.

Anti 'run-on' solenoid—To remove

The anti 'run-on' solenoid is situated on a platform adjacent to 'B' bank carburetter; it is the foremost of the two solenoids fitted on the platform.

1. Disconnect the rubber hose from either side of the solenoid.
2. Disconnect the two electrical leads at their Lucar connection.
3. Unscrew and remove the two screws situated one on either side of the solenoid body and through the mounting bracket.
4. Withdraw the anti 'run-on' solenoid.

Anti 'run-on' solenoid—To fit

Fit the anti 'run-on' solenoid by reversing the procedure given for removal.

Anti 'run-on' solenoid circuit wiring —To check

1. Connect a test lamp across the two Lucar connections to the solenoid.

Note Do not disconnect the two Lucar connections.

2. Switch on the ignition and check that the test lamp bulb illuminates.
3. Switch off the ignition and check that the test lamp bulb is extinguished.

Anti 'run-on' solenoid—To check

1. Detach the hose from the solenoid to the 'Tee' piece at the solenoid end and connect a piece of hose of identical internal diameter but of suitable length, to the solenoid.

2. Clean the open end of the hose.
3. Switch on the ignition.
4. Place the hose in the mouth and blow down the hose.
5. If the operation of the solenoid is correct note that the following conditions apply and connect the original hose to the solenoid.
 - (i) With the ignition switched on the solenoid is energised and it should be possible to blow down the hose.
 - (ii) With the ignition switched off it should not be possible to blow down the hose.
6. If the operation of the solenoid is suspect, fit a new unit.

Weakener valve cut-off switch—To remove

1. Disconnect the electrical supply lead.
2. Unscrew and remove the three 2 B.A. setscrews and washers.
3. Free the joint and withdraw the cut-in switch.

Weakener valve cut-off switch—To fit

Fit the weakener valve cut-off switch by reversing the procedure given for removal noting the following point.

1. Ensure that the joint faces are clean and that a new gasket is fitted.

Weakener valve cut-off switch—To check

1. Disconnect the electrical connection from the switch connection.
2. Connect one side of a test lamp to the switch contact and the other side to a known good electrical supply (i.e. white wire connection on the ballast resistance).
3. Ensure that the engine is cold and switch on the ignition.
4. Check that the test lamp bulb is illuminated.
5. Start the engine and warm-up; as the air intake temperature reached between 12°C. and 16°C. (54°F. and 61°F.) the test lamp bulb should extinguish.

Weakener cut-off solenoid valve—To remove

The weakener cut-off valve is situated on a bracket adjacent to the ignition coil.

1. Detach the rubber hose from either side of the weakener cut-off valve.
2. Disconnect the two electrical leads at their respective Lucar connections.
3. Unscrew and remove the two 2 B.A. screws, nuts and washers securing the weakener cut-off valve in position. Remove the valve.

Weakener cut-off solenoid valve—To fit

Fit the weakener cut-off valve by reversing the procedure given for removal.

Weakener cut-off solenoid valve circuit wiring—To check

1. Connect a test lamp across the two Lucar connections to the solenoid.

Note Do not disconnect the two Lucar connections.

2. Ensure that the engine is cold.
3. Switch on the ignition and start the engine, noting that the bulb of the test lamp is illuminated.
4. When the air intake temperature has reached between 12°C. and 16°C. (54°F. and 61°F.) the test lamp bulb should extinguish.

Weakener cut-off solenoid valve—To check

1. Detach the hose to the weakener cut-off solenoid valve from the 'Tee' piece adjacent to the anti 'run-on' solenoid.
2. Clean the end of the hose.
3. Switch on the ignition.
4. Blow down the hose.
5. If the operation of the solenoid valve is correct note that the following conditions apply and connect the hose to the 'Tee' piece.
 - (i) With the engine air intake temperature below 12°C. to 16°C. (54°F. and 61°F.), it should be possible to blow down the hose.
 - (ii) With the engine air intake temperature above 12°C. to 16°C. (54°F. and 61°F.), it should not be possible to blow down the hose.
6. If the operation of the solenoid is suspect, fit a new unit.

Section U5

THE CARBURETTORS AND AUTOMATIC CHOKE SYSTEM

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CARBURETTER

Data

Carburettors	Two S.U. HD8 diaphragm type
Choke size	2.00 in. (5,08 cm.)
Jet size— spring loaded needle type	0.100 in. (2,44 mm.)
Jet needle— spring loaded type ..	BBS
Carburetter— air valve piston spring	Red/Blue

Description

Two S.U. HD8 diaphragm carburettors with 2.00 in. (5,08 cm.) choke bores are fitted to the engine on a central 'Tee' piece which is mounted over an eight branch induction manifold (*see Fig. U15*).

This type of carburetter automatically adjusts both its choke and jet area to meet the demand of the engine which is dependent on engine speed and loading. As air is drawn through the carburetter, the piston acting as an obstruction will cause a depression to be formed in the area between the throttle and the piston. This depression is communicated by means of transfer holes in the base of the piston to the area above the piston, causing an upward force to be imposed on the piston. The piston will rise in response

to this force relieving the depression in the area between the piston and the throttle as it does so until a point is reached where the force acting on the piston is balanced by the weight of the piston and the load exerted by the piston spring.

A spring-loaded jet needle is fitted to the carburettors, which is biased down stream and operates in a reduced diameter main jet; this jet does not require centralising.

The carburetter is fitted with a synthetic rubber diaphragm which is clamped in position by the jet and jet return spring cup. The diaphragm is in turn secured at its outer edge between the diaphragm housing and the main jet well. The carburetter is fitted with a nylon block in the jet well and a nylon feed tube from the float chamber to prevent vaporisation of the fuel. This assembly is known as the anti-boiling device.

The jet is fed through its lower end from the main jet well, its movement being controlled by the jet return spring and the jet adjusting screw which actuates a rocking lever. This lever raises or lowers the jet as required and so controls the mixture. Turning the adjusting screw clockwise (inwards) lowers the jet and enrichens the mixture; turning the screw anti-clockwise (outwards) weakens the mixture.

The carburettors are balanced by adjustable volume screws which control the mixture output of the carburettors relative to each other under idling conditions.

Slow running speed is adjusted by means of the throttle stop screw, and is finally carried out after the carburettors have been tuned. The throttle stop screw is locked into position by a lock-nut.

Chapter U

CARBURETTER MIXTURE WEAKENING DEVICE

Introduction

An engine normally requires a richer mixture when running at full load than it does under cruising conditions. Normally the S.U. carburetters achieve this automatically due to the pulsating nature of the air flow at full load as compared with the steady flow when cruising with the throttles partly shut. This effect, known as mixture ratio spread, is also contrived by the design of the air intake and induction passages.

However, for optimum exhaust emission control a greater mixture ratio spread than can be met by the

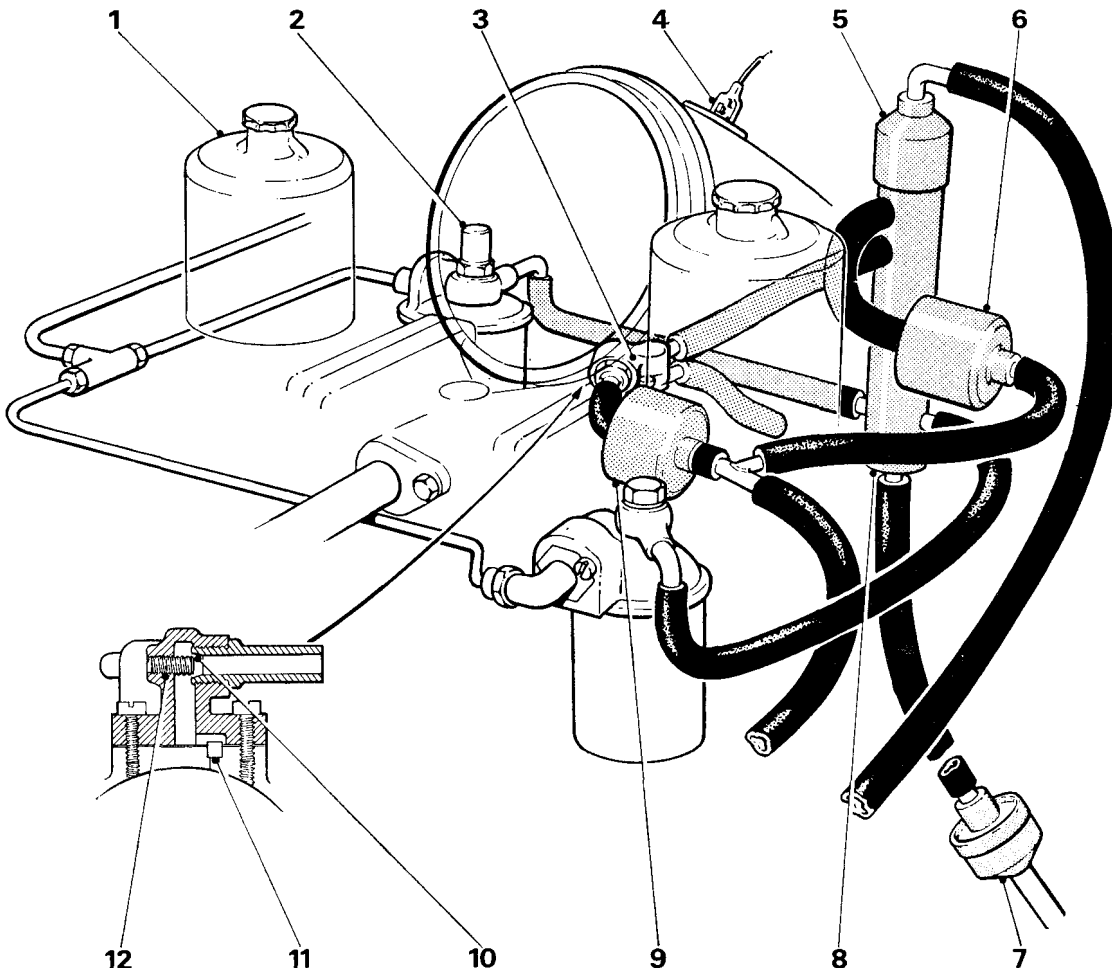
above factors is required. Therefore a weakening device is fitted.

Description

The rate of fuel discharge from the main jet is governed by the difference in air pressure between that existing over the fuel in the float chamber and that over the main jet.

The weakening device is fitted directly to the 'B' bank carburetter (see Fig. U17).

The weakening device is designed to reduce the air pressure (i.e. to create a depression) in the float chamber when the throttle is partly closed, thereby



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FIG. U14 CARBURETTER WEAKENING DEVICE

- | | |
|-------------------------------------|---|
| 1 'A' bank carburetter | 7 Float chamber drain valve |
| 2 Float chamber pressure tapping | 8 Fuel receiver |
| 3 Weakening device | 9 Anti 'run-on' solenoid |
| 4 Bi-metal switch | 10 Bleed orifice |
| 5 Float chamber vent valve | 11 Venturi |
| 6 Weakening device cut-off solenoid | 12 Adjustment screw (set during initial assembly) |

reducing the rate of fuel discharge from the jet. The lid is otherwise sealed by a gasket between the lid and the bowl.

The weakening device consists of a housing containing a venturi at one end which is pressed into a drilling in the carburetter body close to the edge of the throttle butterfly. The other end contains a pre-set air bleed and is connected to the weakener filter by means of a flexible hose. The central passage communicates via pipes with the float chambers.

To obtain adequate float chamber venting to cope with hot soak conditions there is an additional vent from the float chambers. This vent incorporates a low pressure non-return valve to maintain a float chamber depression under normal operating conditions.

A petrol spill pipe incorporating a relief valve is fitted to the pressure balance pipe to provide an outlet for excess petrol in the unlikely event of a float chamber needle sticking.

Operation idling

With the throttle in the normal idling position, the drilling in the carburetter body emerges upstream of the throttle butterfly and is only subjected to the slight depression exerted in that condition. This produces a small flow of air through the venturi but the effect on float chamber air pressure is small.

Full throttle

As with the idling position, the depression produced is slight and will have a negligible effect on air pressure in the float chamber. This small difference is compensated for in the design of the jet needle.

Cruising

With the throttle partly open, the weakener drilling is on the engine side of the throttle butterfly and the high manifold depression causes air to be drawn through the venturi. The size of the venturi is chosen so that the velocity will reach a maximum value which remains substantially constant once a pre-determined manifold depression figure has been reached.

The air bleed orifice controls the flow of air into the weakener and therefore the float chamber depression. The actual value of the float chamber depression reaches a maximum at the same time as the air velocity attains its maximum value.

Low temperatures

To improve engine starting when the engine temperature is below 16°C. (60°F.), a bi-metal switch activates a solenoid valve which vents the float chamber to atmosphere via the evaporation loss control canister and renders the weakener inoperative.

Hot idle mixture compensator valve

At high ambient temperatures the idle quality deteriorates after prolonged periods of idling unless a mixture compensator valve is fitted. The compensator assembly incorporates a bi-metallic valve which meters a small quantity of air, controlled by the inlet air temperature, to a point in the induction system down stream of the carburetter throttle valves. This has the dual effect of weakening the mixture and increasing the mass flow, thereby raising the idle speed slightly, and restoring normal idle speed.

The unit is integral with the choke housing.

Hot air intake

Air is drawn into the hot air intake from over the exhaust manifold and is then passed through the air silencer/filter. This permits the use of leaner mixtures under normal operating conditions together with a quickly opening automatic choke. The hose which connects the intake to air filter/silencer is shown in Figures U1 and U2.

OVERHAUL

Carburetters—To remove

Before commencing to remove the carburetters observe the following points.

1. When disconnecting the various hoses, pipes and wiring connections ensure that they are suitably labelled to assist identification when assembling.
2. Ensure that **all** open ends of pipes, hoses, etc. are suitably blanked off to prevent the ingress of dirt, etc.

To remove the carburetters proceed as follows.

1. Disconnect the battery.
2. Unscrew and remove the two $\frac{7}{16}$ in. A/F nuts and washers securing the exhaust gas recirculation valve distribution pipes to the exhaust gas recirculation mounting flange. Free the joint faces.

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3. Detach the rubber hose from the exhaust gas recirculation cut-off solenoid vent.
4. Unscrew the worm drive clip retaining the exhaust gas recirculation valve to the 'A' bank carburetter air horn. Slide the clip from the exhaust gas recirculation valve mounting.
5. Detach the electrical connection from the weakener cut-off bi-metal thermostat switch.
6. Remove the crankcase breather pipe from the choke butterfly housing; withdraw the housing from the end of the pipe.

7. Disconnect the choke stove pipe from the choke butterfly housing.
8. Unscrew and remove the two $\frac{7}{16}$ in. A/F set-screws securing the support bracket for the air intake hose; collect the two washers and distance pieces.
9. Disconnect the air intake hose and elbow from the air silencer and butterfly housing; remove the hose and elbow together with the bonding cable earth strip.
10. Move the spring clip from the choke solenoid cover and disconnect the wires.

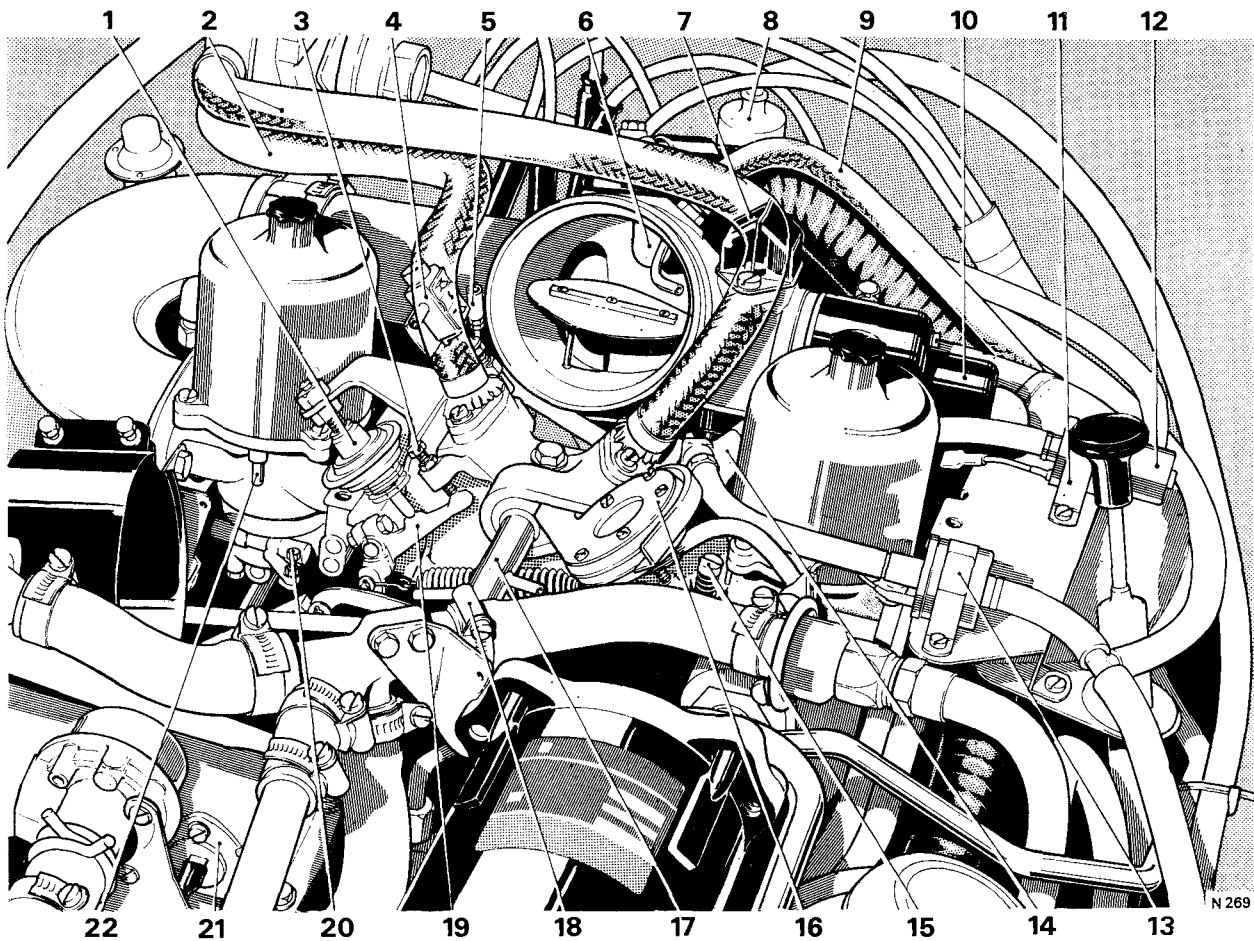


FIG. U15 VIEW OF CARBURETTERS

- | | |
|--|---|
| 1 Throttle damper | 12 Solenoid vent |
| 2 Distribution pipes (Exhaust gas recirculation) | 13 Anti 'run-on' solenoid |
| 3 Fixed throttle stop screw | 14 Weakening device |
| 4 Vacuum retard tap | 15 Volume screw |
| 5 Fast-idle linkage | 16 Throttle stop vacuum actuator |
| 6 Bi-metal switch (Weakener system) | 17 Air injection pipe |
| 7 Choke solenoid | 18 Worm drive clip — correctly positioned to avoid possible foul with air intake hose |
| 8 Fuel receiver and float chamber vent valve | 19 'A' bank butterfly lever |
| 9 Choke stove pipe | 20 Jet adjusting screw |
| 10 Bi-metal coil housing | 21 Bi-metal switch (Exhaust gas recirculation) |
| 11 Cut-off solenoid (Exhaust gas recirculation) | 22 Piston lift pin |

11. Remove the engine oil dipstick.
12. Unscrew and remove the 2 B.A. bolt, nut and washer securing the throttle linkage to the 'fore and aft' manifold shaft level; this connection is adjacent to the 'A' bank carburetter.
13. Withdraw the throttle linkage from the manifold shaft lever.
14. Disconnect the main fuel feed pipe.
15. Remove the three screws securing the small end cover to the bi-metal coil cover, withdraw the cover along the choke stove pipe to reveal the pipe connection. Disconnect the choke stove pipe.
16. Disconnect the hoses from the carburetter weakening device.
17. Disconnect the hoses from the float chamber vents.
18. Disconnect the hose from the anti run-on solenoid to the vent canister pipe.
19. Disconnect the two hoses connected to the gulp valve to carburetter 'Tee' piece pipe.
20. Disconnect the throttle stop vacuum actuator hose.
21. Remove the setscrew securing the throttle stop vacuum actuator bracket and the gulp valve to carburetter 'Tee' piece pipe. Unscrew and remove the top two $\frac{1}{2}$ in. A/F nuts and washers from 'B' bank carburetter and withdraw the throttle stop vacuum actuator and bracket.
22. Remove the pipe fitted between the gulp valve and carburetter 'Tee' piece.
23. Disconnect the electrical connections from the two solenoid valves mounted on and bracket attached to 'B' bank carburetter.
24. Disconnect the vacuum retard rubber pipe from the distributor.
25. Separate the rubber hose from either side of the vacuum retard tap.
26. Remove the air horns, choke butterfly housing, carburetters and 'Tee' piece as one complete assembly. The assembly is secured to the induction manifold by a $\frac{1}{2}$ in. A/F setscrew situated centrally on the carburetter 'Tee' piece and located by two dowel pins.
Dismantle the carburetters from the 'Tee' piece and air horns as follows.
27. Unscrew the four setscrews retaining the exhaust gas recirculation distribution pipes in position on the carburetter 'Tee' piece. Withdraw the pipes and gaskets.
28. Slacken the pinch bolt and remove the fast-idle lever from the 'A' bank carburetter butterfly spindle (*see Chapter K*).

29. Unscrew and remove the two $\frac{1}{2}$ in. A/F nuts from the two setscrews securing the air horn to 'B' bank carburetter. Withdraw the solenoid mounting bracket.
30. Remove the four setscrews securing the two air horns to the carburetters, collect the full throttle stop bracket from 'A' bank carburetter.
31. Unscrew and remove the two 2 B.A. setscrews and washers securing the vacuum retard tap in position.
32. Remove the air horns.
33. Disconnect the petrol feed pipe from the float chambers.
34. Disconnect the carburetter spill pipe from each carburetter float chamber.
35. Remove the float chamber lids and floats, keeping them to their respective carburetter.
36. Remove the nut securing the throttle damper to its bracket; remove the damper.
37. Remove the throttle spring.
38. Completely remove the two pinch bolts securing the throttle levers to the 'A' and 'B' bank carburetter butterfly spindles; remove the levers.
39. Remove the nuts and washers securing both carburetters to the 'Tee' piece, remove the carburetters, together with the throttle damper bracket adjacent to 'A' bank carburetter.

Carburetters—To fit

Fit the carburetters by reversing the procedure given for their removal noting the following points.

1. Fit new gaskets and washers to all joints.
2. Examine the floats for damage or punctures; fit the floats to their respective float chamber.
3. Renew the lid gaskets.
4. Fit the gaskets to the lids then fit the lids to the chambers.
5. Secure the lids and pipes to the float chambers.
6. Examine the paper filter elements for cleanliness and damage; renew if necessary.
7. Ensure that the 'O' ring on the petrol inlet unions are in good condition; renew if necessary. Fit the paper filter elements, spring retainers, springs and inlet unions to each float chamber lid. Secure the inlet unions with the retaining screws.
8. Fill the damper piston with an approved oil; the oil level should be approximately 0.5 in. (12.7 mm.) below the top of the piston rod. Do not overfill.
9. Check that the gap between the throttle stop vacuum actuator and the vacuum throttle stop screw is 0.070 in. (1.78 mm.).

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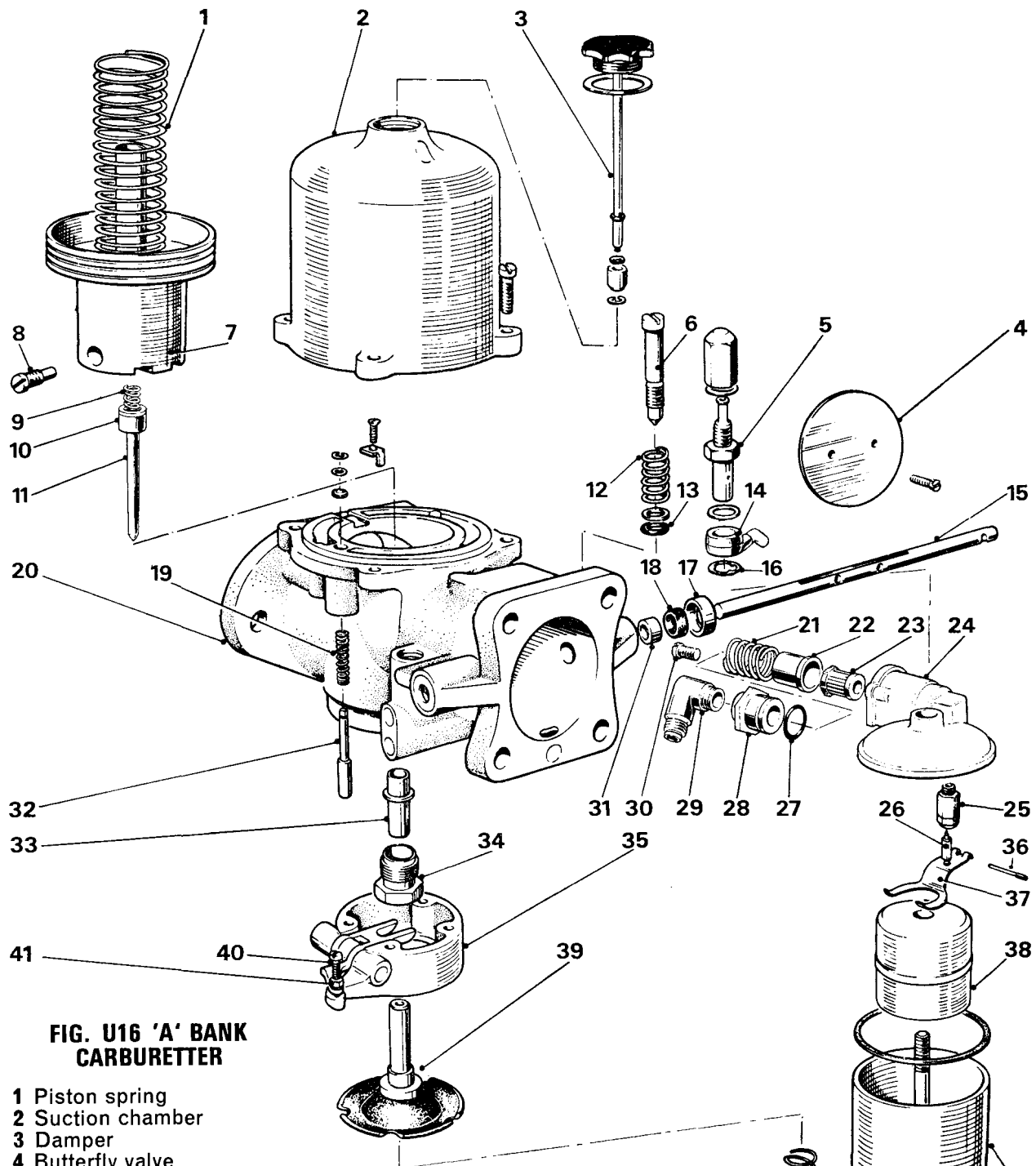


FIG. U16 'A' BANK CARBURETTER

- 1 Piston spring
- 2 Suction chamber
- 3 Damper
- 4 Butterfly valve
- 5 Pressure tapping piece
- 6 Volume screw
- 7 Piston
- 8 Needle locking screw
- 9 Needle spring
- 10 Needle guide
- 11 Needle
- 12 Spring
- 13 Seal
- 14 Overflow pipe
- 15 Spindle
- 16 Fibre washer
- 17 End cap
- 18 Sealing gland
- 19 Piston lift pin spring
- 20 Carburettor body
- 21 Filter retainer spring

- 22 Filter element retainer
- 23 Filter element
- 24 Float chamber cover
- 25 Float needle housing
- 26 Float needle
- 27 'O' ring
- 28 Float chamber cover adapter
- 29 Adapter elbow
- 30 Adapter screw
- 31 Bearing
- 32 Piston lift pin
- 33 Jet bearing
- 34 Jet locking nut
- 35 Jet housing
- 36 Hinge pin

- 37 Lever
- 38 Float
- 39 Jet diaphragm and jet assembly
- 40 Jet adjusting screw
- 41 Lock-nut
- 42 Anti boiling device
- 43 Jet spring
- 44 Float chamber

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Carburetters—To dismantle

1. Thoroughly clean the outside of the carburetters.

Important

Certain special parts are used for exhaust emission control carburetters and in some cases they differ from parts used for standard carburetters only in their dimensional tolerances, therefore when renewing parts ensure that the correct replacements are fitted (see *Parts List T.S.D. 2201*).

Parts from the two carburetters should not be interchanged. To prevent this, the parts as they are removed from each carburetter, should be placed in two boxes, one marked 'A' bank and the other 'B' bank.

2. Unscrew and remove the two weakener unit retaining screws; withdraw the weakener unit.

3. Unscrew and remove the damper and washer.

4. Remove the suction chamber retaining screws and remove the chamber without tilting it.

5. Remove the piston spring.

6. Carefully lift out the piston and needle assembly. Empty the damper oil from the piston rod.

7. Remove the needle guide locking screw from the piston then withdraw the needle assembly taking care not to bend the needle.

8. Withdraw the needle guide from the needle and remove the spring.

Note The flanged collar pressed onto the jet needle is pre-set at the factory and must not be disturbed.

9. Mark the relative position of the float chamber, jet housing and carburetter body. Unscrew the float chamber screws, holding the float chamber against the pressure of the jet spring. Carefully detach the float chamber (see *Fig. K13 in Chapter K*).

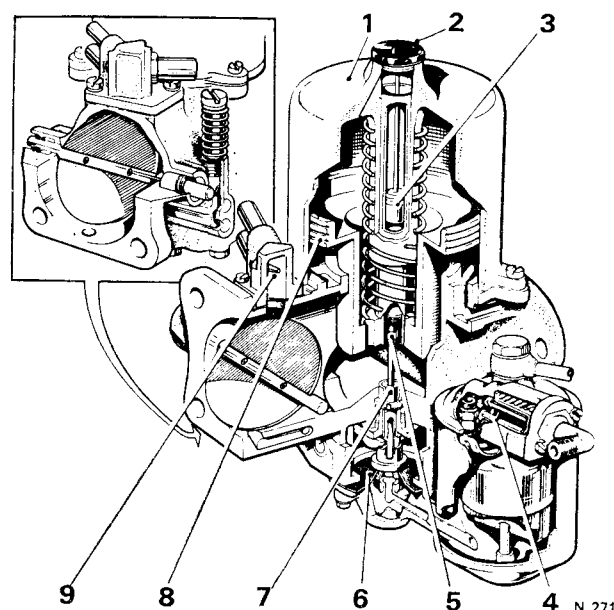
10. Lift off the jet housing. Withdraw the jet assembly and jet spring.

11. Using a ring spanner remove the jet locking nut together with the jet bearing and lock-washer; discard the lock-washer.

Note Lock-washers are not fitted to carburetters with a spring loaded needle.

12. Unscrew the two screws securing the fuel inlet union to the float chamber lid. Withdraw the union together with the spring, spring retainer and paper filter element.

13. Push out the float lever hinge pin from the end opposite to the serrations. Detach the lever.

**FIG. U17 'B' BANK CARBURETTER**

- | | |
|--------------------|--------------------|
| 1 Suction chamber | 5 Needle |
| 2 Damper cap | 6 Diaphragm |
| 3 Damper piston | 7 Jet |
| 4 Filter | 8 Air valve piston |
| 9 Weakening device | |

14. Extract the float needle from its seating and unscrew the seating from the lid using a box spanner. Do not distort the seating.

15. Invert the chamber to remove the float.

16. Close the throttle and mark the relative positions of the throttle butterfly valve and the carburetter flange.

17. Slacken and remove the butterfly valve from its slot in the throttle spindle. The butterfly valve is oval and will jam if care is not taken.

18. Slide out the spindle from its bearing.

19. Remove the two rubber seals from the throttle spindle bore.

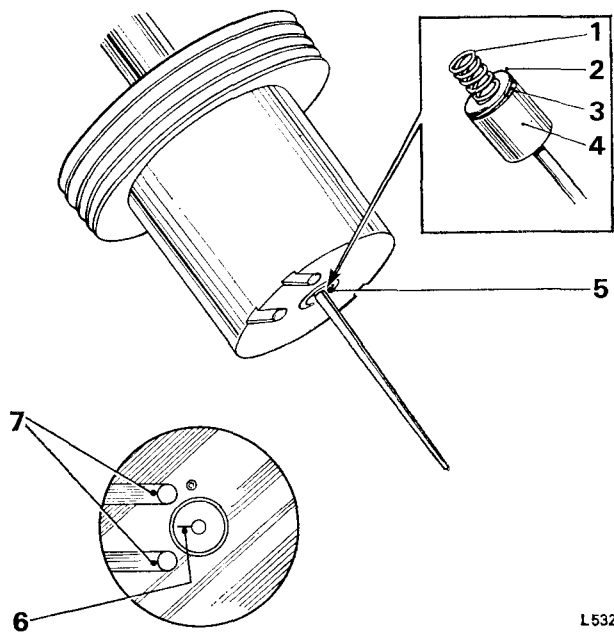
20. Unscrew and remove the slow-running valve complete with spring, seal and brass washer.

21. Remove the two screws and washers retaining the vacuum weakener unit, withdraw the unit and gasket.

22. Remove the piston lifting pin by extracting the circlip from its groove with the pin pressed upwards.

23. Withdraw the pin downwards.

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FIG. U18 CORRECT POSITION OF SPRING-LOADED NEEDLE

- 1 Spring
- 2 Collar
- 3 Indentation
- 4 Guide
- 5 Needle and guide position
- 6 Mark on guide
- 7 Transfer holes and cut-outs

Carburettors—To assemble

1. Check that all the passages in the carburetter body are free from any obstruction.
2. Ensure that the venturi pressed into the carburetter body is not damaged. Fit the weakener unit together with a new gasket to the carburetter body using two screws.
3. Examine the butterfly valve spindle for scoring or signs of wear.
4. Fit the spindle in its bearings and check for slack in the bearings and freedom of operation.
5. Fit the throttle butterfly valve to the slot in the butterfly valve spindle in the position marked during dismantling. The countersunk ends of the screw holes in the spindle must face outwards towards the flange of the carburetter body. Fit two new retaining screws but do not tighten.
6. Adjust the butterfly valve until it closes fully. Check this visually, then tighten the screws. Spread the split ends of the screws sufficiently to prevent turning.

7. Using tool RH 8383 fit the seals to each end of the shaft. Ensure that the concave end of the seals enters the bores first.
8. Examine the slow-running valve seal for serviceability.
9. Check that the concave face of the brass washer is towards the seal.
10. Fit the valve assembly.
11. Fit the piston lifting pin, spring, rubber washer, plain washer and circlip.
12. Examine the float needle and seating for damage or wear.
13. Screw the seating into the float chamber lid but do not overtighten.
14. Fit the needle to the seating, coned end first. Using light finger pressure to hold the needle against its seating, test the assembly for leaks with an air pressure line. The pressure should be approximately 5 lb/sq. in. (0,35 kg/sq. cm.).
15. Fit the float chamber lid lever and fit the hinge pin.
16. **Check the float level.**

With the needle on its seating, insert a 0.438 in. (11,11 mm.) diameter bar between the forked lever and the lip of the float chamber lid. The prongs of the lever should just rest on the bar (*see Chapter K*). If they do not, carefully bend the lever at the start of the pronged section until the correct setting is obtained.

17. Examine the piston rod and the outside surface of the piston for damage.
18. The piston assembly must be scrupulously clean. Use petrol or methylated spirits as a cleaning agent; do not use abrasives.
19. Clean inside the suction chamber and piston rod guide.
20. Fit the damper assembly and washer. Seal the transfer holes in the piston assembly with rubber plugs and fit the assembly to the suction chamber. Invert the complete assembly and check the time it takes for the suction chamber to fall away from the piston (*see Chapter K*). This should be between 5 and 7 seconds. Remove the plugs, damper assembly and washer.
21. Fit the jet bearing and lock-nut; tighten the lock-nut.
22. Fit the jet housing, jet, jet spring and float chamber complete with anti-boiling device ensuring that the jet and diaphragm are kept in the correct relationship to the body and that the raised edge of the diaphragm is located in the housing groove.

23. Before tightening the four screws securing the float chamber, ensure that the chamber is pushed towards the inlet flange of the carburetter. This is very important to prevent a foul with the throttle controls (*see Chapter K Fig. 21, diagram C*); tighten the screws.

24. Check that the jet is not sticking in the guide. This can be carried out by moving the jet lever up and down.

25. Set the jet flush with the bridge of the carburetter and then turn the jet screw clockwise $2\frac{1}{2}$ turns.

26. Fit the spring onto the needle collar ensuring that the spring locates in the groove.

27. Fit the guide onto the needle so that the end with the indentation is towards the flange on the collar.

28. Fit the needle assembly and guide into the piston. The lower face of the guide must be flush with the face of the piston (*for guidance refer to Fig. K17 in Chapter K*) and the mark on the guide must be adjacent to the point mid-way between the two cutouts in the piston (*see Fig. U18*).

29. Fit and tighten a new guide locking screw to the piston.

30. Check that the piston key is secure in the carburetter body.

31. Fit the piston assembly to the carburetter body carefully guiding the needle into the jet.

32. Fit the piston spring over the piston rod.

33. Fit the suction chamber taking care not to 'wind-up' the piston spring; fit and tighten the suction chamber retaining screws.

34. Fit the piston damper and washer.

Fuel drain pipe—To remove

1. Release the two rubber retaining clips which hold the fuel drain hose in position.

2. Withdraw the lower end of the fuel drain hose from the float chamber drain valve.

Note A small quantity of fuel may be present in the fuel drain hose when it is withdrawn from the float drain valve.

3. Withdraw the upper end of the fuel drain hose from its connection at the bottom of the fuel receiver.

4. If the float chamber drain valve is to be removed, unscrew the $\frac{1}{2}$ in. A/F nut and withdraw the bolt which retains the drain valve bracket to the engine mounting foot.

Note If a float chamber drain valve is faulty or damaged a new valve **must** be fitted.

Fuel drain pipe—To fit

Fit the pipe by reversing the procedure given for its removal.

Carburetters—To set

The carburetters fitted to these cars are adjusted at the factory using **special equipment** to ensure that their settings comply with the current emission control regulations.

Under normal circumstances the carburetters should not require adjustment in service.

If however, adjustment is found necessary due to inadvertant disturbance or replacement of a component, proceed as follows.

Having set the mechanical adjustments to the automatic choke (*see Page U36 Automatic Choke—To set*), set the carburetters by carrying out the following operations in the sequence given.

- A. Synchronise throttles and temporarily set engine idle speed.
- B. Set full throttle stop.
- C. Check linkage clearances.
- D. Tune carburetters.
- E. Set cold start 'fast-idle' (*see Page U36—Cold start 'fast-idle'—To set*).
- F. Set the throttle damper plunger.
- G. Set the kick-down micro switch.

Throttle synchronisation

Refer to Chapter K, Section K4.

Ensure that when the throttles are synchronised the eccentric adjuster is in the upper mid-way position, this will allow for adjustment of the eccentric in either direction at a later stage of setting the carburetters.

Full throttle stop

1. Adjust the full throttle stop screw so that it measures 0.350 in. (8.89 mm.) from the boss face (*see Chapter K, Fig. K21, diagram A*).

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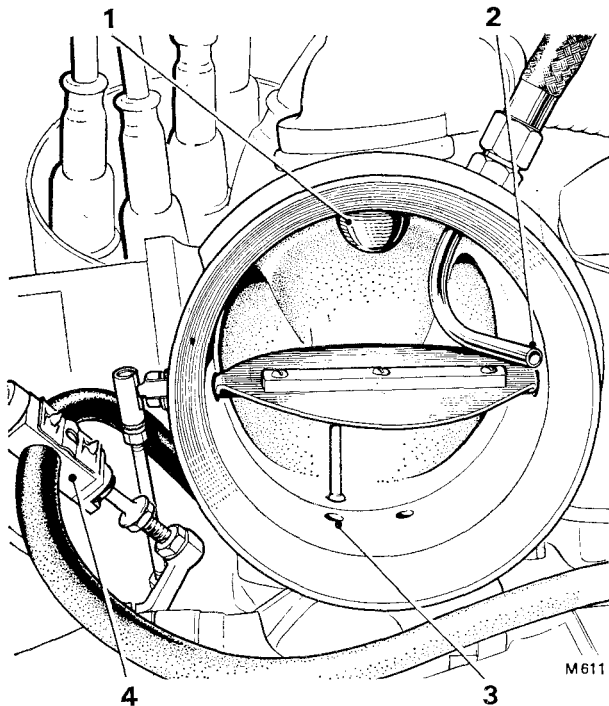


FIG. U19 HOT IDLE MIXTURE COMPENSATOR FEED

- 1 Bi-metal switch
- 2 Choke stove pipe feed
- 3 Hot idle compensator feed
- 4 Vacuum retard tap

2. Check that the clearance (*x* in Fig. K21 diagram A) between the fixed stop and the lever is correct. If the clearance is less than that specified, adjust the throttle stop screw to give the correct clearance.

Linkage clearance—To check

Refer to Chapter K Section K4.

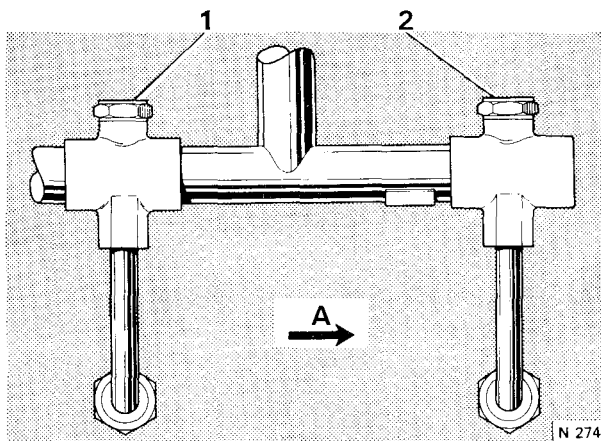


FIG. U20 'A' BANK AIR INJECTION MANIFOLD

A = Front of car

- 1 Blank — 'B' bank carburettor mixture strength
- 2 Blank — 'A' bank carburettor mixture strength

CARBURETTER TUNING

Preliminary checks

Before tuning the carburetters the following checks should be carried out.

Ensure that the vehicle is in Neutral and that the gear range actuator thermal cut-off has been removed from the main fusebox.

1. Check the condition of the spark plugs.
2. Check the condition of the distributor contact breaker points.
3. Check the ignition timing (see Section U6).
4. Check the flow through the choke stove pipe (see Automatic choke stove pipe—To check).
5. Check the entire induction system for air leaks.
6. Check the purge line flow rate (see Section U2).
7. Ensure that the air conditioning system is switched off.
8. Start the engine and warm up; allow to run for at least 5 minutes after the thermostat has opened.
9. Stop the engine, ensure that the choke butterfly valve is fully open and the choke 'fast-idle' off.
10. Connect an electric impulse tachometer in accordance with manufacturer's instructions.
11. Check the float chamber depression. (see Float chamber depression—To check).
12. Check the exhaust gas recirculation signal strength. (see Exhaust gas recirculation signal strength—To check).

Tuning procedure

1. Disconnect the distributor vacuum pipe from the vacuum retard tap and blank off the connection on the tap. Remove the air intake hose and blank off the hot idle compensator feed drilling (see Fig. U19); replace the hose.

Disconnect the solenoid to exhaust gas recirculation valve hose at the valve and blank off the hose. Remove the air hoses from the check valves and fit blanks over the valves. (Suitable blanks may be produced from a short length of rubber hose with one end plugged).

Note Disconnecting air hoses from the check valves makes the air injection system inoperative. The valves must be blanked off to prevent air being drawn into the exhaust ports by pulsations in the exhaust system since this would affect the idle C.O. reading.

2. Remove the pressure tapping cap from 'B' bank carburettor float chamber to vent the float chambers to atmosphere.
3. Top-up both carburettor dampers with approved oil. The oil level should be approximately 0.5 in. (12.7 mm.) below the top of the piston rod.
4. Set the engine idle speed to 600 r.p.m. by means of the fixed throttle stop screw.

5. Balance the air flow through the carburetters by adjusting the eccentric pivot pin until the hiss from the small drilling in the neck of each suction chamber is of equal intensity.

6. The engine must be run for at least 25 mins. after the thermostat has opened.

7. To set 'A' bank carburetter mixture strength, remove the blanking plug (see Fig. U20, item 2) from 'A' bank air injection manifold. Fit adapter RH 8621 and connect to the C.O. meter.

8. Purge the engine at 2000 r.p.m. in neutral for $\frac{1}{4}$ minute. Check the engine idle speed and set to 600 r.p.m. if necessary by adjusting the fixed throttle stop screw.

9. Slacken the jet adjusting screw lock-nut on 'A' bank carburetter using spanner RH 8050 and set the C.O. meter reading to between 5.0% and 5.5% by setting the jet adjusting screw on 'A' bank carburetter. Tighten the lock-nut. (Turning screw clockwise richens mixture).

Disconnect the C.O. meter, remove adapter RH 8621 and replace the blanking plug.

10. To set 'B' bank carburetter mixture strength remove the blanking plug (see Fig. U20, item 1) from 'A' bank air injection manifold. Fit adapter RH 8621 and connect to C.O. meter.

11. Purge the engine at 2000 r.p.m. in neutral for $\frac{1}{4}$ minute. Check the engine idle speed and set to 600 r.p.m. if necessary by adjusting the fixed throttle stop screw.

12. Slacken the jet adjusting screw lock-nut on 'B' bank carburetter using spanner RH 8050 and set the C.O. meter reading to between 5.0% and 5.5% by setting the jet adjusting screw on 'B' bank carburetter. Tighten the lock-nut. (Turning screw clockwise richens mixture).

Disconnect the C.O. meter, remove the adapter RH 8621 and replace the blanking plug.

13. Again check the mixture balance by raising each piston lift pin in turn. If the mixture balance is correct, engine response for each carburetter piston lift will be the same. If response is not the same repeat Operations 4 to 13.

14. Fit probe of a C.O. meter into exhaust pipe in accordance with the manufacturer's instructions. (The Horiba Mexa 200 C.O. meter is suitable).

15. Idle the engine until a steady C.O. reading is obtained (minimum $\frac{1}{4}$ minute). A correct reading is 5.0% to 5.5%. If the C.O. reading is not correct, slacken both jet adjusting screw lock-nuts with spanner RH 8050. Turn both jet adjusting screws by equal amounts in the same direction (up to a maximum of $\frac{1}{4}$ turn) until a C.O. meter reading of between 5.0% and 5.5% is obtained. Tighten the lock-nuts (turning screws clockwise richens mixture).

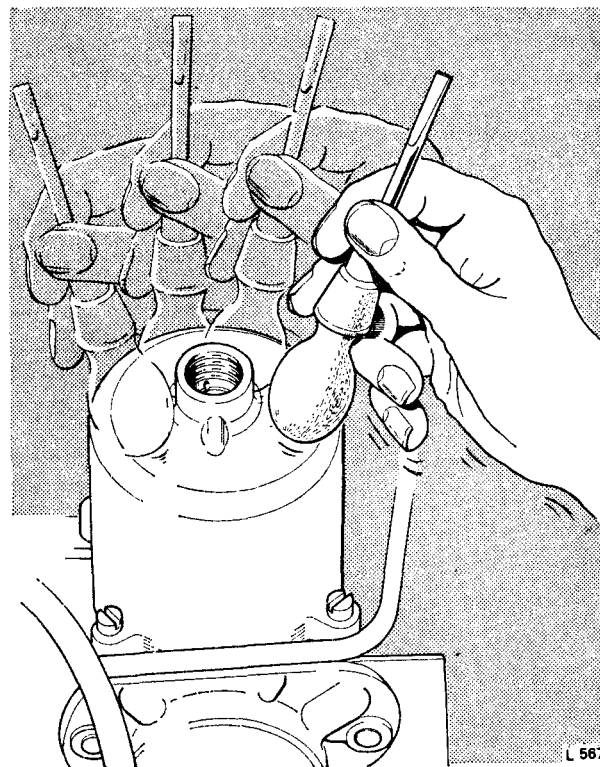


FIG. U21 TAPPING THE NECK OF THE SUCTION CHAMBER

16. Fit the pressure tapping cap to 'B' bank carburetter float chamber cover, remove the blanks from the air hoses and reconnect to check valves, remove the blank from solenoid to exhaust gas recirculation valve hose and connect to the exhaust gas recirculation valve.

17. Set the engine idle speed to 680 r.p.m. by adjusting the fixed throttle stop screw, tighten the lock-nut.

18. Connect the hose to the vacuum retard tap.

19. Check the idle speed and set if necessary to 600 r.p.m. by adjusting the vacuum actuator throttle stop screw.

20. Remove the air intake hose; remove the blank from the hot idle compensator feed drilling and fit the air intake hose.

Note The tuning operation should be carried out in the shortest possible time. If the time exceeds 3 minutes run engine at 2000 r.p.m. in neutral for $\frac{1}{4}$ minute and then resume tuning. Repeat

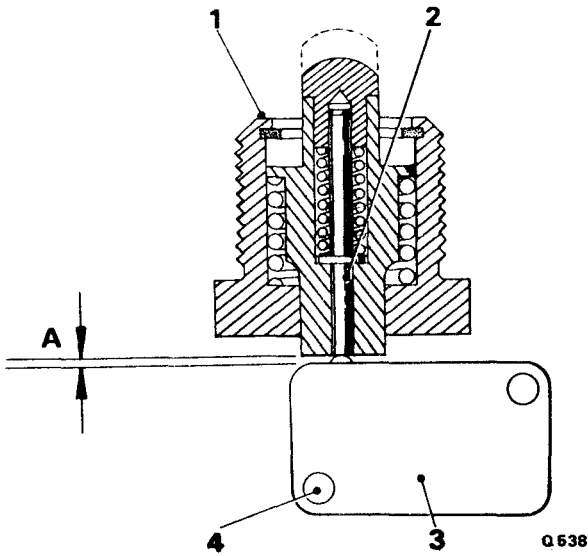


FIG. U22 KICK-DOWN MICRO-SWITCH

A = Clearance of 0.005 in. (0,127 mm.)

- 1 Kick-down micro-switch assembly
- 2 Secondary plunger
- 3 Micro-switch
- 4 Elongated hole in mounting plate (micro-switch adjustment)

this purging operation if further periods of 3 minutes are exceeded. After each purging operation to eliminate carburettor piston hysteresis, gently tap all round the neck of the suction chamber using a lightweight non-metallic object e.g. wooden handle of small screwdriver (see Fig. U21). The engine is to be run on Indolene 30 reference fuel or equivalent.

- 21. Stop the engine and fit the gear range actuator thermal cut-out to the main fusebox.

Throttle damper plunger—To Set

- 1. Move the cold start 'fast-idle' to its off position.
- 2. Move the 'A' bank throttle stop to its closed throttle position.

3. Slacken both nuts securing the throttle damper to its bracket. Back off the nuts until they are well clear of the bracket.

4. Press the damper towards the 'A' bank throttle lever until the damper is fully compressed and the lever is just clear of the throttle stop screw.

5. Screw the lower securing nut until it is 0.025 in. (0,63 mm.) clear of the underside of the bracket. Release the damper and tighten the upper securing nut.

6. Ensure that the damper spindle is resting on the centre of the throttle lever pad.

★ Kick-down micro-switch—To set

1. Swing the micro-switch towards the base of the plunger until a 0.010 in. to 0.030 in. (0,254 mm. to 0,762 mm.) gap exists between the micro-switch button and the plunger.

2. Tighten the micro-switch securing nuts and afterwards, check that the gap set in Operation 1 has not been disturbed.

3. Slowly depress the plunger to obtain full stroke. Check that the switch operates (audible click) during this operation.

4. Ensure that with the main plunger fully depressed it is still clear of the micro-switch case (see Fig. U22).

5. Slowly release the plunger ensuring that the micro-switch contacts open (audible click).

6. Ensure that the clearance set between the plunger and the micro-switch button, remains as set in Operation 1.

Mixture weakening device fittings

—To remove

1. Disconnect and remove all hoses fitted to the weakening device, weakener filter, weakener cut-off valve, fuel receiver, float chambers, float chamber vent valve and float chamber drain valve. As each hose is disconnected the open end of the unit should be blanked off and the hose labelled for identification.

2. Remove the float chamber vent valve by removing the retaining split pin and withdraw the valve from the top of the fuel receiver, note the rubber sealing ring around the top of the fuel receiver.

3. Remove the **float chamber drain valve** by unscrewing the nut and withdrawing the bolt from the engine mounting foot. Withdraw the valve.

4. Remove the **weakener cut-off valve** by unscrewing the two securing screws and nuts, one situated above and one below the valve. Disconnect the two electrical connections.

5. The **fuel receiver** (see Fig. U23) should not under normal circumstances require removal, however, if the necessity arises proceed by removing the ignition distributor and coil; collect the distance pieces as the coil is withdrawn. Remove the weakener cut-off valve as described previously. Unscrew and remove the two bracket retaining setscrews. Withdraw the bracket and fuel receiver.

6. Remove the weakener cut-off valve **temperature switch** situated in the butterfly housing by disconnecting the electrical connection and unscrewing the three retaining screws. Withdraw the unit.

The units referred to in Operations 2 to 6 inclusive must not be dismantled; if any have suspect or faulty operation the unit must be discarded and a new one fitted.

7. Remove the **mixture weakening device** from 'B' bank carburetter by unscrewing the $\frac{1}{2}$ in. A/F connection from the weakening device; unscrew the two retaining screws and withdraw the unit.

8. Remove the **weakener filter** by slackening the worm drive clip which retains the filter to the bracket; withdraw the filter.

9. Before removing the **purge line filter** remove the two steel retaining clips situated one on either side of the unit with the special pliers (RH 8090). Slacken the 2 B.A. setscrew which secures the retaining clip. Withdraw the filter from the clip.

Note The filter units are sealed and no attempt should be made to clean the elements.

Mixture weakening device fittings—To fit

Fit the weakening device fittings by reversing the procedure given for removal, noting the following points.

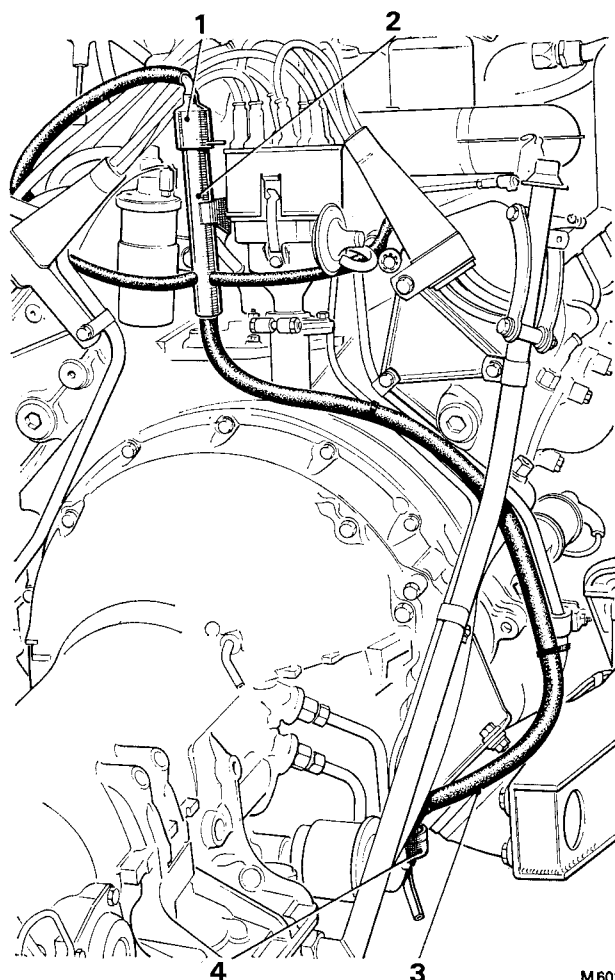


FIG. U23 FUEL RECEIVER AND DRAIN LINE

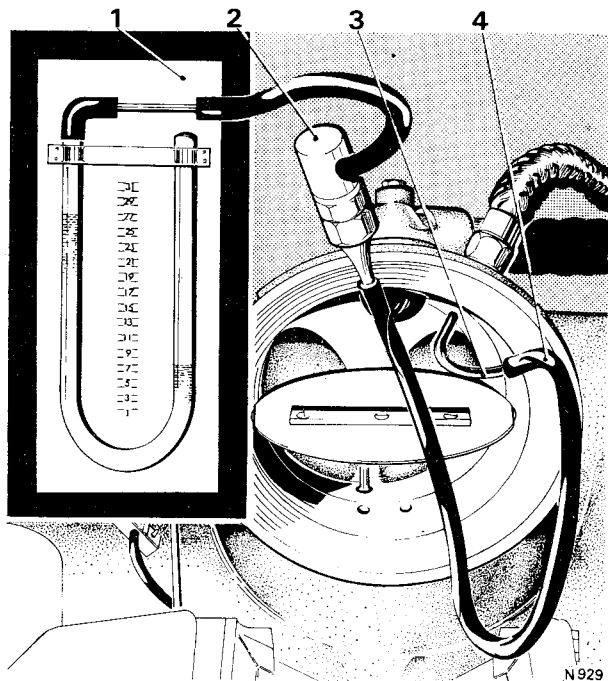
- 1 Float chamber vent valve
- 2 Fuel receiver
- 3 Drain line
- 4 Float chamber drain valve

1. Ensure that all hoses and pipes are in a good condition and not obstructed.
2. Renew all sealing washers and gaskets.
3. Renew all steel clips (where fitted).
4. It is essential that when fitting the weakener filter the inlet pipe which is off-set from the centre is facing the front of the car and is in its lowest position.

Hot air scoop—To remove

1. Slacken the worm drive clip securing the rubber hose to the hot air scoop.
2. Remove the two wing nuts securing the scoop to the body; remove the scoop.

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★ **FIG. U24 CHECKING THE CHOKE STOVE PIPE DEPRESSION**

- 1 Manometer
- 2 Calibrated orifice
- 3 Choke stove pipe
- 4 Rubber tube

Hot air scoop—To fit

Fit the scoop by reversing the procedure given for removal.

★ **Automatic choke stove pipe—To check**

To check the stove pipe for any blockage, carry out the following procedure.

1. Start the engine and run until normal operating temperature is attained.
2. Stop the engine and disconnect the air intake hose from the choke butterfly housing.
3. Connect a flowmeter to the choke stove pipe feed (see Fig. U24) using a suitable length of rubber tube.

Note The flowmeter for this operation consists of a calibrated orifice (RH 8095) and a water manometer capable of measuring up to 25 in. (63,50 cm.).

- 4 Start the engine and run at the idle speed.
5. Observe the depression shown by the manometer reading; the correct reading should be between 16 in. and 20 in. (40,64 cm. and 50,80 cm.).

6. If the manometer level difference is less than 16 in. (40,64 cm.), remove and examine the choke stove pipes and choke stove assembly for any obstructions or blockage.

7. After removing the blockage, fit the components and repeat operations 1 to 5 inclusive; again check the manometer reading.

8. Remove the manometer and connect the air intake hose to the butterfly housing.

AUTOMATIC CHOKE—TO SET

Adjustment to kick diaphragm

Refer to Chapter K, Section K4.

Adjustment of the kick-gap

Refer to Chapter K, Section K4.

Solenoid air gap

Refer to Chapter K, Section K4.

Solenoid lever spring tension

Refer to Chapter K, Section K4.

'Fast-idle' cam and vacuum retard tap

Refer to Chapter K, Section K4.

Thermocoil

Refer to Chapter K, Section K4.

Cold start 'fast-idle'—To set

1. Stop the engine and disconnect the solenoid to exhaust gas recirculation valve hose at the valve end. Blank the hose, remove the pressure tapping cap to vent the float chambers; open the throttles and close the choke butterfly against the bi-metal coil tension by means of the butterfly link lever, release throttles. The fast-idle adjusting screw will now be resting on the high step of the fast-idle cam and the throttles are in the cold start position.

2. Start the engine, slacken the lock-nut and turn the adjusting screw to obtain 2 000 r.p.m.

3. Tighten the lock-nut and check the fast-idle speed. If correct open the throttles to release fast-idle cam mechanism.

4. Remove the blank from the solenoid to the exhaust gas recirculation valve hose and connect the hose to the exhaust gas recirculation valve. Fit the tapping cap to 'A' bank carburetter float chamber cover.

Exhaust gas recirculation signal strength —To check

1. Remove the pressure tapping cap from 'A' bank carburetter to vent the float chambers.

2. Disconnect at the signal block the exhaust gas recirculation cut-out solenoid hose. Connect a vacuum gauge (0 to 10 in. Hg) to the signal line tube.

3. Run the engine at a steady 2 000 r.p.m. and check that the exhaust gas recirculation signal strength is between 2.0 in. Hg. and 5.5 in. Hg.

A low or zero reading may be caused by an air leak at the signal block joint.

4. Disconnect the vacuum gauge and connect the hose to the signal tube.

5. Disconnect the solenoid to the exhaust gas recirculation valve hose at the valve and connect a hose to the vacuum gauge (0 to 10 in. Hg).

6. Run the engine at 2 000 r.p.m. and check that the signal strength is between 2.0 in. Hg. and 5.5 in. Hg.

A low or zero reading may be caused by:

- Blockage in the hose from the signal tube to the cut-out solenoid.
 - Blockage in the hose between the cut-out solenoid and valve.
 - Air leak at the signal block joint face or hose connections.
 - Low engine temperature (below 14°C. (57°F.)), a faulty exhaust gas recirculation cut-out solenoid or cut-in switch (in thermostat outlet).
7. Disconnect the vacuum gauge and connect the hose to the exhaust gas recirculation valve.
8. Check the operation of the valve by running the engine at 2 000 r.p.m. ensuring that the valve opens by observing the movement of the diaphragm.

Float chamber depression—To check

1. Disconnect the solenoid to exhaust gas recirculation valve hose at the valve end and blank off the hose.

2. Disconnect the weakener to vent canister hose at the weakener end and connect a manometer capable of measuring between 0 in. and 6 in. of water.

3. Run the engine at 2 500 r.p.m. in neutral until a steady reading is obtained on the manometer. Correct reading is between 2.0 in. and 2.25 in. of water depression.

A low zero reading may be caused by:—

- A blockage in the weakener venturi.
- Incorrect purge flow rate (less than 50 cu. ft./hr.).

A high reading may be caused by:—

- An obstruction in the weakener bleed orifice or hoses.
- Fouled weakener filter or evaporation loss control canister filter.
- Incorrect connection of weakener hose to valve connection or to evaporation loss control canister.
- Incorrect purge flow rate (greater than 70 cu. ft./hr.).
- Evaporation loss control canister obstructed.
- Incorrect operation of anti run-on solenoid.

4. If the float chamber depression is still incorrect after carrying out all the above checks turn the adjusting screw on the weakening device until the correct reading of between 2.0 in. and 2.25 in. of water is obtained. Turning the screw clockwise increases the depression.

Note The screw is locked with 'Casco' on assembly and if adjusted must again be locked by applying 'Casco' to the threads.

5. Connect the weakener to vent canister hose at the weakener and remove the cap from the pressure tapping on 'A' bank carburetter and connect manometer measuring between 0 in. and 6 in. of water.

6. Run the engine at 2 500 r.p.m. in neutral until a steady reading of between 2.0 in. and 2.25 in. of water is obtained on the manometer.

A low or zero reading may be caused by:—

- A blockage in the hose from the weakener to vent canister.
- A blockage in the hoses from float chambers to vent canister.
- An air leak at the float chamber lid joint, float chamber vent and drain pipes and hoses, weakener solenoid connection or weakener flange on 'B' bank carburetter.
- Dirty or faulty float chamber vent valve or float chamber drain valve.
- Low engine temperature (below 16°C. (60°F.)), a faulty weakener solenoid valve or cut-in switch.

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7. Remove the blank from the solenoid to the exhaust gas recirculation valve hose and connect the hose to the exhaust gas recirculation valve.

8. Raise the engine speed slowly noting the manometer and tachometer readings. The maximum steady manometer reading should be obtained between 1 500 r.p.m. and 1 900 r.p.m. If the maximum depression occurs below 1 500 r.p.m. it is permissible to

screw out the idle bleed screws on the carburetters by equal amounts (maximum 2.5 turns) to obtain this speed.

Note Idle bleed screws are fully closed after the blower rig setting.

9. Disconnect the manometer and fit the pressure tapping cap to 'A' bank carburetter float chamber cover.

Section U6

IGNITION SYSTEM, DISTRIBUTOR, IGNITION COIL AND SPARKING PLUGS

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In addition to the normal centrifugal advance, the ignition distributor is fitted with a vacuum retard timing control.

A throttle operated tap controls the vacuum applied to the distributor, retarding the ignition timing at idle and over-run speeds for improved exhaust emission control.

A thermal vacuum switch is fitted to prevent engine overheating during prolonged idling. This switch interrupts the vacuum line to the throttle operated tap when a predetermined coolant temperature is reached. The thermal vacuum switch de-activates the vacuum retard mechanism and advances the ignition timing to the normal setting.

A vacuum actuated throttle stop is fitted to prevent an excessive increase in idle speed. When idling at normal temperatures a depression is applied to both the distributor retard capsule and the throttle stop vacuum actuator. (The throttle stop vacuum actuator controls the idle speed). Both the retard capsule and the vacuum throttle stop are de-activated simultaneously when the throttle vacuum switch operates at high coolant temperatures. This permits the carburetter throttles to close until the throttle lever contacts the fixed throttle stop. The fixed throttle stop is set to maintain the normal idle speed.

Data

Ignition timing ... T.D.C. (Static) 5° B.T.D.C.
at 800 r.p.m. (stroboscopic)

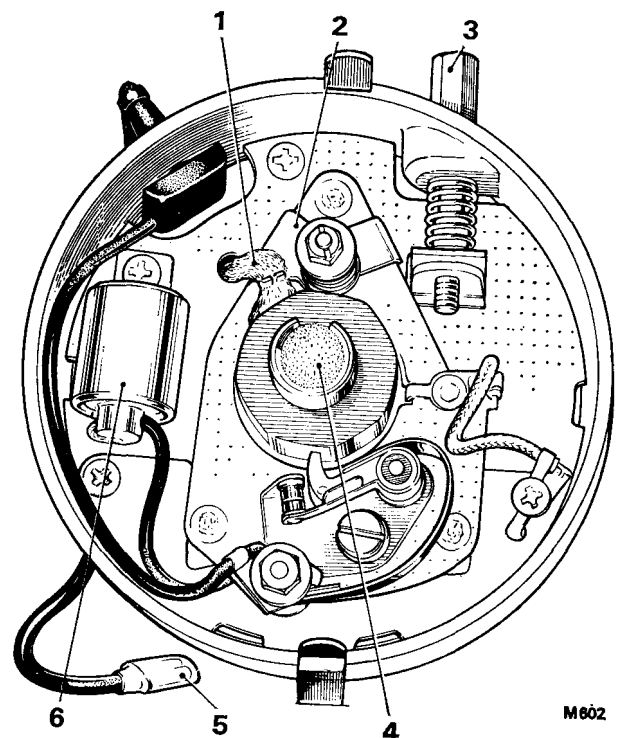


Fig. U25 INTERNAL VIEW OF DISTRIBUTOR

- 1 Felt lubrication pad
- 2 Contact breaker bearing plate
- 3 Dwell angle adjuster
- 4 Felt lubrication pad
- 5 Low tension lead
- 6 Capacitor

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		in Neutral with vacuum retard disconnected. (Approach 800 r.p.m. from a higher speed).
Make and type	...	Lucas 35 D 8. Eight lobe cam with single large contact breaker.
Rotation	Anti-clockwise, viewed from the top.
Advance mechanism		Automatic centrifugal advance with built-in vacuum retard timing control.
	Note	Vacuum control fitted to exhaust emission control engines only.
Firing order	A1, B1, A4, B4, B2, A3, B3, A2.
Dwell angle	26° to 28°.
Contact arm spring pressure	18 oz. to 24 oz. (510 gm. to 680 gm.).
Condenser capacity	0.18 mfd. to 0.25 mfd.
Drive	Through camshaft skew gears.

Contact points—To adjust

Refer to Chapter M—Electrical System.

Ignition—To time (using a stroboscope)

The timing of the ignition is carried out on A1 cylinder (left-hand front cylinder as viewed from the front of the engine).

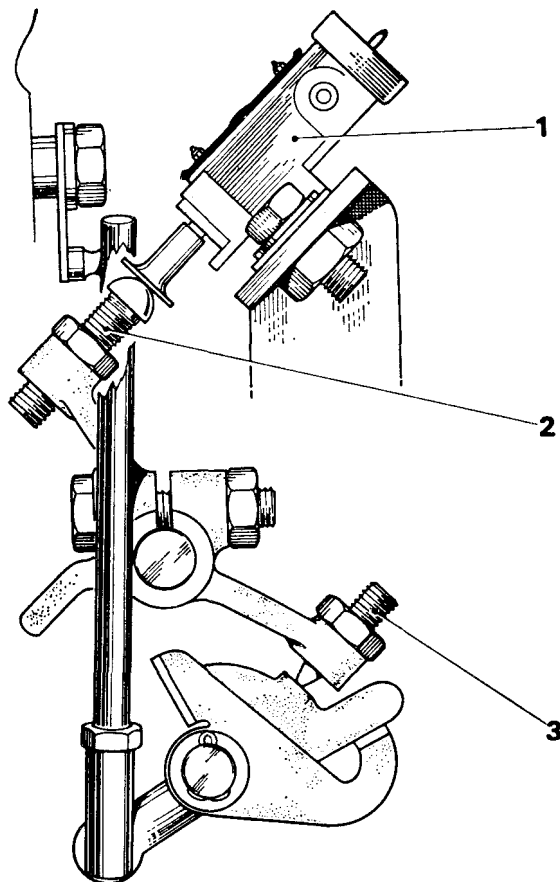
1. Check the condition of the contact breaker points and set the gap to a nominal 0.014 in. to 0.016 in. (0,356 mm. to 0,406 mm.).
Fit new points if necessary.

2. Start the engine and run until normal operating temperature is obtained. Ensure that the choke fast-idle is off.

3. Stop the engine, disconnect the distributor vacuum pipe from the vacuum retard tap and blank off the connection on the tap.

4. Connect a stroboscope and impulse tachometer in accordance with the manufacturer's instructions.

5. Start the engine and set the speed to 800 r.p.m. by means of the fixed throttle stop screw. Ensure that the adjustment screw is clear of the throttle stop vacuum unit.



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FIG. U26 VACUUM RETARD TAP ADJUSTMENT

- 1 Vacuum retard tap
- 2 Vacuum retard tap adjusting screw
- 3 Fast-idle adjusting screw

Note The speed of 800 r.p.m. must be set by approach from a higher speed.

6. Using a dwell meter set the dwell angle to within limits of 26° and 28° by means of the adjusting screw (see Fig. U25).

Note To remove any backlash from the distributor mechanism finally set the dwell angle by approaching from a minimum of 32°.

7. Direct the stroboscope light onto the crankshaft damper and timing pointer. Slacken the distributor clamp bolt and adjust the distributor to set the timing at 5° B.T.D.C. Tighten the clamp bolt and check that the timing is still 5° B.T.D.C.

8. Set the engine idle speed to 680 r.p.m. by adjusting the fixed throttle stop screw.

9. Connect the vacuum pipe to the vacuum retard tap.

10. Adjust the engine idle speed to 600 r.p.m. using the throttle stop vacuum unit adjusting screw, tighten the lock-nut.

11. Disconnect the vacuum line at the distributor retard capsule and 'Tee' in a vacuum gauge (0 to 30 in. Hg.) to the line; retain the connection to the distributor.

12. Set the vacuum retard tap by means of adjusting the screw, item 2 in Figure U26, so that the tap closes at the minimum throttle opening constant with maintaining 14 in. Hg. minimum at the distributor when the engine is idling.

13. Reconnect the vacuum line to the distributor, check and re-adjust idle speed if necessary using the throttle stop vacuum unit adjusting screw.

Section U7

LUBRICATION AND MAINTENANCE

The 'Essential' maintenance which is listed in the following schedules is the minimum servicing which must be carried out at the appropriate distance/time intervals, in order to comply with the Rolls-Royce Motors Limited* warranty and the U.S. Federal and California Emission Regulations.

The 'Preventive' maintenance listed, is aimed at securing the maximum life and efficiency for the vehicle and will be carried out on request.

***In the U.S.A. this warranty is given by Rolls-Royce Inc.**

ESSENTIAL MAINTENANCE INITIAL SERVICE

This service will be carried out by the Dealer after the first 3 000 miles or 3 months whichever is the earlier. Items marked * will be carried out free of charge.

INITIAL 3 000 MILES OR 3 MONTHS SERVICE WHICHEVER IS THE EARLIER

*Air injection pump

Check belt tension and reset if necessary.

*Automatic choke

Check the flow through the choke stove pipe, and check for correct operation.

*Carburettors

Check oil level in air valve dampers and if necessary top-up to correct level. Check tightness of float chamber covers. Check float chamber depression. Check and if necessary reset the idle speed. Check and if necessary reset the choke fast-idle speed.

Engine

Change engine oil.

*Exhaust gas recirculation system

Check the exhaust gas recirculation valve for correct operation.

* Fuel evaporation emission control system

Check the purge rate; this should be between 50 c.f.h. and 70 c.f.h. at 600 r.p.m. in neutral. Pressure test the fuel tank and evaporative loss line and if necessary rectify any leaks.

*Ignition system

Check distributor dwell angle and adjust if necessary. Correct dwell angle is 26° to 28°. Check ignition timing using stroboscope and reset if necessary; timing should be 5° B.T.D.C. at 800 r.p.m. with

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vacuum retard disconnected. Check operation of vacuum retard tap and reset if necessary.

Cooling system

Tighten worm-drive clips of all coolant hoses.

Torque converter transmission

Check fluid level and top-up if necessary.

When checking the fluid level, avoid contact with the exhaust gas recirculation valve and associated pipes as these contain **hot** exhaust gases.

EVERY 3 000 MILES OR 3 MONTHS WHICHEVER IS THE EARLIER

Engine

If the car is used for constant stop/start operation, change the engine oil.

EVERY 6 000 MILES OR 6 MONTHS WHICHEVER IS THE EARLIER

Engine

Change engine oil and renew oil filter element.

Ignition system

Check system with an ignition analyser. If necessary, clean sparking plugs and reset gaps to 0.025 in. (0,635 mm.).

Battery

Check the level of the electrolyte in the battery; if necessary top-up with distilled water.

Brakes

Inspect footbrake and handbrake pad linings. When changing footbrake pads examine condition of dust excluders on calipers. Manually adjust the handbrake pads. Inspect pipes and connections.

Torque converter transmission

Check fluid level and top-up if necessary.

When checking the fluid level, avoid contact with the exhaust gas recirculation valve and associated pipes as these contain **hot** exhaust gases.

EVERY 12 000 MILES OR 12 MONTHS SERVICE WHICHEVER IS THE EARLIER

Air injection pump

Check tension of pump pulley driving belt.

Air silencer

Clean and oil the wire mesh filter elements.

Carburettors

Top-up oil level in air valve dampers. Check tightness of float chamber covers. Check float chamber depression. Check and if necessary reset the idle speed. Check and if necessary, reset choke fast-idle speed.

Crankcase emission control system

Remove and clean gauze flame traps in the crankcase breather tube. Clean the adapter in choke butterfly housing.

Engine

Change engine oil and renew oil filter element.

Exhaust gas recirculation system

Remove and clean the exhaust gas recirculation valve and feed pipes. Clean exhaust gas recirculation orifices in the carburetter 'Tee' piece. Check exhaust gas recirculation valve for correct operation.

Fuel evaporation emission control system

Renew the foam filter element in the evaporation loss control canister.

Ignition system

Renew the sparking plugs ensuring that the gaps are set to 0.025 in. (0,635 mm.). Renew contact breaker points and set dwell angle. Correct dwell angle is 26° to 28°. Replace distributor lubrication pad. Lubricate distributor spindle, automatic advance mechanism and shaft bearings with engine oil. Check ignition timing using stroboscope and reset if necessary; timing should be 5° B.T.D.C. at 800 r.p.m. with the vacuum retard disconnected.

Battery

Check the level of the electrolyte in the battery; if necessary top-up with distilled water.

Brakes

Inspect footbrake and handbrake pad linings. When changing footbrake pads examine condition of dust excluders on calipers. Manually adjust handbrake pads. Inspect pipes and connections.

Final drive unit

Check oil level and top-up if necessary.

Steering mechanism

Lubricate mechanism at the six grease nipples.

Torque converter transmission

Renew transmission fluid.

When checking the fluid level, avoid contact with the exhaust gas recirculation valve and associated pipes as these contain hot exhaust gases.

**EVERY 18 000 MILES OR 18 MONTHS
SERVICE WHICHEVER IS THE EARLIER****Engine**

Change engine oil and renew oil filter element.

Ignition system

Check system with an ignition analyser. If necessary, clean sparking plugs and reset gaps to 0.025 in. (0.635 mm.).

Battery

Check the level of electrolyte in the battery; if necessary top-up with distilled water.

Brakes

Inspect footbrake and handbrake pad linings. When changing footbrake pads examine condition of dust excluders on calipers. Manually adjust the handbrake pads. Inspect pipes and connections.

Torque converter transmission

Check fluid level and top-up if necessary.

When checking the fluid level, avoid contact with the exhaust gas recirculation valve and associated pipes as these contain hot exhaust gases.

**EVERY 24 000 MILES OR 2 YEARS
SERVICE WHICHEVER IS THE EARLIER****Air injection pump**

Check tension of pump pulley driving belt. Remove and clean pump intake filter element.

Air injection system

Check air injection system for leaks and correct functioning. Renew any defective items.

Air silencer

Clean and oil the wire mesh filter elements.

Automatic choke

Check the air flow through the choke stove pipe and check the system for correct functioning.

Carburettors

Clean air valves. Top-up oil level in air valve dampers. Check tightness of float chamber covers. Check float chamber depression. Check and if necessary, reset the idle speed. Check and if necessary, reset choke fast-idle speed.

Carburettor mixture weakening device

Renew air filter element for the carburettor mixture weakening device.

Crankcase emission control system

Remove and clean gauze flame traps in crankcase breather tube. Clean the adapter in choke butterfly housing.

Engine

Change engine oil and renew oil filter element.

Engine coolant system

Fit a new engine coolant thermostat and heater tap feed hose.

Exhaust gas recirculation system

Remove and clean the exhaust gas recirculation valve and feed pipes. Clean exhaust gas recirculation orifices in carburettor 'Tee' piece. Check system for correct operation.

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Fuel evaporation emission control system

Renew the foam filter element in the evaporation loss control canister. Check the purge rate; this should be between 50 c.f.h. and 70 c.f.h. at 600 r.p.m. in neutral. Renew the purge line filter if necessary.

Ignition system

Renew the sparking plugs ensuring that the gaps are set to 0.025 in. (0.635 mm.). Renew contact breaker points and set dwell angle. Correct dwell angle is 26° to 28°. Replace distributor lubrication pad. Lubricate distributor spindle, automatic advance mechanism and shaft bearings with engine oil. Check ignition timing using a stroboscope and reset if necessary; timing should be 5° B.T.D.C. at 800 r.p.m. with the vacuum retard disconnected.

Battery

Check the level of the electrolyte in the battery; if necessary top-up with distilled water.

Brakes

Inspect footbrake and handbrake pad linings. When changing footbrake pads examine condition of dust excluders on calipers. Manually adjust handbrake pads. Inspect pipes and connections.

Final drive unit

Change Oil.

Steering mechanism

Lubricate mechanism at the six grease nipples.

Torque converter transmission

Change transmission fluid. After initial 24 000 miles/2 years whichever is the earlier, renew intake strainer.

When checking the fluid level, avoid contact with the exhaust gas recirculation valve and associated pipes as these contain **hot** exhaust gases.

SERVICING AFTER 24 000 MILES OR 2 YEARS WHICHEVER IS THE EARLIER

After 24 000 miles or 2 years, servicing is still due at 6 000 miles intervals and the respective service listed below should be carried out.

At 30 000 miles carry out the 6 000 miles service.

At 36 000 miles carry out the 12 000 miles service.

At 42 000 miles carry out the 18 000 miles service.

At 48 000 miles carry out the 24 000 miles service.

PREVENTATIVE MAINTENANCE**INITIAL SERVICE**

This service should be carried out by the Dealer after the first 3 000 miles or 3 months whichever is earlier.

Belt tension

Check the tension of the belts driving the following fan and steering pump, alternator and refrigeration compressor. Adjust the belt tension as necessary.

Steering pump

Check the oil level in the reservoir; top-up if necessary.

**EVERY 6 000 MILES OR 6 MONTHS
WHICHEVER IS EARLIER****Air silencer**

Remove and clean the wire mesh filter elements.

Carburettors

Check the oil level in the air valve dampers and top-up if necessary.

Ignition system

Check the distributor dwell angle and adjust if necessary.

Check the ignition timing using a stroboscope and adjust if necessary.

Steering pump

Check for leaks. If necessary top-up the level in the steering pump reservoir.

Belt tension

Check the tension of the belts driving the following; fan and steering pump, alternator and refrigeration compressor. Renew any belts which show signs of wear.

Control linkages

Apply a few drops of engine oil to the accelerator linkage and to the gear range selector controls adjacent to the transmission casing.

Electrical system

Ensure that all lamps, instruments and air conditioning controls are operating satisfactorily.

Check the following levels and pressures

Run the engine for four minutes then check the hydraulic reservoir fluid levels; top-up if necessary with the specified fluid.

Check the level of electrolyte in the battery and top-up with distilled water if necessary.

Check the tyre pressures and adjust if necessary.

**EVERY 12 000 MILES OR 12 MONTHS
WHICHEVER IS THE EARLIER****Belt tension**

Check the tension of the belts driving the following; fan and steering pump, alternator and refrigeration compressor. Renew any belts which show signs of wear.

Control linkage

Apply a few drops of engine oil to the accelerator linkage and to the gear range selector controls adjacent to the transmission casing.

Handbrake linkage

Lubricate the pivot pins and pulleys in the handbrake system with approved grease.

Spare wheel

Lubricate the spare wheel lowering bolt and mechanism.

Electrical system

Ensure that all lamps, instruments and air conditioning controls are operating satisfactorily.

Check the following levels and pressures

Check the fluid level in the power steering pump reservoir and top-up if necessary.

Check the level and specific gravity of the engine coolant and correct if necessary.

Check the fluid level in the steering idler box damper and top-up if necessary.

Check the level of electrolyte in the battery and top-up with distilled water if necessary.

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Run the engine for four minutes then check the hydraulic fluid levels; top-up if necessary.

Check the tyre pressures and adjust if necessary.

EVERY 24 000 MILES OR 2 YEARS WHICHEVER IS THE EARLIER

Belt tension

Check the tension of the belts driving the following; fan and steering pump, alternator and refrigeration compressor.

Renew any belts which show signs of wear.

Alternator

Check the slip rings and the brushes for wear; also check the brushes for freedom in their holders.

Control linkage

Apply a few drops of engine oil to the accelerator linkage and to the gear range selector controls adjacent to the transmission casing.

Fuel pump

Remove the fuel pump from the car and test on the bench. Fit a new pump unit if the performance is below the specified level. (*refer to Chapter K—Fuel System of this Workshop Manual T.S.D. 2476*).

Handbrake linkage

Lubricate the pivot pins and pulleys in the handbrake system with approved grease.

Spare wheel

Lubricate the spare wheel lowering bolt and mechanism.

Electrical system

Ensure that all lamps, instruments and air conditioning controls are operating satisfactorily.

Fuel tank

Remove the drain plug and allow any accumulated water to drain away. Fit the drain plug. Add four S.B.N. Inhibitors to the fuel tank.

Fuel filter

Renew the main line filter element and clean the filter bowl.

Height control mechanism

Disconnect the control valve linkage ball joints. Clean, grease and refit the ball joints.

Rear wheel drive-shaft

Lubricate the rear wheel drive-shaft outer universal couplings with an approved grease.

Check the following levels and pressures

Check the fluid level in the power steering pump reservoir and top-up if necessary.

Check the level and specific gravity of the engine coolant and correct if necessary.

Check the fluid level in the steering idler box damper and top-up if necessary.

Check the level of electrolyte in the battery and top-up with distilled water if necessary.

SEASONAL SCHEDULE EVERY 12 MONTHS

Engine cooling system

Drain the coolant from the radiator and the engine crankcase. Clean any debris from the surfaces of the refrigeration condenser and radiator matrices by reverse flushing with a hose. This should be carried out just prior to the Autumn. Fill the system with the correct anti-freeze mixture (*refer to Chapter L—Engine Cooling System of this Workshop Manual T.S.D. 2476*).

Air conditioning system

Ensure that the foam filter element fitted to the scuttle intake grille is free from obstruction. On Long Wheelbase cars fitted with a centre division, check that the foam filter element fitted to the intake grille in the rear decking panel is free from obstruction.

Refrigeration system

These operations should be carried out only by an experienced refrigeration engineer.

Check that the refrigeration system is functioning correctly. If necessary, top-up the system with refrigerant. If loss of refrigerant is evident, check the system for leakage. Visually check the refrigerant compressor for oil leakage, if oil leakage is apparent check the oil level and top-up if necessary. In the event of a major oil loss, check and repair before topping-up (*refer to Chapter C—Air Conditioning of this Workshop Manual T.S.D. 2476*).

Body

Check that the body drain holes are free from foreign matter.

EVERY 2 YEARS

In addition to the 12 monthly schedule, carry out the following.

Engine cooling system

Drain the coolant from the radiator and engine crankcase. Thoroughly reverse flush the coolant passages with a continuous flow of water. Change the coolant hoses where necessary. Fill the system with the correct anti-freeze mixture.

**SERVICE RECOMMENDATIONS
BRAKE AND HYDRAULIC SYSTEM
COMPONENTS**

48 000 Miles

At this mileage and under normal motoring conditions it is recommended that the following servicing is carried out.

Renew the following flexible high pressure hoses; the front and rear brake pumps to accumulator hoses; the front and rear accumulator to frame hoses. Renew the disc brake caliper seals, the deceleration conscious pressure limiting valve seals, and the master cylinder seals. Completely drain the fluid from the hydraulic

circuits and then fill with Castrol-Girling Brake Fluid Green. This fluid exceeds specification S.A.E. J 1703b in many respects and complies with D.O.T. 3 grade of FMVSS 116. Bleed the braking systems and automatic height control system.

96 000 Miles

At this mileage and under normal motoring conditions it is recommended that the following servicing is carried out.

Renew all the flexible hoses to the braking systems and the automatic height control system. Renew the disc brakes caliper seals, the deceleration conscious pressure limiting valve seals and the master cylinder seals. Completely drain the fluid from the hydraulic circuits and then fill with Castrol-Girling Brake Fluid Green. This fluid exceeds specification S.A.E. J 1703b in many respects and complies with D.O.T. 3 grade of FMVSS 116. Bleed the braking systems and automatic height control system.

SPECIAL PRECAUTIONS

Should the car be used in very cold temperatures, drain the engine sump when thoroughly warm and also drain the carburettor air valve dampers. The engine sump and carburettor air valve dampers should then be filled with oil having the following viscosity.

For constant temperatures of between 0°C. and -23°C. (32°F. and -10°F.), use a 10W/30 grade oil.

For constant temperatures of -23°C. (-10°F.) and below, use a 5W/20 grade oil.

Section U8

FAULT DIAGNOSIS

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T.S.D. 2476

SYMPTOMS	POSSIBLE CAUSE
1. Engine will not start. (Starter motor operating).	1. (a) Fouled contact breaker points or incorrect dwell angle. (b) Ignition circuit broken. (c) Failed anti run-on solenoid or failure of electrical supply circuit. (d) Blocked fuel feed line or fouled float chamber filters. (e) Faulty choke bi-metal coil. (f) Fast-idle speed incorrect. (g) Choke solenoid inoperative. (h) Blocked weakener vent line or fouled filter. (i) Blocked carburetter float chamber vent line. (j) Exhaust gas recirculation valve failed in open position.
2. Engine idles very roughly.	2. (a) Fouled contact breaker points or incorrect dwell angle. (b) Air leaks between control valve and carburetter 'Tee' piece, or in exhaust gas recirculation pipes. (c) Fouled spark plugs. (d) Exhaust gas recirculation valve stuck in the open position. (e) Damaged or contaminated ignition high tension circuit. (f) Failed deceleration (gulp/anti backfire) valve. (g) Damaged vacuum modulator pipe causing air leak (inlet manifold to transmission). (h) Blocked carburetter float chamber vent line.
3. Engine stalls.	3. (a) Incorrect idle speed. (b) Flooding of float chamber or the jet. (c) Water or foreign matter in the float chamber. (d) Faulty hot idle mixture compensator. (e) Exhaust gas recirculation valve stuck open.
4. (i) Engine shows signs of power loss, evident at high speeds and loading. (ii) Engine misfires particularly on hard acceleration from low speed.	4. (a) Insufficient delivery of fuel (i.e. blocked float chamber cover filters). (b) Incorrect ignition timing. (c) Incorrect spark plugs or gap settings. (d) Incorrect dwell angle. (e) Fouled spark plugs.

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SYMPTOMS	POSSIBLE CAUSE
<p>5. Engine hesitates or misfires under light load.</p>	<p>5. High float chamber depression due to:</p> <ul style="list-style-type: none"> (a) Weakening device filter blocked or blockage in rubber hosing or bleed orifice. (b) Dislodged venturi in weakening device. (c) Evaporation loss control canister filter blocked. (d) Incorrect connection of weakener hose to valance adapter or evaporation loss control canister. (e) Incorrect purge flow rate.
<p>6. Increase in fuel consumption.</p>	<p>6. Low float chamber depression due to:</p> <ul style="list-style-type: none"> (a) A blockage in the weakener venturi, the hose from the weakener to vent canister, or the hose from the float chambers to the fuel receiver. (b) Float chamber and weakening device air leaks. (c) Float chamber connection air leaks as far as and including the one way valve in the fuel drain pipe. (d) Engine intake air temperature below 16°C. (60°F.). (e) Air leaks between weakening device and tapping in carburetter body; including the weakener cut-off valve. (f) Faulty cut-off valve. (g) A dirty or faulty float chamber drain valve. (h) A dirty or faulty float chamber vent valve. (i) Incorrect purge flow rate. (j) Incorrect ignition timing.
<p>7. Poor slow running, lack of power and high fuel consumption.</p>	<p>7. (a) Sticking carburetter piston caused by the needle bearing heavily on the jet. (b) Sticking carburetter piston caused by a bent damper rod. (c) Sticking carburetter piston caused by dirt between the suction chamber and piston. (d) Piston rod sticking in bush. (e) Ignition timing incorrect. (f) Failed vacuum retard tap. (g) Exhaust gas recirculation valve stuck open. (h) Fouled spark plugs. (i) Faulty hot idle mixture compensator. (j) Incorrect idle speed.</p>
<p>8. Engine 'backfires' on over-run.</p>	<p>8. (a) Severe air leak in exhaust emission control system, probably between control valve and carburetter 'Tee' piece. (b) Leak in exhaust gas recirculation pipes, probably between valve and carburetters. (c) Deceleration (gulp/anti backfire) valve sticking in closed position. (d) Exhaust gas recirculation valve stuck open.</p>
<p>9. Excessive noise from air injection pump.</p>	<p>9. (a) Relief valve failure. (b) Damaged impeller vanes. (c) Rubbing vanes (an intermittent 'chirping' noise noticeable mainly at low engine speed). (d) Worn bearing (a rolling sound noticeable at all engine speeds).</p>

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WORKSHOP TOOLS

Tool Number Description

RH 8050	Spanner—Carburetter Jet Screw
RH 8087	Spanner—Weakener Cut-off Valve
RH 8089	Jet Centring Tool
RH 8090	Pliers—Wire Hose Clips
RH 8095	Restrictor—Manometer Check—Choke Stove Pipe
RH 8382	Spanner—Distributor Dwell Angle
RH 8383	Positioning Tool—Throttle Spindle Seal
RH 8621	Adapter—Air Manifold to C.O. Meter

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Section U10

SUPPLEMENTS

No. 1 Japan

Printed in Great Britain

April 1973

Rolls-Royce Silver Shadow and Bentley T Series motor cars and Rolls-Royce and Bentley Corniche motor cars destined for Japan after 1st April 1973 (i.e. Car Serial Numbers SRH 15522, SRH 15635, SRX 15637 and onwards), have a revised engine build specification.

Changes from the present engine build specification are as follows:

1. Engine compression ratio reduced to 8:1.
2. Engine fan diameter increased to 20 in. (50,80 cm).
3. Lower engine oil dipstick fitted.
4. Transmission modulator and T.V. vacuum pipe changed.
5. Choke solenoid now held on during engine cranking.
6. Two vane air pump fitted to air injection system.
7. Exhaust gas recirculation system fitted.
8. Exhaust gas recirculation heat shield fitted.
9. Distributor with vacuum retard fitted.
10. Carburetter needles changed.

Changes 1 to 6 inclusive are basically component changes and workshop personnel should in addition to their normal duties, only have to ensure that the correct parts are obtained, if replacement becomes necessary.

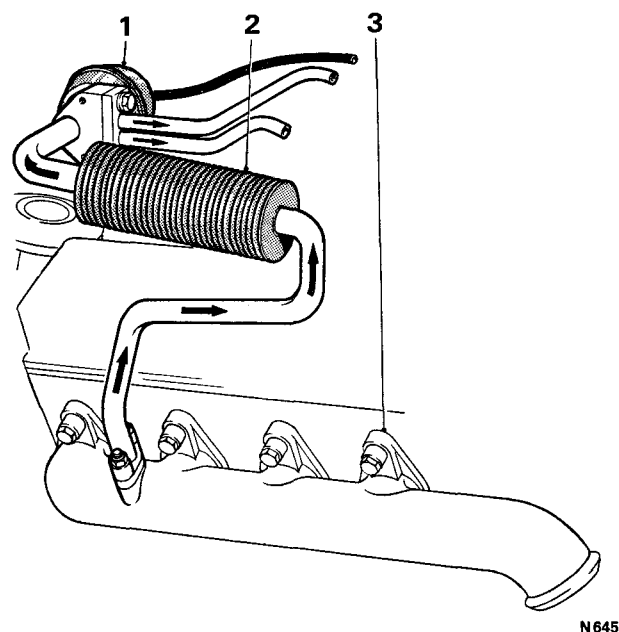


FIG. 1 EXHAUST GAS RECIRCULATION SYSTEM PIPE RUN FROM EXHAUST MANIFOLD TO EXHAUST GAS RECIRCULATION VALVE

- 1 Exhaust gas recirculation valve
- 2 Exhaust gas recirculation cooler
- 3 'A' bank exhaust manifold

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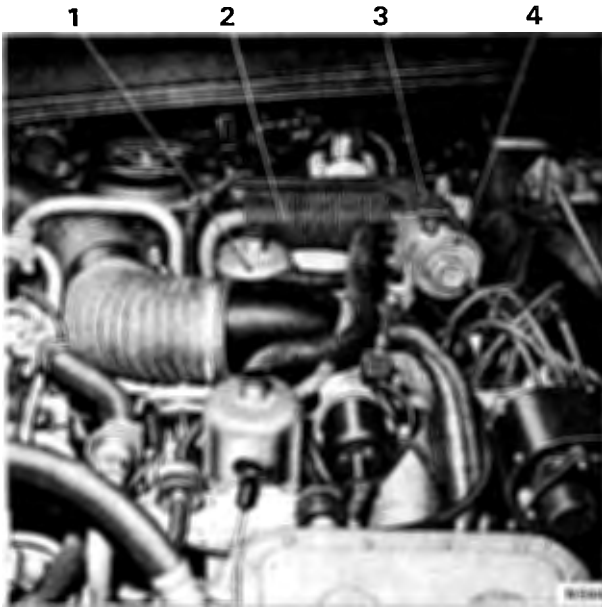


FIG. 2 EXHAUST GAS RECIRCULATION SYSTEM COOLER AND HEAT SHIELD

- 1 'A' bank carburettor
- 2 Exhaust gas recirculation cooler
- 3 Heat shield
- 4 Exhaust gas recirculation valve

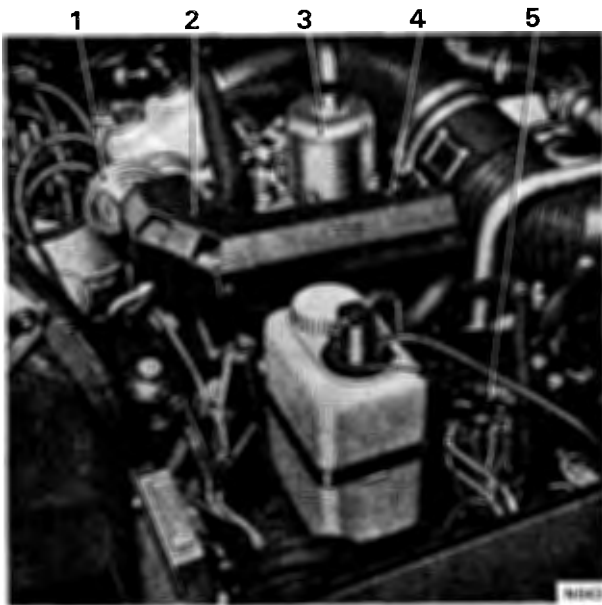


FIG. 3 EXHAUST GAS RECIRCULATION SYSTEM HEAT SHIELD

- 1 Exhaust gas recirculation valve
- 2 Heat shield
- 3 'A' bank carburettor
- 4 Exhaust gas recirculation cooler
- 5 Choke 'hold' relay

Exhaust gas recirculation system

This is similar to the system detailed in Chapter U except that the 'A' bank exhaust manifold has the exhaust gas recirculation system take-off flange above the manifold as shown in Figure 1.

Changes 7 to 10 inclusive are necessary for engines to meet the 1973 Emission Control Regulations in Japan and workshop personnel will require the servicing details given in **Workshop Manual T.S.D. 2476 — Chapter U (Part 2)** with the following differences.

The exhaust gas recirculation system cooler is situated above the engine on the 'A' bank side as shown in Figure 2 and a large heat shield is fitted around the cooler as shown in Figure 3.

As a result of these changes the pipe run between the exhaust manifold and cooler has changed.

When carrying out any work in or around the area of the exhaust gas recirculation system cooler (e.g. when checking the torque converter transmission fluid level), avoid contact with the various components and pipes of the system as they contain **hot** exhaust gases when the engine is running.

For details of the remainder of the exhaust gas recirculation system see Chapter U (Part 2).

The carburetters and automatic choke system

The details for this section differ from Chapter U (Part 2) in two instances only.

The carburettor needles have been changed to BBY and when tuning the carburetters it should be noted that the engine idle speed C.O. setting has been revised from 5.0% — 5.5% to 3.0% — 4.0%.

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SUPPLEMENTS

No. 2 North America 1974

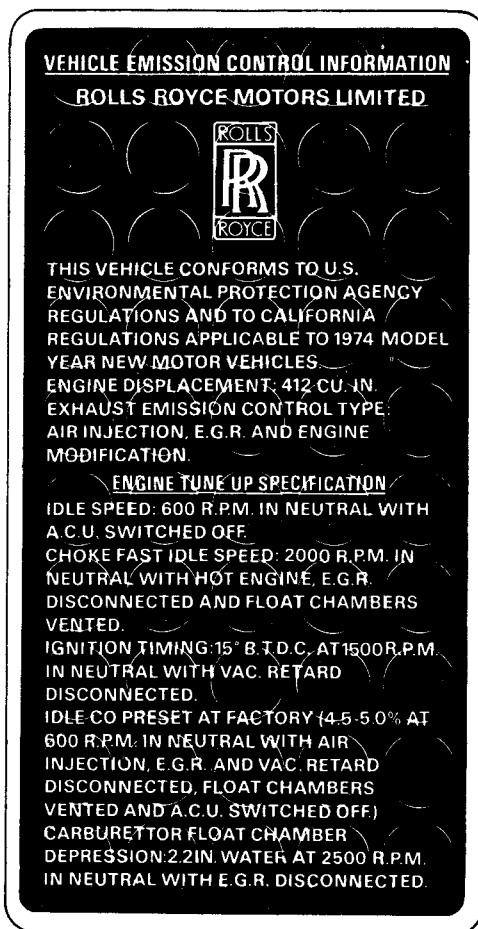
Rolls-Royce and Bentley motor cars conforming to the appropriate emission control regulations and produced during 1974 can be readily identified as follows.

1. Car Serial Number

A letter C as the last prefix of the Car Serial Number (e.g. SRC or LRC, etc.).

2. Emission Control Certification Label

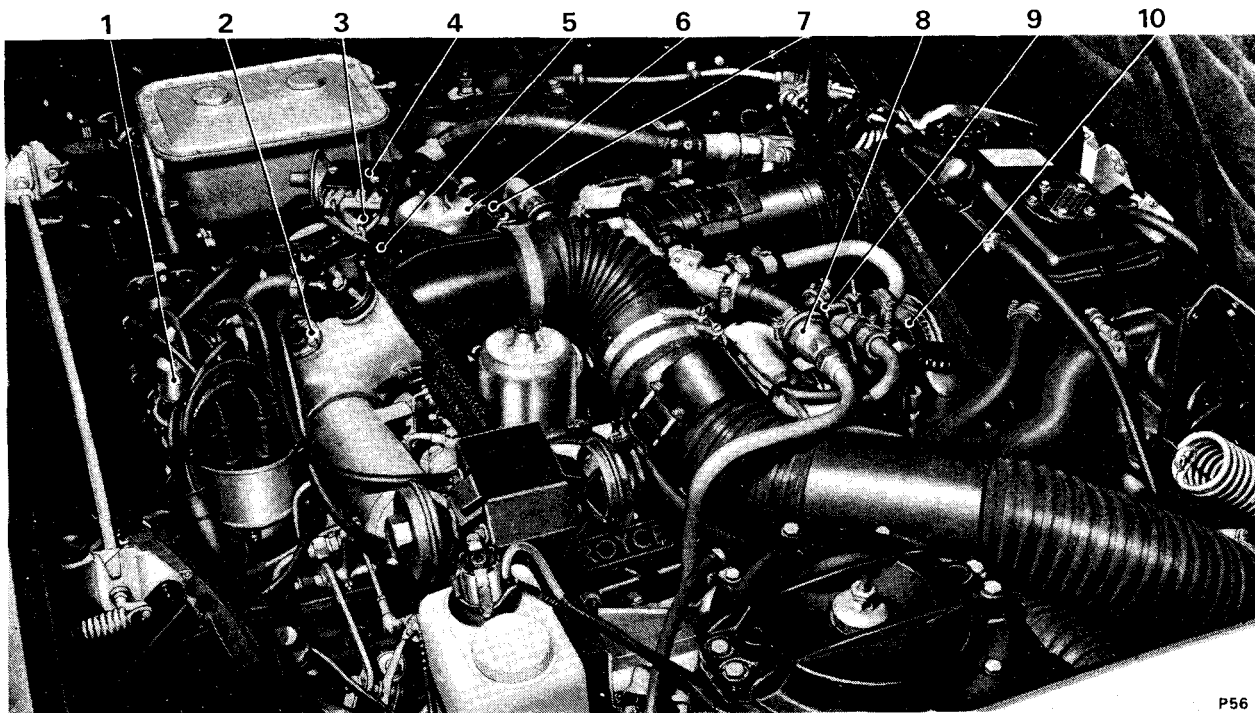
A 1974 Emission Control Certification Label (illustrated below) fitted to the wing valance to the rear of the right-hand front suspension spring cover.



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EMISSION CONTROL CERTIFICATION LABEL

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FIG. 1 VIEW INSIDE ENGINE COMPARTMENT (From Right-hand side of Car)

- | | |
|---|--|
| 1 Fuel receiver and float chamber vent valve | 5 Exhaust gas recirculation distribution pipes |
| 2 Weaker system cut-off switch | 6 'B' bank carburetter |
| 3 Exhaust gas recirculation secondary valve cut-in solenoid | 7 Anti 'run-on' solenoid |
| 4 Exhaust gas recirculation secondary valve vacuum operated micro-switch assembly | 8 Check valve |
| | 9 Deceleration control (gulp) valve |
| | 10 Air pump |

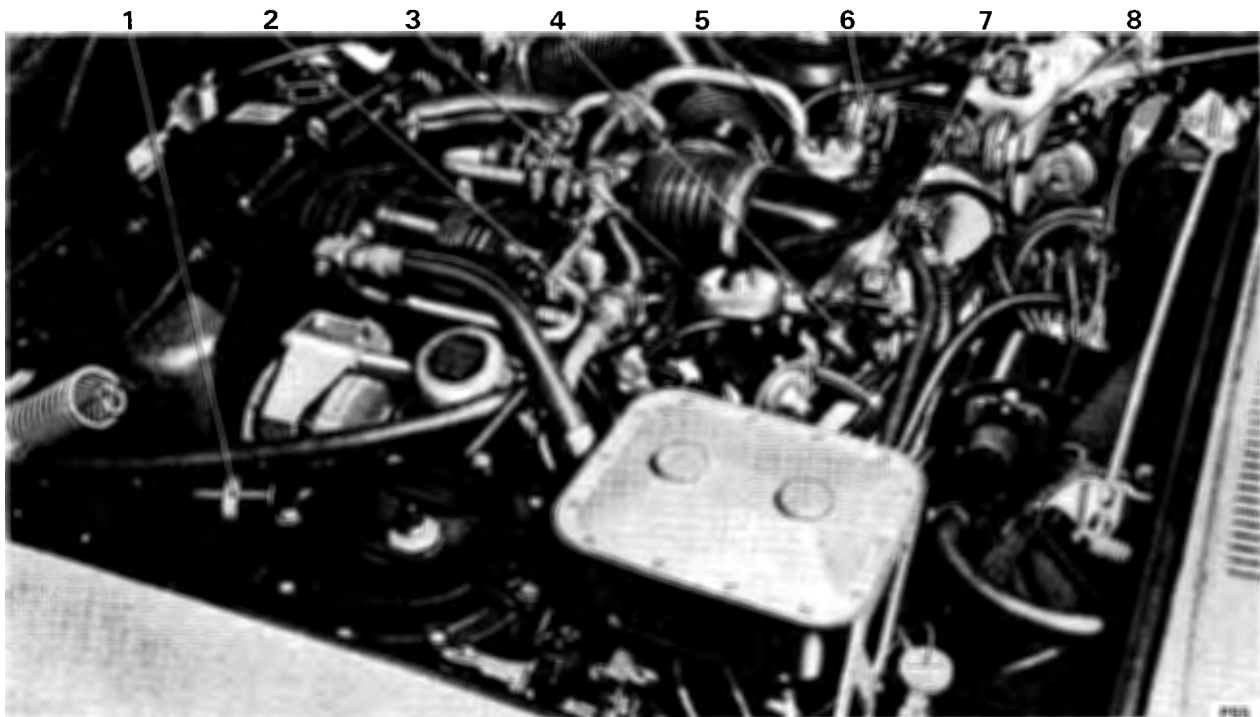


FIG. 2 VIEW INSIDE ENGINE COMPARTMENT (From Left-hand side of Car)

- | | |
|-----------------------------|---|
| 1 Weaker filter | 5 'A' bank carburetter |
| 2 Check valve | 6 Exhaust gas recirculation secondary valve |
| 3 'B' bank carburetter | 7 Choke solenoid |
| 4 Choke thermo-coil housing | 8 Exhaust gas recirculation primary valve |

EXHAUST EMISSION CONTROL SYSTEM

A small proportion of the exhaust gas from the 'A' bank exhaust manifold passes through a cooler and vacuum operated metering valves into the carburettor 'Tee' piece, just downstream of the throttles.

The exhaust gas mixes with the inlet charge in the induction manifold and is distributed to the cylinders thus lowering the peak combustion temperature and reducing oxides of nitrogen emissions.

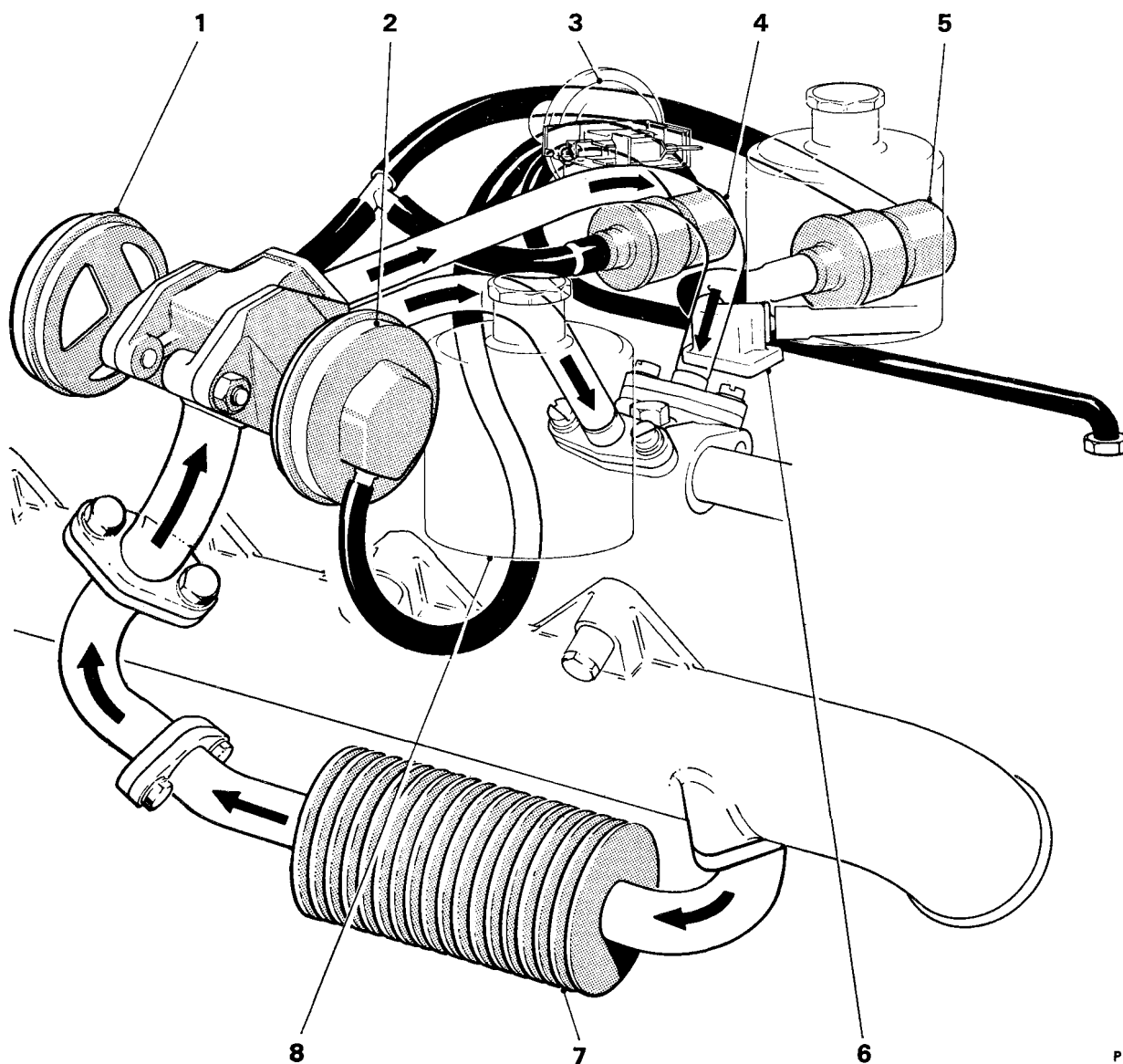


FIG. 3 EXHAUST GAS RECIRCULATION SYSTEM

- | | |
|--|-----------------------------|
| 1 Primary valve | 5 Cut-out solenoid assembly |
| 2 Secondary valve | 6 Weakening device |
| 3 Secondary valve vacuum operated cut-in micro-switch assembly | 7 Cooler |
| 4 Secondary valve solenoid assembly | 8 'A' bank carburettor |

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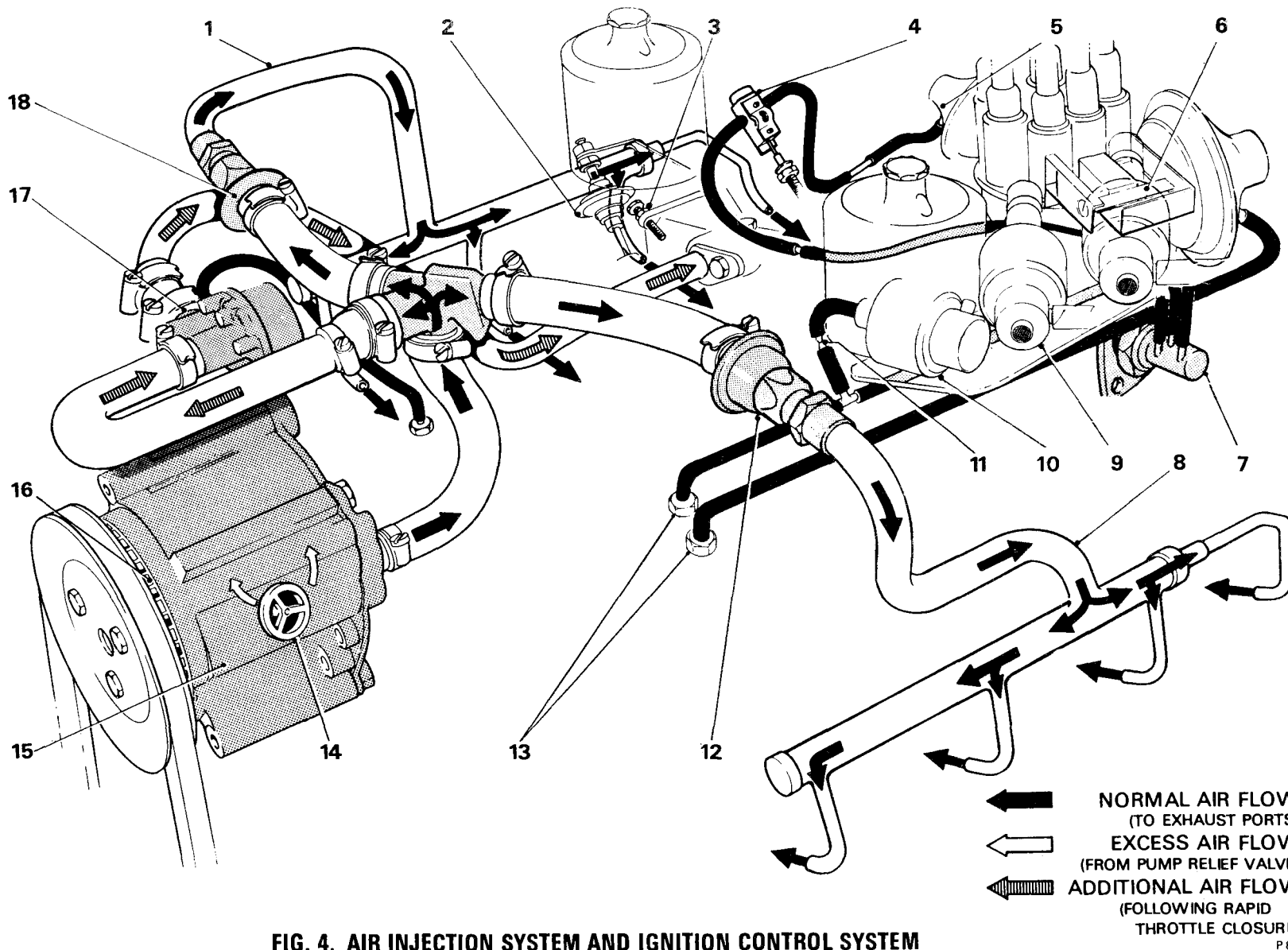


FIG. 4. AIR INJECTION SYSTEM AND IGNITION CONTROL SYSTEM

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A 'dual valve' exhaust gas recirculation system is used, employing a **primary valve** with a tapered metering pintle which gives an increase in flow area for an increased valve lift, and a **secondary valve** which has a reverse tapered pintle and gives a minimum flow area at full valve lift.

The vacuum signal for the exhaust gas recirculation valves is taken from a series of drillings in the carburettor body just upstream of the throttle edge. As the throttle is opened the signal strength is progressively increased (see Fig. 3).

A **direct** connection is made between the **primary valve** and the vacuum signal. The **secondary valve** is connected to the vacuum signal via a **solenoid valve** which in turn is controlled by a vacuum switch; the secondary valve only receives the vacuum signal when a predetermined manifold depression is reached.

When the throttle is opened the **primary valve** opens progressively as the vacuum signal increases. The valve is fully open at the point where the vacuum signal equals manifold depression.

Continued opening of the throttle lowers the manifold depression and actuates the **secondary valve** which immediately moves to the full valve lift position. Further opening of the throttle continues to reduce the manifold depression and consequently, the signal to both exhaust gas recirculation valves.

The reduced signal and valve lift reduces the flow area through the **primary valve** and increases the flow area through the **secondary valve**.

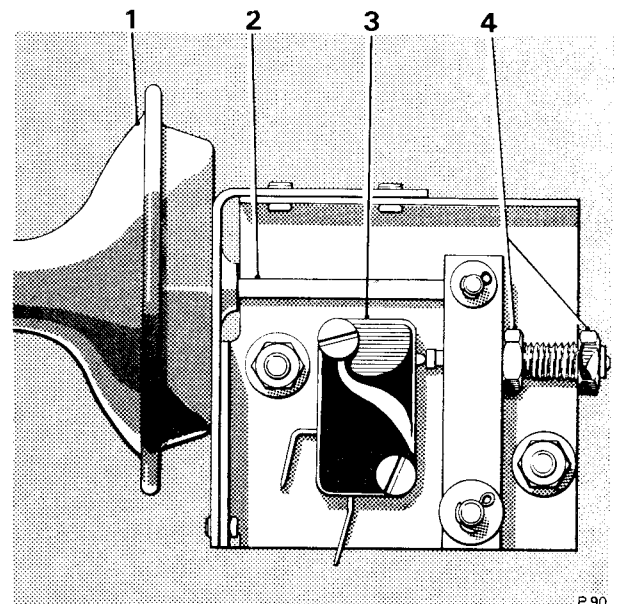
At very low vacuum signal strength both valves are seated and the flow is zero; in this way the recirculated exhaust gas is metered in proportion to the engine requirements for a reduction of oxides of nitrogen whilst retaining acceptable drivability.

To improve starting and driveaway quality at low temperatures a solenoid valve interrupts the vacuum signal to both exhaust gas recirculation valves, ensuring that they remain in the closed position, until a predetermined coolant temperature is reached.

A micro-switch operated by the throttle lever (see Fig. 6) also controls the cut-off solenoid to provide exhaust gas recirculation cut-off at full throttle. This feature of the system prevents the secondary valve remaining open under full throttle, high speed operation, as this would be detrimental to performance and fuel consumption.

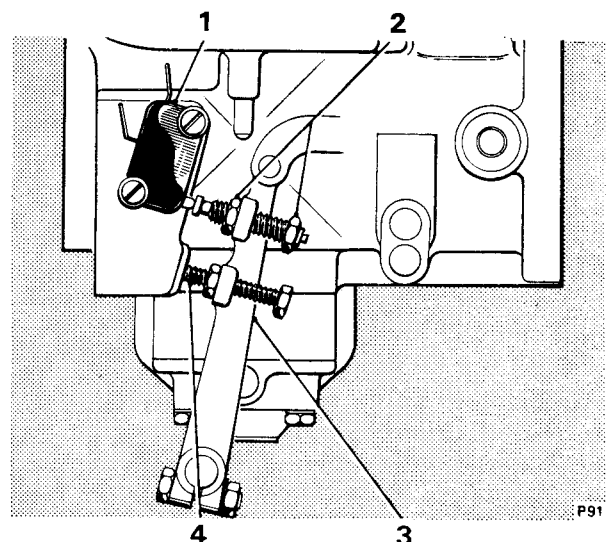
Exhaust gas recirculation valve—To remove

1. Detach the small diameter rubber hose from the valve.
2. Using a $\frac{1}{2}$ in. A/F spanner slacken the three nuts which retain the heat shield.



**FIG. 5 EXHAUST GAS RECIRCULATION SYSTEM
SECONDARY VALVE VACUUM OPERATED
CUT-IN SWITCH**

- 1 Vacuum unit
- 2 Actuating link
- 3 Micro-switch
- 4 Adjustment screws



**FIG. 6 EXHAUST GAS RECIRCULATION SYSTEM
FULL THROTTLE CUT-OFF MICRO-SWITCH**

- 1 Micro-switch
- 2 Adjusting screws
- 3 Throttle lever
- 4 Full throttle stop

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3. Withdraw the heat shield.
4. **Primary valve** Unscrew and remove the two $\frac{1}{2}$ in. A/F nuts and washers retaining the valve to the mounting flange.

Secondary valve Using a $\frac{1}{2}$ in. A/F spanner slacken the remaining nut and then unscrew and remove both retaining nuts and washers. Unscrew the $\frac{7}{16}$ in. A/F nut retaining the mounting bracket to the 'A' bank carburetter bracket; collect the washer and withdraw the bolt.

5. Withdraw the valve and remove the gasket from the mounting flange face.

Exhaust gas recirculation valve—To fit

Fit the valve by reversing the procedure for removal, noting the following points.

1. Ensure that the valve pintle is secure on the valve stem.
2. Ensure that the valve and mounting flange joint faces are clean and free from carbon deposits.
3. Always use a new mounting flange gasket.

Exhaust gas recirculation valve—To clean

1. Remove the valve as described in Exhaust gas recirculation valve — To remove.
2. Using a scraper, remove all carbon film from the valve and mounting flange faces; complete the operation with a wire brush.
3. Clean the carbon from the valve using a wire brush fitted into a portable drill. Take care not to damage the valve seating area.
4. Thoroughly blow out the valve with compressed air to ensure that all loose carbon particles are removed.
5. Upon completion of the cleaning operations, fit the valve to the engine mounting flange as described in Exhaust gas recirculation valve — To fit.

Exhaust gas recirculation valves— Preliminary check

To carry out preliminary checks on the operation of both **primary** and **secondary** exhaust gas recirculation valves proceed as follows.

1. Connect an electric impulse tachometer to the engine in accordance with the manufacturer's instructions.

2. Ensure that the parking brake is firmly applied and that the gear range selector is in the Neutral position.

3. Start the engine and run until normal operating temperature is attained.

4. Allow engine to return to the idle speed.

5. Increase the engine speed slowly noting the operation of the exhaust gas recirculation valves.

6. When the engine speed has reached 2 000 r.p.m. the diaphragm of the primary exhaust gas recirculation valve should have moved to the 'full valve lift' position.

7. Stop the engine. Disconnect the hose from the secondary valve cut-in solenoid vacuum unit. Blank off the open end of both the unit and the hose.

8. Disconnect the hose from the primary valve and blank off the open end of both the valve and the hose.

9. Repeat Operations 3–6 inclusive and note the movement of the secondary valve diaphragm.

If both diaphragms **have moved** to 'full valve lift' position in their respective tests, stop the engine and remove the tachometer as the test is complete.

Remove the blanks from the hoses; fit the vacuum unit hose and primary valve hose to their respective connections.

If the diaphragms **have not moved** to the required position stop the engine and proceed as follows.

Exhaust gas recirculation valve signal strength—To check

1. Remove the pressure tapping cap from 'A' bank carburetter float chamber to vent the float chambers to atmosphere (*see Fig. 9*).

2. Disconnect the small diameter rubber hose from the weakening device to the low temperature exhaust gas recirculation cut-off solenoid (*see Fig. 3*), at the weakening device.

3. Connect a suitable vacuum gauge (0 to 10 in. Hg.) to the exposed connection on the weakening device.

4. Start and run the engine until normal operating temperature is attained.

5. Adjust engine speed to 2 000 r.p.m. and ensure that the vacuum gauge shows a signal strength reading of between 2.0 in. Hg. and 5.5 in. Hg.

6. A **low** or **zero** reading may be caused by an air leak at the weakening device to carburetter joint.

7. Stop the engine; remove the vacuum gauge and fit the rubber hose to the weakening device.

Primary valve

8. Disconnect the exhaust gas recirculation cut-off solenoid to the primary valve rubber hose; at the primary valve.

9. Connect the hose to a vacuum gauge (0 to 10 in. Hg.); start and run the engine at 2 000 r.p.m.

10. Check to ensure that the signal strength reading on the vacuum gauge is between 2.0 in. Hg. and 5.5 in. Hg.

11. A **low** or **zero** reading may be caused by:

- a. Blockage in the hose from the weakener unit to the cut-off solenoid.
- b. Blockage in the hose between the cut-off solenoid and the primary valve.
- c. Air leak at the weakener unit joint face or hose connections.
- d. Low engine temperature (below 14°C. (57°F.), a faulty exhaust gas recirculation cut-off solenoid or cut-in switch (in thermostat outlet).
- e. Air leak in the exhaust gas recirculation secondary valve or connecting hoses.
- f. A faulty exhaust gas recirculation secondary valve solenoid.

12. Stop the engine, disconnect the vacuum gauge and reconnect the hose to the primary valve.

Secondary valve

8. Disconnect the rubber hose from the induction manifold to the vacuum operated micro-switch, at the micro-switch end and blank off the hose.

9. Detach the secondary valve to solenoid hose at the secondary valve.

10. Connect a suitable vacuum gauge (0 to 10 in. Hg.) to the hose.

11. Disconnect the hose from the low temperature exhaust gas recirculation solenoid to the primary valve, at the valve. Blank off the hose.

12. Start and run the engine at 2 000 r.p.m.

13. Check to ensure that the signal strength reading on the vacuum gauge is between 2.0 in. Hg. and 5.5 in. Hg.

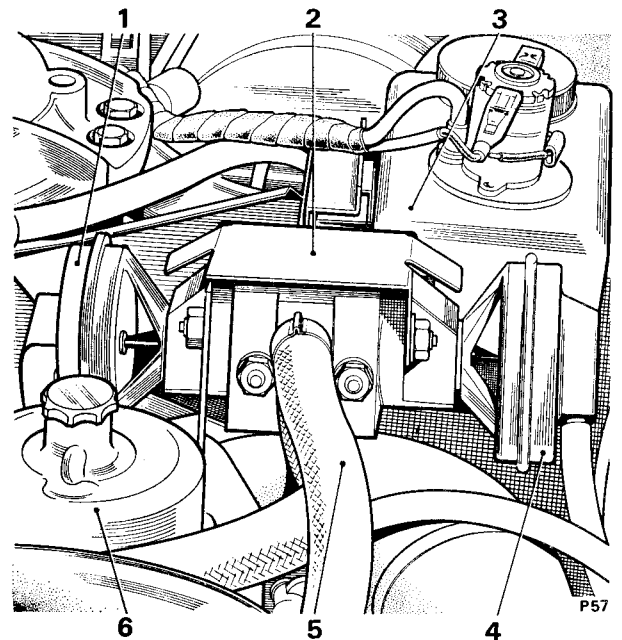


FIG. 7 EXHAUST GAS RECIRCULATION VALVES

- 1 Exhaust gas recirculation secondary valve
- 2 Heat shield
- 3 Windscreen washer reservoir
- 4 Exhaust gas recirculation primary valve
- 5 Exhaust gas recirculation distribution pipes
- 6 'A' bank carburettor

14. A **low** or **zero** reading may be caused by:

- a. A blockage in the hose from the 'Tee' piece to the secondary valve.
- b. A blockage in the hose from the secondary valve solenoid to the exhaust gas recirculation secondary valve.
- c. A faulty exhaust gas recirculation secondary valve solenoid.

15. Stop the engine and disconnect the vacuum gauge; reconnect the hose to the secondary valve.

16. Remove the blank from the low temperature exhaust gas recirculation solenoid to primary valve hose and reconnect the hose to the primary valve.

17. Remove the blank from the induction manifold to vacuum operated micro-switch and reconnect the hose to the micro-switch.

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CRANKCASE EMISSION CONTROL SYSTEM

Crankcase emissions are controlled by a recirculatory closed breather system (see Fig. 8).

An insulated draught tube connects the crankcase via the oil filler which is fitted with a sealed cap, to the choke housing upstream of both the choke butterfly and the carburetters. A flame trap capsule containing three wire mesh discs is fitted in a housing at the crankcase end of the draught tube. Engine emission (blow-by) is drawn into the induction system via the draught tube, due to the depression in the choke housing.

Maintenance

1. The flame trap fitted to the breather pipe should be cleaned in the following manner, at the specified mileage.

2. Unscrew the setscrew securing the breather pipe connection to the oil filler pedestal; withdraw the connection from the pedestal (slight resistance may be felt due to the rubber 'O' ring connections).

3. Withdraw the connection from the pipe flange and collect the restrictor.

4. Wash the flame trap assembly in clean petrol, then dry with a high pressure air line. The flame trap assembly consists of 3 gauzes crimped together as shown in Figure 8.

5. To clean the adapter fitted to the choke housing, remove the single setscrew from the breather pipe end connection and detach the pipe.

6. Clean the adapter fitted to the choke housing and ensure that the holes in the adapter are clear.

7. Assembly of the flame trap and breather pipe is in the reverse order, ensuring that the 'O' rings are in good condition.

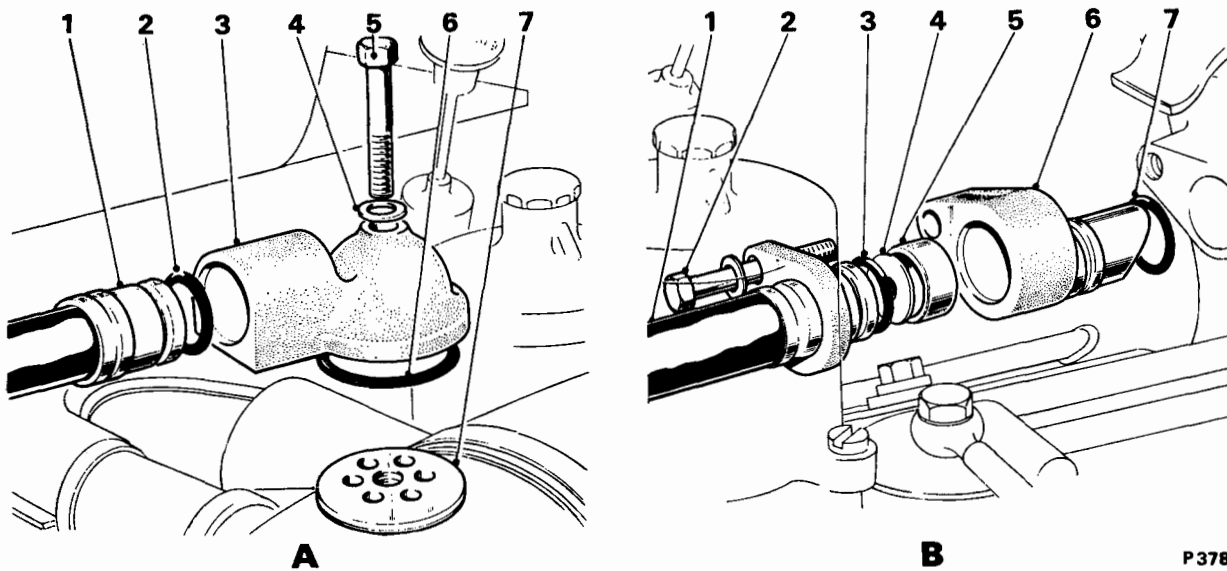


FIG. 8 EXPLODED VIEW OF CRANKCASE EMISSION CONTROL PIPE

- Diagram A**
 1 Pipe
 2 'O' ring
 3 Connection
 4 Washer
 5 Setscrew
 6 'O' ring
 7 Adapter

- Diagram B**
 1 Pipe
 2 Setscrew
 3 'O' ring
 4 Restrictor
 5 Flame trap
 6 Connection
 7 'O' ring

EMISSION CONTROL SYSTEMS (ELECTRICAL COMPONENTS)

The electrical components described in this section would normally appear in Chapter M — Electrical System, however, as they are used in connection with the 1974 emission control systems it is thought more practical to include the information in this Chapter.

The components concerned are as follows.

- (i) The exhaust gas recirculation cut-in switch.
- (ii) The exhaust gas recirculation cut-off solenoid.
- (iii) The anti 'run-on' solenoid.
- (iv) The exhaust gas recirculation secondary valve cut-in solenoid and vacuum operated micro-switch.
- (v) The exhaust gas recirculation full throttle cut-off micro-switch.
- (vi) The weakener cut-off solenoid.
- (vii) The weakener cut-off switch.

Note The temperatures quoted in this section for the various switches are nominal operating temperatures and in service, a plus or minus tolerance of a few degrees may be found.

Exhaust gas recirculation cut-in switch *Refer to page U19*

Exhaust gas recirculation cut-off solenoid
The exhaust gas recirculation cut-off solenoid is the middle solenoid of three solenoids situated on a small platform, adjacent to the 'B' bank carburetter (see Fig. 9).

The servicing details for this component are given on Page U20 — Note the following additional test.

Exhaust gas recirculation cut-off solenoid circuit wiring—To check

4. Start and run the engine, as the coolant temperature approaches 14°C. (57°F.) the test lamp bulb should be extinguished.

5. Depress the full throttle cut-out micro-switch plunger and check to ensure that the test lamp bulb illuminates. Release the plunger and the test lamp bulb should be extinguished.

6. Stop the engine and allow to cool, noting that as the engine coolant temperature drops to 12°C. (54°F.) the test lamp bulb again illuminates.

Note Do not leave the ignition switched on for long periods of time when the engine is not running.

Anti 'run-on' solenoid

The use of low octane fuel often causes an engine to 'diesel' (i.e. to continue to run-on after the ignition

has been switched off, particularly when the engine is hot). To prevent this condition arising an anti 'run-on' solenoid is connected to the weakener unit signal line (see Fig. 10).

When the ignition is switched off the solenoid opens and connects the weakener system to the induction manifold, thus creating a high float chamber depression which cuts off the supply of fuel.

The anti 'run-on' solenoid is situated on a platform adjacent to 'B' bank carburetter; it is the foremost of the three solenoids fitted on the platform.

The servicing details for this component are given on Page U20 — Note the following change to information.

Anti 'run-on' solenoid—To check

5. If the operation of the solenoid is correct note that the following conditions apply and connect the original hose to the solenoid.

- (i) With the ignition switched on it should not be possible to blow the hose.

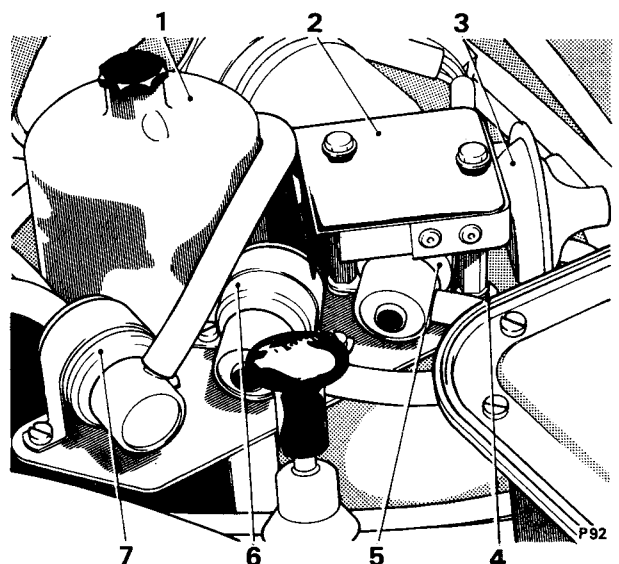


FIG. 9 SOLENOID PLATFORM

- 1 'B' bank carburetter
- 2 Micro-switch assembly
- 3 Vacuum unit
- 4 Distance piece
- 5 Secondary valve cut-in solenoid
- 6 Exhaust gas recirculation cut-out solenoid
- 7 Anti 'run-on' solenoid

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- (ii) With the ignition switched off the solenoid is de-energised and it should be possible to blow down the hose.

Exhaust gas recirculation secondary valve cut-in solenoid and vacuum operated micro-switch—To remove

This assembly is situated rearmost of the three solenoid assemblies mounted on a platform, adjacent to the 'B' bank carburetter (see Figs. 1 and 9).

1. Detach the rubber hoses from the solenoid, solenoid vent and vacuum unit.

Note Each rubber hose should be labelled as it is detached, to facilitate identification during assembly.

2. Disconnect the two electrical leads at their Lucar connections.

3. Unscrew and remove the two 2 B.A. screws which retain the micro-switch cover in position. Withdraw the cover.

4. Unscrew the two reach-nuts and withdraw the micro-switch assembly.

5. Unscrew and remove the two support pillars. Withdraw the solenoid assembly.

6. Collect the two distance pieces situated beneath the solenoid feet.

Exhaust gas recirculation secondary valve cut-in solenoid and vacuum operated micro-switch—To fit

Fit the secondary valve cut-in solenoid and vacuum operated micro-switch assembly by reversing the procedure given for removal.

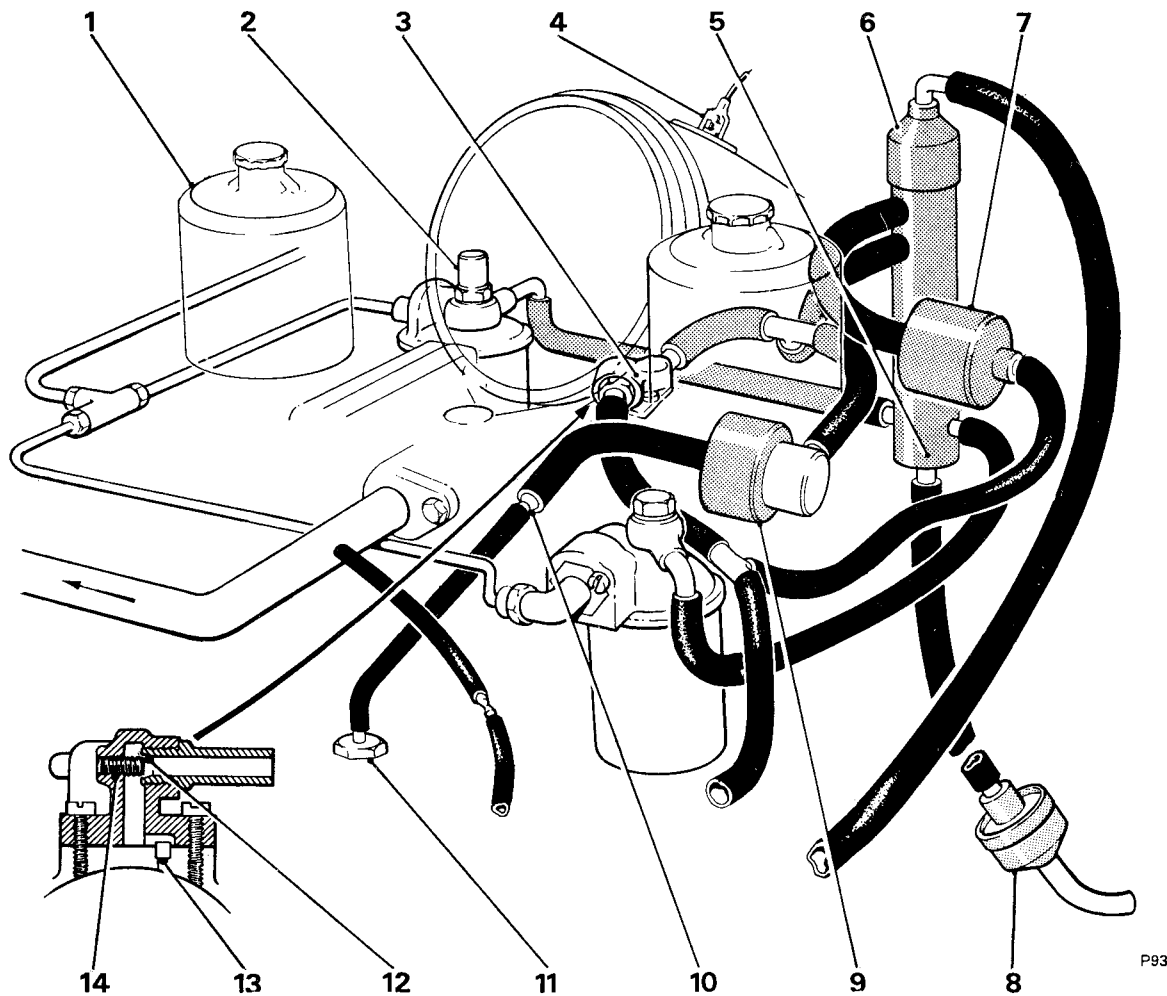


FIG. 10 CARBURETTER WEAKENING DEVICE

- | | |
|---|--|
| <ol style="list-style-type: none"> 1 'A' bank carburetter 2 Float chamber pressure tapping 3 Weakening device 4 Bi-metal switch 5 Fuel receiver 6 Float chamber vent valve 7 Weakening device cut-off solenoid | <ol style="list-style-type: none"> 8 Float chamber drain valve 9 Anti 'run-on' solenoid 10 Restrictor 11 Inlet manifold tapping 12 Bleed orifice 13 Venturi 14 Adjustment screw (set during initial assembly) |
|---|--|

Exhaust gas recirculation secondary valve cut-in solenoid and vacuum operated micro-switch circuit wiring—To check

1. Connect a test lamp across the two Lucar connections to the solenoid.

Note Do not disconnect the two Lucar connections.

2. Switch on the ignition and note that the test lamp bulb remains extinguished.

3. Start the engine and run at the idle speed, noting that the bulb of the test lamp is illuminated.

Exhaust gas recirculation secondary valve cut-in solenoid and vacuum operated micro-switch—To check

1. Disconnect the rubber hose from the vacuum unit.

2. Connect a suitable hand operated vacuum pump with a scale calibrated in ins. of Hg. (RH 8800) to the vacuum unit connection.

3. Draw a vacuum of at least 12 in. Hg. and note that the micro-switch 'clicks' at approximately 10 in. Hg. vacuum.

4. Allow the 12 in. Hg. vacuum to decrease slowly and note that the micro-switch 'clicks' again as the vacuum falls to between 8.5 in. Hg. and 7.5 in. Hg.

5. Release the vacuum and remove the pump assembly. Re-connect the rubber hose.

Exhaust gas recirculation secondary valve cut-in solenoid and vacuum operated micro-switch—To set

1. Unscrew and remove the two 2 B.A. screws which retain the micro-switch cover in position.

2. Remove the cover.

3. Disconnect the rubber hose from the vacuum unit.

4. Connect a suitable hand operated vacuum pump with a scale calibrated in ins. of Hg. (RH 8800) to the vacuum unit connection.

5. Draw a vacuum of 12 in. Hg. with the pump. Allow the vacuum to decrease to 8 in. Hg. and then seal the vacuum line to maintain the vacuum at the micro-switch.

6. Release the lock-nut and screw the spring loaded plunger assembly in until the micro-switch is fully depressed (*see Fig. 5*).

7. Screw the spring loaded plunger assembly out until the micro-switch 'clicks'. Tighten the lock-nut.

8. Check the operation of the vacuum operated micro-switch as detailed in Exhaust gas recirculation secondary valve cut-in solenoid and vacuum operated micro-switch — To check.

9. Fit the micro-switch cover. Remove the vacuum pump and re-connect the rubber hose to the vacuum unit.

Exhaust gas recirculation full throttle cut-off micro-switch—To remove

1. Detach the two electrical leads at their Lucar connections.

2. Unscrew and remove the two small nuts and bolts which retain the micro-switch in position on the mounting bracket.

3. Withdraw the micro-switch.

Exhaust gas recirculation full throttle cut-off micro-switch—To fit

Fit the micro-switch by reversing the procedure given for removal. Finally, set the micro-switch.

Exhaust gas recirculation full throttle cut-off micro-switch circuit wiring—To check

1. Start and run the engine until normal operating temperature is attained.

2. Switch off the ignition.

3. Connect a test lamp across the two Lucar connections to the exhaust gas recirculation cut-off solenoid.

Note Do not disconnect the two Lucar connections.

4. Switch on the ignition and check that the test lamp bulb is extinguished.

5. Open the throttles to the full throttle position to activate the full throttle cut-off micro-switch and thereby, illuminate the test lamp bulb.

Exhaust gas recirculation full throttle cut-off micro-switch—To set

Prior to setting the exhaust gas recirculation system cut-off micro-switch, ensure that the following are correctly set.

- (i) Throttle linkage (*refer to Chapter K*).
- (ii) Kick-down micro-switch (*refer to Chapter U*).

Chapter U

To set the cut-off micro-switch proceed as follows.

1. Depress the accelerator pedal until it touches the toeboard mounted kick-down micro-switch (further depression of the pedal requires increased effort).
2. Hold the throttle linkage in the position described in Operation 1 and release the lock-nut (*item 2, Fig. 6*) on the throttle lever (*item 3*).
3. Screw the spring loaded operating button away from the micro-switch.
4. When there is clearance at this point screw the spring loaded operating button toward the micro-switch until the micro-switch is heard to 'click'.
5. Tighten the lock-nut.
6. Depress the accelerator pedal further to operate the toeboard mounted kick-down micro-switch.

7. Adjust the full throttle stop (*item 4, Fig. 6*) to prevent overloading of the kick-down micro-switch. The full throttle stop should be set so that all throttle movement is stopped just prior to the operating button spring becoming fully compressed.

Weakener cut-off solenoid

Refer to page U21

Weakener valve cut-off switch

Refer to page U21

THE CARBURETTERS AND AUTOMATIC CHOKE SYSTEM

CARBURETTER

Data

Carburetters	Two S.U. HD8 diaphragm type
Choke size	2.00 in. (5,08 cm.)
Jet size— spring loaded needle type	0.100 in. (2,44 mm.)
Jet needle— spring loaded type ..	BCB
Carburetter— air valve piston spring	Red/Blue

Temperature controlled air intake

To ensure rapid warm-up and improve control of the air/fuel ratio a temperature controlled air intake is fitted (*see Fig. 11*).

A vacuum operated blending valve attached to the air cleaner assembly is controlled by a thermal sensor in the air intake elbow. This valve blends hot air from a pick-up point (scoop) adjacent to the exhaust manifold with cold air from under the front wing; thus maintaining a constant temperature of the intake air as it enters the carburetters.

Throttle stop vacuum actuator assembly

The throttle stop vacuum actuator assembly has been deleted from cars produced to the 1974 specification.

OVERHAUL**Carburetters—To remove**

Refer to Page U25 noting the following additional operations concerning the exhaust gas recirculation secondary valve micro-switch and vacuum unit assembly (see Fig. 5).

(i) After Operations 16-20 add:—

Also detach the hose from the exhaust gas recirculation secondary valve vacuum unit and the two hoses from the exhaust gas recirculation secondary valve solenoid.

(ii) Operation 23 should read:—

Disconnect the electrical connections from the three solenoid assemblies mounted on a bracket attached to 'B' bank carburetter.

Note On cars produced to the 1974 specification the vacuum actuator throttle stop assembly has been deleted.

Carburetters—To fit

Refer to Page U27 noting the additional remarks in this Supplement under the heading Carburetters — To remove.

CARBURETTER TUNING**Preliminary checks**

Refer to Page U32.

Tuning procedure

Refer to Page U32 noting the following information.

(i) Operation 1

Delete — Remove the air intake hose and blank off the hot idle compensator feed drilling (see Fig. U19); replace the hose.

Disconnect the solenoid to exhaust gas recirculation valve hose at the valve and blank off the hose.

Insert — Remove the air intake hose, blank off both the hot idle compensator feed drilling and the choke stove feed pipe (see Fig. U19); replace the hose.

Disconnect the low temperature exhaust gas recirculation cut-off solenoid to the exhaust gas recirculation valves hose, at the solenoid and blank off the solenoid.

(ii) Operations 2 and 16

The pressure tapping cap referred to in these two operations is fitted to 'A' bank carburetter float chamber cover.

(iii) Operations 9, 12 and 15

Delete — C.O. reading 5.0% to 5.5%.

Insert — C.O. reading 4.5% to 5.0%.

(iv) Operation 14

Delete — Fit probe of a C.O. meter into exhaust pipe in accordance with the manufacturer's instructions (The Horiba Mexa 200 C.O. meter is suitable).

Insert — Remove the air intake hose and remove the blank from the choke stove feed pipe. Fit the air intake hose.

Fit the probe of a C.O. meter into the exhaust pipe in accordance with the manufacturer's instructions (The Horiba Mexa 200 C.O. meter is suitable).

(v) Operation 16

Delete — Remove the blank from solenoid to exhaust gas recirculation valve hose and connect to the exhaust gas recirculation valve.

Insert — Remove the blank from the low temperature exhaust gas recirculation cut-off solenoid and connect to hose from the exhaust gas recirculation valves to the solenoid.

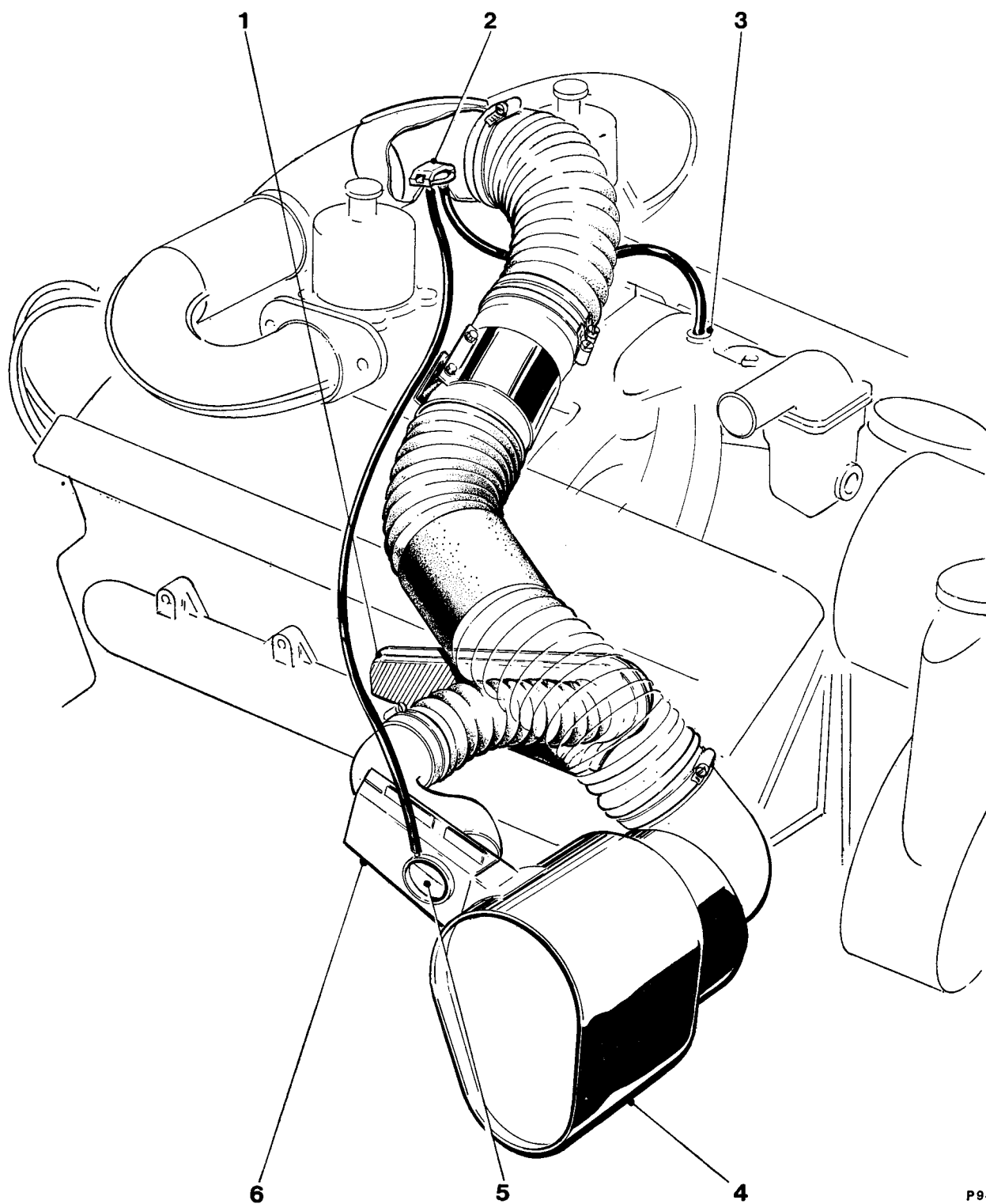
(vi) Operation 19

Delete — Check the idle speed and set if necessary to 600 r.p.m. by adjusting the vacuum actuator throttle stop screw. Remove the air intake hose; remove the blank from the hot idle compensator feed drilling and fit the intake hose.

Insert — Check the idle speed and set if necessary to 600 r.p.m. by adjusting the fixed throttle stop screw. Remove the air intake hose and remove the blank from the hot idle compensator feed drilling. Fit the air intake hose.

Throttle damper plunger—To set

1. Move the cold start 'fast-idle' to its off position.
2. Slacken both nuts securing the throttle damper to its bracket. Back off the nuts until they are well clear of the bracket.
3. Press the damper towards the 'A' bank throttle lever until the damper is fully compressed and the lever is just clear of the throttle stop screw.
4. Screw the lower securing nut until it is 0.025 in. (0.63 mm.) clear of the underside of the bracket. Release the damper and tighten the upper securing nut.
5. Ensure that the damper spindle is at the maximum possible radius, whilst maintaining adequate contact with the throttle lever pad. This can be achieved by adjusting the angle of the bracket.



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FIG. 11 TEMPERATURE CONTROLLED AIR INTAKE

- | | |
|--|-------------------------------|
| 1 Hot air scoop | 4 Air cleaner/silencer |
| 2 Temperature sensor | 5 Air blending valve |
| 3 Inlet manifold vacuum tapping | 6 Cold air intake |

Automatic choke stove pipe—To check

- (i) **Delete**—5. Observe the depression shown by the manometer reading; the correct reading should be between 16 in. and 20 in. (40,64 cm. and 50,80 cm.).
- (ii) **Insert**—5. Observe the depression shown by the manometer reading; the correct reading should be between 20 in. and 24 in. (50,80 cm. and 60,96 cm.).

Cold start 'fast-idle'—To set

Refer to Page U36 noting that the rubber hose referred to in Operations 1 and 4 should be the low temperature cut-off solenoid to exhaust gas recirculation valves hose at the solenoid and the solenoid should be blanked off.

Exhaust gas recirculation signal strength—To check

Refer to Page U62 in this Supplement.

Float chamber depression—To check

Refer to Page U37 noting the following information.

(i) Operation 1

Delete — Disconnect the solenoid to exhaust gas recirculation valve hose at the valve end and blank off the hose.

Insert — Disconnect the low temperature cut-off solenoid to exhaust gas recirculation valves hose, at the solenoid and blank off the solenoid.

(ii) Operation 7

Delete — Remove the blank from the solenoid to the exhaust gas recirculation valve hose and connect the hose to the exhaust gas recirculation valve.

Insert — Remove the blank from the low temperature cut-off solenoid and connect the hose from the exhaust gas recirculation valves to the solenoid.

(iii) Operation 8

Delete — Note Idle bleed screws are fully closed after blower rig setting.

IGNITION SYSTEM, DISTRIBUTOR, IGNITION COIL AND SPARKING PLUGS

In addition to the normal centrifugal advance, the ignition distributor is fitted with a vacuum retard timing control.

A throttle operated tap controls the vacuum applied to the distributor, retarding the ignition timing at idle and over-run speeds for improved exhaust emission control.

A thermal vacuum switch is fitted to prevent engine overheating during prolonged idling. This switch interrupts the vacuum line to the throttle operated tap when a predetermined coolant temperature is reached. The thermal vacuum switch deactivates the vacuum retard mechanism and advances the ignition timing to the normal setting, resulting in a small increase in the engine idle speed.

Data

Ignition timing	...	T.D.C. (Static) 15° B.T.D.C. at 1 500 r.p.m. (stroboscopic) in Neutral with vacuum retard disconnected. (Approach 1 500 r.p.m. from a higher speed).
-----------------	-----	---

Ignition—To time (using a stroboscope)

The timing of the ignition is carried out on A1 cylinder (left-hand front cylinder as viewed from the front of the engine).

1. Check the condition of the contact breaker points and set the gap to a nominal 0.014 in. to 0.016 in. (0,356 mm. to 0,406 mm.).

Fit new points if necessary.

Chapter U

2. Start the engine and run until normal operating temperature is obtained. Ensure that the choke fast-idle is off.

3. Stop the engine, disconnect the distributor vacuum pipe from the vacuum retard tap and blank off the connection on the tap.

4. Connect a stroboscope and impulse tachometer in accordance with the manufacturer's instructions.

5. Start the engine and set the speed to 1 500 r.p.m. by means of the fixed throttle stop screw.

Note The speed of 1 500 r.p.m. must be set by approach from a higher speed.

6. Using a dwell meter set the dwell angle to within limits of 26° and 28° by means of the adjusting screw (see Fig. U25 on Page U39).

Note To remove any backlash from the distributor mechanism finally set the dwell angle by approaching from a minimum of 32°.

7. Direct the stroboscope light onto the crankshaft damper and timing pointer. Slacken the distributor clamp bolt and adjust the distributor to set the timing at 15° B.T.D.C. Tighten the clamp bolt and check that the timing is still 15° B.T.D.C.

8. Set the engine idle speed to 680 r.p.m. by adjusting the fixed throttle stop screw.

9. Connect the vacuum pipe to the vacuum retard tap.

10. Remove the air intake hose and blank off the hot idle compensator feed (see Fig. U19, Page U32). Fit the air intake hose.

11. Adjust the engine idle speed to 600 r.p.m. using the fixed throttle stop screw, tighten the lock-nut.

12. Disconnect the vacuum line at the distributor retard capsule and 'Tee' in a vacuum gauge (0 to 30 in. Hg.) to the line; retain the connection to the distributor.

13. Set the vacuum retard tap by means of adjusting the screw, item 2 in Figure U26, so that the tap closes at the minimum throttle opening consistent with maintaining 14 in. Hg. minimum at the distributor when the engine is idling.

14. Reconnect the vacuum line to the distributor, check and adjust the idle speed if necessary using the fixed throttle stop screw.

15. Remove the air intake hose and remove the blank from the hot idle compensator feed. Fit the air intake hose.

LUBRICATION AND MAINTENANCE

The 'Essential' maintenance which is listed in the following schedules is the minimum servicing which must be carried out at the appropriate distance/time intervals, in order to comply with the Rolls-Royce Motors Limited* warranty and the U.S. Federal and California Emission Regulations.

The 'Preventive' maintenance listed, is aimed at securing the maximum life and efficiency for the vehicle and will be carried out on request.

***In the U.S.A. this warranty is given by Rolls-Royce Motors Inc.**

ESSENTIAL MAINTENANCE INITIAL SERVICE

This service will be carried out by the Dealer after the first 3 000 miles or 3 months whichever is the earlier.
Items marked * will be carried out free of charge.

INITIAL 3 000 MILES OR 3 MONTHS SERVICE WHICHEVER IS THE EARLIER

***Air injection pump**

Check belt tension and reset if necessary.

***Automatic choke**

Check the flow through the choke stove pipe, and check for correct operation.

***Carburettors**

Check oil level in air valve dampers and if necessary top-up to correct level. Check tightness of float chamber covers. Check float chamber depression. Check and if necessary reset the idle speed. Check and if necessary reset the choke fast-idle speed.

Engine

Change engine oil.

***Exhaust gas recirculation system**

Check the exhaust gas recirculation valves for correct operation.

***Fuel evaporation emission control system**

Check the purge rate; this should be between 50 c.f.h. and 70 c.f.h. at 600 r.p.m. in neutral. Pressure test the fuel tank and evaporation loss line and if necessary rectify any leaks.

***Ignition system**

Check distributor dwell angle and adjust if necessary. Correct dwell angle is 26° to 28°. Check ignition timing using stroboscope and reset if necessary; timing should be 15° B.T.D.C. at 1 500 r.p.m. with vacuum retard disconnected. Check operation of vacuum retard tap and reset if necessary.

Cooling system

Tighten worm-drive clips of all coolant hoses.

Torque converter transmission

Check fluid level and top-up if necessary.

When checking the fluid level, avoid contact with the exhaust gas recirculation valves, heat shield and associated pipes as these components will be **hot**.

**EVERY 3 000 MILES OR 3 MONTHS
WHICHEVER IS THE EARLIER****Engine**

If the car is used for constant stop/start operation, change the engine oil.

**EVERY 6 000 MILES OR 6 MONTHS
WHICHEVER IS THE EARLIER****Engine**

Change engine oil and renew oil filter element.

Ignition system

Check system with an ignition analyser. If necessary, clean sparking plugs and reset gaps to 0.025 in. (0.635 mm.).

Battery

Check the level of the electrolyte in the battery; if necessary top-up with distilled water.

Brakes

Inspect footbrake and parking brake pad linings. When changing footbrake pads examine condition of dust excluders on calipers. Manually adjust the parking brake pads. Inspect pipes and connections, rectify if necessary.

Torque converter transmission

Check fluid level and top-up if necessary.

When checking the fluid level, avoid contact with the exhaust gas recirculation valves, heat shield and associated pipes as these components will be **hot**.

**EVERY 12 000 MILES OR 12 MONTHS
SERVICE WHICHEVER IS THE EARLIER****Air injection pump**

Check tension of pump pulley driving belt.

Air silencer

Clean and oil the wire mesh filter elements.

Carburettors

Top-up oil level in air valve dampers. Check tightness of float chamber covers. Check float chamber depression. Check and if necessary reset the idle speed. Check and if necessary, reset choke fast-idle speed.

Crankcase emission control system

Remove and clean gauze flame traps in the crankcase breather tube. Clean the adapter in choke butterfly housing.

Engine

Change engine oil and renew oil filter element.

Chapter U

Exhaust gas recirculation system

Remove and clean the exhaust gas recirculation valves and feed pipes. Clean exhaust gas recirculation orifices in the carburetter 'Tee' piece. Check exhaust gas recirculation valves for correct operation.

Fuel evaporation emission control system

Renew the foam filter element in the evaporation loss control canister. Check the condition of the pipes and connections.

Ignition system

Renew the sparking plugs ensuring that the gaps are set to 0.025 in. (0,635 mm.). Renew contact breaker points and set dwell angle. Correct dwell angle is 26° to 28°. Replace distributor lubrication pad. Lubricate distributor spindle (shaft bearings) and automatic advance mechanism with engine oil. Check ignition timing using stroboscope and reset if necessary; timing should be 15° B.T.D.C. at 1 500 r.p.m. with the vacuum retard disconnected.

Battery

Check the level of the electrolyte in the battery; if necessary top-up with distilled water.

Brakes

Inspect footbrake and parking brake pad linings. When changing footbrake pads examine condition of dust excluders on calipers. Manually adjust parking brake pads. Inspect pipes and connections, rectify if necessary.

Final drive unit

Check oil level and top-up if necessary.

Steering mechanism

Lubricate mechanism at the six grease nipples.

Torque converter transmission

Renew transmission fluid.

When checking the fluid level, avoid contact with the exhaust gas recirculation valves, heat shield and associated pipes as these components will be **hot**.

EVERY 18 000 MILES OR 18 MONTHS SERVICE WHICHEVER IS THE EARLIER

Engine

Change engine oil and renew oil filter element.

Ignition system

Check system with an ignition analyser. If necessary, clean sparking plugs and reset gaps to 0.025 in. (0,635 mm.).

Battery

Check the level of electrolyte in the battery; if necessary top-up with distilled water.

Brakes

Inspect footbrake and parking brake pad linings. When changing footbrake pads examine condition of dust excluders on calipers. Manually adjust the parking brake pads. Inspect pipes and connections, rectify if necessary.

Torque converter transmission

Check fluid level and top-up if necessary.

When checking the fluid level, avoid contact with the exhaust gas recirculation valves, heat shield and associated pipes as these components will be **hot**.

EVERY 24 000 MILES OR 2 YEARS SERVICE WHICHEVER IS THE EARLIER

Air injection pump

Check tension of pump pulley driving belt.

Air injection system

Check air injection system for leaks and correct functioning. Renew any defective items.

Air silencer

Clean and oil the wire mesh filter elements.

Automatic choke

Check the air flow through the choke stove pipe and check the system for correct functioning.

Carburettors

Clean air valves. Remove inlet unions from the float chamber covers and fit new paper filter elements. Top-up oil level in air valve dampers. Check tightness of float chamber covers. Check float chamber depression. Check and if necessary, reset the idle speed. Check and if necessary, reset choke fast-idle speed.

Carburettor mixture weakening device

Renew air filter element for the carburettor mixture weakening device.

Crankcase emission control system

Remove and clean gauze flame traps in crankcase breather tube. Clean the adapter in choke butterfly housing.

Engine

Change engine oil and renew oil filter element.

Engine coolant system

Fit a new engine coolant thermostat and heater tap feed hose.

Exhaust gas recirculation system

Remove and clean the exhaust gas recirculation valves and feed pipes. Clean exhaust gas recirculation orifices in carburettor 'Tee' piece. Check system for correct operation.

Fuel evaporation emission control system

Renew the foam filter element in the evaporation loss control canister. Check the purge rate; this should be between 50 c.f.h. and 70 c.f.h. at 600 r.p.m. in neutral. Renew the purge line filter if necessary.

Ignition system

Renew the sparking plugs ensuring that the gaps are set to 0.025 in. (0.635 mm.). Renew contact breaker points and set dwell angle. Correct dwell angle is 26° to 28°. Replace distributor lubrication pad.

Lubricate distributor spindle (shaft bearings) and automatic advance mechanism with engine oil. Check ignition timing using a stroboscope and reset if necessary; timing should be 15° B.T.D.C. at 1 500 r.p.m. with the vacuum retard disconnected.

Battery

Check the level of the electrolyte in the battery; if necessary top-up with distilled water.

Brakes

Inspect footbrake and parking brake pad linings. When changing footbrake pads examine condition of dust excluders on calipers. Manually adjust parking brake pads. Inspect pipes and connections, rectify if necessary.

Final drive unit

Change oil.

Steering mechanism

Lubricate mechanism at the six grease nipples.

Torque converter transmission

Change transmission fluid. After initial 24 000 miles/2 years whichever is the earlier, renew intake strainer.

When checking the fluid level, avoid contact with the exhaust gas recirculation valves, heat shield and associated pipes as these components will be hot.

SERVICING AFTER 24 000 MILES OR 2 YEARS WHICHEVER IS THE EARLIER

After 24 000 miles or 2 years, servicing is still due at 6 000 miles intervals and the respective service listed below should be carried out.

At 30 000 miles carry out the 6 000 miles service.

At 36 000 miles carry out the 12 000 miles service.

At 42 000 miles carry out the 18 000 miles service.

At 48 000 miles carry out the 24 000 miles service.

Chapter U

PREVENTATIVE MAINTENANCE

INITIAL SERVICE

This service should be carried out by the Dealer after the first 3 000 miles or 3 months whichever is earlier.

Belt tension

Check the tension of the belts driving the following; fan and steering pump, alternator and refrigeration compressor. Adjust the belt tension as necessary.

Steering pump

Check the oil level in the reservoir; top-up if necessary.

EVERY 6 000 MILES OR 6 MONTHS WHICHEVER IS EARLIER

Air silencer

Remove and clean the wire mesh filter elements.

Carburettors

Check the oil level in the air valve dampers and top-up if necessary.

Ignition system

Check the distributor dwell angle and adjust if necessary.

Check the ignition timing using a stroboscope and adjust if necessary.

Steering pump

Check for leaks. If necessary top-up the level in the steering pump reservoir.

Belt tension

Check the tension of the belts driving the following; fan and steering pump, alternator and refrigeration compressor. Renew any belts which show signs of wear.

Control linkages

Apply a few drops of engine oil to the accelerator linkage and to the gear range selector controls adjacent to the transmission casing.

Electrical system

Ensure that all lamps, instruments, warning devices and air conditioning controls are operating satisfactorily.

Check the following levels and pressures

Run the engine for four minutes then check the hydraulic reservoir fluid levels; top-up if necessary with the specified fluid.

Check the level and specific gravity of the engine coolant and correct if necessary.

Check the tyre pressures and adjust if necessary.

Check the tread depth of all tyres and inspect for signs of damage.

EVERY 12 000 MILES OR 12 MONTHS WHICHEVER IS THE EARLIER

Belt tension

Check the tension of the belts driving the following; fan and steering pump, alternator and refrigeration compressor. Renew any belts which show signs of wear.

Control linkage

Apply a few drops of engine oil to the accelerator linkage and to the gear range selector controls adjacent to the transmission casing.

Parking brake linkage

Lubricate the pivot pins and pulleys in the parking brake system with approved grease.

Spare wheel

Lubricate the spare wheel lowering bolt and mechanism.

Electrical system

Ensure that all lamps, instruments, warning devices and air conditioning controls are operating satisfactorily.

Check the following levels and pressures

Check the fluid level in the power steering pump reservoir and top-up if necessary.

Check the level and specific gravity of the engine coolant and correct if necessary.

Check the fluid level in the steering idler box damper and top-up if necessary.

Check the level of electrolyte in the battery and top-up with distilled water if necessary.

Run the engine for four minutes then check the hydraulic fluid levels; top-up if necessary.

Check the tyre pressures and adjust if necessary.

Check the tread depth of all tyres and inspect for signs of damage.

EVERY 24 000 MILES OR 2 YEARS WHICHEVER IS THE EARLIER

Belt tension

Check the tension of the belts driving the following; fan and steering pump, alternator and refrigeration compressor.

Renew any belts which show signs of wear.

Alternator

Check the slip rings and the brushes for wear; also check the brushes for freedom in their holders.

Control linkage

Apply a few drops of engine oil to the accelerator linkage and to the gear range selector controls adjacent to the transmission casing.

Fuel pump

Remove the fuel pump from the car and test on the bench. Fit a new pump unit if the performance is below the specified level. (*refer to Chapter K—Fuel System of this Workshop Manual T.S.D. 2476*).

Parking brake linkage

Lubricate the pivot pins and pulleys in the parking brake system with approved grease.

Spare wheel

Lubricate the spare wheel lowering bolt and mechanism.

Electrical system

Ensure that all lamps, instruments, warning devices and air conditioning controls are operating satisfactorily.

Fuel tank

Slacken the drain plug one or two turns and allow any accumulated water to drain away. Tighten the drain plug.

Fuel filter

Renew the main line filter element and clean the filter bowl.

Height control mechanism

Disconnect the control valve linkage ball joints. Clean, grease and refit the ball joints.

Rear wheel drive-shaft

Lubricate the rear wheel drive-shaft outer universal couplings with an approved grease.

Check the following levels and pressures

Check the fluid level in the power steering pump reservoir and top-up if necessary.

Check the level and specific gravity of the engine coolant and correct if necessary.

Check the fluid level in the steering idler box damper and top-up if necessary.

Check the tyre pressures and adjust if necessary.

Check the tread depth of all tyres and inspect for signs of damage.

SEASONAL SCHEDULE EVERY 12 MONTHS

Engine cooling system

Drain the coolant from the radiator and the engine crankcase. Clean any debris from the surfaces of the refrigeration condenser and radiator matrices by reverse flushing with a hose. This should be carried out just prior to the Autumn. Fill the system with the correct anti-freeze mixture (*refer to Chapter L—Engine Cooling System of this Workshop Manual T.S.D. 2476*).

Air conditioning system

Ensure that the foam filter element fitted to the scuttle intake grille is free from obstruction. On Long Wheelbase cars fitted with a centre division, check that the foam filter element fitted to the intake grille in the rear decking panel is free from obstruction.

Refrigeration system

These operations should be carried out only by an experienced refrigeration engineer.

Check that the refrigeration system is functioning correctly. If necessary, top-up the system with refrigerant. If loss of refrigerant is evident, check the system for leakage. Visually check the refrigerant compressor for oil leakage, if oil leakage is apparent check the oil level and top-up if necessary. In the event of a major oil loss, check and repair before topping-up (*refer to Chapter C—Air Conditioning of this Workshop Manual T.S.D. 2476*).

Chapter U

Body

Check that the body drain holes are free from foreign matter.

EVERY 2 YEARS

In addition to the 12 monthly schedule, carry out the following.

Engine cooling system

Drain the coolant from the radiator and engine crankcase. Thoroughly reverse flush the coolant passages with a continuous flow of water. Change the coolant hoses where necessary. Fill the system with the correct anti-freeze mixture.

**SERVICE RECOMMENDATIONS
BRAKE AND HYDRAULIC SYSTEM
COMPONENTS**

48 000 Miles

At this mileage and under normal motoring conditions it is recommended that the following servicing is carried out.

Renew the front and rear accumulator to frame connector block hoses.

Examine the sub-frame to brake caliper hoses for chafing or surface cracking; renew if necessary.

Renew the disc brake caliper seals, the deceleration conscious pressure limiting valve seals, and the master cylinder seals.

Completely drain the fluid from the hydraulic circuits. Thoroughly clean the brake fluid reservoirs

and sight glasses, ensuring that no foreign matter is allowed to enter during the operation.

Fill the hydraulic system with Castrol RR 363 Brake Fluid. This fluid exceeds specification S.A.E. J 1703b in many respects and complies with D.O.T. 3 grade of FMVSS 116. Bleed the braking systems and automatic height control system.

96 000 Miles

At this mileage and under normal motoring conditions it is recommended that the following servicing is carried out.

Renew all the flexible hoses to the braking systems and the automatic height control system. Renew the disc brakes caliper seals, the deceleration conscious pressure limiting valve seals and the master cylinder seals.

Completely drain the fluid from the hydraulic circuits. Thoroughly clean the brake fluid reservoirs and sight glasses, ensuring that no foreign matter is allowed to enter during the operation.

Fill the hydraulic system with Castrol RR 363 Brake Fluid. This fluid exceeds specification S.A.E. J 1703b in many respects and complies with D.O.T. 3 grade of FMVSS 116. Bleed the braking systems and automatic height control system.

SPECIAL PRECAUTIONS

Should the car be used in very cold temperatures, drain the engine sump when thoroughly warm and also drain the carburetter air valve dampers. The engine sump and carburetter air valve dampers should then be filled with oil having the following viscosity.

For constant temperatures of between 0°C. and -23°C. (32°F. and -10°F.), use a 10W/30 grade oil.

For constant temperatures of -23°C. (-10°F.) and below, use a 5W/20 grade oil.

FAULT DIAGNOSIS

SYMPTOMS	POSSIBLE CAUSE
<p>1. Engine will not start. (Starter motor operating).</p>	<p>1. (a) Fouled contact breaker points or incorrect dwell angle. (b) Ignition circuit broken. (c) Failed anti run-on solenoid or failure of electrical supply circuit. (d) Blocked fuel feed line or fouled float chamber filters. (e) Faulty choke bi-metal coil. (f) Fast-idle speed incorrect. (g) Choke solenoid inoperative. (h) Blocked weakener vent line or fouled filter. (i) Blocked carburetter float chamber vent line. (j) Exhaust gas recirculation valves failed in open position.</p>

SYMPTOMS	POSSIBLE CAUSE
2. Engine idles very roughly.	2. (a) Fouled contact breaker points or incorrect dwell angle. (b) Air leaks between control valve and carburetter "Tee" piece, or in exhaust gas recirculation pipes. (c) Fouled spark plugs. (d) Exhaust gas recirculation valves stuck in the open position. (e) Damaged or contaminated ignition high tension circuit. (f) Failed deceleration (gulp/anti backfire) valve. (g) Damaged vacuum modulator pipe causing air leak (inlet manifold to transmission). (h) Blocked carburetter float chamber vent line.
3. Engine stalls.	3. (a) Incorrect idle speed. (b) Flooding of float chamber or the jet. (c) Water or foreign matter in the float chamber. (d) Faulty hot idle mixture compensator. (e) Exhaust gas recirculation valves stuck open.
4. (i) Engine shows signs of power loss, evident at high speeds and loading. (ii) Engine misfires particularly on hard acceleration from low speed.	4. (a) Insufficient delivery of fuel (i.e. blocked float chamber cover filters). (b) Incorrect ignition timing. (c) Incorrect spark plugs or gap settings. (d) Incorrect dwell angle. (e) Fouled spark plugs.
5. Engine hesitates or misfires under light load.	5. High float chamber depression due to: (a) Weakening device filter blocked or blockage in rubber hosing or bleed orifice. (b) Dislodged venturi in weakening device. (c) Evaporation loss control canister filter blocked. (d) Incorrect connection of weakener hose to valance adapter or evaporation loss control canister. (e) Incorrect purge flow rate. (f) Failed exhaust gas recirculation secondary valve solenoid or cut-in vacuum switch.
6. Increase in fuel consumption.	6. Low float chamber depression due to: (a) A blockage in the weakener venturi, the hose from the weakener to vent canister or the hose from the float chambers to the fuel receiver. (b) Float chamber and weakening device air leaks. (c) Float chamber connection air leaks as far as and including the one way valve in the fuel drain pipe. (d) Engine intake air temperature below 16°C. (60°F.). (e) Air leaks between weakening device and tapping in carburetter body; including the weakener cut-off valve. (f) Faulty cut-off valve. (g) A dirty or faulty float chamber drain valve. (h) A dirty or faulty float chamber vent valve. (i) Incorrect purge flow rate. (j) Incorrect ignition timing.
7. Poor slow running, lack of power and high fuel consumption.	7. (a) Sticking carburetter piston caused by the needle bearing heavily on the jet. (b) Sticking carburetter piston caused by a bent damper rod. (c) Sticking carburetter piston caused by dirt between the suction chamber and piston. (d) Piston rod sticking in bush. (e) Ignition timing incorrect. (f) Failed vacuum retard tap. (g) Exhaust gas recirculation valves stuck open. (h) Fouled spark plugs. (i) Faulty hot idle mixture compensator. (j) Incorrect idle speed.

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SYMPTOMS	POSSIBLE CAUSE
8. Engine 'backfires' on over-run.	8. (a) Severe air leak in exhaust emission control system, probably between control valve and carburetter 'Tee' piece. (b) Leak in exhaust gas recirculation pipes, probably between valves and carburetters. (c) Deceleration (gulp/anti backfire) valve sticking in closed position. (d) Exhaust gas recirculation valves stuck open.
9. Excessive noise from air injection pump.	9. (a) Relief valve failure. (b) Damaged impeller vanes. (c) Rubbing vanes (an intermittent 'chirping' noise noticeable mainly at low engine speed). (d) Worn bearing (a rolling sound noticeable at all engine speeds).

WORKSHOP TOOLS

Tool Number Description

RH 8050 Spanner—Carburetter Jet Screw

RH 8087 Spanner—Weakener Cut-off Valve

RH 8089 Jet Centring Tool

RH 8090 Pliers—Wire Hose Clips

RH 8095 Restrictor—Manometer Check—Choke Stove Pipe

RH 8382 Spanner—Distributor Dwell Angle

RH 8383 Positioning Tool—Throttle Spindle Seal

RH 8621 Adapter—Air Manifold to C.O. Meter

RH 8800 Vacuum Pump—Hand Operated

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Section U10

SUPPLEMENTS

No. 3 North America 1975

Rolls-Royce motor cars conforming to the appropriate emission control regulations and produced during 1975 can be readily identified as follows.

1. Car Serial Number

A letter D as the last prefix of the Car Serial Number (e.g. SRD or LRD, etc.).

2. Emission Control Certification Label

A 1975 Emission Control Certification Label (illustrated below) fitted to the wing valance to the rear of the right-hand front suspension spring cover.



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EMISSION CONTROL CERTIFICATION LABEL

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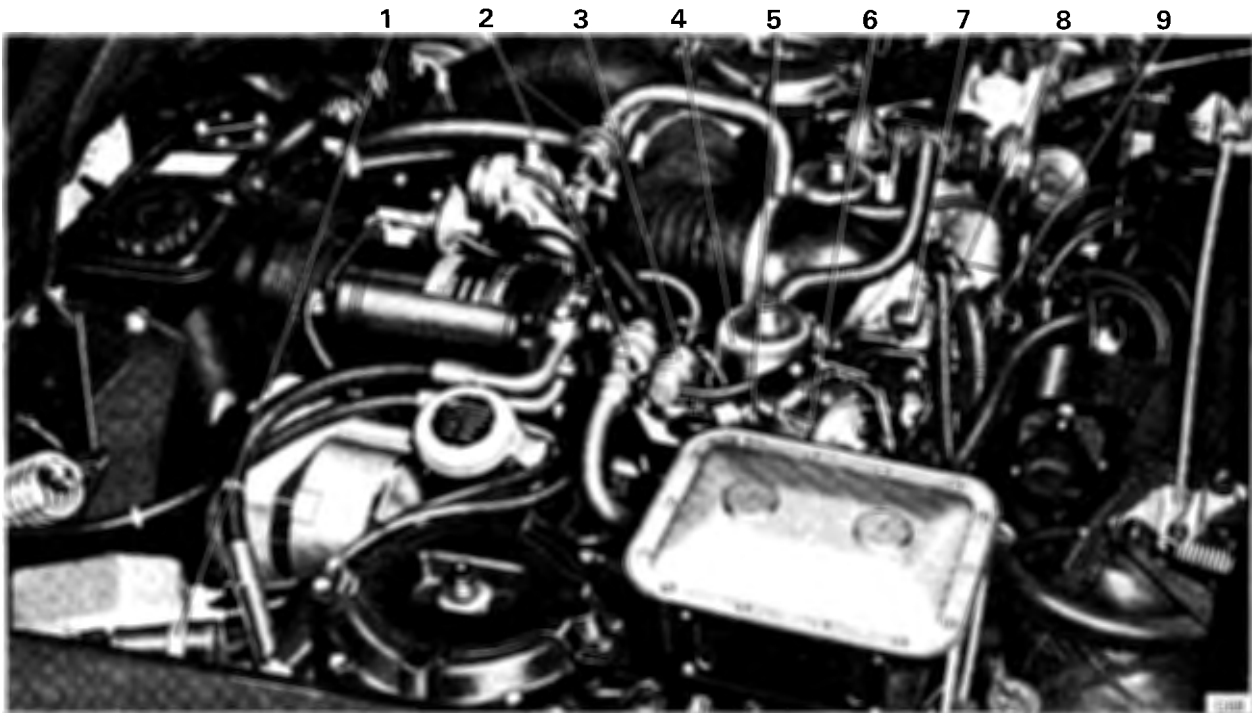


FIG. 1 VIEW INSIDE ENGINE COMPARTMENT (From Right-hand side of Car)

- | | |
|---------------------------|---|
| 1 Weaker filter | 6 E.G.R. secondary valve cut-in micro-switch assembly |
| 2 Check valves | 7 Choke solenoid |
| 3 Anti 'run-on' solenoid | 8 Choke stove pipe |
| 4 'B' bank carburetter | 9 Crankcase emission control system breather tube |
| 5 E.G.R. cut-out solenoid | |

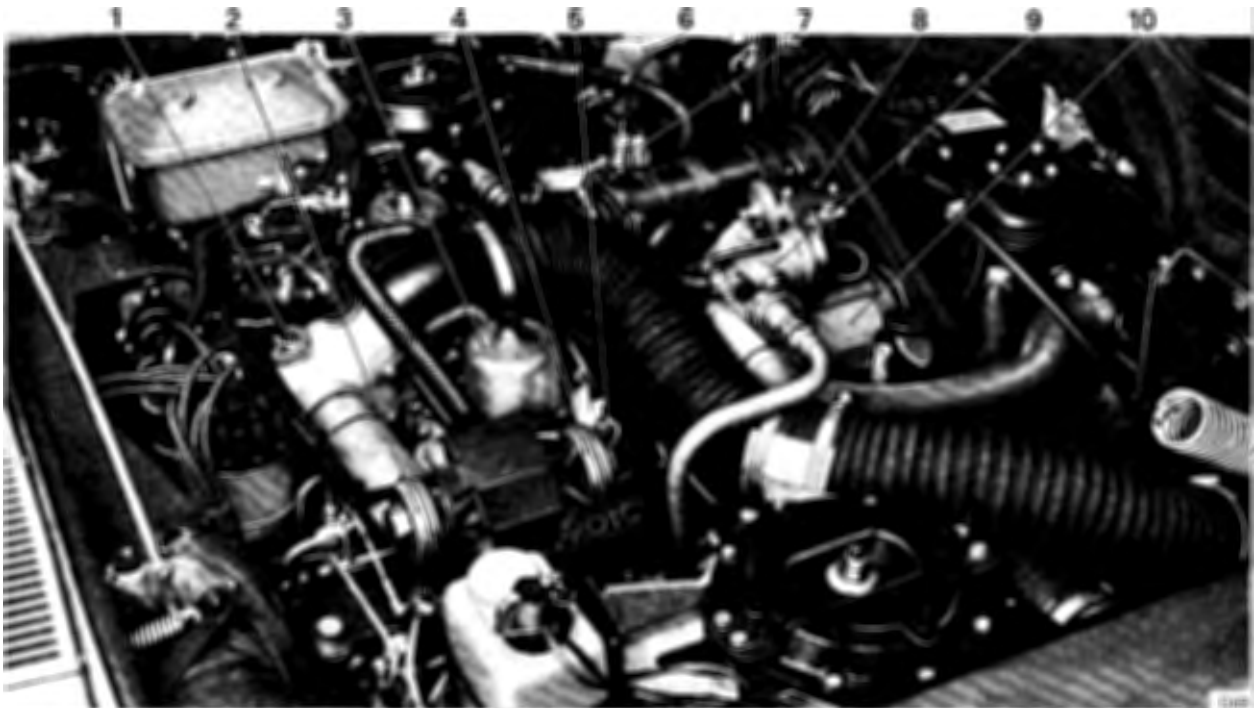


FIG. 2 VIEW INSIDE ENGINE COMPARTMENT (From Left-hand side of Car)

- | | |
|---|--|
| 1 Weaker system cut-off switch | 6 Speed control system regulator |
| 2 E.G.R. primary valve | 7 Hydraulic accumulator fluid pressure switches |
| 3 'A' bank carburetter | 8 Air diverter valve cut-out micro-switch assembly |
| 4 E.G.R. secondary valve | 9 Air diverter valve |
| 5 E.G.R. full throttle cut-out micro-switch | 10 Air pump |

EXHAUST EMISSION CONTROL SYSTEM

AIR INJECTION SYSTEM

Air injection system relief valve

The relief valve located in the discharge cavity of the air pump is changed on 1975 model year cars and is as follows.

Air pump relief valve

A spring loaded relief valve is located within the diverter valve housing and permits excess air to bypass the air injection system when the check valves are closed. The by-pass system prevents damage to the pump vanes and excessive exhaust temperatures under extreme operating conditions.

Air diverter valve

The air diverter valve is located at the front of the engine above the air pump (*see Fig. 2*) and performs two important functions in addition to housing the pressure relief valve for the air pump.

(i) Backfire protection (*see Fig. 3*)

Following rapid throttle closure, the inlet manifold pressure drops suddenly, causing fuel to be vapourised from the manifold walls which results in a mixture too rich to burn in the cylinders. This mixture combined with the air injected into the exhaust ports could cause backfiring.

To prevent backfiring, the diverter valve, triggered by manifold depression diverts the injected air from the exhaust ports for a short period of time.

(ii) Catalyst overtemperature protection (*see Fig. 3*)

Under high load conditions the low manifold depression activates a vacuum switch controlling a solenoid valve. The solenoid valve is located in the pressure line connecting the diverter valve inlet to the lower diaphragm cover. When the vacuum switch is activated the solenoid opens and applies air pump delivery pressure to the lower diaphragm, thereby diverting the air from the exhaust ports. This prevents excessive temperatures which could result in catalyst failure.

Air diverter valve—To check

The air diverter valve is a non-serviceable component. If the operation of the component is suspect the following checks should be carried out before it is replaced.

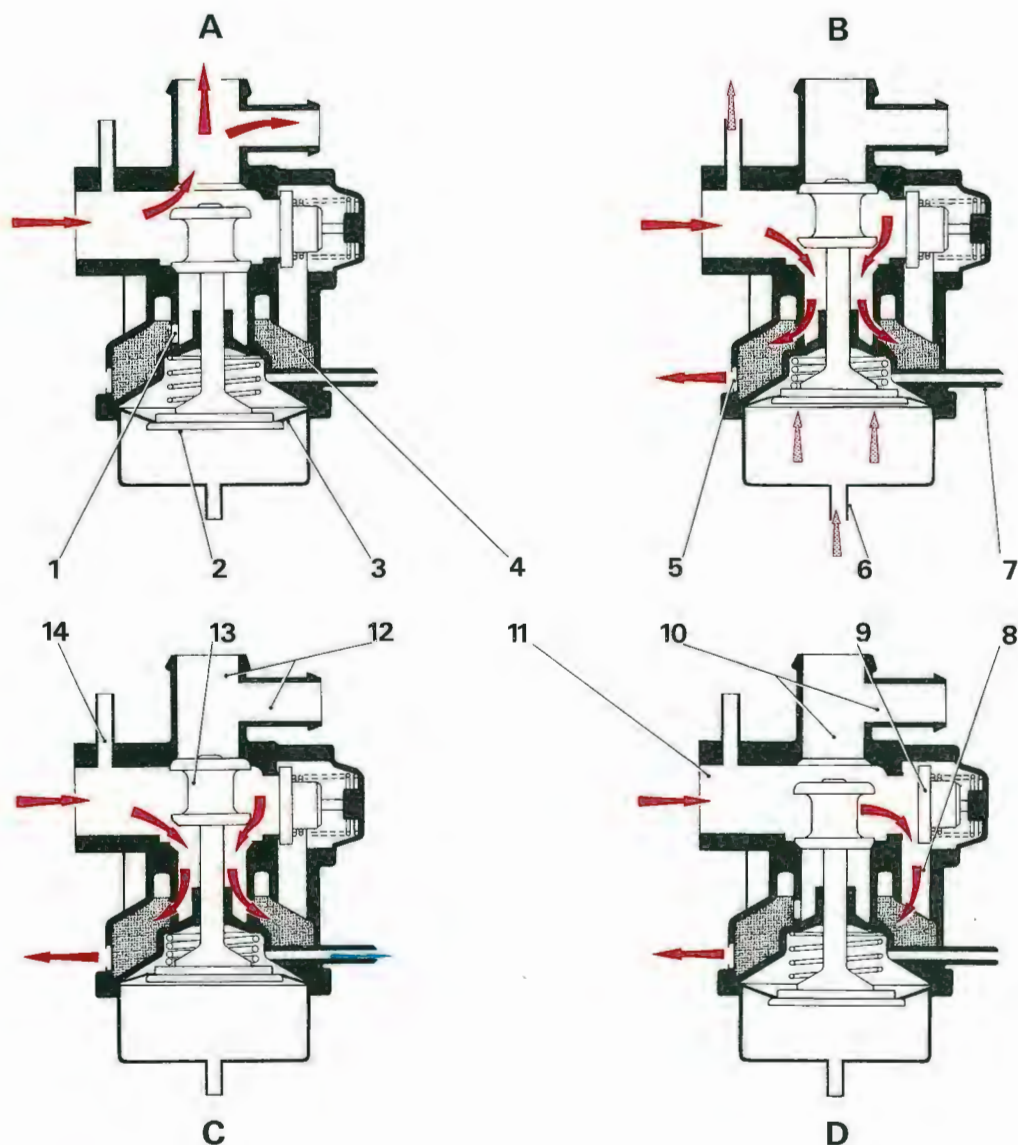
(i) Relief valve failure or shuttle seizure

1. Ensure that the vehicle is in Neutral and the parking brake firmly applied.
2. Start and run the engine at 2 000 r.p.m.
3. Ensure that air **does not** escape from the air diverter valve exhaust ports, situated around the body of the diverter valve (*see Fig. 3*).
4. Stop the engine.

Should air escape from the air diverter valve exhaust ports under these test conditions, the assembly must be replaced with a new component as either the relief valve has failed, or the shuttle has seized.

A failure of this nature would probably be accompanied by a complaint of excessive noise from within the engine compartment, due to the pressurised air escaping from the air diverter valve exhaust ports.

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- AIR PUMP PRESSURE
- AIR PUMP PRESSURE (Transmitted via vacuum control solenoid line)
- HIGH MANIFOLD VACUUM (Overrun)

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FIG. 3 AIR DIVERTER VALVE

- A Normal operation
- B Catalyst over temperature protection
- C Backfire protection
- D Relief valve operation

- 1 Exhaust to internal silencer
- 2 Timing valve
- 3 Lower diaphragm
- 4 Internal silencer

- 5 Exhaust to atmosphere
- 6 Air pump pressure via solenoid valve
- 7 Manifold vacuum signal
- 8 Excess air
- 9 Relief valve
- 10 Valve outlets restricted
- 11 Valve inlet
- 12 Valve outlets to air manifolds
- 13 Metering valve
- 14 Air pump pressure to solenoid valve

(ii) Diaphragm and timing valve failure

1. With the engine stationary and the ignition switched off withdraw the rubber hose from the pressure connection on the diaphragm cover (see Fig. 3, item 6).
2. Attach one end of a length of hose to the pressure connection and place the other end into the mouth. Gently blow down the hose.
3. If air will not pass down the hose the diaphragm and timing valve are intact. However, if air does pass down the hose under these test conditions, either the diaphragm or the timing valve has failed and the air diverter valve assembly must be replaced with a new component.

A failure of this nature would result in the air diverter valve no longer protecting the exhaust catalyst from either high load running or backfires.

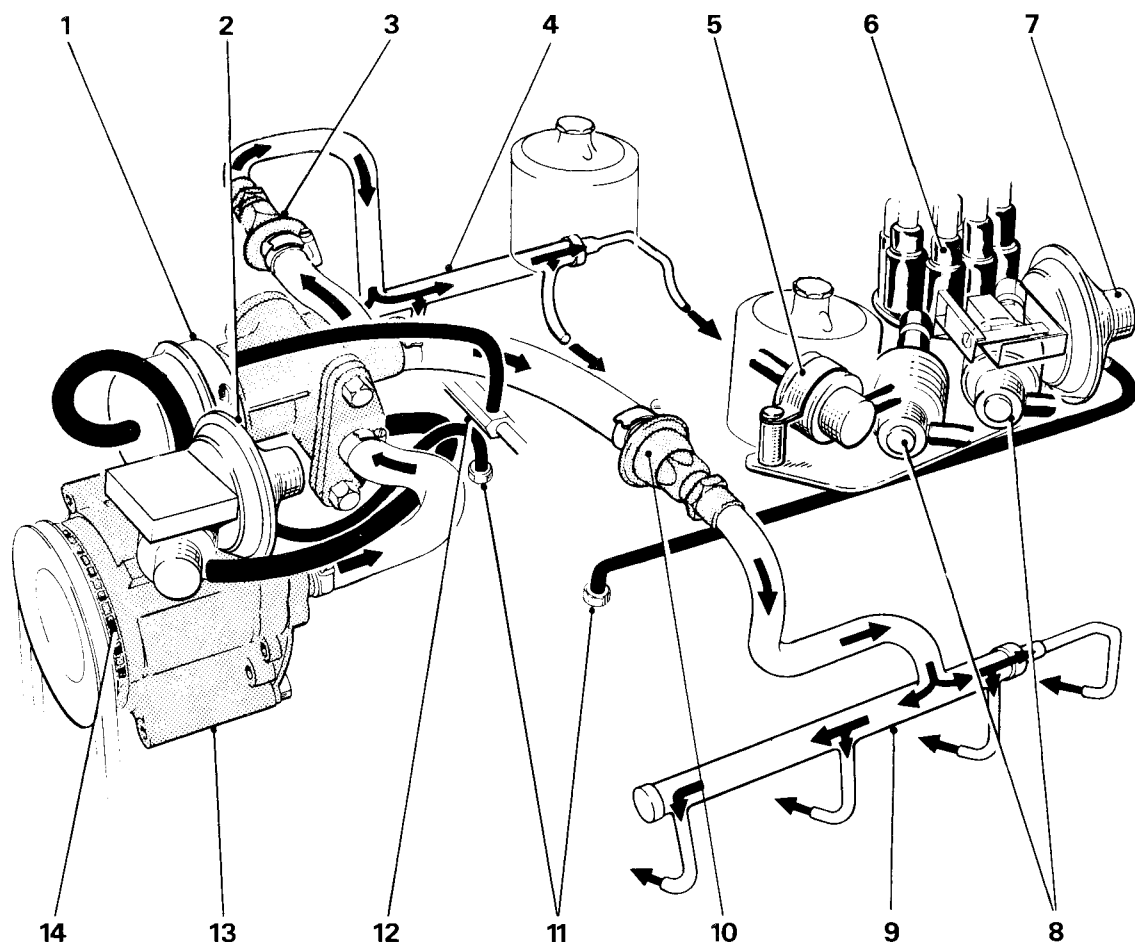
Air diverter valve—To remove

Before commencing to remove the air diverter valve observe the following points.

1. When disconnecting the various hoses ensure that each is suitably labelled to assist identification when assembling.
2. Ensure that all open ends of pipes and hoses are suitably blanked off to prevent the ingress of dirt, etc.

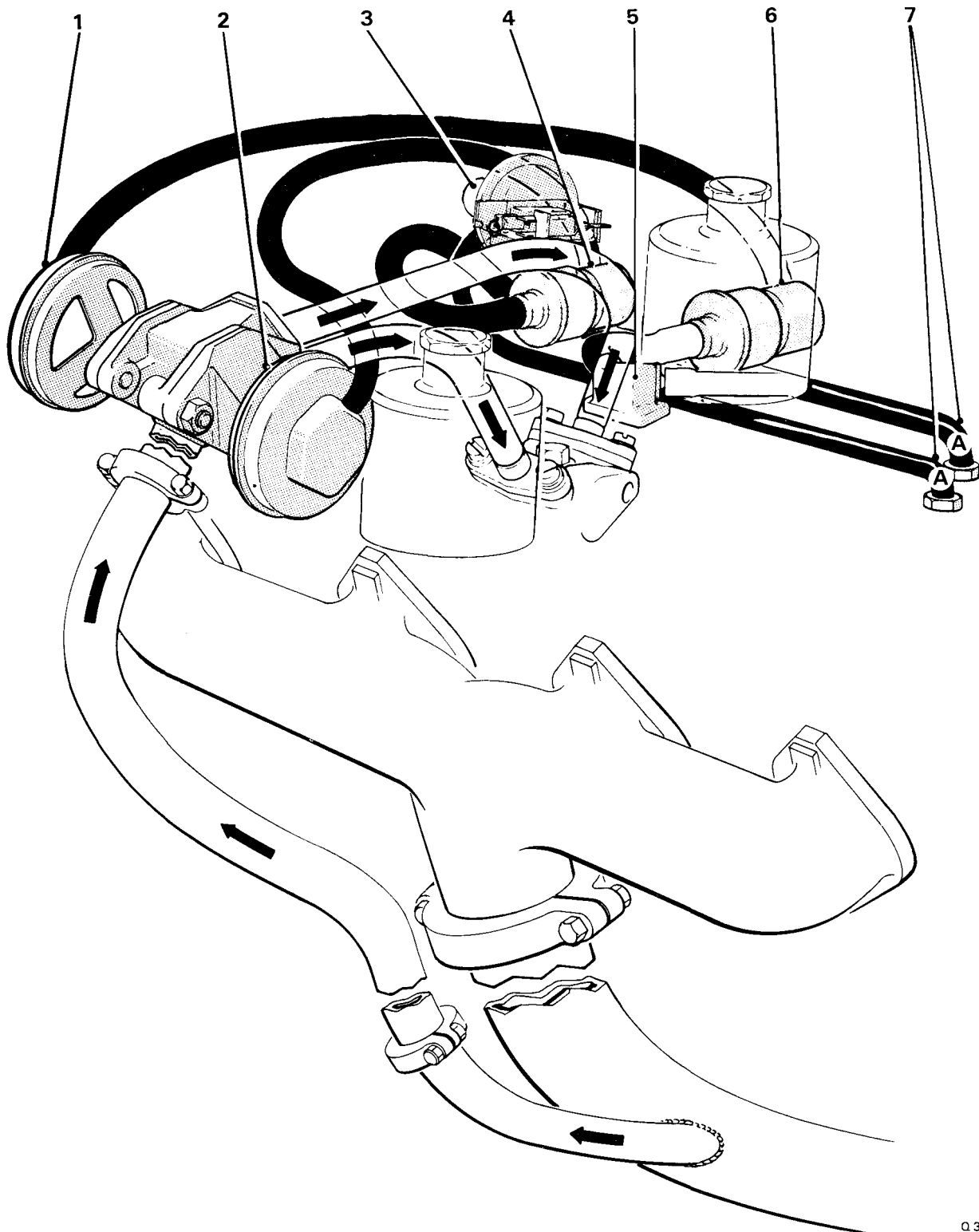
To remove the air diverter valve proceed as follows

1. Unscrew the three worm drive clips which secure the three larger diameter rubber hoses to the air diverter valve and withdraw the hoses. Two of the hoses connect to their respective air manifold check valves and the third hose to the air pump.

**FIG. 4 AIR INJECTION SYSTEM**

- | | | |
|--|---|----------------------------|
| 1 Air diverter valve | 5 Anti 'run-on' solenoid | 9 'B' bank air manifold |
| 2 Air diverter valve vacuum operated control switch assembly | 6 Ignition distributor | 10 Check valve |
| 3 Check valve | 7 Secondary valve micro-switch assembly | 11 Inlet manifold tappings |
| 4 'A' bank air manifold | 8 Exhaust gas recirculation solenoids | 12 Vacuum manifold |
| | | 13 Air pump |
| | | 14 Air pump intake |

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FIG. 5 EXHAUST GAS RECIRCULATION SYSTEM

A Hoses to be detached when removing carburetters

1 Primary valve

2 Secondary valve
3 Secondary valve vacuum-operated micro-switch assembly

4 Secondary valve solenoid assembly
5 Fuel mixture weakening device
6 Primary valve solenoid assembly
7 Inlet manifold vacuum tappings

2. Withdraw the three smaller diameter rubber hoses from the air diverter valve.

The hose fitted to the front of the air diverter valve connects to the solenoid of the air diverter valve vacuum operated micro-switch assembly. The hose fitted to the rear of the assembly connects to the solenoid inlet and the hose fitted on the top of the assembly connects to the vacuum manifold. The hose connections are illustrated in Figure 4.

3. Using a $\frac{7}{16}$ in. A/F spanner unscrew and remove the two nuts which secure the air diverter valve to the mounting plate. Collect the two washers.

4. Hold the diverter valve and withdraw the two bolts from the mounting plate, taking care not to lose the washer situated under the head of each bolt.

5. Remove the air diverter valve together with the spacer plate and gasket.

Air diverter valve—To fit

Fit the air diverter valve by reversing the procedure given for removal, noting the following points.

1. Ensure that all joint faces are clean.
2. Ensure that the gasket is in a good condition.
3. Always ensure that the spacer plate is fitted with the spigot projecting through the mounting plate into the hose which connects to the air pump and that the gasket is fitted to the opposite side of the mounting plate from the spigot.

EXHAUST GAS RECIRCULATION SYSTEM

A proportion of the exhaust gas from the 'A' bank exhaust downtake pipe is recirculated through vacuum operated metering valves into the carburetter 'Tee' piece, just downstream of the throttle plates.

This exhaust gas mixes with the inlet charge in the induction manifold and is distributed to the cylinders thus lowering the peak combustion temperature and reducing the formation of oxides of nitrogen emissions.

A 'dual valve' exhaust gas recirculation system is used, employing a **primary valve** with a tapered metering pintle which gives an increase in flow area for an increased valve lift, and a **secondary valve** which has a reverse tapered pintle and gives a minimum flow area at full valve lift.

The vacuum signal for the **primary exhaust gas recirculation valve** is taken from a series of drillings in the carburetter body, just upstream of the throttle edge. As the throttle is opened the signal strength is progressively increased.

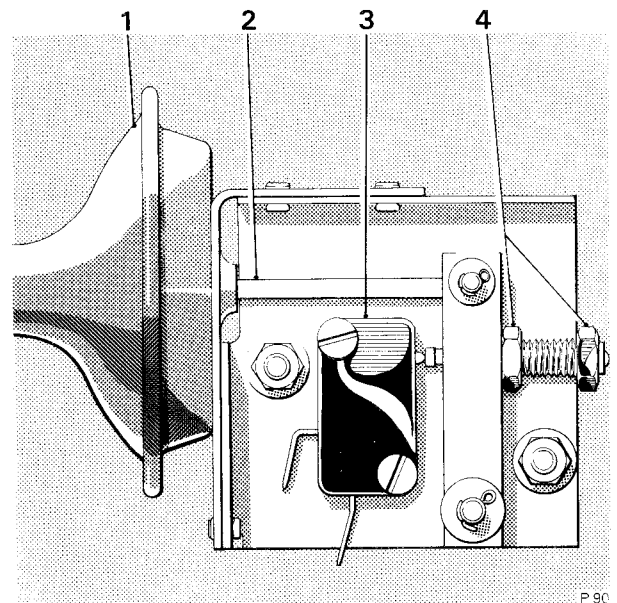


FIG. 6 VACUUM OPERATED CUT-IN SWITCH

- 1 Vacuum unit
- 2 Actuating link
- 3 Micro-switch
- 4 Adjustment screws

The **secondary valve** vacuum signal is taken from the induction manifold via a **solenoid valve** which is controlled by a vacuum switch; the secondary valve only receives the vacuum signal when a predetermined manifold depression is reached.

When the throttle is opened the **primary valve** opens progressively as the vacuum signal increases. The valve is fully open at the point where the vacuum signal equals manifold depression.

Continued opening of the throttle lowers the manifold depression and actuates the **secondary valve** which immediately moves to the full valve lift position. Further opening of the throttle continues to reduce the manifold depression and consequently, the signal to both exhaust gas recirculation valves.

The reduced signal and valve lift reduces the flow area through the **primary valve** and increases the flow area through the **secondary valve**.

At very low vacuum signal strength both valves are seated and the flow is zero; in this way the recirculated exhaust gas is metered in proportion to the engine requirements for a reduction of oxides of nitrogen whilst retaining acceptable drivability.

To improve starting and driveaway quality at low temperatures solenoid valves activated by lock-out switches (see Fig. 13), interrupt the vacuum signals to both exhaust gas recirculation valves, ensuring that

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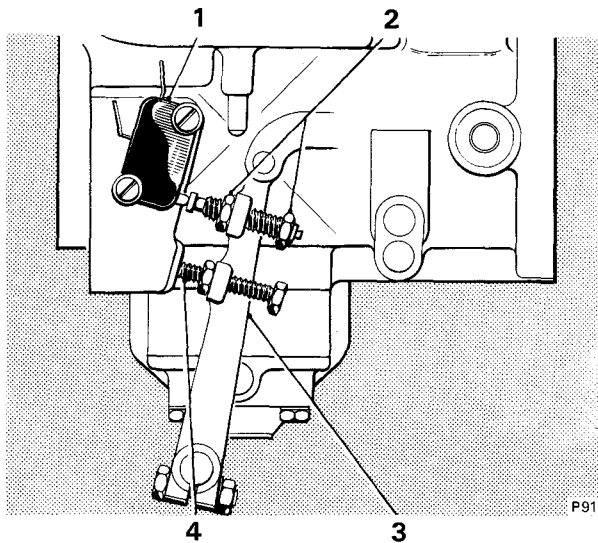


FIG. 7 FULL THROTTLE CUT-OFF MICRO-SWITCH

- 1 Micro-switch
- 2 Adjusting screws
- 3 Throttle lever
- 4 Full throttle stop

they remain in the closed position, until predetermined coolant temperatures are reached. The **secondary valve** cuts in at a higher coolant temperature than the **primary valve**.

A micro-switch operated by the throttle lever (see Fig. 7) also controls the cut-off solenoids to provide exhaust gas recirculation cut-off at full throttle. This feature of the system prevents the secondary valve remaining open under full throttle, high speed operation, as this would be detrimental to performance and fuel consumption.

Exhaust gas recirculation valve—To remove

1. Detach the small diameter rubber hose from the valve.
2. Using a ½ in. A/F spanner slacken the three nuts which retain the heat shield.
3. Withdraw the heat shield.
4. **Primary valve**—Unscrew and remove the two ½ in. A/F nuts and washers retaining the valve to the mounting flange.

Secondary valve—Using a ½ in. A/F spanner slacken the remaining nut and then unscrew and remove both retaining nuts and washers. Unscrew the 7/8 in. A/F nut retaining the mounting bracket to the 'A' bank carburettor bracket; collect the washer and withdraw the bolt.

5. Withdraw the valve and remove the gasket from the mounting flange face.

Exhaust gas recirculation valve—To fit

Fit the valve by reversing the procedure given for removal, noting the following points.

1. Ensure that the valve pintle is secure on the valve stem.
2. Ensure that the valve and mounting flange joint faces are clean and free from carbon deposits.
3. Always use a new mounting flange gasket.

Exhaust gas recirculation valve—To clean

1. Remove the valve as described in Exhaust gas recirculation valve—To remove.
2. Using a scraper, remove all carbon film from the valve and mounting flange faces; complete the operation with a wire brush.
3. Clean the carbon from the valve using a wire brush fitted into a portable drill. Take care not to damage the valve seating area.
4. Thoroughly blow out the valve with compressed air to ensure that all loose carbon particles are removed.
5. Upon completion of the cleaning operations, fit the valve to the engine mounting flange as described in Exhaust gas recirculation valve—To fit.

Exhaust gas recirculation valves—Preliminary check

To carry out preliminary checks on the operation of both **primary** and **secondary** exhaust gas recirculation valves proceed as follows.

1. Connect an electric impulse tachometer to the engine in accordance with the manufacturer's instructions.
2. Ensure that the parking brake is firmly applied and that the gear range selector is in the Neutral position.
3. Start the engine and run until normal operating temperature is attained.
4. Allow the engine to return to the idle speed.
5. Increase the engine speed slowly noting the operation of the exhaust gas recirculation valves.

6. When the engine speed has reached 2 000 r.p.m. the diaphragm of the primary exhaust gas recirculation valve should have moved to the 'full valve lift' position.

7. Stop the engine. Disconnect the hose from the secondary valve cut-in solenoid vacuum unit. Blank off the open end of both the unit and the hose.

8. Disconnect the hose from the primary valve and blank off the open end of both the valve and the hose.

9. Start the engine and note that the secondary valve also moves to the full lift position. It may be necessary to increase the engine speed to prevent stalling.

If both diaphragms **have moved** to 'full valve lift' position in their respective tests, stop the engine and remove the tachometer as the test is complete.

Remove the blanks from the hoses; fit the vacuum unit hose and primary valve hose to their respective connections.

If the diaphragms **have not moved** to the required position stop the engine and proceed as follows.

Exhaust gas recirculation valve signal strength—To check

1. Remove the pressure tapping cap from 'A' bank carburetter to vent the float chambers.
2. Disconnect at the signal block the exhaust gas recirculation cut-out solenoid hose. Connect a mercury manometer 0 to 10 in. Hg. (0 to 25,4 cm. Hg.) to the signal line tube.
3. Fit dial gauge assemblies RH8841 to the carburetters in place of the dampers.
4. Zero the gauges with the engine stationary.
5. Lightly tighten the clamp screws of the dial gauge assemblies.
6. Start the engine and allow to run at an idle speed of 600 r.p.m., ensure that the piston lift of the carburetters shown on the dial gauge assemblies is equal (within 10%), adjust by using the eccentric adjuster on the carburetter throttle linkage.
7. Raise the engine speed using the idle speed adjusting screw until 'B' bank carburetter dial gauge reads 0.25 in. (6,35 mm.). 'A' bank carburetter dial gauge should also read 0.25 in. (6,35 mm.) with a tolerance of plus or minus 0.010 in. (0,254 mm.).

Note The suction chambers of both carburetters should be lightly tapped with a non-metallic object (wooden handle of a small screw-driver) during this operation.

8. Adjust the exhaust gas recirculation signal to 3.2 in. Hg. (8,13 cm. Hg.) using the adjusting screw (see Fig. 17, item 15).

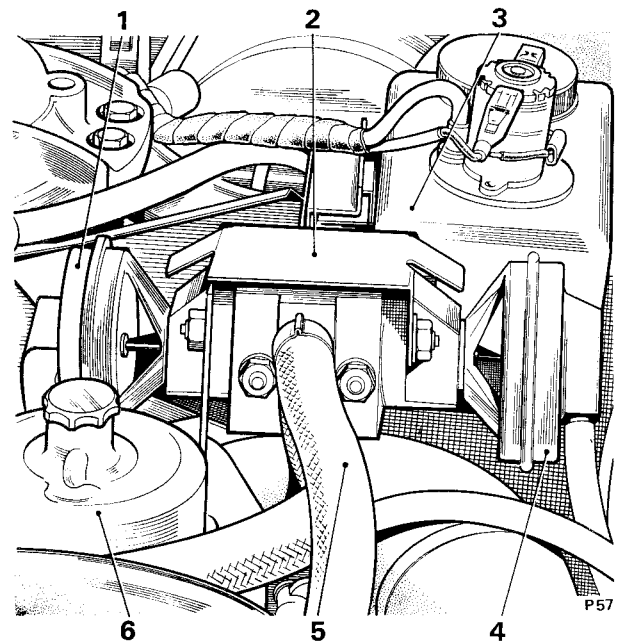


FIG. 8 EXHAUST GAS RECIRCULATION VALVES

- 1 Secondary valve
- 2 Heat shield
- 3 Windscreen washer reservoir
- 4 Primary valve
- 5 Distribution pipes
- 6 'A' bank carburetter

9. If difficulty is experienced in obtaining the signal reading, ensure that air is not leaking at the signal block joint.

10. Disconnect the manometer and connect the exhaust gas recirculation solenoid hose to the signal tube.

Note If it is necessary to adjust the E.G.R. signal by more than 0.2 in. Hg. (0,51 cm. Hg.), refer to Operation 8, Page U110—Float chamber depression—To check and ensure that the maximum steady manometer reading is still obtainable within an engine speed range of 1 300 r.p.m. to 1 600 r.p.m.

Primary valve

11. Disconnect the solenoid to exhaust gas recirculation primary valve hose at the valve. Connect the hose to the manometer.
12. Repeat Operation 7.
13. Ensure that the exhaust gas recirculation signal shown on the manometer is between 3.0 in. Hg. (7,6 cm. Hg.) and 3.4 in. Hg. (8,6 cm. Hg.).

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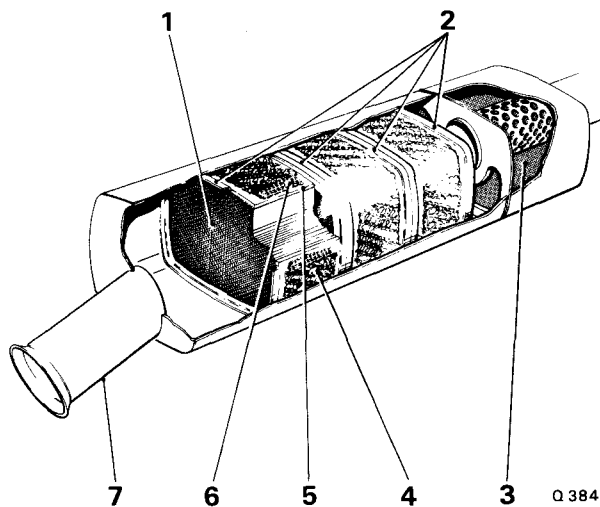


FIG. 9 CATALYTIC CONVERTER

- 1 Monolithic catalyst
- 2 Catalyst retaining plates
- 3 Silencing chamber
- 4 Stainless steel wire mesh
- 5 Fireclay coating
- 6 Ceramic tape
- 7 Inlet pipe

A low or zero reading may be caused by:

- a. Blockage in the hose from the signal tube to the cut-out solenoid.
- b. Blockage in the hose between the cut-out solenoid and valve.
- c. Air leak at the signal block joint face or hose connections.
- d. Low engine temperature below 14°C. (57°F.), a faulty exhaust gas recirculation cut-off solenoid or lock-out switch (in thermostat outlet).

14. Disconnect the manometer and connect the hose to the exhaust gas recirculation valve.

15. Check the operation of the valve by running the engine at 2 000 r.p.m. ensuring that the valve opens by observing the movement of the diaphragm.

Secondary valve

11. Disconnect the rubber hose from the induction manifold to the vacuum operated micro-switch, at the micro-switch end and blank off the hose.

12. Detach the secondary valve to solenoid hose at the secondary valve.

13. Connect a suitable mercury manometer 0 to 10 in. Hg. (0 to 25,4 cm. Hg.) to the hose.

14. Disconnect the hose from the inlet manifold tapping to the secondary valve solenoid at the solenoid. Blank off the hose.

15. Disconnect the hose from the low temperature exhaust gas recirculation solenoid to the primary valve, at the valve.

16. Connect the primary valve hose to the open connection on the secondary valve solenoid.

17. Repeat Operation 7.

18. Ensure that the exhaust gas recirculation signal shown on the manometer is between 3.0 in. Hg. (7,6 cm. Hg.) and 3.4 in. Hg. (8,6 cm. Hg.).

A low or zero reading may be caused by:

- a. A blockage in the hose from the secondary valve solenoid to the exhaust gas recirculation secondary valve.
- b. A faulty exhaust gas recirculation secondary valve solenoid.
- c. Low engine temperature below 44°C. (111°F.), or a faulty exhaust gas recirculation lock-out switch (in thermostat housing).

19. Disconnect the mercury manometer and connect the hoses to their respective connections, leaving only the hose to the vacuum operated micro-switch disconnected and blanked off.

20. Check the operation of the valve by running the engine and observing the movement of the diaphragm.

If the secondary valve does not move, it may be due to a blockage in the hose from the manifold to the secondary valve solenoid.

21. Connect the hose to the vacuum operated micro-switch after first removing the blank.

OXIDATION CATALYST SYSTEM

A catalytic converter, in place of the conventional front silencer is situated in the exhaust system to the rear of the point in the system where both exhaust manifold downtake pipes combine.

The box unit contains three catalyst blocks and has sufficient volume to perform the dual functions of both converter and silencer (see Fig. 9). A platinum group metal catalyst on a ceramic monolith support is used for optimum conversion efficiency and rapid warm-up. Three separate blocks are used to minimise the effect of thermal shock and are positioned to ensure good gas distribution and effective utilisation of the catalyst volume.

The catalyst promotes reaction between the residual hydrocarbons and carbon monoxide in the exhaust

and the secondary air injected into the exhaust ports. After completion of the oxidation process the exhaust gas is discharged to the atmosphere from the tailpipe.

Catalytic converter protection

To protect the catalytic converter from possible damage the following precautions should be taken.

(i) Unleaded gasoline

Use unleaded gasoline only. The use of leaded gasoline will result in a **substantial reduction in the performance of the catalyst**. Under no circumstances add fuel system cleaning agents to either the fuel tank or carburettors for induction into the engine, as these materials may have a **detrimental effect on the catalytic converter**.

(ii) Engine malfunction

If the engine misfires or suffers from a lack of power which could be attributed to a malfunction of either the ignition or fuel systems, the vehicle **should be driven only at low speed** and the fault rectified as soon as possible by an authorised Dealer. Driving at high speeds with a malfunction in either of these systems could cause overheating and consequent damage to the catalyst.

(iii) Fuel

Do not allow the engine to run out of fuel. If the engine does run out of fuel at a high speed possible **damage to the catalyst could result**.

Catalytic converter—To remove

1. Unscrew the self-tapping screws that secure the shield below the catalytic converter assembly. Withdraw the shield.

2. Unscrew the $\frac{7}{16}$ in. A/F nuts that secure the two shields to the exhaust pipe on either side of spherical joint, situated to the rear of the body cross-member.

3. Collect the washers, withdraw the bolts and remove the shields.

Note Take care when removing the shields as the edges are sharp and could cause injury to the hands.

4. Support the weight of the exhaust pipe which passes into the expansion box.

5. Using a $\frac{1}{2}$ in. A/F spanner unscrew and remove the nut retaining the exhaust mounting around the exhaust pipe (situated behind the body cross-member).

6. Remove the nut and withdraw the bolt, collect the washer.

7. Open the mount and slide it over the exhaust pipe.

8. Slacken the two $\frac{9}{16}$ in. A/F nuts retaining the exhaust clamp around the spherical joint to the rear of the body cross-member and catalytic converter assembly.

9. Unscrew the nuts completely and withdraw the bolts; collect the washers.

10. Remove the two halves of the clamp joint from the exhaust pipe. Free the two sections of the pipe from each other and collect the sealing ring.

11. Allow the forward section of the exhaust to rest on the body cross-member and repeat Operations 8 to 10 inclusive on the spherical exhaust joint situated in front of the catalytic converter assembly. Hold the forward end of the assembly as the front joint is freed.

12. Withdraw the catalytic converter assembly in a forward and downwards direction.

Catalytic converter—To fit

Fit the catalytic converter assembly by reversing the procedure given for removal, noting the following points.

1. The seal rings and pipe flares must be thoroughly clean and free from scale and may be lightly dressed with fine emery cloth if required.

2. The clamp bolt threads should be lightly oiled to prevent binding during assembly and the spherical faces of the sealing rings and the grooves in the clamps should be smeared with a graphite lubricant, to ensure correct alignment of the pieces on assembly.

3. Fit the pipe and catalytic converter assembly complete with seal rings, then loosely fit the joint clamps and the 'handcuff' clamp.

4. The joints must not be fully tightened until the pipe has been manoeuvred to obtain the best run (free from possible fouls) and good joint alignment.

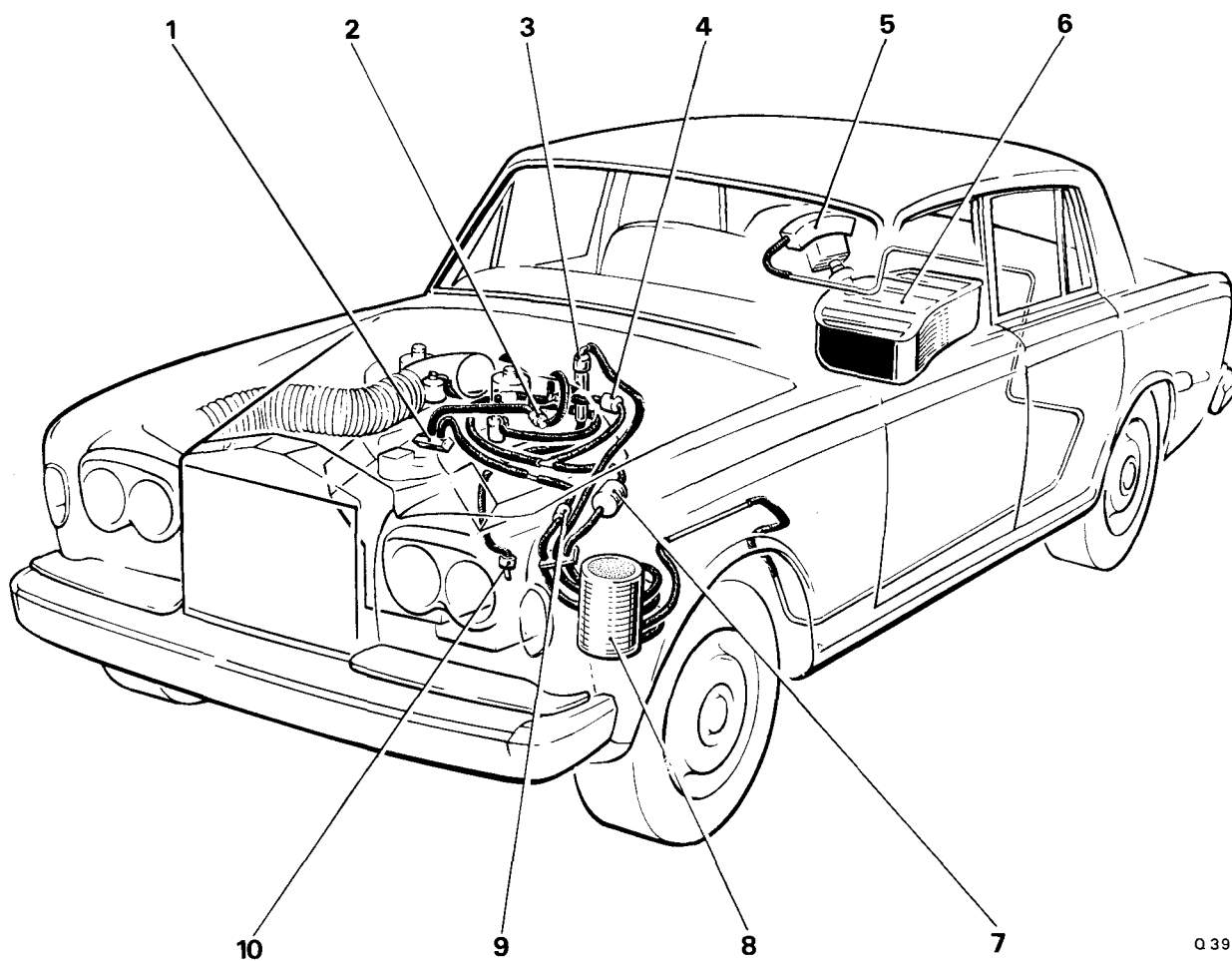
Note The pipe joints must not be 'sprung' or 'clamped' into position.

5. When the pipe run is satisfactory, torque tighten the joint clamp nuts in accordance with the standard torque figures given in Chapter P then 'set' the 'Vibrashock' mount to allow for expansion in the exhaust system, when hot.

'Vibrashock' exhaust mount—To set

This exercise is carried out by holding the 'handcuff' clamp forward whilst tightening the pinch bolt. This has the effect of misaligning the centre of the mount and this misalignment should be approximately 0.187 in. (4.76 mm.) at the mount centre.

FUEL EVAPORATION EMISSION CONTROL SYSTEM



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FIG. 10 FUEL EVAPORATION EMISSION CONTROL SYSTEM—GENERAL VIEW

- | | |
|-----------------------------|-------------------------------------|
| 1 Vacuum manifold | 6 Fuel tank assembly |
| 2 Anti 'run-on' solenoid | 7 Weakener filter |
| 3 Float chamber vent valve | 8 Evaporative loss control canister |
| 4 Weakener cut-off solenoid | 9 Purge line filter |
| 5 Fuel trap assembly | 10 Float chamber drain valve |

Purge line

The purge line consists of a rubber hose, passing from the lowest connection on the canister through the valance junction piece to the vacuum manifold. Incorporated into this hose is the purge line filter and restrictor.

When the engine is running, air drawn through the canister filter and carbon picks up the stored fuel vapours and passes them via the hose, to the induction manifold. The restrictor in the line controls the flow rate at between 50 cu. ft. per hr. and 70 cu. ft. per hr. (1.41 cu. m. per hr. and 1.98 cu. m. per hr.) to maintain carburettor metering accuracy and the paper element line filter is fitted to prevent blockage of the restrictor.

Purge line filter—To remove

1. Using special pliers (RH 8090) remove the two steel retaining clips situated on either side of the unit.
2. Slacken the setscrew which secures the nylon retaining clip.
3. Withdraw the component from the clip.

Purge line filter—To fit

Fit the purge line filter by reversing the procedure given for removal noting the following points.

1. Ensure that the rubber hoses are in a good condition and new hose retaining clips are used.

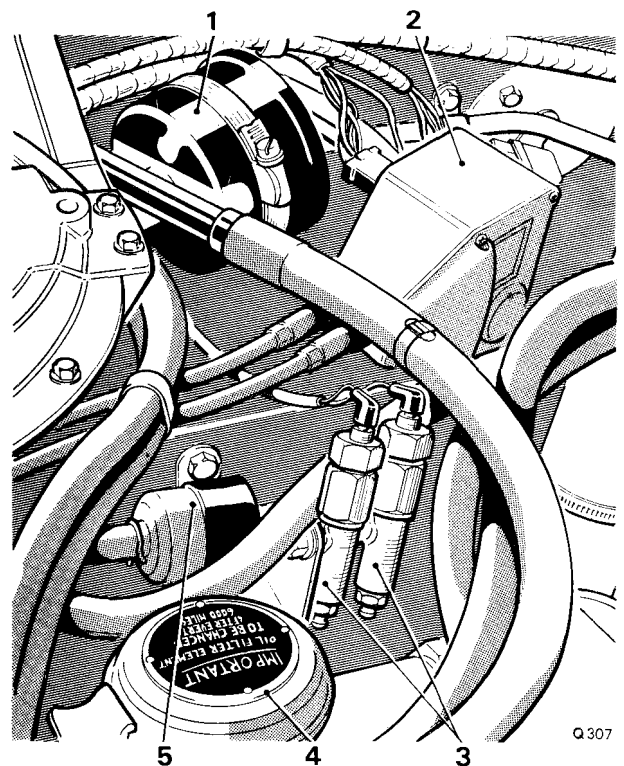


FIG. 11 POSITION OF MIXTURE WEAKENING DEVICE FILTER AND PURGE LINE FILTER

- 1 Weakener filter
- 2 Speed control system regulator
- 3 Hydraulic fluid accumulator pressure switches
- 4 Engine oil filler
- 5 Purge line filter

CRANKCASE EMISSION CONTROL SYSTEM

Crankcase emissions are controlled by a recirculatory closed breather system (see Fig. 12).

An insulated draught tube connects the crankcase via the oil filler which is fitted with a sealed cap, to the choke housing upstream of both the choke butterfly and the carburetters. A flame trap capsule containing three wire mesh discs is fitted in a housing at the crankcase end of the draught tube. Engine emission (blow-by) is drawn into the induction system via the draught tube, due to the depression in the choke housing.

Maintenance

1. The flame trap fitted to the breather pipe should be cleaned in the following manner, at the specified mileage.

2. Unscrew the setscrew securing the breather pipe connection to the oil filler pedestal; withdraw the connection from the pedestal (slight resistance may be felt due to the rubber 'O' ring connections).

3. Withdraw the connection from the pipe flange and collect the restrictor.

4. Wash the flame trap assembly in clean petrol, then dry with a high pressure air line. The flame trap assembly consists of 3 gauzes crimped together as shown in Figure 12.

5. To clean the adapter fitted to the choke housing, remove the single setscrew from the breather pipe end connection and detach the pipe.

6. Clean the adapter fitted to the choke housing and ensure that the holes in the adapter are clear.

7. Assembly of the flame trap and breather pipe is in the reverse order, ensuring that the 'O' rings are in good condition.

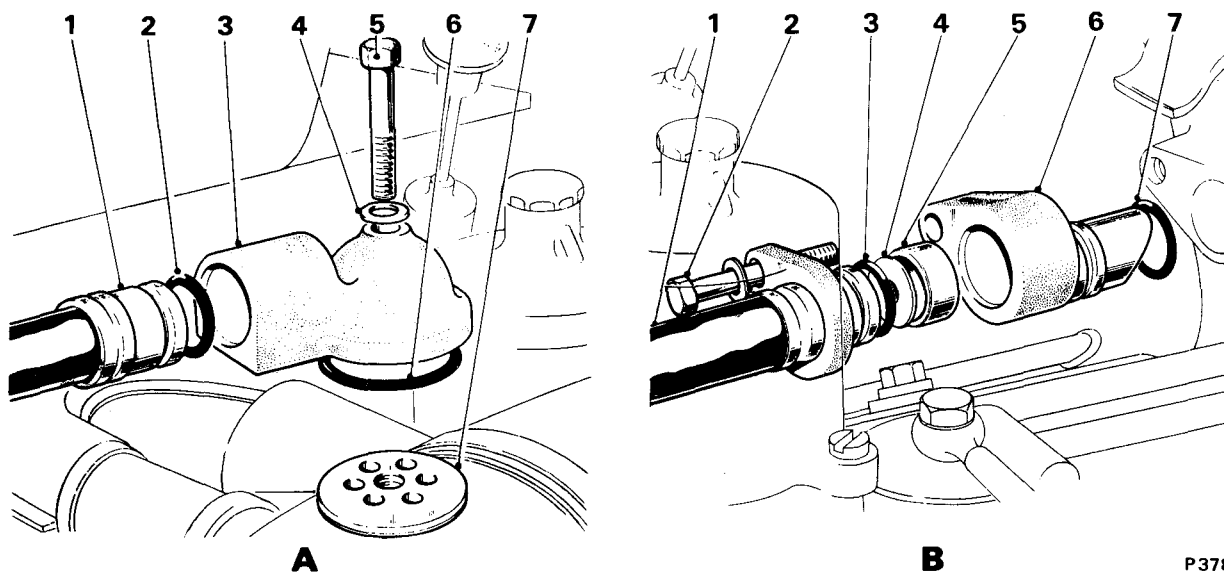


FIG. 12 EXPLODED VIEW OF CRANKCASE EMISSION CONTROL PIPE

Diagram A
 1 Pipe
 2 'O' ring
 3 Connection
 4 Washer
 5 Setscrew
 6 'O' ring
 7 Adapter

Diagram B
 1 Pipe
 2 Setscrew
 3 'O' ring
 4 Restrictor
 5 Flame trap
 6 Connection
 7 'O' ring

EMISSION CONTROL SYSTEMS (ELECTRICAL COMPONENTS)

The electrical components described in this section would normally appear in Chapter M—Electrical System, however, as they are only used in connection with the emission control system it is thought more practical to include the information in this Chapter.

The components concerned are as follows.

- (i) The exhaust gas recirculation primary valve lock-out switch.
- (ii) The exhaust gas recirculation secondary valve lock-out switch.
- (iii) The exhaust gas recirculation valve cut-off solenoid.
- (iv) The anti 'run-on' solenoid.
- (v) The weakener cut-off solenoid valve.
- (vi) The weakener cut-off solenoid switch.

Note The temperatures quoted throughout this section for the various switches are nominal operating temperatures and in service, a plus or minus tolerance of a few degrees may be found.

Exhaust gas recirculation lock-out switch —To remove

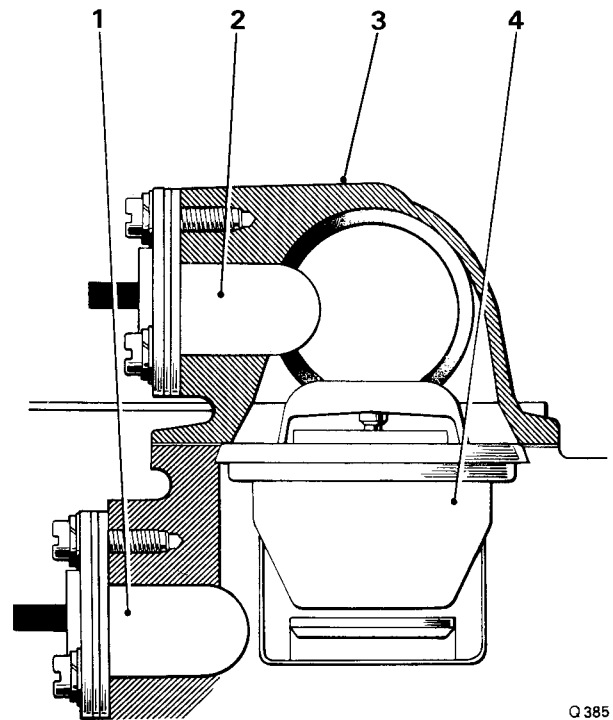
The bi-metal lock-out switches are situated in the engine coolant thermostat housing and outlet elbow (see Fig. 13).

1. Remove the radiator filler cap and drain the engine coolant.
2. Disconnect the electrical lead.
3. Unscrew and remove the three 2 B.A. setscrews, spring washers and plain washers from the appropriate switch.
4. Free the joint and withdraw the respective lock-out switch.

Exhaust gas recirculation lock-out switch —To fit

Fit the lock-out switch by reversing the procedure given for removal, noting the following points.

1. Each setscrew has one spring and one plain washer.
2. The joint faces must be clean and a new gasket fitted.



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**FIG. 13 EXHAUST GAS RECIRCULATION
LOCK-OUT SWITCHES**

- 1 Secondary valve lock-out switch
- 2 Primary valve lock-out switch
- 3 Thermostat outlet elbow
- 4 Engine coolant thermostat

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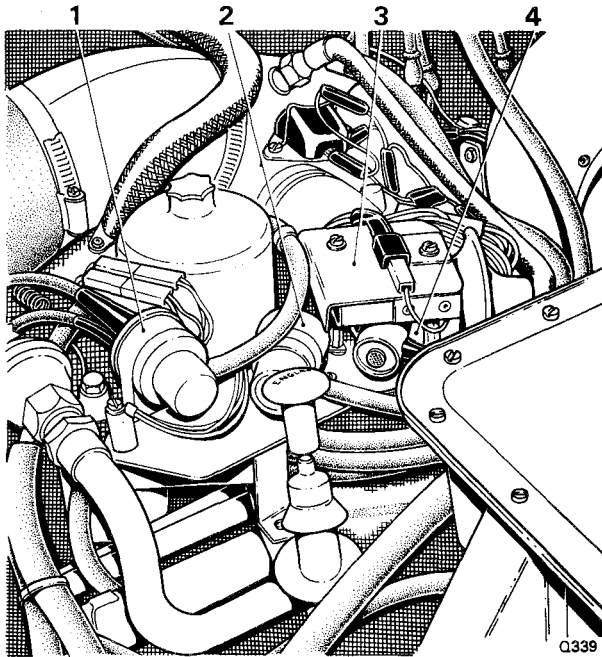


FIG. 14 SOLENOID PLATFORM

- 1 Anti 'run-on' solenoid
- 2 E.G.R. primary valve cut-out solenoid
- 3 E.G.R. secondary valve micro-switch assembly
- 4 E.G.R. secondary valve cut-out solenoid

**Exhaust gas recirculation lock-out switch
—To check**

1. Disconnect the electrical connection from the switch.
2. Connect one side of a test lamp to the switch contact of the lock-out switch to be tested and the other side to a known good electrical supply.
3. Ensure that the engine is cold and switch on the ignition.
4. Check that the test lamp bulb is illuminated.
5. **Primary valve lock-out switch**—Start and run the engine, as the coolant temperature rises to 14°C. (57°F.) the test lamp bulb should extinguish.
6. Stop the engine and allow to cool, noting that as the coolant temperature drops to 12°C. (54°F.) the test lamp bulb again illuminates.
5. **Secondary valve lock-out switch**—Start and run the engine, as the coolant temperature rises to 44°C. (111°F.) the test lamp bulb should extinguish.
6. Stop the engine and allow to cool, noting that as the coolant temperature drops to 42°C. (108°F.) the test lamp bulb again illuminates.

Note Do not leave the ignition switched on for long periods of time when the engine is not running.

**Exhaust gas recirculation primary valve
cut-off solenoid**

The exhaust gas recirculation primary valve cut-off solenoid is the middle solenoid of three solenoids situated on a small platform, adjacent to the 'B' bank carburettor (see Fig. 14).

**Exhaust gas recirculation primary valve
cut-off solenoid—To remove**

1. Detach the electrical connections, noting the position of the connections to assist identification when assembling.
2. Unscrew the two 'cheese-headed' mounting screws and withdraw the solenoid.

**Exhaust gas recirculation primary valve
cut-off solenoid—To fit**

Fit the cut-off solenoid by reversing the procedure given for removal.

**Exhaust gas recirculation primary valve
cut-off solenoid circuit wiring
—To check**

1. Connect a test lamp across the two Lucar connections to the solenoid.

Note Do not disconnect the two Lucar connections.

2. Ensure that the engine is cold.
3. Switch on the ignition and start the engine, noting that the bulb of the test lamp is illuminated.
4. Start and run the engine, as the coolant temperature rises to 14°C. (57°F.) the test lamp bulb should extinguish.
5. Depress the full throttle cut-out micro-switch plunger and check to ensure that the test lamp bulb illuminates. Release the plunger and the test lamp bulb should be extinguished.
6. Stop the engine and allow to cool, noting that as the coolant temperature drops to 12°C. (54°F.) the test lamp bulb again illuminates.

Note Do not leave the ignition switched on for long periods of time when the engine is not running.

**Exhaust gas recirculation primary valve
cut-off solenoid—To check**

1. Detach the solenoid hose at the weakener unit.
2. Clean the end of the hose.
3. Switch on the ignition.

Note Do not leave the ignition switched on for long periods of time when the engine is not running.

4. Place the hose in the mouth and apply suction.
5. If the operation of the solenoid is correct note that the following conditions apply and connect the hose to the weakener.

- (i) With an engine coolant temperature of below 14°C. (57°F.) sucking on the hose should not prompt any movement of the exhaust gas recirculation valve.

Disconnect the hose from the exhaust gas recirculation valve. Clean the end of the hose, place in the mouth and blow; it should be possible to blow down this hose as the solenoid is vented to atmosphere. Connect the hose to the exhaust gas recirculation valve.

- (ii) With an engine coolant temperature of above 14°C. (57°F.) sucking on the hose from the weakener unit should move the exhaust gas recirculation valve.
 - (iii) As the engine coolant temperature falls to 12°C. (54°F.) the conditions described in (i) should again apply.
6. If the operation of the solenoid is suspect, fit a new unit.

Exhaust gas recirculation secondary valve cut-in solenoid and vacuum operated micro-switch

This assembly is situated rearmost of the three solenoid assemblies mounted on a platform, adjacent to the 'B' bank carburetter (see Figs. 5 and 14).

Exhaust gas recirculation secondary valve cut-in solenoid and vacuum operated micro-switch—To remove

1. Detach the rubber hoses from the solenoid, solenoid vent and vacuum unit.

Note Each rubber hose should be labelled as it is detached, to facilitate identification during assembly.

2. Disconnect the two electrical leads at their Lucar connections.
3. Unscrew and remove the two 2 B.A. screws which retain the micro-switch cover in position. Withdraw the cover.
4. Unscrew the two reach-nuts and withdraw the micro-switch assembly.
5. Unscrew and remove the two support pillars. Withdraw the solenoid assembly.
6. Collect the two distance pieces situated beneath the solenoid feet.

Exhaust gas recirculation secondary valve cut-in solenoid and vacuum operated micro-switch—To fit

Fit the secondary valve cut-in solenoid and vacuum operated micro-switch assembly by reversing the procedure given for removal.

Exhaust gas recirculation secondary valve cut-in solenoid and vacuum operated micro-switch circuit wiring—To check

1. Connect a test lamp across the two Lucar connections to the solenoid.

Note Do not disconnect the two Lucar connections.

2. Ensure that the engine is cold.
3. Switch on the ignition and start the engine, noting that the bulb of the test lamp is illuminated.
4. Start and run the engine until the coolant temperature rises to 44°C. (111°F.).
5. Stop the engine.
6. Switch on the ignition and note that the test lamp bulb is extinguished.
7. Start the engine and run at the idle speed, noting that the bulb of the test lamp is illuminated.

Exhaust gas recirculation secondary valve cut-in solenoid and vacuum operated micro-switch—To check

1. Disconnect the rubber hose from the vacuum unit.
2. Connect a suitable hand operated vacuum pump with a scale calibrated in ins. of Hg. (RH 8800) to the vacuum unit connection.
3. Draw a vacuum of at least 12 in. Hg. (30,5 cm. Hg.) and note that the micro-switch 'clicks' at approximately 10 in. Hg. (25,4 cm. Hg.) vacuum.
4. Allow the 12 in. Hg. (30,5 cm. Hg.) vacuum to decrease slowly and note that the micro-switch 'clicks' again as the vacuum falls to between 9.0 in. Hg. and 8.5 in. Hg. (22,9 cm. Hg. and 21,6 cm. Hg.).
5. Release the vacuum and remove the pump assembly. Re-connect the rubber hose.

Exhaust gas recirculation secondary valve cut-in solenoid and vacuum operated micro-switch—To set

1. Unscrew and remove the two 2 B.A. screws which retain the micro-switch cover in position.
2. Remove the cover.

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3. Disconnect the rubber hose from the vacuum unit.
4. Connect a suitable hand operated vacuum pump with a scale calibrated in ins. of Hg. (RH 8800) to the vacuum unit connection.
5. Draw a vacuum of 12 in. Hg. (30,5 cm. Hg.) with the pump. Allow the vacuum to decrease to 8.75 in. Hg. (22,2 cm. Hg.) and then seal the vacuum line to maintain the vacuum at the micro-switch.
6. Release the lock-nut and screw the spring

loaded plunger assembly in until the micro-switch is fully depressed (*see Fig. 6*).

7. Screw the spring loaded plunger assembly out until the micro-switch 'clicks'. Tighten the lock-nut.

8. Check the operation of the vacuum operated micro-switch as detailed in Exhaust gas recirculation secondary valve cut-in solenoid and vacuum operated micro-switch—To check.

9. Fit the micro-switch cover. Remove the vacuum pump and re-connect the rubber hose to the vacuum unit.

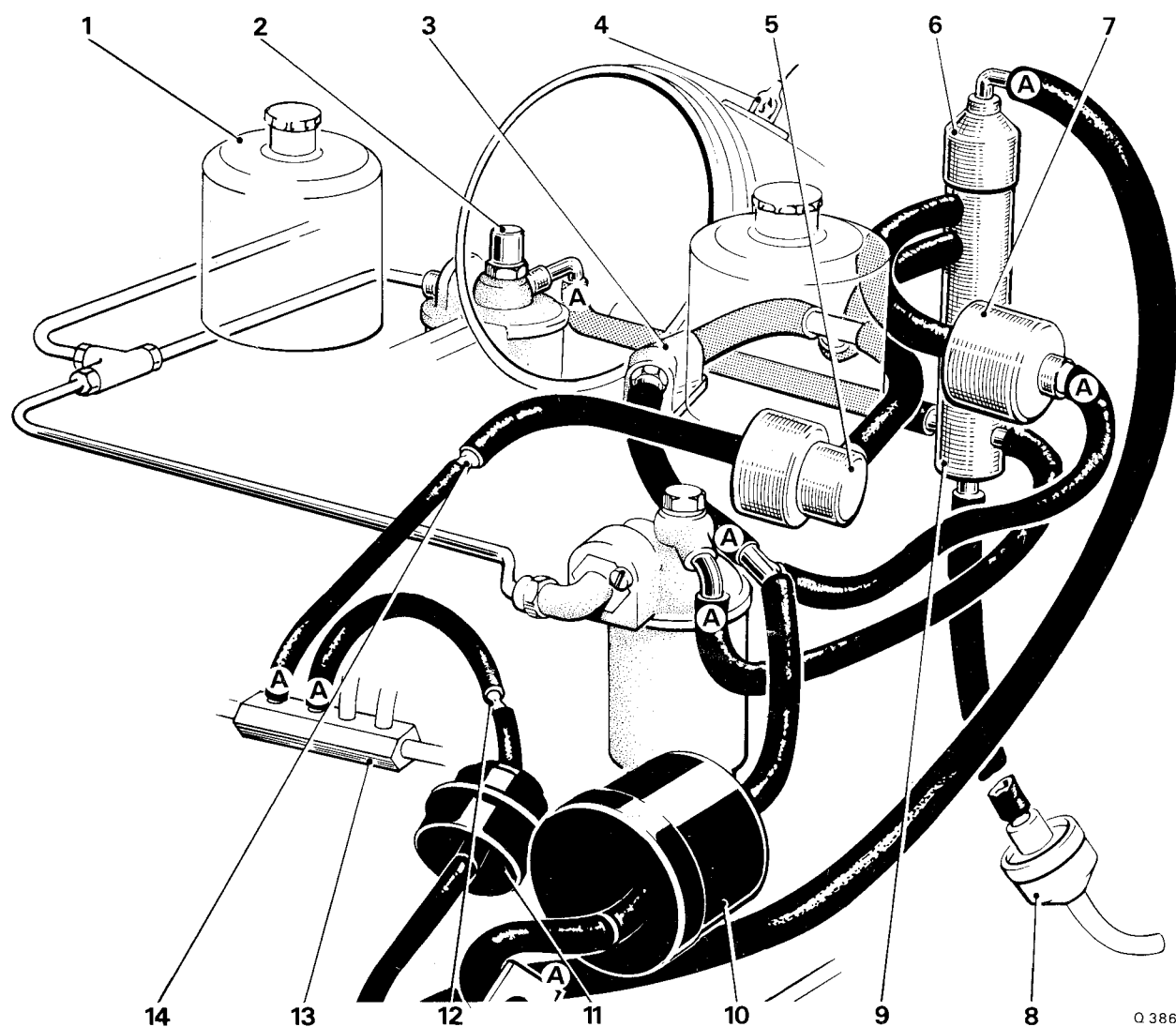


FIG. 15 CARBURETTER WEAKENING DEVICE

A Hoses to be detached when removing carburetters

- 1 'A' bank carburetter
- 2 Float chamber pressure tapping
- 3 Weakening device
- 4 Bi-metal switch
- 5 Float chamber vent valve
- 6 Weakening device cut-off solenoid

- 7 Anti 'run-on' solenoid
- 8 Float chamber drain valve
- 9 Fuel receiver
- 10 Weaker filter
- 11 Purge line filter
- 12 Purge line restrictor
- 13 Vacuum manifold
- 14 Restrictor

Exhaust gas recirculation full throttle cut-off micro-switch—To remove

1. Detach the two electrical leads at their Lucar connections.
2. Unscrew and remove the two small nuts and bolts which retain the micro-switch in position on the mounting bracket.
3. Withdraw the micro-switch.

Exhaust gas recirculation full throttle cut-off micro-switch—To fit

Fit the micro-switch by reversing the procedure given for removal. Finally, set the micro-switch.

Exhaust gas recirculation full throttle cut-off micro-switch circuit wiring—To check

1. Start and run the engine until normal operating temperature is attained.
2. Switch off the ignition.
3. Connect a test lamp in turn across the two Lucar connections to the primary and secondary exhaust gas recirculation cut-off solenoids.

Note Do not disconnect the Lucar connections.

4. Switch on the ignition and check that the test lamp bulb is extinguished.
5. Open the throttles to the full throttle position to activate the full throttle cut-off micro-switch and thereby, illuminate the test lamp bulb.

Exhaust gas recirculation full throttle cut-off micro-switch—To set

Prior to setting the exhaust gas recirculation system cut-off micro-switch, ensure that the following are correctly set.

- (i) Throttle linkage (*refer to Chapter K*).
- (ii) Carburetter linkage (*refer to page U104 of this Supplement*).
- (iii) Kick-down micro-switch (*refer to Chapter U*).

To set the cut-off micro-switch proceed as follows.

1. Depress the accelerator pedal until it touches the toeboard mounted kick-down micro-switch (further depression of the pedal requires increased effort).
2. Hold the throttle linkage in the position described in Operation 1 and release the lock-nut (*Fig. 7, item 2*) on the throttle lever (*item 3*).

3. Screw the spring loaded operating button away from the micro-switch.

4. When there is clearance at this point screw the spring loaded operating button toward the micro-switch until the micro-switch is heard to 'click'.

5. Tighten the lock-nut.

6. Depress the accelerator pedal further to operate the toeboard mounted kick-down micro-switch.

7. Adjust the full throttle stop (*Fig. 7, item 4*) to prevent overloading of the kick-down micro-switch. The full throttle stop should be set so that all throttle movement is stopped just prior to the operating button spring becoming fully compressed.

Anti 'run-on' solenoid

The anti 'run-on' solenoid is situated on a platform adjacent to 'B' bank carburetter; it is the foremost of the three solenoids fitted on the platform.

The use of low octane fuel often causes an engine to 'diesel' (i.e. continue to run-on after the ignition has been switched off, particularly when the engine is hot). To prevent this condition arising an anti 'run-on' solenoid is connected to the weakener unit signal line (*see Fig. 15*).

When the ignition is switched off the solenoid opens and connects the weakener system to the induction manifold, thus creating a high float chamber depression which cuts off the supply of fuel.

Anti 'run-on' solenoid—To remove

1. Disconnect the rubber hose from either side of the solenoid.
2. Disconnect the two electrical leads at their Lucar connections.
3. Unscrew and remove the two screws situated one on either side of the solenoid body.
4. Withdraw the anti 'run-on' solenoid.

Anti 'run-on' solenoid—To fit

Fit the anti 'run-on' solenoid by reversing the procedure given for removal.

Anti 'run-on' solenoid circuit wiring—To check

1. Connect a test lamp across the two Lucar connections to the solenoid.

Note Do not disconnect the two Lucar connections.

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2. Switch on the ignition and check that the test lamp bulb illuminates.
3. Switch off the ignition and check that the test lamp bulb is extinguished.

Anti 'run-on' solenoid—To check

1. Detach the hose from the solenoid to the 'Tee' piece at the solenoid end and connect a piece of hose of identical internal diameter but of suitable length, to the solenoid.
2. Clean the open end of the hose.
3. Switch on the ignition.
4. Place the hose in the mouth and blow down the hose.
5. If the operation of the solenoid is correct note that the following conditions apply and connect the original hose to the solenoid.

- (i) With the ignition switched on it should not be possible to blow down the hose.
 - (ii) With the ignition switched off the solenoid is de-energised and it should be possible to blow down the hose.
6. If the operation of the solenoid is suspect, fit a new unit.

Weakener cut-off solenoid

Refer to page U21

Weakener valve cut-off switch

Refer to page U21

THE CARBURETTERS AND AUTOMATIC CHOKE SYSTEM

CARBURETTER

**CARBURETTER MIXTURE WEAKENING
DEVICE**

Data	Description
Carburetters	Two S.U. HD8 diaphragm type
Choke size	2.00 in. (5,08 cm.)
Jet size— spring loaded needle type	0.100 in. (2,44 mm.)
Jet needle— spring loaded type . . .	BCQ
Carburetter— air valve piston spring	Red/Blue

In addition to the description given on pages U24 and U25, the following information is applicable.

**Anti-diesel device
(anti 'run-on' solenoid)**

The use of low octane fuel causes the engine to 'diesel' (i.e. continue to run-on after the ignition has been switched off) when it is hot. To prevent this from happening an anti 'run-on' solenoid valve is fitted into the weakener signal line. When the ignition is switched off this valve opens and connects the weakening system to the induction manifold thus creating a high float chamber depression which cuts off the fuel supply.

Carburetter overrun valves

During overrun (i.e. when decelerating with the throttles closed), insufficient mixture is supplied to the engine to maintain satisfactory combustion. The overrun valves alleviate this condition by allowing some mixture to pass through the throttle plates (butterflies) at high inlet manifold depressions.

An overrun valve consists of a small disc retained in each throttle plate by a spring loaded plunger. Under normal conditions the disc is seated against the throttle plate. When the throttle is suddenly closed, the increased inlet manifold depression lifts

the disc from its seating and allows a metered quantity of air/fuel mixture to pass through the throttle plate.

The action of the overrun valves maintains satisfactory combustion on overrun, thus reducing hydrocarbon emissions and controlling catalyst temperatures.

After the sudden closure of the throttles and as soon as the manifold depression falls, the overrun valve disc returns to its seat on the throttle plate.

Throttle damper

The throttle damper prevents rapid throttle closure which would suddenly drop the inlet manifold

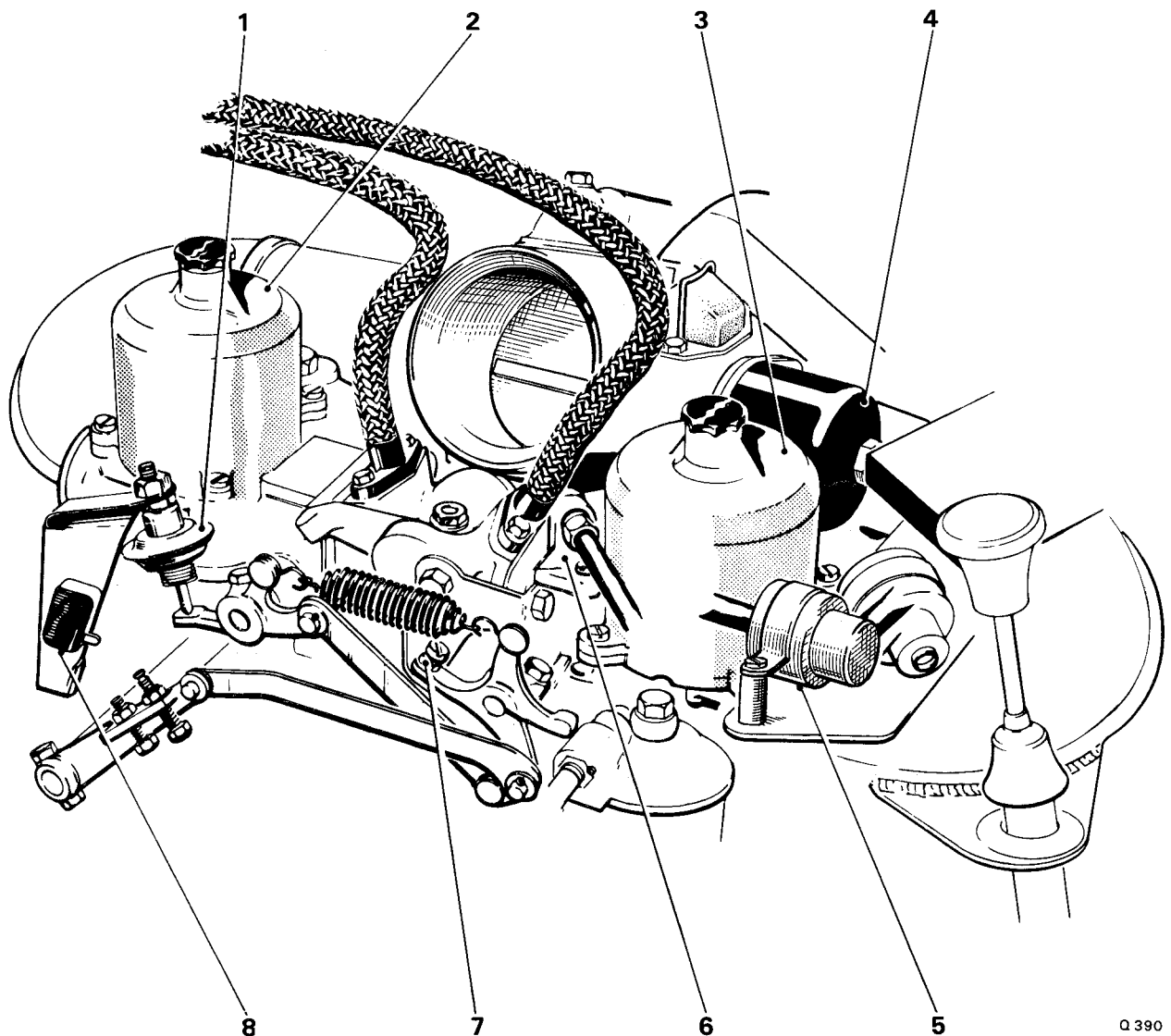
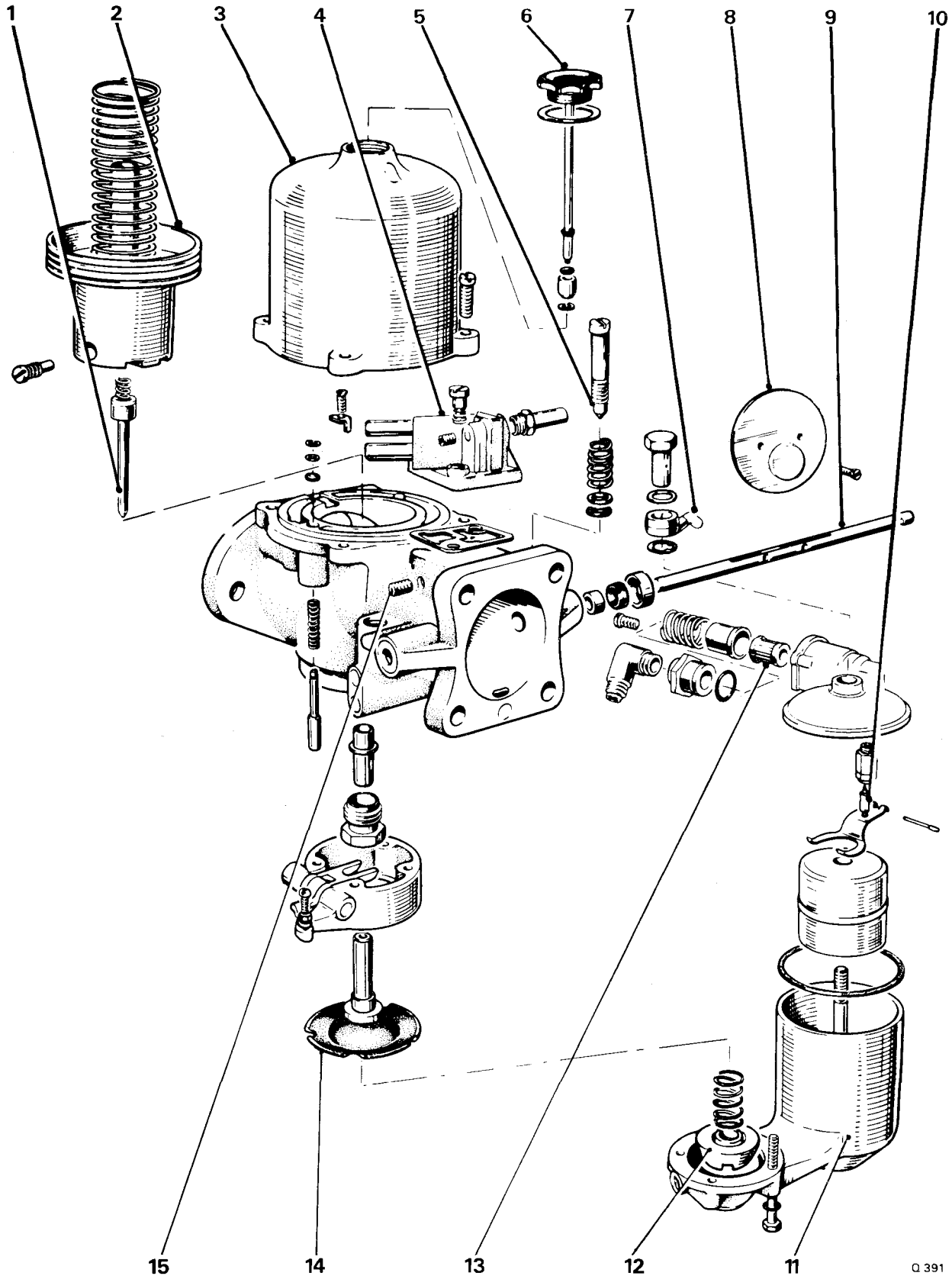


FIG. 16 VIEW OF CARBURETTERS

- | | |
|--------------------------|---|
| 1 Throttle damper | 5 Anti 'run-on' solenoid |
| 2 'A' bank carburetter | 6 Mixture weakening device |
| 3 'B' bank carburetter | 7 Idle stop |
| 4 Choke bi-metal housing | 8 Full throttle (E.G.R.) cut-off micro-switch |

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FIG. 17 'B' BANK CARBURETTER

- | | | |
|--|------------------|--|
| 1 'Swing' needle assembly | 6 Damper | 11 Float chamber |
| 2 Piston | 7 Overflow pipe | 12 Anti-boiling device |
| 3 Suction chamber | 8 Throttle plate | 13 Filter element |
| 4 Mixture weakening device
('B' bank carburetter only) | 9 Spindle | 14 Jet diaphragm |
| 5 Volume screw | 10 Float needle | 15 E.G.R. signal adjusting screw
('B' bank carburetter only) |

pressure causing vapourisation of fuel from the manifold walls and a sudden increase in mixture strength.

Temperature controlled air intake

To ensure rapid warm-up and improve control of the air/fuel ratio a temperature controlled air intake is fitted (see Fig. 20).

A vacuum operated blending valve attached to the air cleaner assembly is controlled by a thermal sensor in the air intake elbow. This valve blends hot air from a pick-up point (scoop) adjacent to the exhaust manifold with cold air from under the front wing; thus maintaining a constant temperature of the intake air as it enters the carburetters.

Throttle stop vacuum actuator assembly

The throttle stop vacuum actuator assembly is not fitted to cars produced to the 1975 specification.

OVERHAUL

Carburetters—To remove

Before commencing to remove the carburetters observe the following points.

1. When disconnecting the various hoses, pipes and wiring connections ensure that they are suitably labelled to assist identification when assembling.

2. Ensure that **all** open ends of pipes, hoses, etc. are suitably blanked off to prevent the ingress of dirt, etc.

To remove the carburetters proceed as follows.

1. Disconnect the battery.
2. Unscrew and remove the two $\frac{7}{16}$ in. A/F nuts from the joint in the small diameter exhaust pipe, situated below the exhaust gas recirculation valves. Free the joint.
3. Detach the following rubber hoses (see Fig. 15).
 - (i) The hose from the weakening device cut-off solenoid to the small diameter 'tee' piece, at the solenoid.
 - (ii) The hose from the float chamber vent valve to the valance connection block, at both ends.
 - (iii) The hose from the weakening device to the 'tee' piece.
 - (iv) The hose from the vacuum manifold to the anti 'run-on' solenoid.

(v) The overflow hoses from the carburetter float chambers to the fuel receiver.

(vi) Both hoses from the inlet manifold tappings (see Fig. 5).

4. Detach the following electrical connections.

(i) The two connections at the full throttle E.G.R. cut-out micro-switch, also release the two rubber clips which hold the loom to the 'B' bank float chamber fuel feed pipe.

(ii) The two connections to the anti 'run-on' solenoid, including the earth wires from beneath one of the solenoid mounting feet. Also, release the loom from the clip situated on the solenoid mounting platform.

(iii) The two connections to the E.G.R. secondary valve cut-in micro-switch and one connection above the micro-switch assembly.

(iv) The connections to both E.G.R. cut-out solenoids at the Lucar connection block.

(v) The choke solenoid connections, also release the wires from the adjacent clip.

(vi) The weakener cut-off bi-metal switch.

5. Remove the crankcase breather pipe from the choke butterfly housing; withdraw the connection from the end of the pipe.

6. Disconnect the choke stove pipe from the choke housing.

7. Disconnect the choke stove pipe from the choke bi-metal coil housing connection.

8. Unscrew the worm drive clips securing the air intake hose in position; remove the hose.

Unscrew the worm drive clip securing the metal intake elbow to the butterfly choke housing. Disconnect the two rubber hoses connected to the thermal sensor situated inside the metal elbow. Withdraw the elbow.

9. Remove the engine oil dipstick.

10. Unscrew and remove the 2 B.A. bolt, nut and washer securing the throttle linkage to the 'fore and aft' manifold shaft lever; this connection is adjacent to the 'A' bank carburetter.

11. Withdraw the throttle linkage from the manifold shaft.

12. Disconnect the main fuel feed pipe.

13. Remove the air horns, choke butterfly housing, carburetters and 'Tee' piece as one complete assembly. The assembly is secured to the induction manifold by a $\frac{1}{2}$ in. A/F setscrew situated centrally on the carburetter 'Tee' and located by two dowel pins.

14. Before lifting the carburetters assembly from the engine check to ensure that no wires, hoses or other joints have been left connected.

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Dismantle the carburetters from the 'Tee' piece and air horns as follows.

15. Unscrew the four setscrews retaining the E.G.R. distribution pipes in position on the carburetter 'Tee' piece.
16. Remove the exhaust gas recirculation valves from the carburetters assembly (*refer to Exhaust gas recirculation valves—To remove in this Supplement*) noting that the distribution pipes can be left connected to the E.G.R. valves.
17. Slacken the pinch bolt and remove the fast-idle lever from the 'A' bank carburetter butterfly spindle.
18. Unscrew and remove the two $\frac{1}{2}$ in. A/F nuts from the two setscrews securing the air horn to 'B' bank carburetter. Disconnect the rubber hoses from the solenoids. Unscrew the cheese-headed screw from the solenoid platform mounting foot adjacent the engine oil dipstick tube, collect the nut and washer, and withdraw the solenoid platform assembly.
19. Remove the four setscrews securing the two air horns to the carburetters, collect the full throttle stop bracket assembly with the throttle damper from 'A' bank carburetter. Remove the air horns.
20. Disconnect the fuel feed pipe from the float chambers.
21. Disconnect and remove the throttle spring.
22. Completely remove the two pinch bolts securing the throttle levers to the 'A' and 'B' bank carburetter butterfly spindles; remove the levers.
23. Remove the nuts and washers securing both carburetters to the 'Tee' piece, remove the carburetters.

Carburetters—To fit

Fit the carburetters by reversing the procedure given for their removal noting the following points.

1. Fit new gaskets and washers to all joints.
2. Examine the floats for damage or punctures; fit the floats to their respective float chambers.
3. Renew the lid gaskets.
4. Fit the gaskets to the lids then fit the lids to the chambers.
5. Secure the lids and pipes to the float chambers.
6. Examine the paper filter elements for cleanliness and damage; renew if necessary.
7. Ensure that the 'O' rings on the petrol inlet unions are in good condition; renew if necessary. Fit the paper filter elements, spring retainers, springs and inlet unions to each float chamber lid. Secure the inlet unions with the retaining screws.

8. Fill the damper piston with an approved oil; the oil level should be approximately 0.5 in. (12.7 mm.) below the top of the piston rod. Do not overfill.

Carburetters—To set

The carburetters fitted to these cars are adjusted at the factory using **special equipment** to ensure that their settings comply with the current emission control regulations.

Under normal circumstances the carburetters should not require adjustment in service.

If however, adjustment is found necessary due to inadvertent disturbance or replacement of a component, set the carburetters by carrying out the following operations in the sequence given.

- A. Set throttle linkage and temporarily set engine idle speed. Check linkage clearances.
- B. Set cold start 'fast-idle' cam.
- C. Tune carburetters.
- D. Set cold start 'fast-idle' speed.
- E. Set the throttle damper plunger.
- F. Set the kick-down micro-switch.
- G. Set full throttle stop and full throttle E.G.R. cut-off micro-switch.

Contra-rotating throttles—To fit and set (see Fig. 18)

1. Assemble 'A' bank and 'B' bank throttle levers (*items 7 and 13*) onto the carburetter spindles.
2. Fit the setting jig (RH 8880) into position on the throttle levers.
3. Fully close 'B' bank carburetter butterfly (*item 8*).
4. Tighten the pinch bolt securing 'B' bank throttle lever.
5. Fully close 'A' bank carburetter butterfly (*item 3*).
6. Tighten the pinch bolt securing 'A' bank throttle lever.
7. Fit the throttle spring (*item 4*) to the throttle levers.
8. Remove the setting jig from the throttle levers.
9. Fit the cross link (*item 12*) and the eccentric throttle adjuster (*item 5*) onto the throttle levers, ensuring that both throttle butterflies are closed when adjusting and tightening the eccentric adjuster.

Note The eccentric pin should be set in the lowest position possible.

10. Ensure that the tang of the throttle guard (*item 6*) has a clearance of between 0.050 in. (1.27 mm.) and 0.070 in. (1.78 mm.) with the cross link and also that the tang does not foul the throttle spring. If necessary bend the tang to give these clearances.

11. Check that the throttle linkage moves freely.

12. Fit the idle stop screw (*item 10*) and adjust until it just contacts the stop bracket (*item 11*) with the throttle butterflies remaining in the closed throttle position.

13. Screw down the idle stop screw $\frac{1}{2}$ turn and tighten the lock-nut.

14. Screw both of the carburetter volume screws (*items 2 and 9*) fully in.

15. Fit the throttle damper (*item 1*) with the damper spindle compressed 0.187 in. (4.75 mm.) when throttle lever (*item 13*) is in the closed position. Ensure that the damper rod contacts the throttle lever centrally 0.20 in. (5.1 mm.) from the outer edge.

16. Connect the drive link (*item 14*) to the manifold shaft lever (*item 15*).

17. Operate the linkage to ensure free movement.

18. With the throttles in the closed position check that the 'A' bank control shaft to control rod lever

(*item 16*) on the rear of the manifold shaft is in line with the front manifold shaft lever (*item 15*). Tighten the securing bolts on both levers.

19. Operate the mechanism; check for freedom of movement within the linkage and also clearance with the various engine components.

20. To set the remainder of the linkage from the control rod lever on the rear of the manifold shaft to the accelerator pedal refer to Chapter T—Part 2.

CARBURETTER TUNING

Preliminary checks

Before tuning the carburetters the following checks should be carried out.

Ensure that the vehicle is in Neutral and that the gear range actuator thermal cut-off has been removed from the main fusebox.

1. Check the condition of the spark plugs.
2. Check the ignition timing.
3. Check the flow through the choke stove pipe.
4. Check the entire induction system for air leaks.

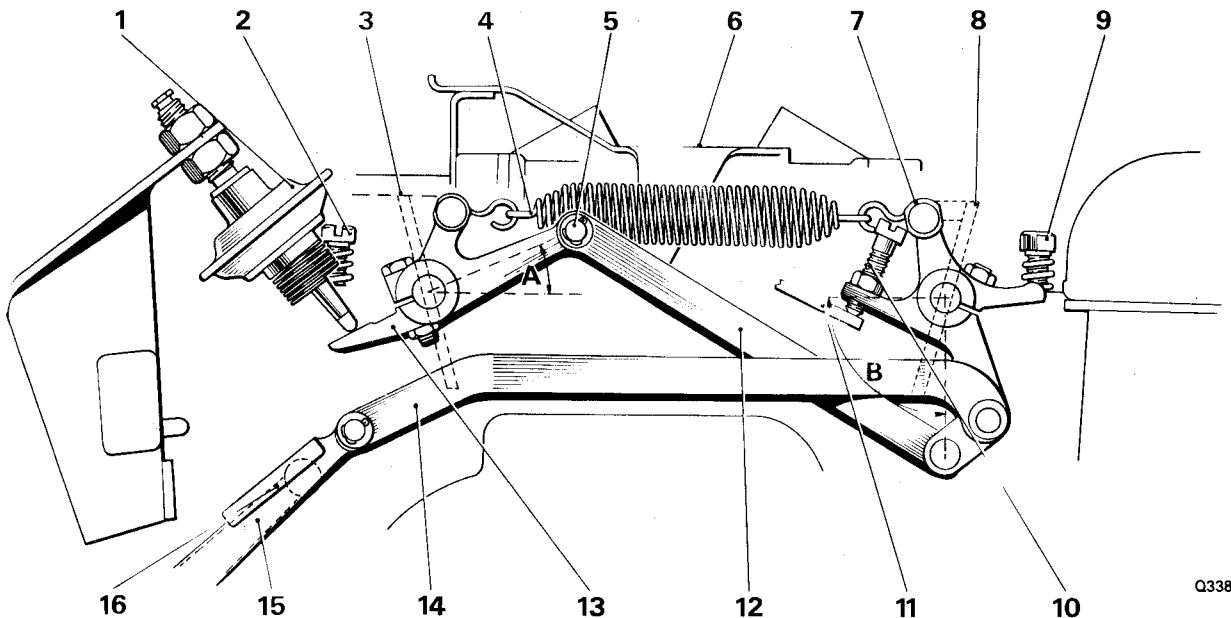


FIG. 18 CONTRA-ROTATING THROTTLE CONTROLS

A=Reference angle 22°

B=Reference angle 90°

1 Throttle damper

2 'A' bank carburetter volume screw

3 'A' bank carburetter throttle plate

4 Throttle spring

5 Eccentric throttle adjuster

6 Throttle guard

7 'B' bank carburetter throttle lever

8 'B' bank carburetter throttle plate

9 'B' bank carburetter volume screw

10 Idle stop screw

11 Closed throttle bracket

12 Cross link

13 'A' bank carburetter throttle lever

14 Drive link

15 Front manifold shaft lever

16 Rear manifold shaft lever

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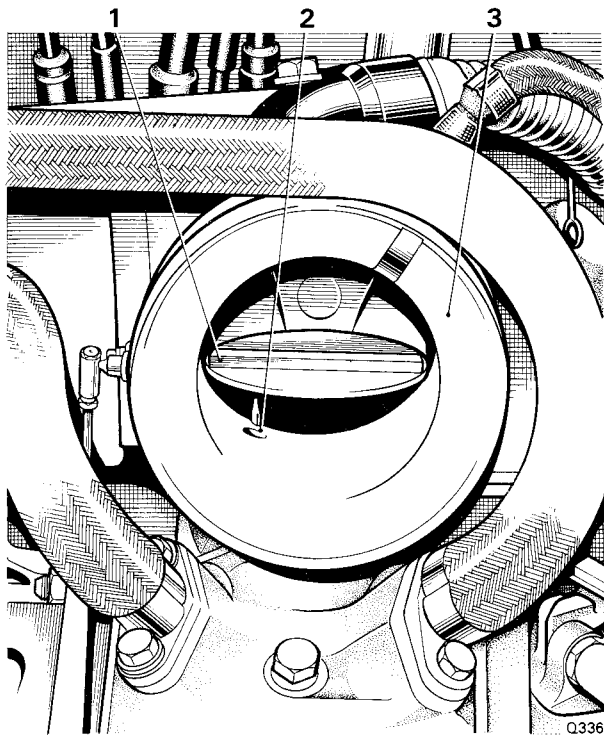


FIG. 19 HOT IDLE MIXTURE COMPENSATOR FEED

- 1 Choke butterfly
- 2 Hot idle compensator feed
- 3 Butterfly housing

5. Check the purge line flow rate.
6. Ensure that the air conditioning system is switched off.
7. Start the engine and warm up; allow to run for at least 5 minutes after the thermostat has opened.
8. Stop the engine, ensure that the choke butterfly valve is fully open and the choke 'fast-idle' off.
9. Connect an electric impulse tachometer in accordance with manufacturer's instructions.
10. Check the float chamber depression.
11. Check the exhaust gas recirculation signal strength.
12. Check the operation of the secondary exhaust gas recirculation valve and the vacuum operated micro-switch.
13. Check and set the full throttle exhaust gas recirculation cut-out micro-switch.

Tuning procedure

1. Remove the air intake hose, blank off the hot idle compensator feed drilling (*see Fig. 19*) and replace the hose.

2. Remove the air hoses from the check valves and fit blanks over the valves (suitable blanks may be produced from two short lengths of rubber hose with one end plugged).

Note The air injection system is inoperative when the air hoses are disconnected from the check valves. The valves must be blanked to prevent air being drawn into the exhaust port by pulsations in the exhaust system since this would affect the idle CO reading.

3. Disconnect the exhaust gas recirculation (E.G.R.) cut-out solenoid to E.G.R. valve hoses at the E.G.R. valve ends and blank off the hoses.

4. Remove the pressure tapping cap from 'A' bank carburetter float chamber to vent the float chambers to atmosphere.

5. Remove the carburetter dampers and fit a dial gauge assembly (RH 8841) in place of the damper. Ensure that both gauges read zero with the engine stopped. Start the engine and allow to idle at 600 r.p.m. noting that the piston lift shown on the dial gauge assemblies is equal (within 10%), adjust using the eccentric adjuster on the carburetter throttle linkage.

Note The average carburetter piston lift is between 0.035 in. (0.89 mm.) and 0.050 in. (1.27 mm.).

6. Ensure that the engine has run for at least 25 minutes after the thermostat has opened.

7. To set 'A' bank carburetter mixture strength, remove the forward of the two blanks on the 'A' bank air manifold (*see Fig. U20—Page U32*); fit adapter (RH 8621) and connect to the CO meter.

8. Purge the engine at 2 000 r.p.m. in Neutral for $\frac{1}{4}$ minute, check the idle speed and reset to 600 r.p.m. using the throttle stop screw (*Fig. 16, item 7*).

9. Slacken the jet adjusting screw lock-nut on 'A' bank carburetter using spanner RH 8050 and set the CO meter reading to between $3\frac{3}{4}\%$ and $4\frac{1}{4}\%$ by adjusting the jet screw on 'A' bank carburetter (turning the screw clockwise richens the mixture). Tighten the lock-nut.

10. Remove the adapter RH 8621 from the air manifold and fit the blanking plug.

11. To set the mixture strength of 'B' bank carburetter, remove the rear blanking plug of the two blanking plugs on the 'A' bank air manifold (*see Fig. U20—Page U32*); fit adapter RH 8621 and connect to the CO meter.

12. Purge the engine at 2 000 r.p.m. in Neutral for $\frac{1}{4}$ minute, check the idle speed and reset to 600 r.p.m. using the throttle stop screw (*Fig. 16, item 7*).

13. Slacken the jet adjusting screw lock-nut on 'B' bank carburetter using spanner RH 8050 and set

the CO meter reading to between $3\frac{3}{4}\%$ and $4\frac{1}{4}\%$ by adjusting the jet screw on 'B' bank carburetter (turning the screw clockwise richens the mixture). Tighten the lock-nut.

14. Remove the adapter RH 8621 from the air manifold and refit the blanking plug.

15. If setting the mixture strength involves adjusting 'B' bank carburetter jet adjusting screw by more than $\frac{3}{16}$ of a turn, the setting operations should be repeated again on 'A' bank carburetter (*Operations 7 to 9 inclusive*).

16. Check the mixture balance by raising each piston lift pin in turn. If the mixture balance is correct, the engine response for each carburetter piston lift will be identical.

If the response from each carburetter is not identical repeat Operations 6 to 16 inclusive.

17. Stop the engine and fit the probe of a suitable CO meter into the exhaust pipe in accordance with the manufacturer's instructions (a suitable CO meter is the Horiba Mexa 200).

18. Start the engine and run at idle speed until a steady CO reading is obtained (minimum time $\frac{1}{2}$ minute). The correct reading is between $3\frac{3}{4}\%$ and $4\frac{1}{4}\%$.

19. If the CO reading is not correct, slacken both jet adjusting screw lock-nuts with spanner RH 8050. Turn both jet adjusting screws by equal amounts in the same direction (up to a maximum of $\frac{1}{4}$ turn) until a CO meter reading of between $3\frac{3}{4}\%$ and $4\frac{1}{4}\%$ is obtained (turning the screws clockwise richens the mixture). Tighten the lock-nuts.

20. Fit the pressure tapping to 'A' bank carburetter float chamber, fitting a new washer if necessary. Remove the blanks from the air hoses and connect the hoses to the check valves. Remove the blanks from the E.G.R. cut-out hoses and connect the hoses to their respective E.G.R. valves.

21. Check the engine idle speed and if necessary adjust to 600 r.p.m. using the throttle stop screw.

22. Stop the engine. Remove the air intake hose and the blank from the hot idle compensator feed; fit the air intake hose.

23. Fit the gear range actuator thermal cut-out to the main fusebox.

Note The tuning operations should be carried out in the shortest possible time. If the time exceeds 3 minutes, run the engine at 2 000 r.p.m. in Neutral for $\frac{1}{4}$ minute and then resume the tuning operations. Repeat this purging operation if a further period of 3 minutes is exceeded.

After purging the system gently tap all around the neck of the carburetter suction chamber with a lightweight non-metallic object (i.e. the wooden handle of a small screwdriver), to eliminate carburetter piston hysteresis. The engine is to be run on Indolene Clear (HO) reference fuel or equivalent (Unleaded gasoline only).

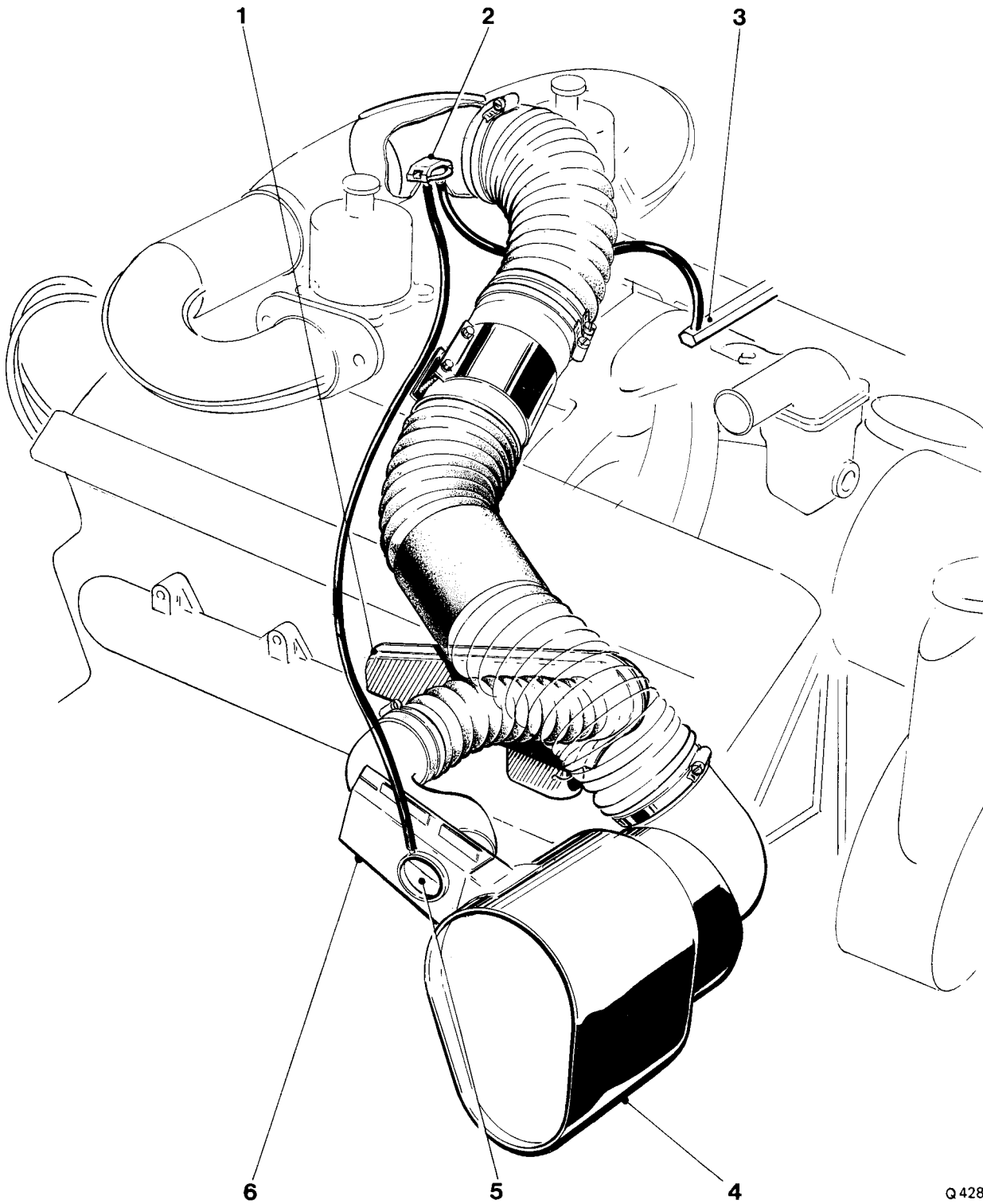
Throttle damper plunger—To set

1. Move the cold start 'fast-idle' to the off position.
2. Slacken both nuts securing the throttle damper to its' bracket. Back off the nuts until they are well clear of the bracket.
3. Press the damper towards the 'A' bank throttle lever until the damper is fully compressed and the lever is just clear of the throttle stop screw.
4. Screw the lower securing nut until it is 0.025 in. (0.63 mm.) clear of the underside of the bracket. Release the damper and tighten the upper securing nut.
5. Ensure that the damper spindle is at the maximum possible radius, whilst maintaining adequate contact with the throttle lever pad. This can be achieved by adjusting the angle of the bracket.

Automatic choke stove pipe—To check

To check the stove pipe for any blockage, carry out the following procedure.

1. Start the engine and run until normal operating temperature is attained.
2. Disconnect the union at the butterfly housing and connect a flowmeter to the pipe via connector RH 8837. The flowmeter consists of a calibrated orifice (RH 8097) and a water manometer capable of reading up to 35 ins. (88.9 cm.).
3. Start the engine and run at idle speed (i.e. 600 r.p.m.); observe the manometer reading which should be between 20 in. (50.8 cm.) and 24 in. (61.0 cm.).
4. If the manometer reading is below 20 in. (50.8 cm.), stop the engine, remove the choke stove pipe and stove assembly to check for leaks.
5. Fit the choke stove pipe and stove assembly, start the engine and again observe the manometer reading at idle speed.



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FIG. 20 TEMPERATURE CONTROLLED AIR INTAKE

- | | |
|----------------------|------------------------|
| 1 Hot air scoop | 4 Air cleaner/silencer |
| 2 Temperature sensor | 5 Air blending valve |
| 3 Vacuum manifold | 6 Cold air intake |

6. Disconnect the flowmeter assembly and fit the choke stove pipe to the connection on the butterfly housing.

AUTOMATIC CHOKE—TO SET

Adjustment to kick diaphragm

Refer to Chapter K, Section K4.

Adjustment of the kick gap

Refer to Chapter K, Section K4.

Solenoid air gap

Refer to Chapter K, Section K4.

Solenoid lever spring tension

Refer to Chapter K, Section K4.

'Fast-idle' cam—To set

1. Fit the 'fast-idle' mechanism; do not tighten the 'fast-idle' lever clamping bolt.

2. Ensure that the 'fast-idle' adjustment screw is directly over the cam.

3. With the throttles closed, insert a 0.100 in. (2.54 mm.) diameter rod between the top of the 'fast-idle' cam and the boss under the 'fast-idle' adjustment screw. Tighten the clamping bolt on the 'fast-idle' lever.

4. Ensure that the throttles are closed; screw in the 'fast-idle' adjustment screw until it just makes contact with the top step of the 'fast-idle' cam.

5. Insert a 0.050 in. (1.27 mm.) diameter drill between the leading edge of the choke butterfly valve and the choke housing.

6. With the butterfly valve in this position, adjust the length of the butterfly rod so that the tip of the 'fast-idle' screw is in line with the start of the top step of the 'fast-idle' cam, (i.e. the position when the tip of the adjustment screw is about to fall from the top step to the bottom step of the cam).

Remove the 0.050 in. (1.27 mm.) diameter drill from the choke housing.

7. With the throttles closed and the choke partly open, adjust the 'fast-idle' adjustment screw to just contact the start or bottom step of the 'fast-idle' cam, screw in a further $\frac{3}{4}$ turn and tighten the lock-nut ensuring that the adjustment screw does not move.

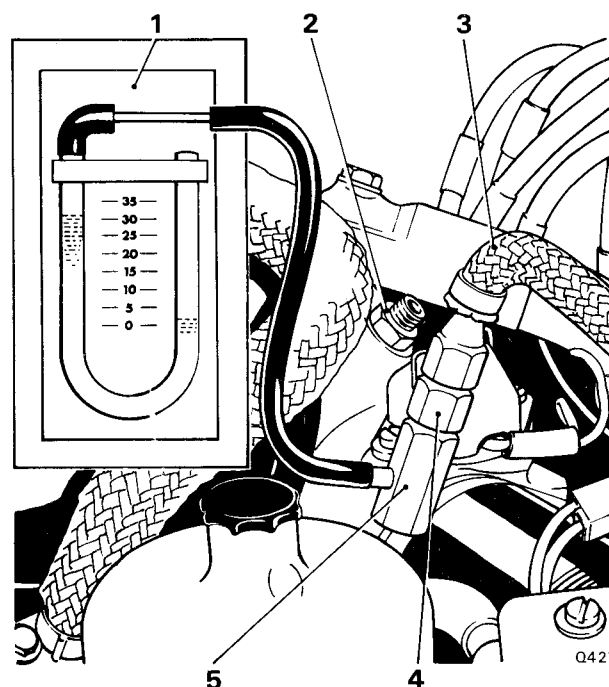


FIG. 21 CHECKING THE CHOKE STOVE PIPE DEPRESSION

- 1 Manometer
- 2 Choke stove pipe connection
- 3 Choke stove pipe
- 4 Adapter RH 8837
- 5 Restrictor RH 8095

Thermocoil

Refer to Chapter K, Section K4.

Cold start 'fast-idle'—To set

1. Stop the engine and disconnect both solenoid to exhaust gas recirculation valve hoses at the valve ends. Blank the hoses, remove the pressure tapping cap to vent the float chambers; open the throttles and close the choke butterfly against the bi-metal coil tension by means of the butterfly link lever, release throttles. The 'fast-idle' adjusting screw will now be resting on the high step of the 'fast-idle' cam and the throttles are in the cold start position.

2. Start the engine and check the 'fast-idle' speed. If the speed is not between 1 900 r.p.m. and 2 100 r.p.m., stop the engine, open the throttles to gain access to the adjusting screw and adjust $\frac{1}{8}$ turn for each 100 r.p.m. outside the required speed.

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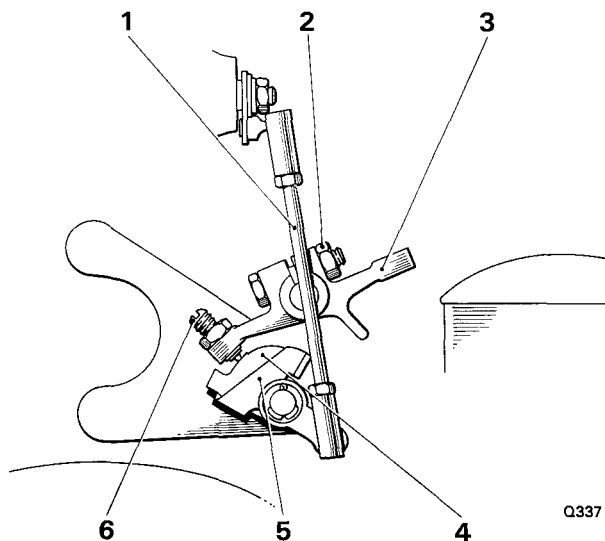


FIG. 22 'FAST-IDLE' MECHANISM

- 1 Butterfly rod
- 2 Lever clamp bolt
- 3 'Fast-idle' lever
- 4 Cam
- 5 Cam link
- 6 Adjusting screw

3. Tighten the lock-nut and check the 'fast-idle' speed. If correct open the throttles to release 'fast-idle' cam mechanism.

4. Remove the blanks from both solenoid to the exhaust gas recirculation valve hoses and connect the hoses to their respective exhaust gas recirculation valves. Fit the tapping cap to 'A' bank carburetter float chamber cover.

Float chamber depression—To check

Refer to Page U37 noting the following information.

- (i) The hose referred to in Operations 1 and 7 is

now two hoses, one for each exhaust gas recirculation valve.

- (ii) The correct reading to be obtained on the manometer is 2.0 in. (5.08 cm.).

(iii) Operation 8 should read

8. Raise the engine speed slowly noting the manometer and tachometer readings. The maximum steady manometer reading should be obtained between 1 300 r.p.m. and 1 600 r.p.m. If the maximum depression occurs below 1 300 r.p.m. it is permissible to screw out the idle bleed screws on the carburetters by equal amounts (maximum 2.5 turns) to obtain this speed.

Exhaust gas recirculation secondary valve cut-in solenoid and vacuum operated micro-switch—To check and set

Refer to Page U97 in this Supplement

Exhaust gas recirculation signal strength—To check

Refer to Page U89 in this Supplement

Exhaust gas recirculation full throttle cut-off micro-switch—To set

Refer to Page U99 in this Supplement

IGNITION SYSTEM, DISTRIBUTOR, IGNITION COIL AND SPARKING PLUGS

Data

Ignition timing . . . T.D.C. (Static) 15° B.T.D.C. at 1 200 r.p.m. (stroboscopic) in Neutral.
(Approach 1 200 r.p.m. from a higher speed).

Ignition control system

The ignition system utilises an Opus distributor (in which a magnetic pick-up and control unit replace the conventional contact breaker), a low inductance ignition coil and a ballast resistor. The control unit comprises an electronic oscillator, amplifier and power transistor.

FIG. 23 EXPLODED VIEW OF DISTRIBUTOR

- 1 Pick-up module
- 2 Pick-up arm
- 3 Distributor cover/cap
- 4 High tension brush and spring
- 5 Rotor arm
- 6 Flash over shield (dust cover)
- 7 Timing rotor
- 8 Control unit
- 9 Lubrication pad
- 10 Driving dog and pin
- 11 Thrust washer
- 12 Distributor body
- 13 Automatic advance mechanism
- 14 Electronic module assembly

A drum with eight ferrite rods (one per cylinder) moulded into the outer edge is mounted onto the distributor drive-shaft. As the drum rotates a voltage is created each time a ferrite rod passes the magnetic pick-up, this signal is then amplified and used to switch-off the normally conducting power transistor in the primary coil circuit thus inducing a high voltage in the secondary winding which is distributed to the sparking plugs in the normal manner.

This ignition control system provides increased accuracy of timing and increased service life before maintenance is required.

Ignition—To time (using a stroboscope)

The ignition is timed on A1 cylinder which is located at the front left-hand side of the engine (viewed from the front of the car).

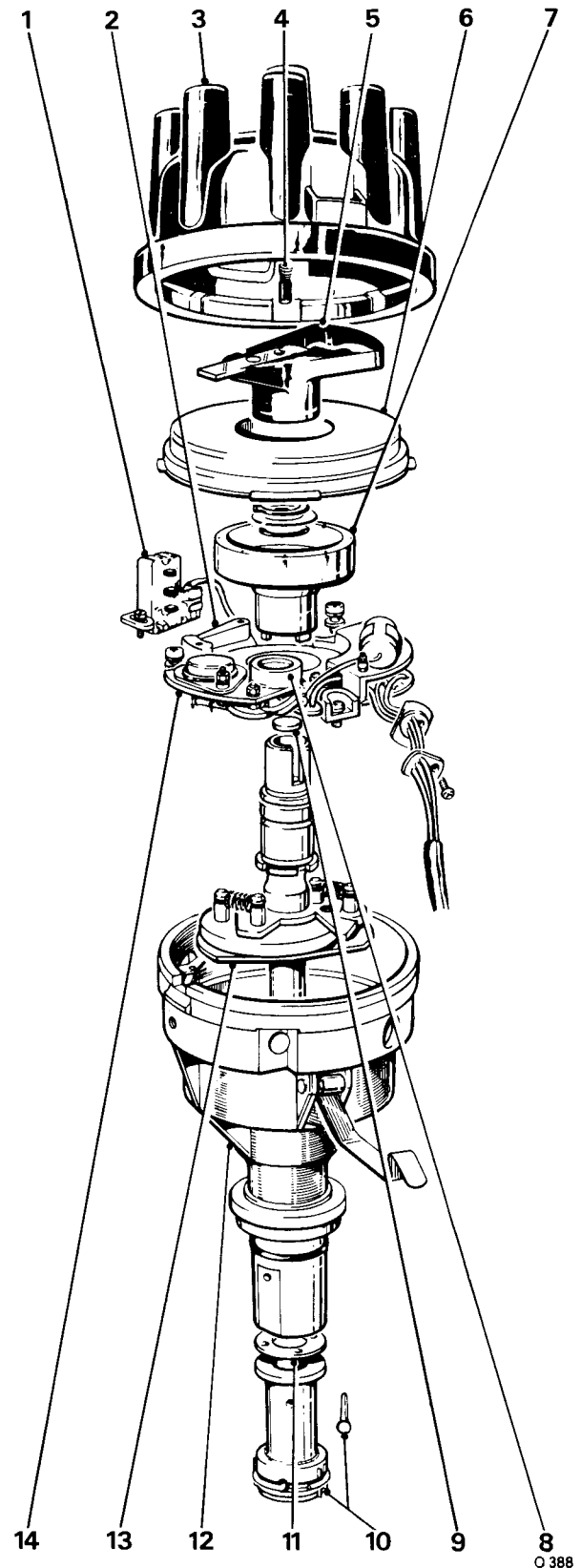
Note If the ignition timing is to be set, ensure that the sparking plugs are in good condition before running the engine; if they require cleaning or renewal the sparking plugs gap should be set to 0.035 in. (0.9 mm.).

1. To check the ignition timing commence by running the engine until normal operating temperature is attained and the choke 'fast-idle' is in the off position. Switch off the engine.

2. Connect a stroboscope and a tachometer to the engine as described in the instructions supplied with the respective equipment.

3. Start the engine and adjust the throttle stop screw to give an idle speed of 1 200 r.p.m. When setting the engine idle speed reduce from a higher speed to 1 200 r.p.m.

4. Direct the flashing light of the stroboscope onto the crankshaft damper timing marks and timing pointer; the pointer is positioned on the right-hand side of the crankshaft damper when viewed from the front of the engine.



5. If the timing pointer does not coincide with the 15° B.T.D.C. mark on the crankshaft damper adjust the ignition timing as follows.

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6. Release the clamp screw on the distributor and rotate the head of the distributor in the appropriate direction until the correct timing is obtained. Clockwise rotation of the distributor head advances the ignition and conversely anti-clockwise rotation retards the ignition. After adjustment has been carried out tighten the clamp screw and again check to ensure that the timing has not altered whilst tightening the clamp screw.

7. Set the engine idle speed to 600 r.p.m.

Setting the engine idle speed

Ensure that the engine is at normal operating temperature and that the choke 'fast-idle' is in the off position.

The air conditioning system must be switched off and a tachometer connected to the engine in accordance with the manufacturer's instructions.

1. Stop the engine, remove the air intake hose and blank off the hot idle compensator feed drilling (see Fig. 19); replace the air intake hose.

2. Start the engine and, if necessary, adjust the engine idle speed to 600 r.p.m. using the throttle stop screw; tighten the lock-nut.

3. Stop the engine and remove the air intake hose. Remove the blank from the hot idle compensator feed drilling and detach the tachometer and stroboscopic timing equipment (if fitted). Fit the air intake hose.

Sparking plugs

The sparking plugs approved for this car are Champion N.14.Y. Before fitting the plugs, set the gaps with the aid of a feeler gauge to 0.035 in. (0.9 mm.) and lightly smear the threads with 'Graphogen' grease.

LUBRICATION AND MAINTENANCE

The 'Essential' maintenance which is listed in the following schedules is the minimum servicing which must be carried out at the appropriate distance/time intervals, in order to comply with the Rolls-Royce Motors Limited* warranty and the U.S. Federal and California Emission Regulations.

The 'Preventive' maintenance listed, is aimed at securing the maximum life and efficiency for the vehicle and will be carried out on request.

***In the U.S.A. this warranty is given by Rolls-Royce Motors Inc.**

ESSENTIAL MAINTENANCE INITIAL SERVICE

This service will be carried out by the Dealer after the first 3 000 miles or 3 months whichever is the earlier. **Items marked * will be carried out free of charge.**

INITIAL 3 000 MILES (5 000 km.) OR 3 MONTHS SERVICE WHICHEVER IS THE EARLIER

***Air injection pump**

Check belt tension and reset if necessary.

***Automatic choke**

Check the flow through the choke stove pipe and check for correct operation.

***Carburettors**

Check oil level in air valve dampers and if necessary top-up to correct level. Check tightness of float chamber covers. Check float chamber depression. Check and if necessary reset the idle speed. Check and if necessary reset the choke 'fast-idle' speed.

Engine

Change engine oil.

***Fuel evaporation emission control system**

Check the purge rate; this should be between 50 cu. ft. per hr. and 70 cu. ft. per hr. (1.41 cu. m. and 1.98 cu. m.) at 600 r.p.m. in neutral. Pressure test the fuel tank and evaporation loss line and if necessary rectify any leaks.

***Ignition system**

Check ignition timing using stroboscope and adjust if necessary; the ignition timing should be 15° B.T.D.C. with the engine running at 1 200 r.p.m.

Engine cooling system

Tighten worm-drive clips of all coolant hoses.

Torque converter transmission

Check fluid level and top-up if necessary.

When checking the fluid level, avoid contact with the exhaust gas recirculation valves, heat shield and associated pipes as these components will be **hot**.

**EVERY 3 000 MILES (5 000 km.) OR
3 MONTHS WHICHEVER
IS THE EARLIER**

If the car is used for constant stop/start operation, change the engine oil.

**EVERY 6 000 MILES (10 000 km.) OR
6 MONTHS WHICHEVER
IS THE EARLIER**

Engine

Change engine oil and renew oil filter element.

Battery

Check the level of the electrolyte in the battery; if necessary top-up with distilled water.

Brakes

Inspect footbrake and parking brake pad linings. When changing footbrake pads examine condition of dust excluders on calipers. Manually adjust the parking brake pads. Inspect pipes and connections, rectify if necessary.

Torque converter transmission

Check fluid level and top-up if necessary.

When checking the fluid level, avoid contact with the exhaust gas recirculation valves, heat shield and associated pipes as these components will be **hot**.

**EVERY 12 500 MILES (20 800 km.) OR
12 MONTHS SERVICE WHICHEVER
IS THE EARLIER**

Air injection pump

Check tension of pump pulley driving belt.

Air silencer

Fit a new paper filter element.

Carburettors

Top-up oil level in air valve dampers. Check tightness of float chamber covers. Check float chamber depression. Check and if necessary reset the idle speed. Check and if necessary, reset choke 'fast-idle' speed.

Crankcase emission control system

Remove and clean gauze flame traps in the crankcase breather tube. Clean the adapter in choke butterfly housing.

Engine

Change engine oil and renew oil filter element.

Fuel evaporation emission control system

Check the condition of the pipes and connections.

Ignition system

Fit new sparking plugs ensuring that the gaps are set to 0.035 in. (0.9 mm.).

Lubricate distributor spindle (shaft bearings) and automatic advance mechanism with engine oil.

Check the ignition timing using a stroboscope and adjust if necessary; the ignition timing should be 15° B.T.D.C. with the engine running at 1 200 r.p.m.

Battery

Check the level of the electrolyte in the battery; if necessary top-up with distilled water.

Brakes

Inspect footbrake and parking brake pad linings. When changing footbrake pads examine condition of dust excluders on calipers. Manually adjust parking brake pads. Inspect pipes and connections, rectify if necessary.

Final drive unit

Check oil level and top-up if necessary.

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Steering ball joints

Lubricate the six grease nipples. Inspect the rubber covers on the ball joints; if the covers are found to be damaged the joints should be dismantled and new parts fitted as necessary.

Front sub-frame and compliant front suspension

The front suspension ball joints are sealed for life and no maintenance is required until renewal is necessary or the ball joint rubber covers are damaged. Inspect the rubber covers on the front suspension ball joints; if the covers are found to be damaged new joints and covers should be fitted.

Torque converter transmission

Renew transmission fluid.

When checking the fluid level, avoid contact with the exhaust gas recirculation valves, heat shield and associated pipes as these components will be **hot**.

**EVERY 18 500 MILES (30 800 km.) OR
18 MONTHS SERVICE WHICHEVER
IS THE EARLIER**

Engine

Change engine oil and renew oil filter element.

Battery

Check the level of electrolyte in the battery; if necessary top-up with distilled water.

Brakes

Inspect footbrake and parking brake pad linings. When changing footbrake pads examine condition of dust excluders on calipers. Manually adjust the parking brake pads. Inspect pipes and connections, rectify if necessary.

Torque converter transmission

Check fluid level and top-up if necessary.

When checking the fluid level, avoid contact with the exhaust gas recirculation valves, heat shield and associated pipes as these components will be **hot**.

**EVERY 25 000 MILES (41 600 km.) OR
2 YEARS SERVICE WHICHEVER
IS THE EARLIER**

Air injection pump

Check tension of pump pulley driving belt.

Air injection system

Check air injection system for leaks and correct functioning. Renew any defective items.

Air silencer

Fit a new paper filter element.

Automatic choke

Check the air flow through the choke stove pipe and check the system for correct functioning.

Carburettors

Clean air valves. Remove inlet unions from the float chamber covers and fit new paper filter elements. Top-up oil level in air valve dampers. Check tightness of float chamber covers. Check float chamber depression. Check and if necessary, reset the idle speed. Check and if necessary, reset choke 'fast-idle' speed.

Carburetter mixture weakening device

Renew air filter element for the carburetter mixture weakening device.

Crankcase emission control system

Remove and clean gauze flame traps in crankcase breather tube. Clean the adapter in choke butterfly housing.

Engine

Change engine oil and renew oil filter element.

Engine cooling system

Fit a new engine coolant thermostat and heater tap feed hose.

Fuel evaporation emission control system

Renew the foam filter element in the evaporation loss control canister. Check the purge rate; this should be between 50 cu. ft. per hr. and 70 cu. ft. per hr. (1.41 cu. m. and 1.98 cu. m.) at 600 r.p.m. in neutral. Renew the purge line filter if necessary.

Ignition system

Fit new sparking plugs ensuring that the gaps are set to 0.035 in. (0.9 mm.).

Lubricate distributor spindle (shaft bearings) and automatic advance mechanism with engine oil.

Check the ignition timing using a stroboscope and adjust if necessary; the ignition timing should be 15° B.T.D.C. with the engine running at 1 200 r.p.m.

Battery

Check the level of the electrolyte in the battery; if necessary top-up with distilled water.

Brakes

Inspect footbrake and parking brake pad linings. When changing footbrake pads examine condition of dust excluders on calipers. Manually adjust parking brake pads. Inspect pipes and connections; rectify if necessary.

Final drive unit

Change oil.

Steering ball joints

Lubricate the six grease nipples. Inspect the rubber covers on the ball joints; if the covers are found to be damaged the joints should be dismantled and new parts fitted as necessary.

Front sub-frame and compliant front suspension

The front suspension ball joints are sealed for life and no maintenance is required until renewal is necessary or the ball joint rubber covers are damaged. Inspect the rubber covers on the front suspension ball joints; if the covers are found to be damaged new joints and covers should be fitted.

Torque converter transmission

Change transmission fluid.

Fit a new intake strainer.

When checking the fluid level, avoid contact with the exhaust gas recirculation valves, heat shield and associated pipes as these components will be **hot**.

**SERVICING AFTER 25 000 MILES
(41 600 km.) OR 2 YEARS
WHICHEVER IS THE EARLIER**

After 25 000 miles (41 600 km.) or 2 years, servicing is still due at the following intervals.

**31 000 MILES (51 600 km.)
2½ YEARS WHICHEVER IS
THE EARLIER**

Carry out the 6 000 miles (10 000 km.) service.

**37 500 MILES (62 400 km.) OR
3 YEARS WHICHEVER IS THE
EARLIER**

Carry out the 12 500 miles (20 800 km.) service.

**43 500 MILES (72 500 km.) OR
3½ YEARS WHICHEVER IS
THE EARLIER**

Carry out the 6 000 miles (10 000 km.) service.

**50 000 MILES (83 200 km.) OR
4 YEARS WHICHEVER IS
THE EARLIER**

Carry out the 25 000 miles (41 600 km.) service and in addition the following operations.

Exhaust gas recirculation system

Remove and clean the exhaust gas recirculation valves and feed pipes. Clean the orifices in the carburetter 'Tee' piece. Check the exhaust gas recirculation valves for correct operation.

Exhaust system

Fit a new catalytic converter assembly.

Chapter U

PREVENTATIVE MAINTENANCE

INITIAL SERVICE

This service should be carried out by the Dealer after the first 3 000 miles (5 000 km.) or 3 months whichever is earlier.

Belt tension

Check the tension of the belts driving the following; fan and steering pump, alternator and refrigeration compressor. Adjust the belt tension as necessary.

Steering pump

Check the oil level in the reservoir; top-up if necessary.

**EVERY 6 000 MILES (10 000 km.) OR
6 MONTHS WHICHEVER IS
EARLIER**

Carburettors

Check the oil level in the air valve dampers and top-up if necessary.

Steering pump

Check for leaks. If necessary top-up the level in the steering pump reservoir.

Belt tension

Check the tension of the belts driving the following; fan and steering pump, alternator and refrigeration compressor. Renew any belts which show signs of wear.

Control linkages

Apply a few drops of engine oil to the accelerator linkage and to the gear range selector controls adjacent to the transmission casing.

Electrical system

Ensure that all lamps, instruments, warning devices and air conditioning controls are operating satisfactorily.

Check the following levels and pressures

Run the engine for four minutes then check the hydraulic reservoir fluid levels; top-up if necessary with the specified fluid.

Check the level and specific gravity of the engine coolant and correct if necessary.

Check the tyre pressures and adjust if necessary.

Check the tread depth of all tyres and inspect for signs of damage.

**EVERY 12 500 MILES (20 800 km.) OR
12 MONTHS WHICHEVER IS
THE EARLIER**

Belt tension

Check the tension of the belts driving the following; fan and steering pump, alternator and refrigeration compressor. Renew any belts which show signs of wear.

Control linkage

Apply a few drops of engine oil to the accelerator linkage and to the gear range selector controls adjacent to the transmission casing.

Parking brake linkage

Lubricate the pivot pins and pulleys in the parking brake system with approved grease.

Spare wheel

Lubricate the spare wheel lowering bolt and mechanism.

Electrical system

Ensure that all lamps, instruments, warning devices and air conditioning controls are operating satisfactorily.

Check the following levels and pressures

Check the fluid level in the power steering pump reservoir and top-up if necessary.

Check the level and specific gravity of the engine coolant and correct if necessary.

Check the fluid level in the steering idler box damper and top-up if necessary.

Run the engine for four minutes then check the hydraulic fluid levels; top-up if necessary.

Check the tyre pressures and adjust if necessary.

Check the tread depth of all tyres and inspect for signs of damage.

Electrical system

Ensure that all lamps, instruments, warning devices and air conditioning controls are operating satisfactorily.

Fuel tank

Slacken the drain plug one or two turns and allow any accumulated water to drain away. Tighten the drain plug.

Fuel filter

Renew the main line filter element and clean the filter bowl.

Height control mechanism

Disconnect the control valve linkage ball joints. Clean, grease and refit the ball joints.

Rear wheel drive-shafts

Lubricate the rear wheel drive-shaft outer universal couplings with an approved grease.

**EVERY 25 000 MILES (41 600 km.) OR
2 YEARS WHICHEVER IS
THE EARLIER****Belt tension**

Check the tension of the belts driving the following; fan and steering pump, alternator and refrigeration compressor.

Renew any belts which show signs of wear.

Control linkage

Apply a few drops of engine oil to the accelerator linkage and to the gear range selector controls adjacent to the transmission casing.

Fuel pump

Remove the fuel pump from the car and test on the bench. Fit a new pump unit if the performance is below the specified level (*refer to Chapter K—Fuel System of this Workshop Manual T.S.D. 2476*).

Parking brake linkage

Lubricate the pivot pins and pulleys in the parking brake system with approved grease.

Spare wheel

Lubricate the spare wheel lowering bolt and mechanism.

Check the following levels and pressures

Check the fluid level in the power steering pump reservoir and top-up if necessary.

Check the level and specific gravity of the engine coolant and correct if necessary.

Check the fluid level in the steering idler box damper and top-up if necessary.

Check the tyre pressures and adjust if necessary.

Check the tread depth of all tyres and inspect for signs of damage.

SEASONAL SCHEDULES**EVERY 12 MONTHS****Engine cooling system**

Drain the coolant from the radiator and the engine crankcase. Clean any debris from the surfaces of the refrigeration condenser and radiator matrices by reverse flushing with a hose. This should be carried out just prior to the Autumn. Fill the system with the correct anti-freeze mixture (*refer to Chapter L—Engine Cooling System of this Workshop Manual T.S.D. 2476*).

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Air conditioning system

Ensure that the foam filter element fitted to the scuttle intake grille is free from obstruction. On Long Wheelbase cars fitted with a centre division, check that the foam filter element fitted to the intake grille in the rear decking panel is free from obstruction.

Refrigeration system

These operations should be carried out only by an experienced refrigeration engineer.

Check that the refrigeration system is functioning correctly. If necessary, top-up the system with refrigerant. If loss of refrigerant is evident, check the system for leakage. Visually check the refrigerant compressor for oil leakage, if oil leakage is apparent check the oil level and top-up if necessary. In the event of a major oil loss, check and repair before topping-up (refer to Chapter C—*Air Conditioning of this Workshop Manual T.S.D. 2476*).

Body

Check that the body drain holes are free from foreign matter.

EVERY 2 YEARS

In addition to the 12 monthly schedule, carry out the following.

Engine cooling system

Drain the coolant from the radiator and engine crankcase. Thoroughly reverse flush the coolant passages with a continuous flow of water. Change the coolant hoses where necessary. Fill the system with the correct anti-freeze mixture.

SERVICE RECOMMENDATIONS BRAKE AND HYDRAULIC SYSTEM COMPONENTS

50 000 Miles (83 200 km.)

At this mileage and under normal motoring conditions it is recommended that the following servicing is carried out.

Renew the front and rear accumulator to frame connector block hoses.

Examine the sub-frame to brake caliper hoses for chafing or surface cracking; renew if necessary.

Fit new seals to the disc brake calipers, the deceleration conscious pressure limiting valve and the master cylinder.

Completely drain the fluid from the hydraulic circuits. Thoroughly clean the brake fluid reservoirs and sight glasses, ensuring that no foreign matter is allowed to enter during the operation.

Fill the hydraulic system with Castrol RR 363 Brake Fluid. This fluid exceeds specification S.A.E. J 1703b in many respects and complies with D.O.T. 3 grade of FMVSS 116. Bleed the braking systems and automatic height control system.

100 000 Miles (166 400 km.)

At this mileage and under normal motoring conditions it is recommended that the following servicing is carried out.

Renew all the flexible hoses to the braking systems and the automatic height control system. Fit new seals to the disc brake calipers, the deceleration conscious pressure limiting valve and the master cylinder.

Completely drain the fluid from the hydraulic circuits. Thoroughly clean the brake fluid reservoirs and sight glasses, ensuring that no foreign matter is allowed to enter during the operation.

Fill the hydraulic system with Castrol RR 363 Brake Fluid. This fluid exceeds specification S.A.E. J 1703b in many respects and complies with D.O.T. 3 grade of FMVSS 116. Bleed the braking systems and automatic height control system.

Fit a new convoluted rubber hose between the fuel filler head and fuel tank assembly. Examine all flexible fuel pipes and renew any which show signs of deterioration.

SPECIAL PRECAUTIONS

Should the car be used in very cold temperatures, drain the engine sump when thoroughly warm and also drain the carburettor air valve dampers. The engine sump and carburettor air valve dampers should then be filled with oil having the following viscosity.

For constant temperatures of between 0°C. and -23°C. (32°F. and -10°F.), use a 10W/30 grade oil.

For constant temperatures of -23°C. (-10°F.) and below, use a 5W/20 grade oil.

FAULT DIAGNOSIS

SYMPTOMS	POSSIBLE CAUSE
1. Engine will not start. (Starter motor operating).	1. (a) Ignition circuit broken. (b) Failed anti 'run-on' solenoid or failure of electrical supply circuit. (c) Ignition system faulty. (d) Damaged or contaminated ignition high-tension circuit. (e) Blocked fuel feed line or fouled float chamber filters. (f) Faulty choke bi-metal coil. (g) Choke solenoid inoperative. (h) Faulty choke 'fast-idle' mechanism. (i) Air leak into induction system. (j) Faulty hot idle mixture compensator. (k) Weakening device filter blocked or blockage in rubber connecting hoses. (l) Faulty weakener cut-off solenoid or failure of electrical supply circuit. (m) Faulty weakening device control switch or failure of electrical supply circuit. (n) Dislodged venturi in weakener device. (o) Flooding of carburetter float chamber or jet. (p) Fouled carburetter float chamber or jet. (q) Exhaust gas recirculation valve(s) failed. (r) Faulty exhaust gas recirculation secondary valve control switch or failure of electrical supply circuit. (s) Failed secondary exhaust gas recirculation valve cut-out solenoid or electrical supply circuit.
2. Engine idles very roughly.	2. (a) Ignition system faulty. (b) Fouled sparking plugs. (c) Damaged or contaminated ignition high-tension circuit. (d) Air leak into induction system. (e) Faulty hot idle compensator. (f) Weakening device filter blocked or blockage in rubber connecting hoses. (g) Dislodged venturi in weakener device. (h) Badly worn or damaged carburetter control linkage. (i) Flooding of carburetter float chamber or jet. (j) Sticking carburetter piston. (k) Fouled carburetter float chamber or jet. (l) Air leak into exhaust gas recirculation vacuum control circuit. (m) Exhaust gas recirculation valve(s) failed. (n) Faulty exhaust gas recirculation secondary valve control switch or failure of electrical supply circuit. (o) Failed secondary exhaust gas recirculation valve cut-out solenoid or electrical supply circuit. (p) Faulty air diverter valve. (q) Incorrect operation of temperature controlled air intake system.
3. Engine stalls.	3. (a) Ignition circuit broken. (b) Failed anti 'run-on' solenoid or failure of electrical supply circuit. (c) Ignition system faulty. (d) Damaged or contaminated ignition high-tension circuit. (e) Blocked fuel feed line or fouled float chamber filters. (f) Air leak into induction system. (g) Faulty hot idle mixture compensator. (h) Weakening device filter blocked or blockage in rubber connecting hoses. (i) Dislodged venturi in weakening device. (j) Badly worn or damaged carburetter control linkage. (k) Flooding of carburetter float chamber or jet. (l) Sticking carburetter piston. (m) Fouled carburetter float chamber or jet. (n) Air leak into exhaust gas recirculation vacuum control circuit. (o) Exhaust gas recirculation valve(s) failed. (p) Faulty exhaust gas recirculation secondary valve control switch or failure of electrical supply circuit. (q) Failed secondary exhaust gas recirculation valve cut-out solenoid or electrical supply circuit. (r) Faulty air diverter valve.

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SYMPTOMS	POSSIBLE CAUSE
<p>4. (i) Engine shows signs of power loss, evident at high speeds and loading. (ii) Engine misfires particularly on hard acceleration from low speed.</p>	<p>4. (a) Ignition system faulty. (b) Fouled sparking plugs. (c) Damaged or contaminated ignition high-tension circuit. (d) Blocked fuel feed line or fouled float chamber filters. (e) Choke system operation incorrect. (f) Sticking carburetter piston. (g) Fouled carburetter float chamber or jet. (h) Faulty exhaust gas recirculation full throttle cut-out switch or failure of electrical supply circuit. (i) Exhaust gas recirculation valve(s) failed. (j) Failed primary exhaust gas recirculation valve cut-out solenoid or electrical supply circuit. (k) Failed secondary exhaust gas recirculation valve cut-out solenoid or electrical supply circuit.</p>
<p>5. Engine hesitates or misfires under light load.</p>	<p>5. (a) Failed anti 'run-on' solenoid or failure of electrical supply circuit. (b) Ignition system faulty. (c) Fouled sparking plugs. (d) Damaged or contaminated ignition high-tension circuit. (e) Blocked fuel feed line or fouled float chamber filters. (f) Air leak into induction system. (g) Faulty hot idle mixture compensator. (h) Weakening device filter blocked or blockage in rubber connecting holes. (i) Dislodged venturi in weakening device. (j) Flooding of carburetter float chamber or jet. (k) Sticking carburetter piston. (l) Fouled carburetter float chamber or jet. (m) Incorrect purge flow rate. (n) Exhaust gas recirculation valve(s) failed. (o) Faulty exhaust gas recirculation secondary valve control switch or failure of electrical circuit. (p) Failed secondary exhaust gas recirculation valve cut-out solenoid or electrical supply circuit. (q) Faulty air diverter valve. (r) Incorrect operation of temperature controlled air intake system.</p>
<p>6. Increase in fuel consumption.</p>	<p>6. (a) Ignition system faulty. (b) Faulty choke bi-metal coil. (c) Choke system operation incorrect. (d) Air leak into induction system. (e) Faulty hot idle mixture compensator. (f) Weakening device filter blocked or blockage in rubber connecting hoses. (g) Faulty weakener cut-off solenoid or failure of electrical supply circuit. (h) Faulty weakening device control switch or failure of electrical supply circuit. (i) Air leaks in mixture weakening system. (j) Flooding of carburetter float chamber or jet. (k) Sticking carburetter piston. (l) Incorrect purge flow rate. (m) Exhaust gas recirculation valve(s) failed. (n) Faulty exhaust gas recirculation secondary valve control switch or failure of electrical supply circuit. (o) Failed secondary exhaust gas recirculation valve cut-out solenoid or electrical supply circuit. (p) Faulty air diverter valve.</p>
<p>7. Decrease in fuel consumption.</p>	<p>7. (a) Air leaks in mixture weakening system. (b) Incorrect purge flow rate. (c) Faulty exhaust gas recirculation temperature control switch or failure of electrical supply circuit. (d) Air leak into exhaust gas recirculation vacuum control circuit. (e) Exhaust gas recirculation valve(s) failed. (f) Faulty exhaust gas recirculation secondary valve control switch or failure of electrical supply circuit.</p>

SYMPTOMS	POSSIBLE CAUSE
8. Engine 'backfires' on overrun.	8. (a) Ignition system faulty. (b) Air leak into induction system. (c) Exhaust gas recirculation valve(s) failed. (d) Failed secondary exhaust gas recirculation valve cut-out solenoid or electrical supply circuit.
9. Sudden increase in engine idle speed.	9. (a) Faulty choke 'fast-idle' mechanism. (b) Failed carburettor overrun valve.
10. Excessive noise from air injection pump or system.	10. (a) Faulty air diverter valve. (b) Faulty or damaged air injection pump.

WORKSHOP TOOLS

Tool Number Description

RH 8050 Spanner—Carburettor Jet Screw

RH 8087 Spanner—Weakener Cut-off Valve

RH 8089 Jet Centring Tool

RH 8090 Pliers—Wire Hose Clips

RH 8095 Restrictor—Manometer Check—Choke Stove Pipe

RH 8383 Positioning Tool—Throttle Spindle Seal

RH 8621 Adapter—Air Manifold to CO Meter

RH 8800 Vacuum Pump—Hand Operated

RH 8841 Dial Gauge—Carburettor Piston Lift

RH 8880 Setting Jig—Throttle Levers

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Section U10

SUPPLEMENTS

No. 4 Australia 1975

FUEL EVAPORATION EMISSION CONTROL SYSTEM

In order to comply with regulations in Australia governing the emission of fuel vapour, an efficient Fuel Evaporation Emission Control System has been designed and is fitted to cars produced from the beginning of 1975.

The Fuel Evaporation Emission Control System eliminates direct venting of the fuel tank and carburetters, thus preventing the release of unburnt hydro-carbons into the atmosphere.

Fuel vapours are collected from the fuel tank and carburetters and stored in an activated charcoal canister. The canister is purged whenever the engine is running and the stored fuel vapours are extracted from the charcoal and burnt in the engine.

A diagrammatic illustration of the system can be seen in Figure 2.

The engine compartment components are clearly shown in Figure 3 and the fuel tank components in Figure 6.

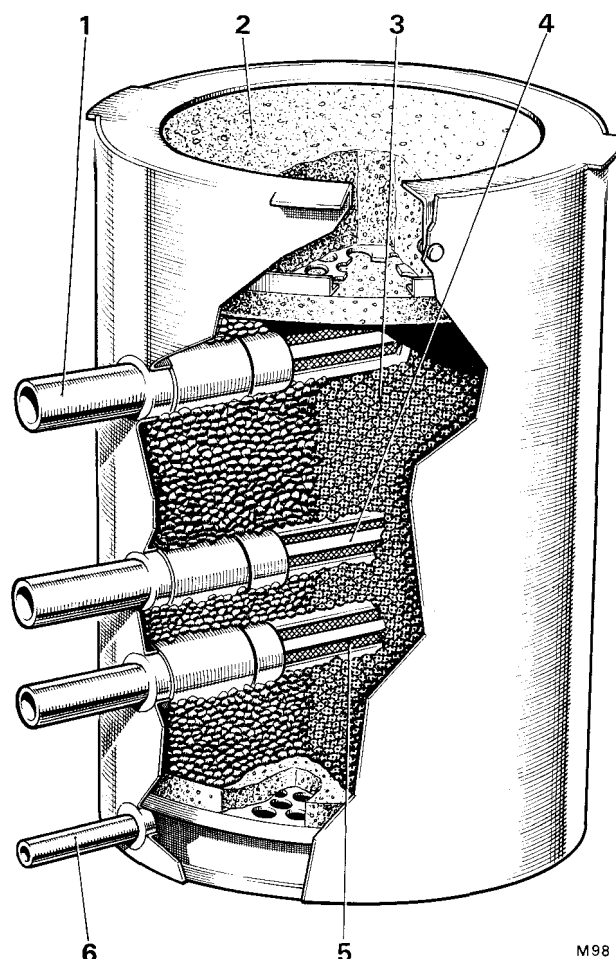
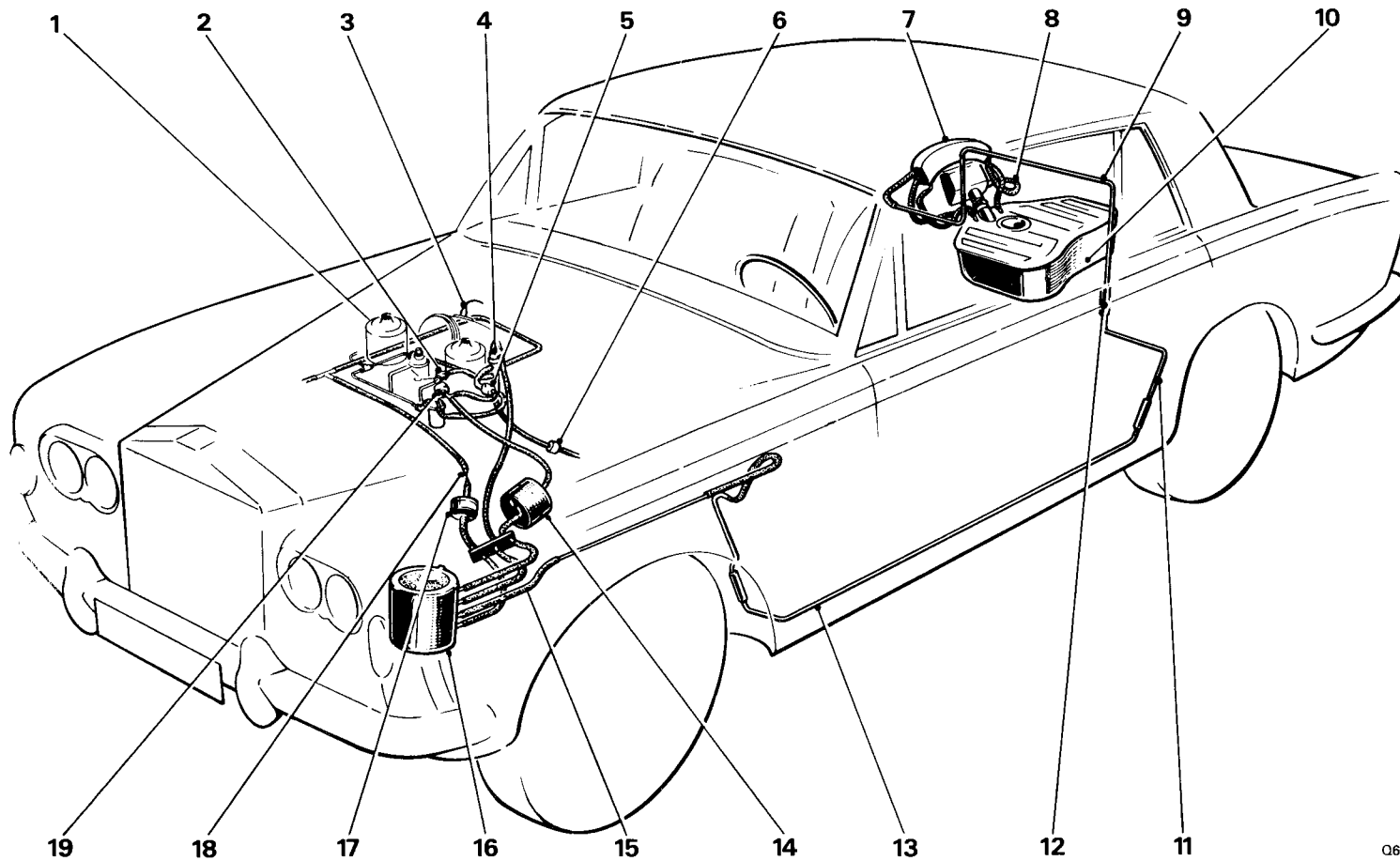


FIG. 1 FUEL EVAPORATION LOSS CONTROL CANISTER

- 1 Weaker connection
- 2 Polyurethane filter
- 3 Carbon
- 4 Float chamber vent connection
- 5 Fuel tank vent connection
- 6 Purge line connection

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FIG. 2 FUEL EVAPORATION EMISSION CONTROL SYSTEM—GENERAL VIEW

- | | | |
|----------------------------------|-------------------------------------|--------------------------------------|
| 1 'A' bank carburettor | 8 Relief valve hose | 14 Weakener filter |
| 2 Weakening device | 9 Luggage compartment pipe | 15 Canister to wing hose |
| 3 Bi-metal switch | 10 Fuel tank assembly | 16 Evaporation loss control canister |
| 4 Float chamber vent valve | 11 Luggage compartment to sill pipe | 17 Purge line filter |
| 5 Weakening device cut-off valve | 12 Vent pipe hose | 18 Purge line restrictor |
| 6 Float chamber drain valve | 13 Fuel vapour line | 19 Anti 'run-on' solenoid |
| 7 Fuel trap assembly | | |

Fuel evaporation loss control canister

The large centre section of the canister contains the dust-free activated carbon and accommodates nylon filter connectors which connect the canister to the various fuel vapour emission sources on the car (i.e. the carburettor weakener unit, float chamber vent and fuel tank vent).

The function of the activated carbon is to absorb and retain fuel vapour from the carburettor float chambers and fuel tank.

At either end of this section of the canister are thin discs of polyurethane filter.

The lower compartment of the canister is the purge chamber and is connected to the engine induction system via the purge line filter and line restrictor. It is operative whenever the engine is running, and its function is to draw air through the carbon, extracting the fuel vapour for consumption in the engine. The upper section of the canister is open to the atmosphere and houses a polyurethane foam filter to ensure that the air drawn through the carbon is clean.

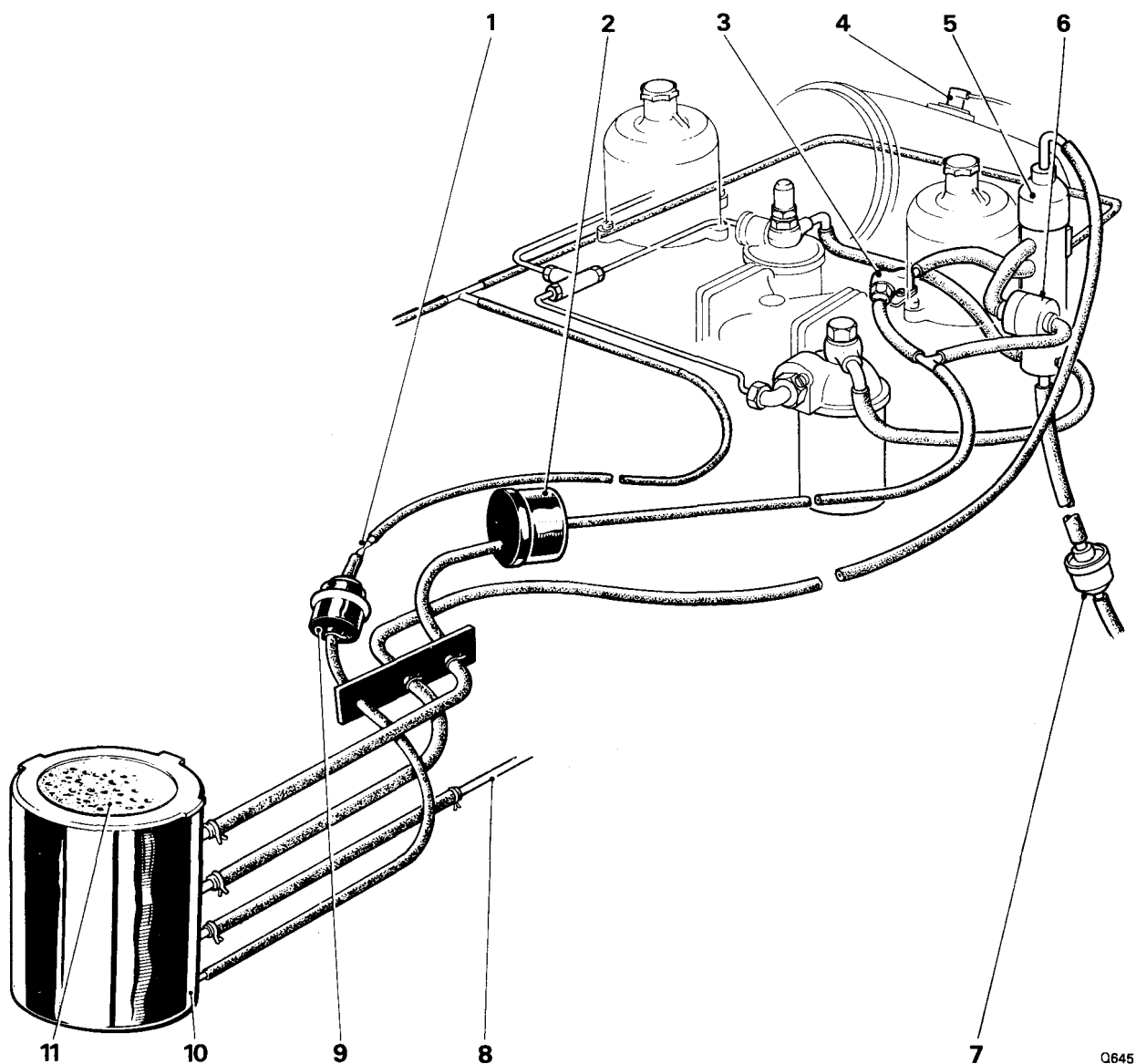


FIG. 3 FUEL EMISSION CONTROL SYSTEM—
ENGINE COMPARTMENT FITTINGS

- | | |
|--|--------------------------------------|
| 1 Purge line restrictor | 7 Float chamber drain valve |
| 2 Anti 'run-on' solenoid | 8 Weakener filter |
| 3 Weakener unit | 9 Vent from fuel trap |
| 4 Bi-metal switch | 10 Purge line filter |
| 5 Fuel receiver and float chamber vent valve | 11 Evaporation loss control canister |
| 6 Weakener cut-off valve | 12 Polyurethane filter |

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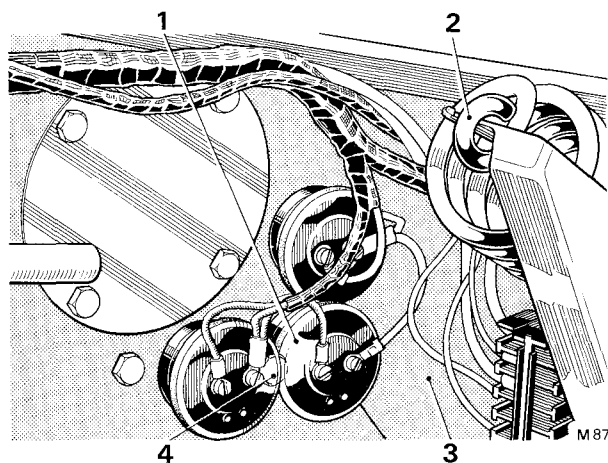


FIG. 4 SETSCREWS SECURING CONTROL CANISTER AND ACCESS COVER

- 1 Blower motor resistances
- 2 Bonnet hinge spring
- 3 Valance
- 4 Securing setscrew (hidden by blower motor resistances)

Polyurethane foam filter element—To renew

It is not necessary to remove the canister from the car in order to extract the polyurethane foam filter element. A detachable cover is situated in the left-hand valance, adjacent to the blower motor resistances (see Fig. 4).

1. Unscrew the four screws retaining the access cover, lift off the cover and withdraw the filter element from the top of the canister.

When fitting a new element, ensure that it is correctly positioned inside the retaining rim of the canister. Fit the access cover and tighten the setscrews.

Fuel evaporation loss control canister —To remove

The canister is mounted under the left-hand front wing and is removed as follows.

1. Remove the front left-hand road wheel as described in Chapter R—Wheel—To remove.

Note Left-hand front is determined when viewed from the driver's seat.

2. Position suitable stands under the raised portion of the car as a safety precaution.

3. Remove the front section of the underwing sheet by unscrewing the $\frac{7}{16}$ in. A/F nut and bolt, and the 16 small screws situated around the sheet.

4. The canister will be clearly visible.

5. Using special pliers (RH 8090), remove the steel retaining clips and detach the four rubber hoses connected to the canister.

6. Inside the engine compartment adjacent to the blower motor resistances (see Fig. 4), locate the six $\frac{7}{16}$ in. A/F setscrews. Unscrew the lower four setscrews and withdraw the canister from beneath the wing.

Fuel evaporation loss control canister —To fit

Fit the canister by reversing the procedure described for removal, noting the following points.

1. Ensure that the rubber hoses are in a good condition and new hose retaining clips are used.

2. Ensure that the underwing sheet is sealed with Bostik Sealing Compound 771.

Purge line

The purge line consists of a rubber hose, passing from the lowest connection on the canister through the valance junction piece to the main suction line on the opposite side of the engine (see Fig. 3). Incorporated into this hose is the purge line filter and restrictor.

When the engine is running, air drawn through the canister filter and carbon picks up the stored fuel vapours and passes them via the hoses, to the induction system at a point just below the choke housing. The restrictor in the line controls the flow rate at between 1,41 cu. m. per hr. and 1,98 cu. m. per hr. (50 cu. ft. per hr. and 70 cu. ft. per hr.) to maintain carburettor metering accuracy and the paper element line filter is fitted to prevent blockage of the restrictor.

Purge line filter—To remove

1. Using special pliers (RH 8090) remove the two steel retaining clips situated on either side of the unit.

2. Slacken the setscrew which secures the nylon retaining clip.

3. Withdraw the component from the clip.

Purge line filter—To fit

Fit the purge line filter by reversing the procedure given for removal noting the following points.

1. Ensure that the rubber hoses are in a good condition and new hose retaining clips are used.

Purge flow rate—To check

Check the purge flow rate as follows.

1. Disconnect the hose from the engine side of the purge line filter and insert a flowmeter and stand assembly in to the line. The flowmeter is a rotameter type capable of measuring 1,41/1,98 cu. m. per hr. (50/70 cu. ft./hr.). Pressure drop across the meter is not to exceed 2 in. Hg.

2. Check the flowmeter reading with the engine idling. The flow reading should be between 1,41 cu. m. per hr. and 1,98 cu. m. per hr. (50 cu. ft./hr. and 70 cu. ft./hr.).

3. If the flow is incorrect fit a new restrictor and repeat Operation 2.

4. Remove the flowmeter and reconnect the hose to the purge line filter.

Purge line restrictor—To remove

1. Hold the restrictor firmly and slide the rubber hosing from both ends.

Purge line restrictor—To fit

Fit the restrictor by reversing the procedure given for removal, noting the following point.

1. Ensure that the purge line restrictor is fitted into the line correctly. This can be determined by comparing the diameters of the restrictor ends with those of the rubber hoses.

Weakener line

The weakener line connects the weakener unit with the evaporation loss control canister (*see Fig. 3*). With the engine running under light throttle opening a depression is created in this line, so allowing air to pass from the canister to the weakener unit.

A filter incorporated in the line prevents blockage of the weakener unit.

During 'hot soak' conditions fuel vapour can pass along this pipe from the float chamber to be stored in the carbon filled canister.

Weakener filter—To remove

1. Slacken the worm drive clip which retains the weakener filter to the bracket.

2. Withdraw the filter.

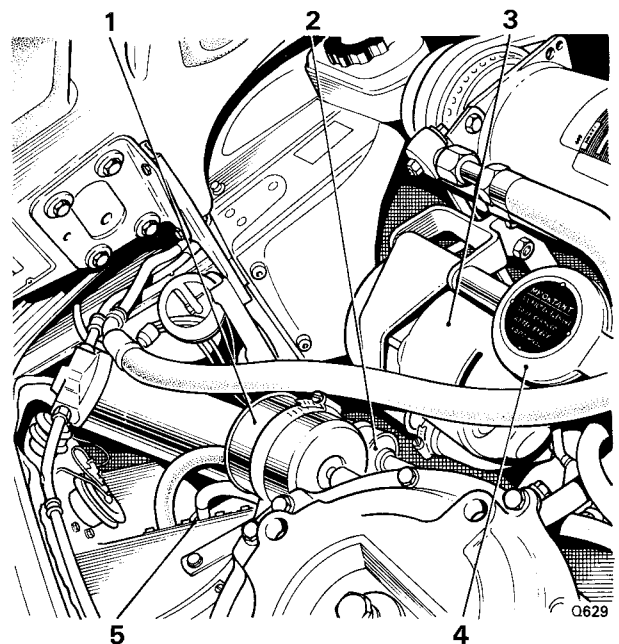


FIG. 5 POSITION OF MIXTURE WEAKENING DEVICE FILTER AND PURGE LINE FILTER

- 1 Weakener filter
- 2 Purge line filter
- 3 Alternator
- 4 Engine oil filler
- 5 Valve connection block

Weakener filter—To fit

Fit the weakener filter by reversing the procedure given for its removal noting the following points.

1. Ensure that the rubber hoses are in good condition.

2. If clips have been fitted previously, ensure that new clips are fitted.

3. Ensure that the inlet pipe for the unit which is off-set from the centre is facing the front of the car and is in its lowest position (*see Fig. 3*).

Float chamber vent line

The carburettor float chambers are vented to the evaporation loss control canister through the float

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chamber vent line (see Fig. 3). Incorporated in the line is a non-return valve which maintains a depression in the float chamber during light throttle operation.

The vent valve cannot be serviced and if its operation is suspect a new vent valve should be fitted.

Float chamber vent valve—To remove

1. Remove the rubber hose connection.
2. Withdraw and discard the retaining split pin.
3. Withdraw the vent valve from the top of the fuel receiver.

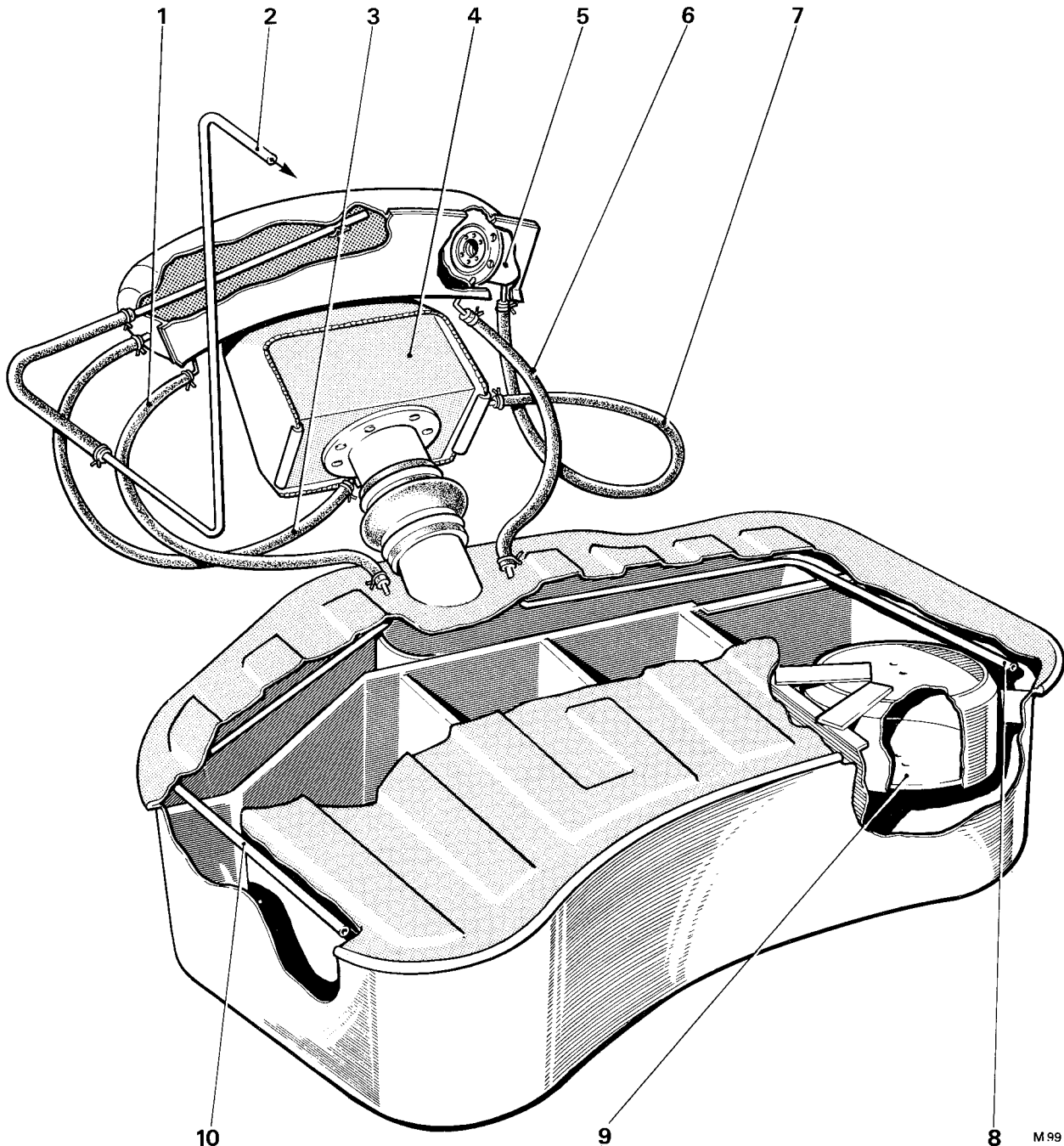


FIG. 6 FUEL EVAPORATION EMISSION CONTROL SYSTEM—FUEL TANK

- | | | |
|---|------------------------------------|-------------------|
| 1 Fuel trap drain | 4 Fuel filler box | 6 Fuel trap drain |
| 2 Connection to evaporation loss control canister | 5 Combined relief and vacuum valve | 7 Valve vent |
| 3 Filler vent neck | | 8 Vent pipe |
| | | 9 Expansion tank |
| | | 10 Vent pipe |

Float chamber vent valve—To fit

Fit the vent valve by reversing the procedure given for its removal noting the following points.

1. Ensure that the rubber 'O' ring at the top of the fuel receiver is in good condition, renew if the slightest doubt exists.
2. Use a new split pin to retain the vent valve in position.

Fuel receiver

The fuel receiver is situated adjacent to the ignition distributor and coil (*see Fig. U23—Page U35*).

The unit should not require removal under normal circumstances. However, should the need arise the ignition distributor, coil and weakener cut-off solenoid valve should all be removed before unscrewing the two $\frac{1}{2}$ in. A/F setscrews which secure the fuel receiver bracket in position.

Fuel tank assembly

The fuel tank assembly consists of the fuel tank, expansion tank and fuel trap assembly (*see Fig. 6*).

The fuel tank is vented from three positions to a fuel trap assembly which is mounted above the fuel filler. One vent is from the fuel filler neck and the other two vents from the fuel tank.

From the fuel trap, a vent line passes under the floor of the car to the evaporation loss control canister.

Fuel tank

The fuel tank (*see Fig. 6*) is similar to that fitted to standard cars, except that two vent pipes 9,525 mm. (0.375 in.) diameter, are rigidly attached to the underside of the fuel tank top plate. The open ends of the vents terminate inside the tank at the front and rear. The outer ends of the two vent pipes terminate adjacent to the fuel filler neck.

A 3,125 litres (5.5 Imp. pt., 6.7 U.S. pt.) capacity expansion tank situated within the main fuel tank inhibits complete filling and provides additional fuel expansion volume to contend with extreme temperature conditions.

When a vehicle is being filled with fuel, automatic cut-off could completely fill the tank leaving only the filler neck, vent connector pipes and fuel trap to accommodate the expansion of the fuel. The expansion

tank is situated in the upper part of the fuel tank and as the fuel level rises above the lower part of the expansion tank it flows inside through the two small holes in the base. Two additional holes in the top of the expansion tank allow air to escape.

At normal rates of filling it takes approximately 3 minutes to fill an empty tank whereas it takes approximately 9 minutes for the levels in both the main and expansion tanks to stabilise. After this time the main tank will have transferred 3,125 litres (5.5 Imp. pt., 6.7 U.S. pt.) to the expansion tank leaving the equivalent air space in the main tank for expansion.

Fuel tank—To remove

To remove the fuel tank proceed as described in Section K1—Fuel System (Early Cars) noting that Operation 6 should be omitted and Operation 6 as follows should be carried out.

6. Using a pair of special pliers (RH 8090), remove the steel clips from the two rubber hoses situated one on either side of the fuel filler neck.

Withdraw the rubber hoses from the pipes.

Fuel tank—To fit

Note Prior to assembly, apply 'Hylomar' sealing compound to the fuel tank filler head union and tube assembly. Also spray 'Hylomar' on both sides of the fuel tank level unit joint.

Fit the fuel tank by reversing the procedure given for its removal noting the following points.

1. Ensure that the two rubber vent hoses are in good condition.
2. New steel clips should be used to secure the rubber vent hoses to the metal pipes on either side of the filler neck base.

Fuel trap assembly

The fuel trap (*see Fig. 6*) has a capacity of 1,87 litres (3.25 Imp. pt., 4.00 U.S. pt.).

The fuel trap acts as a liquid separator and prevents liquid fuel from being transferred to the control canister under severe driving manoeuvres when the fuel tank is full or during expansion of the fuel at high ambient temperatures.

The tank vent pipes are fed to the lower ends of the banana-shaped fuel trap. These pipes also serve as drain pipes for any fuel in the trap.

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The filler tube is vented into the forward end of the fuel trap.

An outlet pipe is attached to the interior of the fuel trap and the other end is connected via metal and rubber pipes to the evaporation loss control canister.

A combined relief and vacuum valve in the fuel trap prevents any excessive pressure build-up due to vaporisation, or depression as the fuel is consumed, should the vent line to the evaporation loss control canister become blocked.

Fuel trap assembly—To remove

1. Disconnect the battery.
2. Remove the carpet and underlay in the luggage compartment.
3. Remove the tool kit (*see Chapter R—Wheels and Tyres, Fig. R10*).
4. Remove the fuel filler door release ring.
5. Unscrew the five 'Phillips' headed screws from the side carpet; four secure the brackets retaining the tool kit and the fifth is positioned at the front of the side carpet.
6. Release the 'Tenax' clip situated adjacent to the rear lamps access point.
7. Remove the side carpet and the carpet covering the fuel filler neck.
8. Using special pliers (RH 8090) remove the steel clips from the rubber hoses. Withdraw the hoses from their respective pipes.
9. Unscrew and remove the three 2 B.A. setscrews securing the fuel trap assembly.
10. Slowly move the fuel trap rearward and downward until the lower end can be turned into the luggage compartment and the assembly withdrawn from the car.

Fuel trap assembly—To fit

Fit the fuel trap assembly by reversing the procedure given for its removal noting the following points.

1. Ensure that the rubber hose connections are in good condition.
2. Ensure that new steel retaining clips are used.

Fuel trap relief and vacuum valve

—To remove

1. Remove the fuel trap assembly as described in Fuel trap assembly—To remove.
2. Unscrew the retaining setscrews, taking care not to lose the washers.
3. Withdraw the relief and vacuum valve.

Fuel trap relief and vacuum valve—To fit

Fit the relief and vacuum valve by reversing the procedure given for its removal, noting the following points.

1. Ensure that the joint faces of the relief and vacuum valve and fuel trap assembly are clean and in good condition.
2. Fit a new gasket.

Fuel evaporation emission control system

—To leak check

To test the fuel evaporation emission control system and pipes (i.e. fuel tank, fuel trap assembly and pipes, etc.) for leaks, proceed as follows.

1. Blank off the lower end of the relief valve hose (*see Fig. 2 item 8*).
2. Connect an air pressure supply (with a manometer tapping) to the lower end of the fuel trap to boot pipe (*item 9*) in place of the vent pipe hose (*item 12*).
3. Using a pressure regulator apply a pressure of 0,105 kg/sq. cm. (1.5 lb/sq. in.) to the system and close the pressure supply.
4. Check manometer after 5 minutes. If the level has fallen by more than 12,7 mm. (0.5 in.) check all joints including petrol level transmitter to tank joint with soap solution.
5. After rectifying any leaks repeat the pressure test. When the system is satisfactory connect the fuel trap to boot pipe (*item 9*) and the boot to sill pipe (*item 11*) using the rubber vent pipe hose (*item 12*).
6. Detach the canister to wing hose (*item 15*) from the evaporation loss control canister and connect to the test equipment. Repeat Operation 3 to the same acceptance limits.
7. Rectify any leaks and repeat the pressure test. If the system is now satisfactory connect the canister to wing hose (*item 15*) to the evaporation loss control canister.

LUBRICATION AND MAINTENANCE

In addition to the normal Service Schedules the following servicing must be carried out.

It is important that items marked with an asterisk (*) in the Service Schedules are carried out during the Warranty period by a Distributor or Retailer at the time specified in order to comply with the Rolls-Royce Motors Warranty and relevant Emission Control Regulations.

**EVERY 20 000 km. (12 000 MILES) OR
12 MONTHS SERVICE WHICHEVER
IS THE EARLIER**

***Fuel evaporation emission control system**

Check the condition of the pipes and connections.

**INITIAL 5 000 km. (3 000 MILES) OR
3 MONTHS SERVICE WHICHEVER
IS THE EARLIER**

**EVERY 40 000 km. (24 000 MILES) OR
2 YEARS SERVICE WHICHEVER
IS THE EARLIER**

***Fuel evaporation emission control system**

Check the purge rate; this should be between 1,41 cu. m. per hr. and 1,98 cu. m. per hr. (50 cu. ft. per hr and 70 cu. ft. per hr.) at 600 r.p.m. in neutral. Pressure test the fuel tank and evaporation loss line and if necessary rectify any leaks.

***Fuel evaporation emission control system**

Renew the foam filter element in the evaporation loss control canister. Check the purge rate; this should be between 1,41 cu. m. per hr. and 1,98 cu. m. per hr. (50 cu. ft. per hr. and 70 cu. ft. per hr.) at 600 r.p.m. in neutral. Renew the purge line filter if necessary.

WORKSHOP TOOLS

Tool Number Description

RH 8090 Pliers—Wire Hose Clips

Chapter U

Section U10

SUPPLEMENTS

No. 5 Japan 1975

Printed in Great Britain

March 1975

Workshop personnel should refer to Chapter U (Part 2) for servicing information. However, the changes applicable to the 1975 model year cars and the relevant service details are given in this Supplement.

Rolls-Royce Silver Shadow and Bentley T Series motor cars and Rolls-Royce and Bentley Corniche motor cars destined for Japan and built to the 1975 specification, have the following changes.

Changes to the original build specification retained from the 1974 model.

1. Engine fan diameter increased to 50,80 cm. (20 in.).
2. Lower engine oil dipstick fitted.
3. Transmission modulator and T.V. vacuum pipe changed.
4. Choke solenoid held on during engine cranking.
5. Two vane air pump fitted to air injection system.
6. Exhaust gas recirculation system fitted (single valve system).
7. Exhaust gas recirculation heat shields fitted.
8. Under bonnet heat protection plates fitted.

Changes from the present 1974 build specification.

9. Engine compression ratio reduced to 7:3:1.
10. Air injection system with diverter valve but without external power mode function.
11. Carburetter needles changed and overrun valves fitted to throttle plates.
12. Contra-rotating throttles and new throttle linkage.
13. Sleeved choke butterfly housing.
14. Modified choke stove pipe from exhaust manifold.
15. Modified carburetter 'tee' piece.
16. Lucas Mk. II Opus ignition distributors.
17. New high tension (H.T.) harness.
18. New coil and ballast resistance.
19. Transmission with improved shift qualities.
20. Paper element fitted to air cleaner/silencer.
21. Metal temperature switch in 'B' bank cylinder head.
22. Exhaust tailpipe outlet modified.
23. Speedometer scale lined in red above 100 k.p.h., a buzzer will sound inside the car when it approaches this speed.
24. Seat belts fitted.
25. Modified head restraints.

T.S.D. 2476

Chapter U

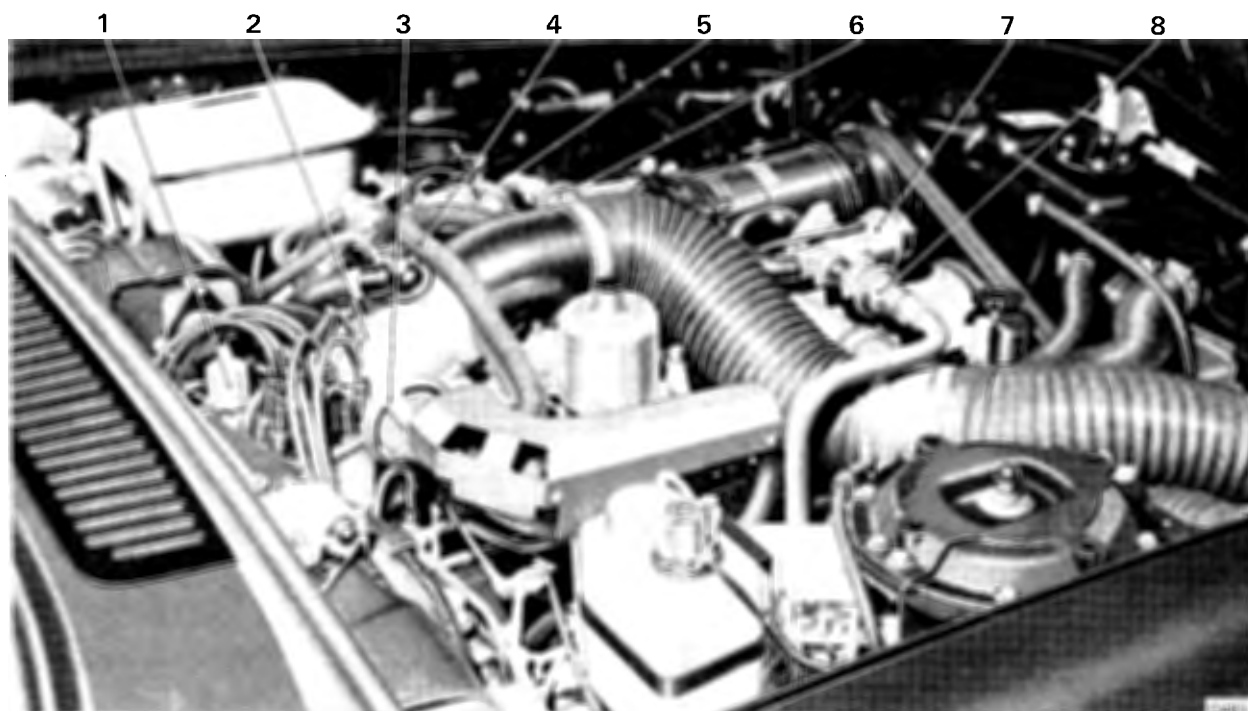


FIG. 1 VIEW INSIDE ENGINE COMPARTMENT (From Right-hand side of Car)

- | | |
|--|------------------------|
| 1 Fuel receiver and float chamber vent valve | 5 'B' bank carburetter |
| 2 Weakener system cut-off switch | 6 Check valve |
| 3 Exhaust gas recirculation valve | 7 Air diverter valve |
| 4 Exhaust gas recirculation distribution pipes | 8 Check valve |

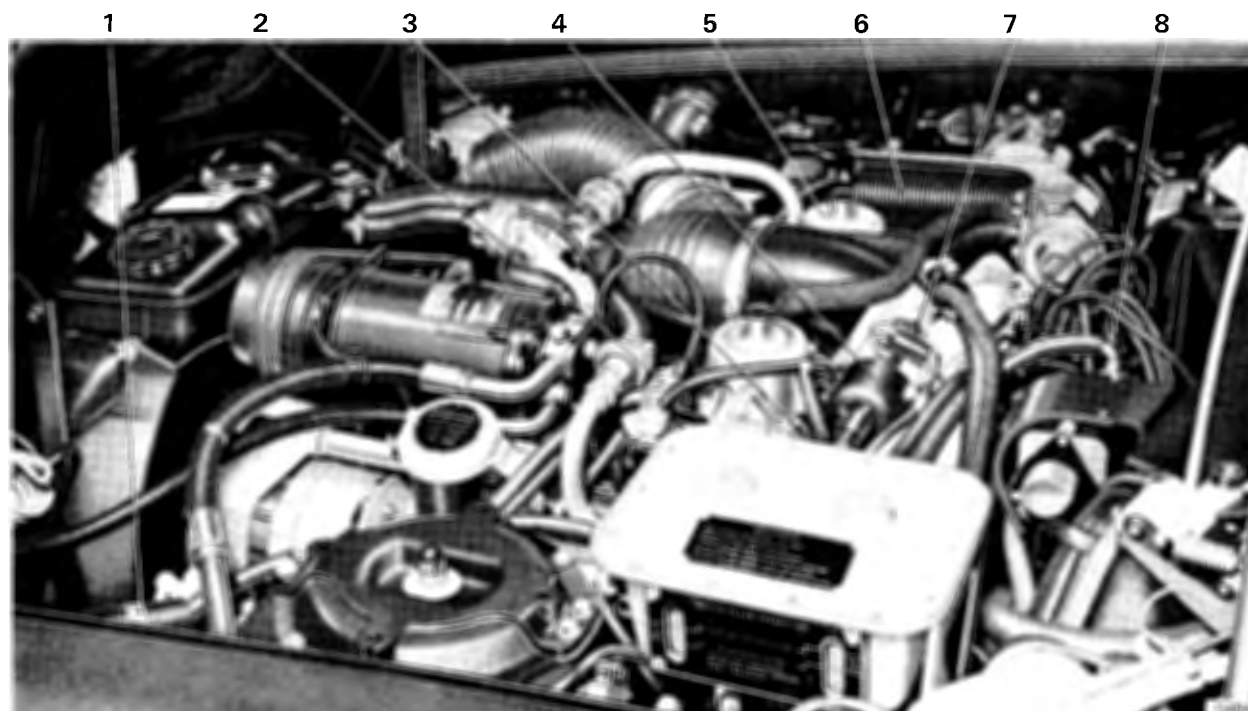


FIG. 2 VIEW INSIDE ENGINE COMPARTMENT (From Left-hand side of Car)

- | | |
|--------------------------------------|------------------------------------|
| 1 Weakener filter | 5 'A' bank carburetter |
| 2 Anti 'run-on' solenoid | 6 Exhaust gas recirculation cooler |
| 3 Exhaust gas recirculation solenoid | 7 Choke solenoid |
| 4 Choke thermo-coil housing | 8 Ignition distributor |

EXHAUST EMISSION CONTROL SYSTEM

AIR INJECTION SYSTEM

Air injection system relief valve

The relief valve located in the discharge cavity of the air pump is changed in 1975 model year cars and is as follows.

Air pump relief valve

A spring loaded relief valve is located within the diverter valve housing and permits excess air to bypass the air injection system when the check valves are closed. The by-pass system prevents damage to the pump vanes and excessive exhaust temperatures under extreme operating conditions.

Air diverter valve

The air diverter valve is located at the front of the engine above the air pump (*see Fig. 2*) and performs the following important function in addition to housing the pressure relief valve for the air pump.

(i) Backfire protection (*see Fig. 3*)

Following rapid throttle closure, the inlet manifold pressure drops suddenly, causing fuel to be vaporised from the manifold walls which results in a mixture too rich to burn in the cylinders. This mixture combined with the air injected into the exhaust ports could cause backfiring.

To prevent backfiring, the diverter valve, triggered by manifold depression diverts the injected air from the exhaust ports for a short period of time.

Air diverter valve—To check

The air diverter valve is a non-serviceable component. If the operation of the component is suspect the

following checks should be carried out before it is replaced.

(i) Relief valve failure or shuttle seizure

1. Ensure that the vehicle is in Neutral and the parking brake firmly applied.
2. Start and run the engine at 2 000 r.p.m.
3. Ensure that air **does not** escape from the air diverter valve exhaust ports, situated around the body of the diverter valve (*see Fig. 3*).
4. Stop the engine.

Should air escape from the air diverter valve exhaust ports under these test conditions, the assembly must be replaced with a new component as either the relief valve has failed, or the shuttle has seized.

A failure of this nature would probably be accompanied by a complaint of excessive noise from within the engine compartment, due to the pressurised air escaping from the air diverter valve exhaust ports.

Air diverter valve—To remove

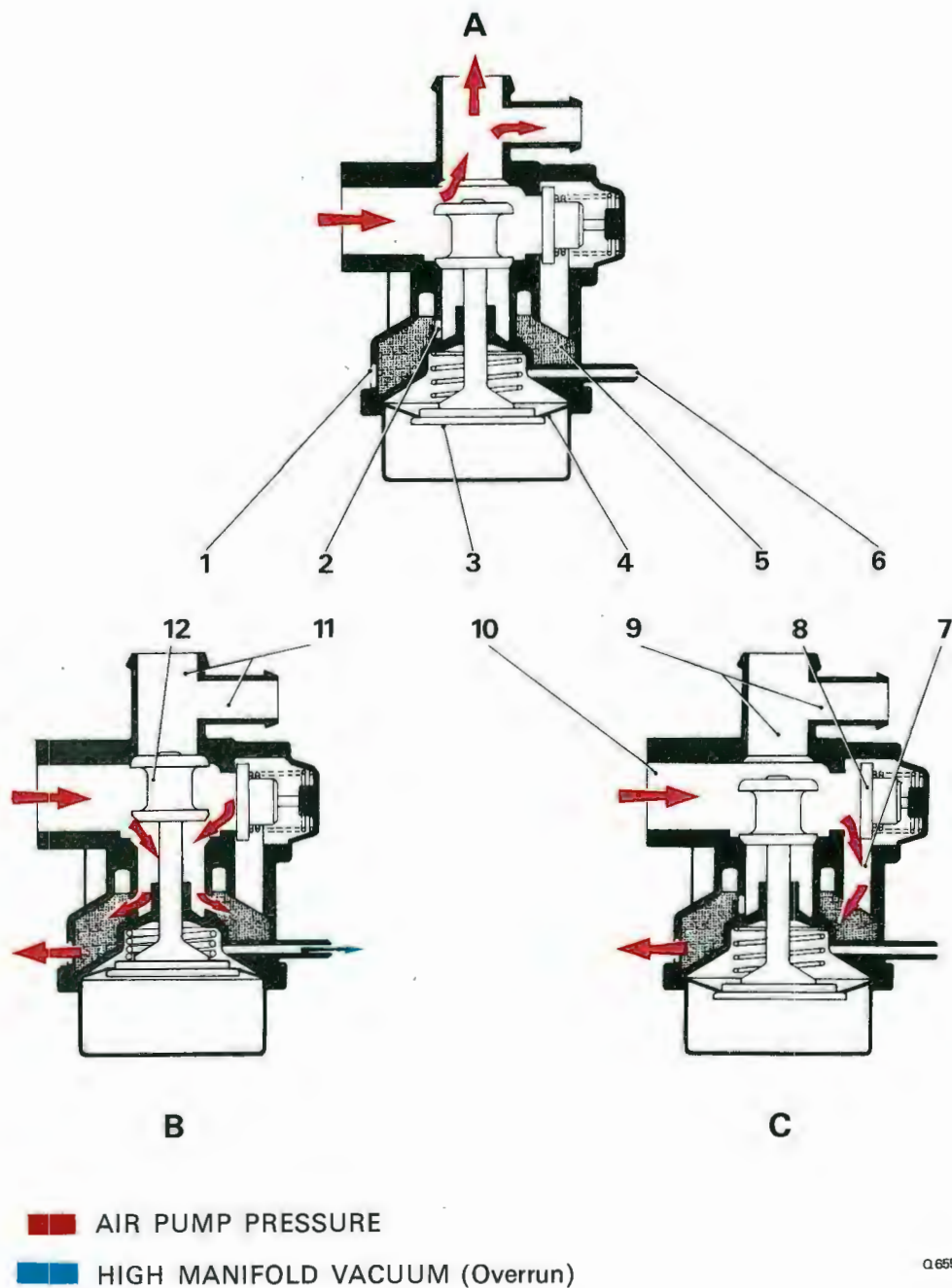
Before commencing to remove the air diverter valve observe the following points.

1. When disconnecting the various hoses ensure that each is suitably labelled to assist identification when assembling.
2. Ensure that all open ends of pipes and hoses are suitably blanked off to prevent the ingress of dirt, etc.

To remove the air diverter valve proceed as follows

1. Unscrew the three worm drive clips which secure the three larger diameter rubber hoses to the air diverter valve and withdraw the hoses. Two of the hoses connect to their respective air manifold check valves and the third hose to the air pump.

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FIG. 3 AIR DIVERTER VALVE

- | | |
|---|---|
| <ul style="list-style-type: none"> A Normal operation B Backfire protection C Relief valve operation 1 Exhaust to atmosphere 2 Exhaust to internal silencer 3 Timing valve 4 Lower diaphragm | <ul style="list-style-type: none"> 5 Internal silencer 6 Manifold vacuum signal 7 Excess air 8 Relief valve 9 Valve outlets restricted 10 Valve inlet 11 Valve outlets to air manifolds 12 Metering valve |
|---|---|

2. Withdraw the small diameter rubber hose from the air diverter valve.
3. Using a $\frac{7}{16}$ in. A/F spanner unscrew and remove the two nuts which secure the air diverter valve to the mounting plate. Collect the two washers.
4. Hold the diverter valve and withdraw the two bolts from the mounting plate, taking care not to lose the washer situated under the head of each bolt.
5. Remove the air diverter valve together with the spacer plate and gasket.

3. Always ensure that the spacer plate is fitted with the spigot projecting through the mounting plate into the hose which connects to the air pump and that the gasket is fitted to the opposite side of the mounting plate from the spigot.

For details of the remainder of the air injection system see **Workshop Manual T.S.D. 2476—Chapter U (Part 2)**.

Air diverter valve—To fit

Fit the air diverter valve by reversing the procedure given for removal, noting the following points.

1. Ensure that all joint faces are clean.
2. Ensure that the gasket is in a good condition.

EXHAUST GAS RECIRCULATION SYSTEM

This system is similar to the system detailed in Chapter U except that the 'A' bank exhaust manifold has the exhaust gas recirculation system take-off flange above the manifold as shown in Figure 5.

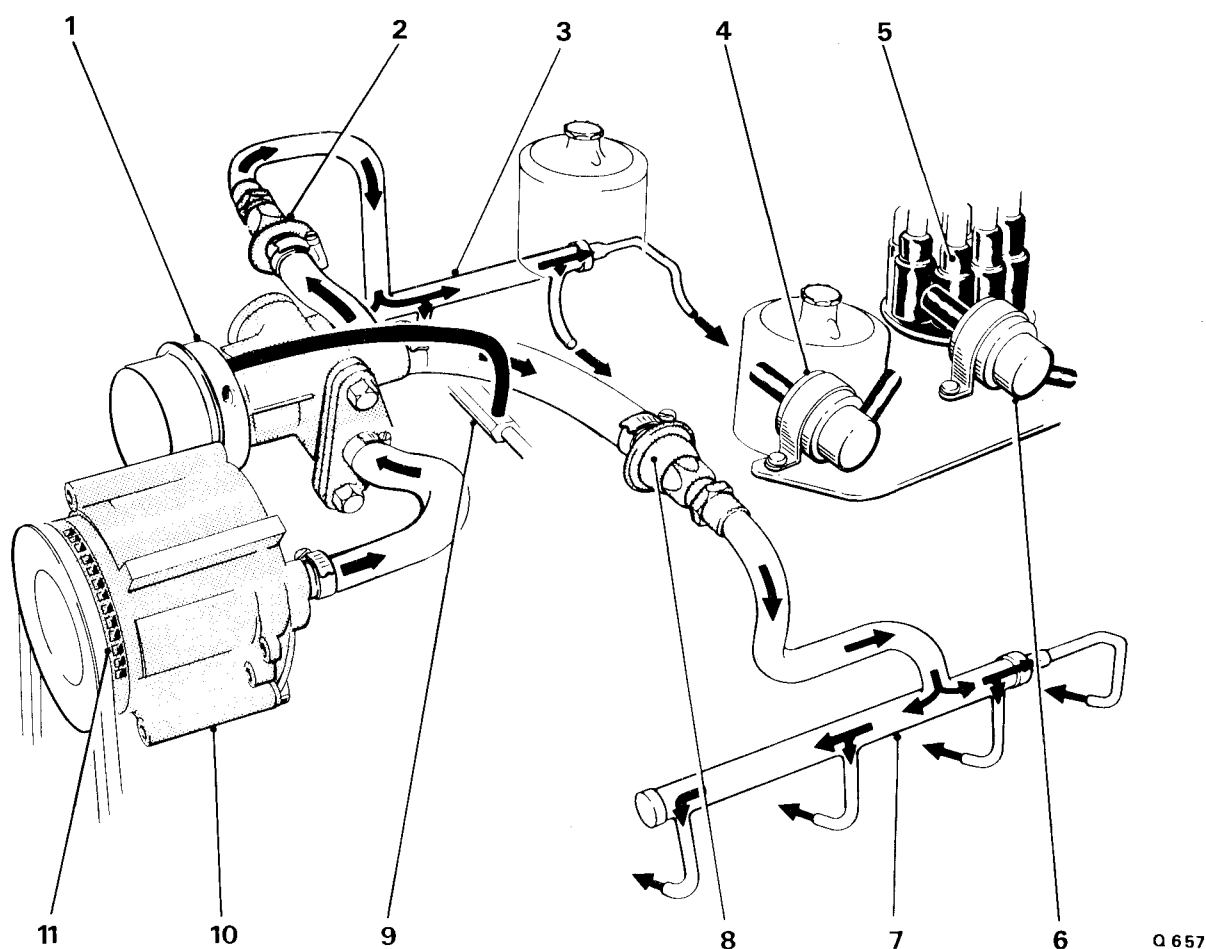


FIG. 4 AIR INJECTION SYSTEM

- | | | |
|--------------------------|--------------------------------------|--------------------|
| 1 Air diverter valve | 5 Ignition distributor | 8 Check valve |
| 2 Check valve | 6 Exhaust gas recirculation solenoid | 9 Vacuum manifold |
| 3 'A' bank air manifold | 7 'B' bank air manifold | 10 Air pump |
| 4 Anti 'run-on' solenoid | | 11 Air pump intake |

Chapter U

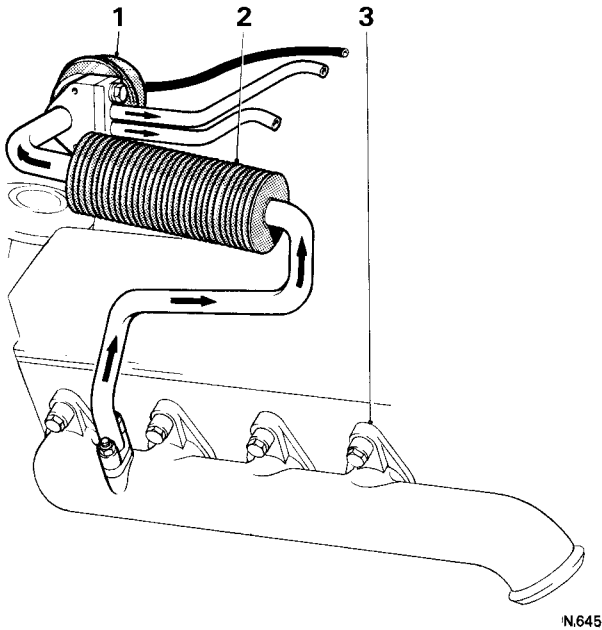


FIG. 5 EXHAUST GAS RECIRCULATION SYSTEM PIPE RUN FROM EXHAUST MANIFOLD TO EXHAUST GAS RECIRCULATION VALVE

- 1 Exhaust gas recirculation valve
- 2 Exhaust gas recirculation cooler
- 3 'A' bank exhaust manifold

The exhaust gas recirculation system cooler is situated above the engine on the 'A' bank side and a large heat shield is fitted around the cooler as shown in Figure 5.

As a result of these changes the pipe run between the exhaust manifold and cooler has changed.

CAUTION

When carrying out any work in or around the area of the exhaust gas recirculation system cooler (e.g. when checking the torque converter transmission fluid level), avoid contact with the various components and pipes of the system as they contain **hot** exhaust gases when the engine is running.

For details of the remainder of the exhaust gas recirculation system see **Workshop Manual T.S.D. 2476 —Chapter U (Part 2)**.

FUEL EVAPORATION EMISSION CONTROL SYSTEM

Purge line

The purge line consists of a rubber hose, passing from the lowest connection on the canister through the valance junction piece to the vacuum manifold. Incorporated into this hose is the purge line filter and restrictor.

When the engine is running, air drawn through the canister filter and carbon picks up the stored fuel vapours and passes them via the hose, to the induction manifold. The restrictor in the line controls the flow rate at between 1,41 cu. m. per hr. and 1,98 cu. m. per hr. (50 cu. ft. per hr. and 70 cu. ft. per hr.) to maintain carburettor metering accuracy and the paper element line filter is fitted to prevent blockage of the restrictor.

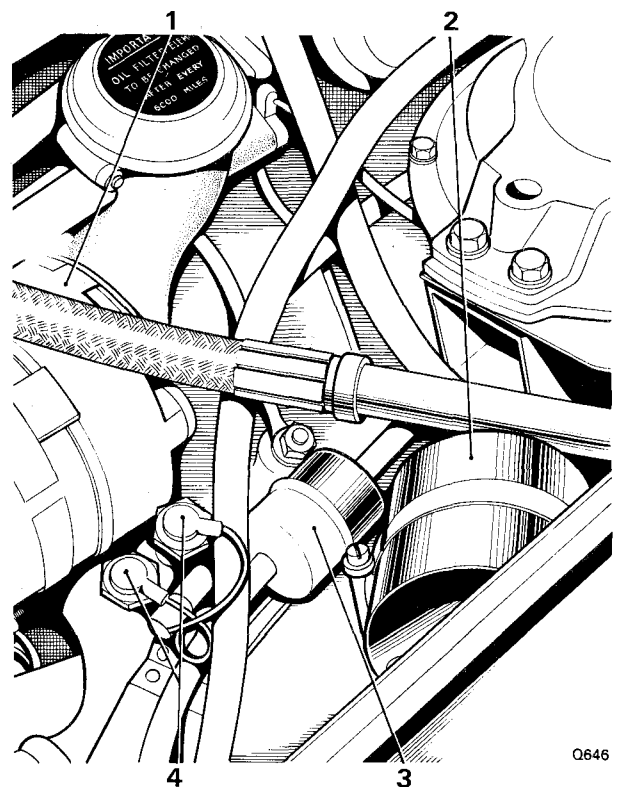
Purge line filter—To remove

1. Using special pliers (RH 8090) remove the two steel retaining clips situated on either side of the unit.
2. Slacken the setscrew which secures the nylon retaining clip.
3. Withdraw the component from the clip.

Purge line filter—To fit

Fit the purge line filter by reversing the procedure given for removal noting the following points.

1. Ensure that the rubber hoses are in a good condition and new hose retaining clips are used.



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FIG. 6 POSITION OF MIXTURE WEAKENING DEVICE FILTER AND PURGE LINE FILTER

- 1 Alternator
- 2 Weakener filter
- 3 Purge line filter
- 4 Hydraulic fluid accumulator pressure switches

Chapter U

CRANKCASE EMISSION CONTROL SYSTEM

Crankcase emissions are controlled by a recirculatory closed breather system (see Fig. 7).

An insulated draught tube connects the crankcase via the oil filler which is fitted with a sealed cap, to the choke housing upstream of both the choke butterfly and the carburetters. A flame trap capsule containing three wire mesh discs is fitted in a housing at the crankcase end of the draught tube. Engine emission (blow-by) is drawn into the induction system via the draught tube, due to the depression in the choke housing.

Maintenance

1. The flame trap fitted to the breather pipe should be cleaned in the following manner, at the specified mileage.

2. Unscrew the setscrew securing the breather pipe connection to the oil filler pedestal; withdraw the connection from the pedestal (slight resistance may be felt due to the rubber 'O' ring connections).

3. Withdraw the connection from the pipe flange and collect the restrictor.

4. Wash the flame trap assembly in clean petrol, then dry with a high pressure air line. The flame trap assembly consists of 3 gauzes crimped together as shown in Figure 7.

5. To clean the adapter fitted to the choke housing, remove the single setscrew from the breather pipe end connection and detach the pipe.

6. Clean the adapter fitted to the choke housing and ensure that the holes in the adapter are clear.

7. Assembly of the flame trap and breather pipe is in the reverse order, ensuring that the 'O' rings are in good condition.

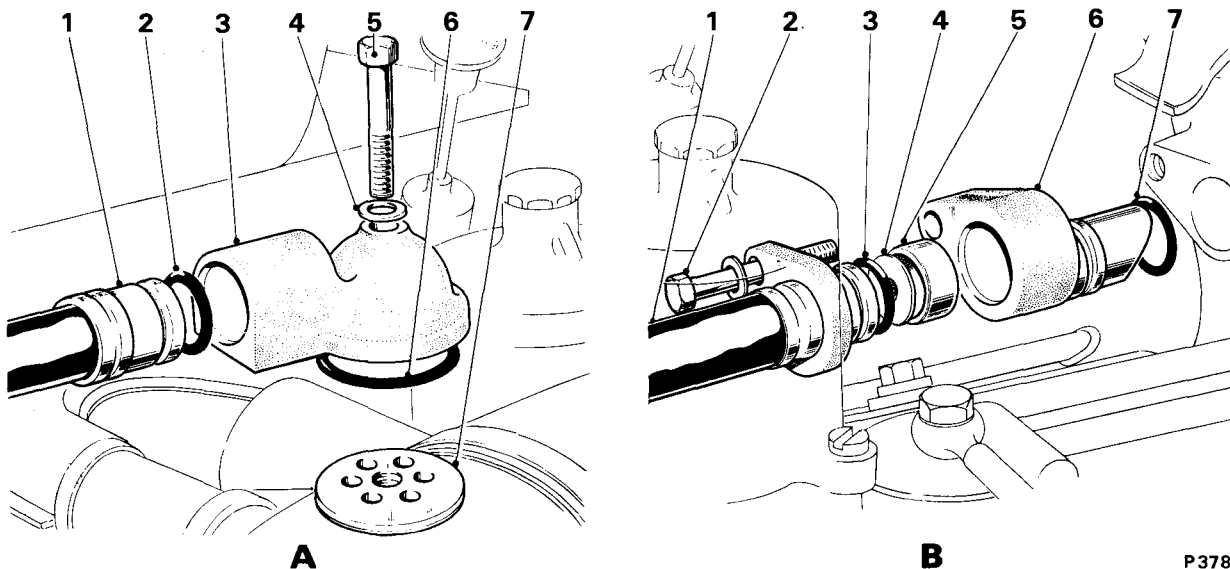


FIG. 7 EXPLODED VIEW OF CRANKCASE EMISSION CONTROL PIPE

Diagram A
 1 Pipe
 2 'O' ring
 3 Connection
 4 Washer
 5 Setscrew
 6 'O' ring
 7 Adapter

Diagram B
 1 Pipe
 2 Setscrew
 3 'O' ring
 4 Restrictor
 5 Flame trap
 6 Connection
 7 'O' ring

THE CARBURETTERS AND AUTOMATIC CHOKE SYSTEM

CARBURETTER

Data

Carburetters	Two S.U. HD8 diaphragm type
Choke size	5.08 cm. (2.00 in.)
Jet size—	
spring loaded needle type	2.44 mm. (0.100 in.)
Jet needle—	
spring loaded type ..	BDA
Carburetter—	
air valve piston spring	Red/Blue

CARBURETTER MIXTURE WEAKENING DEVICE

Description

In addition to the description given on pages U24 and U25, the following information is applicable.

Anti-diesel device (anti 'run-on' solenoid)

The use of low octane fuel causes the engine to 'diesel' (i.e. continue to run-on after the ignition has been switched off) when it is hot. To prevent this from happening an anti 'run-on' solenoid valve is fitted into the weakener signal line. When the ignition is switched off this valve opens and connects the weakening system to the induction manifold thus creating a high float chamber depression which cuts off the fuel supply.

Carburetter overrun valves

During overrun (i.e. when decelerating with the throttles closed), insufficient mixture is supplied to the engine to maintain satisfactory combustion. The overrun valves alleviate this condition by allowing some mixture to pass through the throttle plates (butterflies) at high inlet manifold depressions.

An overrun valve consists of a small disc retained in each throttle plate by a spring loaded plunger. Under normal conditions the disc is seated against the throttle plate. When the throttle is suddenly closed, the increased inlet manifold depression lifts the disc from its seating and allows a metered quantity of air/fuel mixture to pass through the throttle plate.

The action of the overrun valves maintains satisfactory combustion on overrun, thus reducing hydrocarbon emissions.

After the sudden closure of the throttles and as soon as the manifold depression falls, the overrun valve disc returns to its seat on the throttle plate.

Throttle damper

The throttle damper prevents rapid throttle closure which would suddenly drop the inlet manifold pressure causing vapourisation of fuel from the manifold walls and a sudden increase in mixture strength.

Temperature controlled air intake

To ensure rapid warm-up and improve control of the air/fuel ratio a temperature controlled air intake is fitted.

A vacuum operated blending valve attached to the air cleaner assembly is controlled by a thermal sensor in the air intake elbow. This valve blends hot air from a pick-up point (scoop) adjacent to the exhaust manifold with cold air from under the front wing; thus maintaining a constant temperature of the intake air as it enters the carburetters.

Throttle stop vacuum actuator assembly

The throttle stop vacuum actuator assembly is not fitted to cars produced to the 1975 specification.

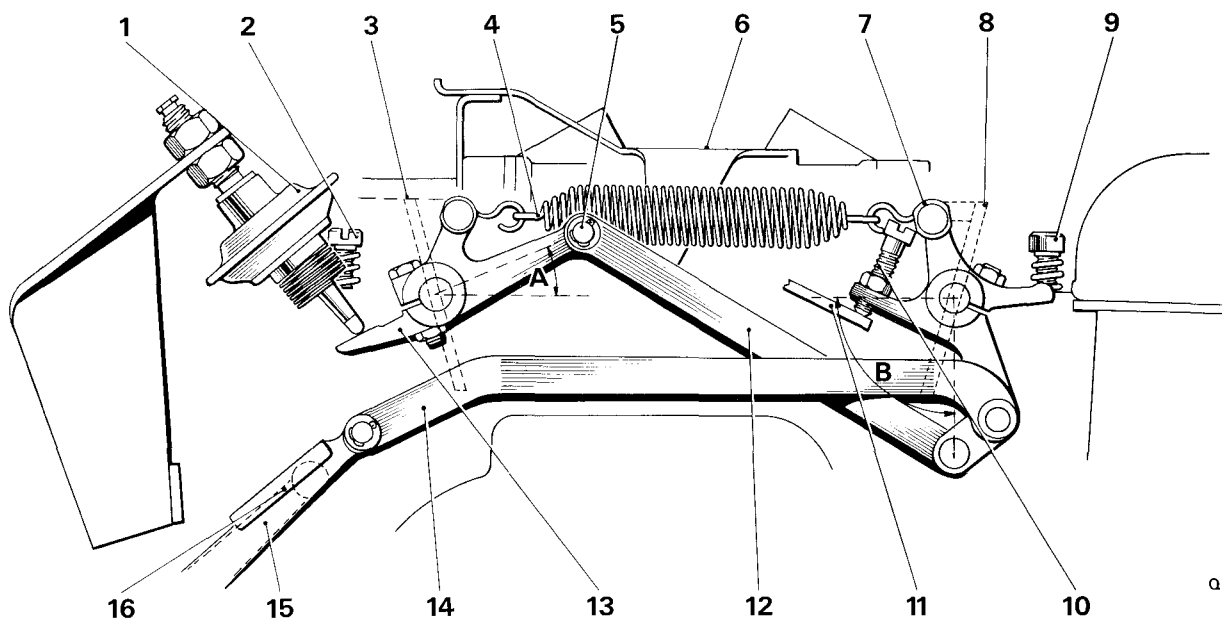
Chapter U

Contra-rotating throttles—To fit and set (see Fig. 8)

1. Assemble 'A' bank and 'B' bank throttle levers (items 7 and 13) onto the carburetter spindles.
2. Fit the setting jig (RH 8880) into position on the throttle levers.
3. Fully close 'B' bank carburetter butterfly (item 8).
4. Tighten the pinch bolt securing 'B' bank throttle lever.
5. Fully close 'A' bank carburetter butterfly (item 3).
6. Tighten the pinch bolt securing 'A' bank throttle lever.
7. Fit the throttle spring (item 4) to the throttle levers.
8. Remove the setting jig from the throttle levers.
9. Fit the cross link (item 12) and the eccentric throttle adjuster (item 5) onto the throttle levers, ensuring that both throttle butterflies are closed when adjusting and tightening the eccentric adjuster.

Note The eccentric pin should be set in the lowest position possible.

10. Ensure that the tang of the throttle guard (item 6) has a clearance of between 1,27 mm. (0.050 in.) and 1,78 mm. (0.070 in.) with the cross link and also that the tang does not foul the throttle spring. If necessary bend the tang to give these clearances.
11. Check that the throttle linkage moves freely.
12. Fit the idle stop screw (item 10) and adjust until it just contacts the stop bracket (item 11) with the throttle butterflies remaining in the closed throttle position.
13. Screw down the idle stop screw $\frac{1}{2}$ turn and tighten the lock-nut.
14. Screw both of the carburetter volume screws (items 2 and 9) fully in.
15. Fit the throttle damper (item 1) with the damper spindle compressed 4,75 mm. (0.187 in.) when throttle lever (item 13) is in the closed position. Ensure that the damper rod contacts the throttle lever centrally 5,1 mm. (0.20 in.) from the outer edge.
16. Connect the drive link (item 14) to the manifold shaft lever (item 15).
17. Operate the linkage to ensure free movement.
18. With the throttles in the closed position check that the 'A' bank control shaft to control rod lever



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FIG. 8 CONTRA-ROTATING THROTTLE CONTROLS

- | | |
|---------------------------------------|--|
| A=Reference angle 22° | 8 'B' bank carburetter throttle plate |
| B=Reference angle 90° | 9 'B' bank carburetter volume screw |
| 1 Throttle damper | 10 Idle stop screw |
| 2 'A' bank carburetter volume screw | 11 Closed throttle bracket |
| 3 'A' bank carburetter throttle plate | 12 Cross link |
| 4 Throttle spring | 13 'A' bank carburetter throttle lever |
| 5 Eccentric throttle adjuster | 14 Drive link |
| 6 Throttle guard | 15 Front manifold shaft lever |
| 7 'B' bank carburetter throttle lever | 16 Rear manifold shaft lever |

(item 16) on the rear of the manifold shaft is in line with the front manifold shaft lever (item 15). Tighten the securing bolts on both levers.

19. Operate the mechanism; check for freedom of movement within the linkage and also clearance with the various engine components.

20. To set the remainder of the linkage from the control rod lever on the rear of the manifold shaft to the accelerator pedal refer to Chapter T—Part 2.

Tuning procedure

The tuning procedure is given on page U32 with the following changes.

1. When blanking off the hot idle compensator feed drilling refer to Figure 9 in this Supplement.
2. The idle CO reading referred to should be 3.0% to 4% and not 5.0% to 5.5%.

Throttle damper plunger—To set

1. Move the cold start 'fast-idle' to the off position.
2. Slacken both nuts securing the throttle damper to its bracket. Back off the nuts until they are well clear of the bracket.
3. Press the damper towards the 'A' bank throttle lever until the damper is fully compressed and the lever is just clear of the throttle stop screw.
4. Screw the lower securing nut until it is 0.63 mm. (0.025 in.) clear of the underside of the bracket. Release the damper and tighten the upper securing nut.
5. Ensure that the damper spindle is at the maximum possible radius, whilst maintaining adequate contact with the throttle lever pad. This can be achieved by adjusting the angle of the bracket.

Automatic choke stove pipe—To check

To check the stove pipe for any blockage, carry out the following procedure.

1. Start the engine and run until normal operating temperature is attained.
2. Disconnect the union at the butterfly housing (see Fig. 10) and connect a flowmeter to the pipe via connector RH 8837. The flowmeter consists of a

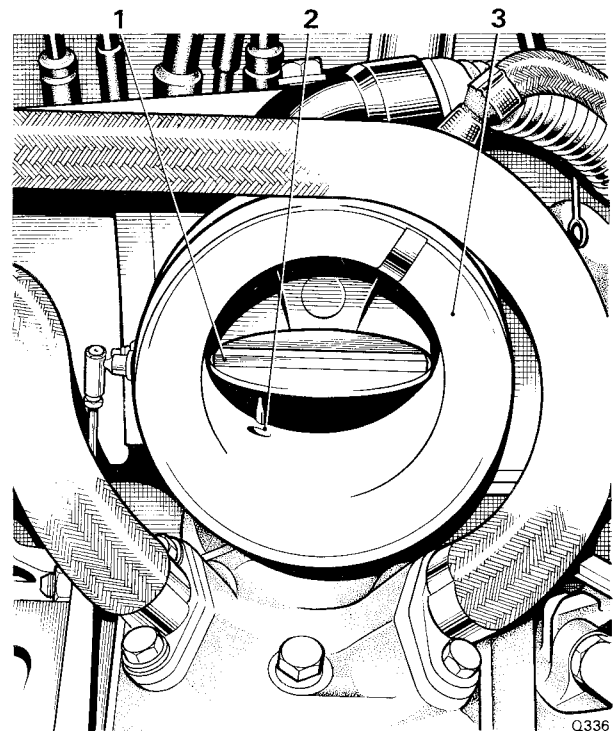


FIG. 9 HOT IDLE MIXTURE COMPENSATOR FEED

- 1 Choke butterfly
- 2 Hot idle compensator feed
- 3 Butterfly housing

calibrated orifice (RH 8097) and a water manometer capable of reading up to 88.9 cm. (35 in.).

3. Start the engine and run at idle speed (i.e. 600 r.p.m.); observe the manometer reading which should be between 40.6 cm. (16 in.) and 50.8 cm. (20 in.).

4. If the manometer reading is below 16 in. (40.6 cm.), stop the engine, remove the choke stove pipe and stove assembly to check for leaks.

5. Fit the choke stove pipe and stove assembly, start the engine and again observe the manometer reading at idle speed.

6. Disconnect the flowmeter assembly and fit the choke stove pipe to the connection on the butterfly housing.

'Fast-idle' cam—To set

1. Fit the 'fast-idle' mechanism; do not tighten the 'fast-idle' lever clamping bolt.

Chapter U

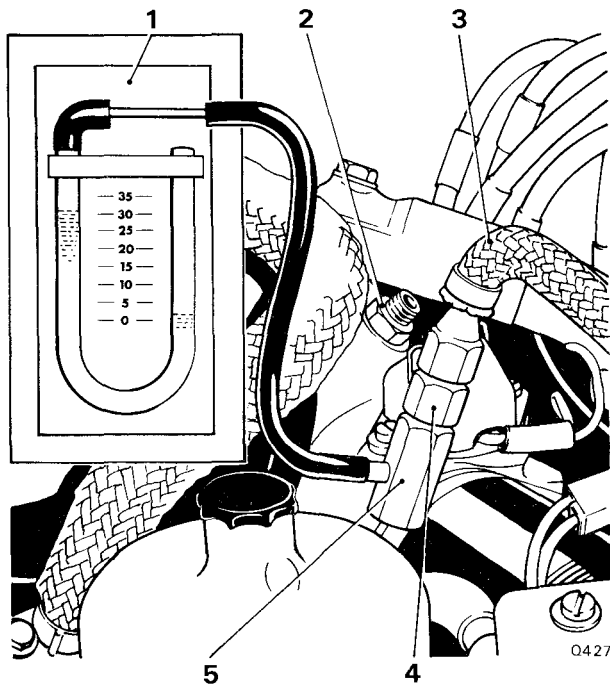


FIG. 10 CHECKING THE CHOKE STOVE PIPE DEPRESSION

- 1 Manometer
- 2 Choke stove pipe connection
- 3 Choke stove pipe
- 4 Adapter RH 8837
- 5 Restrictor RH 8095

2. Ensure that the 'fast-idle' adjustment screw is directly over the cam.

3. With the throttles closed, insert a 2,54 mm. (0.100 in.) diameter rod between the top of the 'fast-idle' cam and the boss under the 'fast-idle' adjustment screw. Tighten the clamping bolt on the 'fast-idle' lever.

4. Ensure that the throttles are closed; screw in the 'fast-idle' adjustment screw until it just makes contact with the top step of the 'fast-idle' cam.

5. Insert a 1,27 mm. (0.050 in.) diameter drill between the leading edge of the choke butterfly valve and the choke housing.

6. With the butterfly valve in this position, adjust the length of the butterfly rod so that the tip of the 'fast-idle' screw is in line with the start of the top step of the 'fast-idle' cam, (i.e. the position when the tip of the adjustment screw is about to fall from the top step to the bottom step of the cam).

Remove the 1,27 mm. (0.050 in.) diameter drill from the choke housing.

7. With the throttles closed and the choke partly open, adjust the 'fast-idle' adjustment screw to just contact the start or bottom step of the 'fast-idle' cam, screw in a further $\frac{3}{4}$ turn and tighten the lock-nut ensuring that the adjustment screw does not move.

Cold start 'fast-idle'—To set

1. Stop the engine and disconnect both solenoid to exhaust gas recirculation valve hoses at the valve ends. Blank the hoses, remove the pressure tapping cap to vent the float chambers; open the throttles and close the choke butterfly against the bi-metal coil tension by means of the butterfly link lever, release throttles. The 'fast-idle' adjusting screw will now be resting on the high step of the 'fast-idle' cam and the throttles are in the cold start position.

2. Start the engine and check the 'fast-idle' speed. If the speed is not between 1 900 r.p.m. and 2 100 r.p.m., stop the engine, open the throttles to gain access to the adjusting screw and adjust $\frac{1}{8}$ turn for each 100 r.p.m. outside the required speed.

3. Tighten the lock-nut and check the 'fast-idle' speed. If correct open the throttles to release 'fast-idle' cam mechanism.

4. Remove the blanks from both solenoid to the exhaust gas recirculation valve hoses and connect the hoses to their respective exhaust gas recirculation valves. Fit the tapping cap to 'A' bank carburetter float chamber cover.

Float chamber depression—To check

Refer to Page U37 noting the following information.

(i) The correct reading to be obtained on the manometer is 5,08 cm. (2.0 in.).

(ii) **Operation 8 should read**

8. Raise the engine speed slowly noting the manometer and tachometer readings. The maximum steady manometer reading should be obtained between 1 300 r.p.m. and 1 600 r.p.m. If the maximum depression occurs below 1 300 r.p.m. it is permissible to screw out the idle bleed screws on the carburetters by equal amounts (maximum 2.5 turns) to obtain this speed.

IGNITION SYSTEM, DISTRIBUTOR, IGNITION COIL AND SPARKING PLUGS

Data

Ignition timing	.. T.D.C. (Static) 15° B.T.D.C. at 1 600 r.p.m. (stroboscopic) in Neutral. (Approach 1 600 r.p.m. from a higher speed).
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Ignition control system

The ignition system utilises an Opus distributor (in which a magnetic pick-up and control unit replace the conventional contact breaker), a low inductance ignition coil and a ballast resistor. The control unit comprises an electronic oscillator, amplifier and power transistor.

A drum with eight ferrite rods (one per cylinder) moulded into the outer edge is mounted onto the distributor drive-shaft. As the drum rotates a voltage is created each time a ferrite rod passes the magnetic pick-up, this signal is then amplified and used to switch-off the normally conducting power transistor in the primary coil circuit thus inducing a high voltage in the secondary winding which is distributed to the sparking plugs in the normal manner.

This ignition control system provides increased accuracy of timing and increased service life before maintenance is required.

Ignition—To time (using a stroboscope)

The ignition is timed on A1 cylinder which is located at the front left-hand side of the engine (viewed from the front of the car).

Note If the ignition timing is to be set, ensure that the sparking plugs are in good condition before running the engine; if they require cleaning or renewal the sparking plugs gap should be set to 0.9 mm. (0.035 in.).

1. To check the ignition timing commence by running the engine until normal operating temperature is attained and the choke 'fast-idle' is in the off position. Switch off the engine.

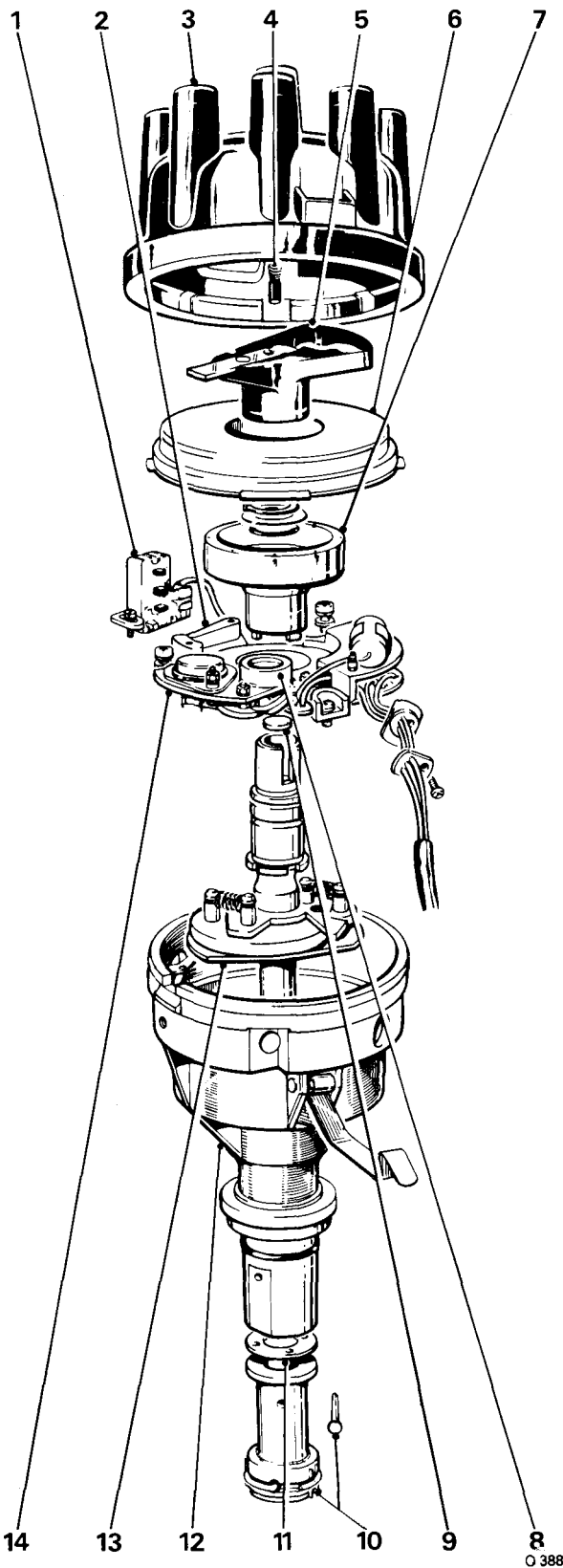
2. Connect a stroboscope and a tachometer to the engine as described in the instructions supplied with the respective equipment.

3. Start the engine and adjust the throttle stop screw to give an idle speed of 1 600 r.p.m. When setting the engine idle speed reduce from a higher speed to 1 600 r.p.m.

4. Direct the flashing light of the stroboscope onto the crankshaft damper timing marks and timing pointer; the pointer is positioned on the right-hand side of the crankshaft damper when viewed from the front of the engine.

5. If the timing pointer does not coincide with the 15° B.T.D.C. mark on the crankshaft damper adjust the ignition timing as follows.

FIG. 11 EXPLODED VIEW OF DISTRIBUTOR



- 1 Pick-up module
- 2 Pick-up arm
- 3 Distributor cover/cap
- 4 High tension brush and spring
- 5 Rotor arm
- 6 Flash over shield (dust cover)
- 7 Timing rotor
- 8 Control unit
- 9 Lubrication pad
- 10 Driving dog and pin
- 11 Thrust washer
- 12 Distributor body
- 13 Automatic advance mechanism
- 14 Electronic module assembly

6. Release the clamp screw on the distributor and rotate the head of the distributor in the appropriate direction until the correct timing is obtained. Clockwise rotation of the distributor head advances the ignition and conversely anti-clockwise rotation retards the ignition. After adjustment has been carried out tighten the clamp screw and again check to ensure that the timing has not altered whilst tightening the clamp screw.

7. Set the engine idle speed to 600 r.p.m.

Setting the engine idle speed

Ensure that the engine is at normal operating temperature and that the choke 'fast-idle' is in the off position.

The air conditioning system must be switched off and a tachometer connected to the engine in accordance with the manufacturer's instructions.

1. Stop the engine, remove the air intake hose and blank off the hot idle compensator feed drilling (see Fig. 9); replace the air intake hose.

2. Start the engine and, if necessary, adjust the engine idle speed to 600 r.p.m. using the throttle stop screw; tighten the lock-nut.

3. Stop the engine and remove the air intake hose. Remove the blank from the hot idle compensator feed drilling and detach the tachometer and stroboscopic timing equipment (if fitted). Fit the air intake hose.

Sparking plugs

The sparking plugs approved for this car are Champion N.14.Y. Before fitting the plugs, set the gaps with the aid of a feeler gauge to 0.9 mm. (0.035 in.) and lightly smear the threads with 'Graphogen' grease.

LUBRICATION AND MAINTENANCE

Special attention should be paid to the following lubrication and maintenance schedules which Rolls-Royce Motors Distributors and Retailers are authorised to carry out.

It is important that items marked with an asterisk (*) in the Service Schedules are carried out during the Warranty period by a Distributor or Retailer at the time specified in order to comply with the Rolls-Royce Motors Warranty and relevant Emission Control Regulations.

The schedules marked 'REGULAR MAINTENANCE' should be carried out either by the Owner, his chauffeur, or by a Distributor or Retailer.

REGULAR MAINTENANCE

Carburetters

Monthly, check the oil level in the reservoirs of the automatic air valve dampers; top-up if necessary.

Engine

Weekly or every 800 km. (500 miles), whichever is the earlier, check the oil level by means of the dipstick; top-up if necessary.

Hydraulic reservoirs

Monthly, check the level of fluid in the reservoirs for the braking and automatic levelling systems; the engine should be run for 4 minutes before checking the fluid level. Top-up if necessary to the indicated level. If frequent topping-up is required check the hydraulic systems for leaks and rectify if necessary.

Lamp bulbs

Weekly, check all lamp bulbs for correct operation and replace any faulty bulbs.

Radiator

Every 3 months, check the level of coolant in the radiator header tank; if necessary, top-up with the correct anti-freeze/water mixture or inhibited solution.

Tyres

Weekly, check the tyre pressures; adjust if necessary. Also check the spare wheel tyre pressure; adjust if necessary. Check the tread depth of all tyres and inspect the tyres for signs of damage.

Windscreen washer

Weekly, top-up the reservoir if necessary.

**INITIAL 5 000 km. (3 000 MILES) OR
3 MONTHS SERVICE WHICHEVER
IS THE EARLIER**

*Air injection pump

Check belt tension and reset if necessary.

*Automatic choke

Check the flow through the choke stove pipe and check for correct operation.

*Carburetters

Check oil level in air valve dampers and if necessary top-up to correct level. Check tightness of float chamber covers. Check float chamber depression. Check and if necessary reset the idle speed. Check and if necessary reset the choke 'fast-idle' speed.

*Engine

Change engine oil.

*Engine cooling system

Tighten worm-drive clips of all coolant hoses.

*Exhaust gas recirculation system

Check the exhaust gas recirculation valve for correct operation.

Chapter U

***Fuel evaporation emission control system**

Check the purge rate; this should be between 1,41 cu. m. per hr. and 1,98 cu. m. per hr. (50 cu. ft. per hr. and 70 cu. ft. per hr.) at 600 r.p.m. in neutral. Pressure test the fuel tank and evaporation loss line and if necessary rectify any leaks.

***Ignition system**

Check ignition timing using stroboscope and adjust if necessary; the ignition timing should be 15° B.T.D.C. with the engine running at 1 600 r.p.m.

***Torque converter transmission**

Check fluid level and top-up if necessary.

When checking the fluid level, avoid contact with the exhaust gas recirculation valve and associated pipes as these contain **hot** exhaust gases.

Belt tension

Check the tension of the belts driving the following: fan and steering pump, alternator and refrigeration compressor. Adjust the belt tension as necessary.

Steering pump

Check the oil level in the reservoir; top-up if necessary.

EVERY 5 000 KM. (3 000 MILES) OR 3 MONTHS WHICHEVER IS THE EARLIER

If the car is used for constant stop/start operation, change the engine oil.

EVERY 10 000 KM. (6 000 MILES) OR 6 MONTHS WHICHEVER IS THE EARLIER

***Battery**

Check the level of the electrolyte in the battery; if necessary top-up with distilled water.

***Brakes**

Inspect footbrake and parking brake pad linings. When changing footbrake pads examine condition of dust excluders on calipers. Manually adjust the parking brake pads. Inspect pipes and connections, rectify if necessary.

***Engine**

Change engine oil and renew oil filter element.

Belt tension

Check the tension of the belts driving the following: fan and steering pump, alternator and refrigeration compressor. Renew any belts which show signs of wear.

Carburettors

Check the oil level in the air valve dampers and top-up if necessary.

Check the idle speed.

Torque converter transmission

Check fluid level and top-up if necessary.

When checking the fluid level, avoid contact with the exhaust gas recirculation valve, heat shield and associated pipes as these components will be **hot**.

Control linkages

Apply a few drops of engine oil to the accelerator linkage and to the gear range selector controls adjacent to the transmission casing.

Electrical system

Ensure that all lamps, instruments, warning devices and air conditioning controls are operating satisfactorily.

Check the following levels and pressures

Run the engine for four minutes then check the hydraulic reservoir fluid levels; top-up if necessary with the specified fluid.

Check the level of fluid in the power steering pump reservoir.

Check the level and specific gravity of the engine coolant and correct if necessary.

Check the tyre pressures and adjust if necessary.

Check the tread depth of all tyres and inspect for signs of damage.

**EVERY 20 000 KM. (12 000 MILES) OR
12 MONTHS SERVICE WHICHEVER
IS THE EARLIER**

***Air injection pump**

Check tension of pump pulley driving belt.

***Air silencer**

Fit a new paper filter element.

***Battery**

Check the level of the electrolyte in the battery; if necessary top-up with distilled water.

***Brakes**

Inspect footbrake and parking brake pad linings. When changing footbrake pads examine condition of dust excluders on calipers. Manually adjust parking brake pads. Inspect pipes and connections; rectify if necessary.

***Carburettors**

Top-up oil level in air valve dampers. Check tightness of float chamber covers. Check float chamber depression. Check and if necessary reset the idle speed. Check and if necessary, reset choke 'fast-idle' speed.

***Crankcase emission control system**

Remove and clean gauze flame traps in the crankcase breather tube. Clean the adapter in choke butterfly housing.

***Engine**

Change engine oil and renew oil filter element.

***Exhaust gas recirculation system**

Remove and clean the exhaust gas recirculation valve and feed pipes. Clean exhaust gas recirculation orifices in the carburetter 'Tee' piece. Check exhaust gas recirculation valve for correct operation.

***Final drive unit**

Check oil level and top-up if necessary.

***Fuel evaporation emission control system**

Check the condition of the pipes and connections.

***Ignition system**

Fit new sparking plugs ensuring that the gaps are set to 0,9 mm. (0.035 in.).

Lubricate distributor spindle (shaft bearings) and automatic advance mechanism with engine oil.

Check the ignition timing using a stroboscope and adjust if necessary; the ignition timing should be 15° B.T.D.C. with the engine running at 1 600 r.p.m.

***Steering ball joints**

Lubricate the six grease nipples. Inspect the rubber covers on the ball joints; if the covers are found to be damaged the joints should be dismantled and new parts fitted as necessary.

***Front sub-frame and compliant front suspension**

The front suspension ball joints are sealed for life and no maintenance is required until renewal is necessary or the ball joint rubber covers are damaged. Inspect

Chapter U

the rubber covers on the front suspension ball joints; if the covers are found to be damaged new joints and covers should be fitted.

***Torque converter transmission**

Renew transmission fluid.

When checking the fluid level, avoid contact with the exhaust gas recirculation valve, heat shield and associated pipes as these components will be **hot**.

Belt tension

Check the tension of the belts driving the following: fan and steering pump, alternator and refrigeration compressor. Renew any belts which show signs of wear.

Control linkage

Apply a few drops of engine oil to the accelerator linkage and to the gear range selector controls adjacent to the transmission casing.

Electrical system

Ensure that all lamps, instruments, warning devices and air conditioning controls are operating satisfactorily.

Hand brake/Parking brake linkage

Lubricate the pivot pins and pulleys in the parking brake system with approved grease.

Spare wheel

Lubricate the spare wheel lowering bolt and mechanism.

Check the following levels

Check the fluid level in the power steering pump reservoir and top-up if necessary.

Check the level and specific gravity of the engine coolant and correct if necessary.

**EVERY 30 000 KM. (18 000 MILES) OR
18 MONTHS SERVICE WHICHEVER
IS THE EARLIER**

***Battery**

Check the level of electrolyte in the battery; if necessary top-up with distilled water.

***Brakes**

Inspect footbrake and parking brake pad linings. When changing footbrake pads examine condition of dust excluders on calipers. Manually adjust the parking brake pads. Inspect pipes and connections, rectify if necessary.

***Engine**

Change engine oil and renew oil filter element.

Belt tension

Check the tension of the belts driving the following: fan and steering pump, alternator and refrigeration compressor.

Renew any belts which shown signs of wear

Carburettors

Check the oil level in the air valve dampers and top-up if necessary.

Check the idle speed.

***Torque converter transmission**

Check fluid level and top-up if necessary.

When checking the fluid level, avoid contact with the exhaust gas recirculation valve, heat shield and associated pipes as these components will be **hot**.

Control linkages

Apply a few drops of engine oil to the accelerator linkage and to the gear range selector controls adjacent to the transmission casing.

Electrical system

Ensure that all lamps, instruments, warning devices and air conditioning controls are operating satisfactorily.

Check the following levels

Check the level of fluid in the power steering pump reservoir.

Check the level and specific gravity of the engine coolant and correct if necessary.

**EVERY 40 000 KM. (24 000 MILES) OR
2 YEARS SERVICE WHICHEVER
IS THE EARLIER**

***Air injection pump**

Check tension of pump pulley driving belt.

***Air injection system**

Check air injection system for leaks and correct functioning. Renew any defective items.

***Air silencer**

Fit a new paper filter element.

***Automatic choke**

Check the air flow through the choke stove pipe and check the system for correct functioning.

***Battery**

Check the level of the electrolyte in the battery; if necessary top-up with distilled water.

***Brakes**

Inspect footbrake and parking brake pad linings. When changing footbrake pads examine condition of dust excluders on calipers. Manually adjust parking brake pads. Inspect pipes and connections, rectify if necessary.

***Carburetters**

Clean air valves. Remove inlet unions from the float chamber covers and fit new paper filter elements. Top-up oil level in air valve dampers. Check tightness of float chamber covers. Check float chamber depression. Check and if necessary, reset the idle speed. Check and if necessary, reset choke 'fast-idle' speed.

***Carburettor mixture weakening device**

Renew air filter element for the carburettor mixture weakening device.

***Crankcase emission control system**

Remove and clean gauze flame traps in crankcase breather tube. Clean the adapter in choke butterfly housing.

***Engine**

Change engine oil and renew oil filter element.

***Engine cooling system**

Fit a new engine coolant thermostat and heater tap feed hose.

***Exhaust gas recirculation system**

Remove and clean the exhaust gas recirculation valve and feed pipe. Clean the orifices in the carburettor 'Tee' piece. Check the exhaust gas recirculation valve for correct operation.

***Final drive unit**

Change oil.

***Fuel evaporation emission control system**

Renew the foam filter element in the evaporation loss control canister. Check the purge rate; this should be between 1,41 cu. m. per hr. and 1,98 cu. m. per hr. (50 cu. ft. per hr. and 70 cu. ft. per hr.) at 600 r.p.m. in neutral. Renew the purge line filter if necessary.

Chapter U

***Ignition system**

Fit new sparking plugs ensuring that the gaps are set to 0,9 mm. (0.035 in.).

Lubricate distributor spindle (shaft bearings) and automatic advance mechanism with engine oil.

Check the ignition timing using a stroboscope and adjust if necessary; the ignition timing should be 15° B.T.D.C. with the engine running at 1 600 r.p.m.

***Steering ball joints**

Lubricate the six grease nipples. Inspect the rubber covers on the ball joints; if the covers are found to be damaged the joints should be dismantled and new parts fitted as necessary.

***Front sub-frame and compliant front suspension**

The front suspension ball joints are sealed for life and no maintenance is required until renewal is necessary or the ball joint rubber covers are damaged. Inspect the rubber covers on the front suspension ball joints; if the covers are found to be damaged new joints and covers should be fitted.

***Torque converter transmission**

Change transmission fluid.

Fit a new intake strainer.

When checking the fluid level, avoid contact with the exhaust gas recirculation valve, heat shield and associated pipes as these components will be **hot**.

Belt tension

Check the tension of the belts driving the following: fan and steering pump, alternator and refrigeration compressor. Renew any belts which show signs of wear.

Control linkage

Apply a few drops of engine oil to the accelerator linkage and to the gear range selector controls adjacent to the transmission casing.

Electrical system

Ensure that all lamps, instruments, warning devices and air conditioning controls are operating satisfactorily.

Fuel filter

Renew the main line filter element and clean the filter bowl.

Fuel pump

Remove the fuel pump from the car and test on the bench. Fit a new pump unit if the performance is below the specified level (*refer to Chapter K—Fuel System of this Workshop Manual T.S.D. 2476*).

Fuel tank

Slacken the drain plug one or two turns and allow any accumulated water to drain away. Tighten the drain plug.

Hand brake/Parking brake linkage

Lubricate the pivot pins and pulleys in the parking brake system with approved grease.

Height control mechanism

Disconnect the control valve linkage ball joints. Clean, grease and refit the ball joints.

Rear wheel drive-shafts

Lubricate the rear wheel drive-shaft outer universal couplings with an approved grease.

Spare wheel

Lubricate the spare wheel lowering bolt and mechanism.

Check the following levels and pressures

Check the fluid level in the power steering pump reservoir and top-up if necessary.

Check the level and specific gravity of the engine coolant and correct if necessary.

Check the tyre pressures and adjust if necessary.

Check the tread depth of all tyres and inspect for signs of damage.

**SERVICING AFTER 40 000 KM.
(24 000 MILES) OR 2 YEARS
WHICHEVER IS THE EARLIER**

After 41 600 km. (24 000 miles) or 2 years, servicing is still due at the following intervals.

**50 000 KM. (30 000 MILES) OR
2½ YEARS WHICHEVER IS
THE EARLIER**

Carry out the 10 000 km. (6 000 miles) service.

**60 000 KM. (36 000 MILES) OR
3 YEARS WHICHEVER IS
THE EARLIER**

Carry out the 20 000 km. (12 000 miles) service.

**70 000 KM. (42 000 MILES) OR
3½ YEARS WHICHEVER IS
THE EARLIER**

Carry out the 10 000 km. (6 000 miles) service.

**80 000 KM. (48 000 MILES) OR
4 YEARS WHICHEVER IS
THE EARLIER**

Carry out the 40 000 km. (24 000 miles) service.

SEASONAL SCHEDULES

EVERY 12 MONTHS

Engine cooling system

Drain the coolant from the radiator and the engine crankcase. Clean any debris from the external surface of the refrigeration condenser and radiator matrices by reverse flushing with a hose. This should be carried out just prior to the Autumn. Fill the system with the correct anti-freeze mixture (*refer to Chapter L—Engine Cooling System of this Workshop Manual T.S.D. 2476*).

Air conditioning system

Ensure that the foam filter element fitted to the scuttle intake grille is free from obstruction. On Long Wheelbase cars fitted with a centre division, check that the foam filter element fitted to the intake grille in the rear decking panel is free from obstruction.

Refrigeration system

These operations should be carried out only by an experienced refrigeration engineer.

Check that the refrigeration system is functioning correctly. If necessary, top-up the system with refrigerant. If loss of refrigerant is evident, check the system for leakage. Visually check the refrigerant compressor for oil leakage, if oil leakage is apparent check the oil level and top-up if necessary. In the event of a major oil loss, check and repair before topping-up (*refer to Chapter C—Air Conditioning of this Workshop Manual T.S.D. 2476*).

Body

Check that the body drain holes are free from foreign matter.

EVERY 2 YEARS

In addition to the 12 monthly schedule, carry out the following.

Engine cooling system

Drain the coolant from the radiator and engine crankcase. Thoroughly reverse flush the coolant passages with a continuous flow of water. Change the coolant hoses where necessary. Fill the system with the correct anti-freeze mixture.

Chapter U

SERVICE RECOMMENDATIONS BRAKE AND HYDRAULIC SYSTEM COMPONENTS

80 000 KM. (48 000 MILES)

At this mileage and under normal motoring conditions it is recommended that the following servicing is carried out.

Renew the front and rear accumulator to frame connector block hoses.

Examine the sub-frame to brake caliper hoses for chafing or surface cracking; renew if necessary.

Completely drain the fluid from the hydraulic circuits. Thoroughly clean the brake fluid reservoirs and sight glasses, ensuring that no foreign matter is allowed to enter during the operation.

Fill the hydraulic system with Castrol RR363 Brake Fluid. This fluid exceeds specification S.A.E. J1703b in many respects and complies with D.O.T. 3 grade of FMVSS 116. Bleed the braking systems and automatic height control system.

160 000 KM. (96 000 MILES)

At this mileage and under normal motoring conditions it is recommended that the following servicing is carried out.

Renew all the flexible hoses to the braking systems and the automatic height control system. Fit new seals

to the disc brake calipers, the deceleration conscious pressure limiting valve and the master cylinder.

Completely drain the fluid from the hydraulic circuits. Thoroughly clean the brake fluid reservoirs and sight glasses, ensuring that no foreign matter is allowed to enter during the operation.

Fill the hydraulic system with Castrol RR363 Brake Fluid. This fluid exceeds specification S.A.E. J1703b in many respects and complies with D.O.T. 3 grade of FMVSS 116. Bleed the braking systems and automatic height control system.

Fit a new convoluted rubber hose between the fuel filler head and fuel tank assembly. Examine all flexible fuel pipes and renew any which show signs of deterioration.

SPECIAL PRECAUTIONS

Should the car be used in very cold temperatures, drain the engine sump when thoroughly warm and also drain the carburettor air valve dampers. The engine sump and carburettor air valve dampers should then be filled with oil having the following viscosity.

For constant temperatures of between 0°C. and -23°C. (32°F. and -10°F.), use a 10W/30 grade oil.

For constant temperatures of -23°C. (-10°F.) and below, use a 5W/20 grade oil.

WORKSHOP TOOLS

The tool listed, is in addition to those mentioned in Chapter U (Part 2).

Tool Number Description

RH 8880 Setting Jig—Throttle Levers

Chapter U

Section U10

SUPPLEMENTS

No. 6 North America 1976

Rolls Royce motor cars conforming to the appropriate emission control regulations and produced to the 1976 specification can be readily identified as follows.

1. Car Serial Number

A letter E as the last prefix of the Car Serial Number (e.g. SRE or LRE, etc.).

2. Emission Control Certification Label

A 1976 Emission Control Certification Label (illustrated below) fitted to the wing valance to the rear of the right-hand front suspension spring cover.



R 57

1976 EMISSION CONTROL CERTIFICATION LABEL

U155

Chapter U



FIG. 1 VIEW INSIDE ENGINE COMPARTMENT (From Left-hand side of Car)

- | | |
|---------------------------|---|
| 1 Weaker filter | 6 E.G.R. secondary valve cut-in micro-switch assembly |
| 2 Check valves | 7 Choke solenoid |
| 3 Anti 'run-on' solenoid | 8 Choke stove pipe |
| 4 'B' bank carburetter | 9 Crankcase emission control system breather tube |
| 5 E.G.R. cut-out solenoid | |



FIG. 2 VIEW INSIDE ENGINE COMPARTMENT (From Right-hand side of Car)

- | | |
|---|--|
| 1 Weaker system cut-off switch | 6 Speed control system regulator |
| 2 E.G.R. primary valve | 7 Hydraulic accumulator fluid pressure switches |
| 3 'A' bank carburetter | 8 Air diverter valve cut-out micro-switch assembly |
| 4 E.G.R. secondary valve | 9 Air diverter valve |
| 5 E.G.R. full throttle cut-out micro-switch | 10 Air pump |

EXHAUST EMISSION CONTROL SYSTEM

AIR INJECTION SYSTEM

Air injection system relief valve

The relief valve located in the discharge cavity of the air pump is changed on 1976 model year cars and is as follows.

Air pump relief valve

A spring loaded relief valve is located within the diverter valve housing and permits excess air to bypass the air injection system when the check valves are closed. The by-pass system prevents damage to the pump vanes and excessive exhaust temperatures under extreme operating conditions.

Air diverter valve

The air diverter valve is located at the front of the engine above the air pump (*see Fig. 2*) and performs two important functions in addition to housing the pressure relief valve for the air pump.

- (i) **Backfire protection** (*see Fig. 3*)
Following rapid throttle closure, the inlet manifold pressure drops suddenly, causing fuel to be vapourised from the manifold walls which results in a mixture too rich to burn in the cylinders. This mixture combined with the air injected into the exhaust ports could cause backfiring.
To prevent backfiring, the diverter valve, triggered by manifold depression diverts the injected air from the exhaust ports for a short period of time.

- (ii) **Catalyst overtemperature protection** (*see Fig. 3*)
Under high load conditions the low manifold depression activates a vacuum switch controlling a solenoid valve. The solenoid valve is located in the pressure line connecting the diverter valve inlet to the lower diaphragm cover. When the vacuum switch is activated the solenoid opens and applies air pump delivery pressure to the lower diaphragm, thereby diverting the air from the exhaust ports. This prevents excessive temperatures which could result in catalyst failure.

Air diverter valve—To check

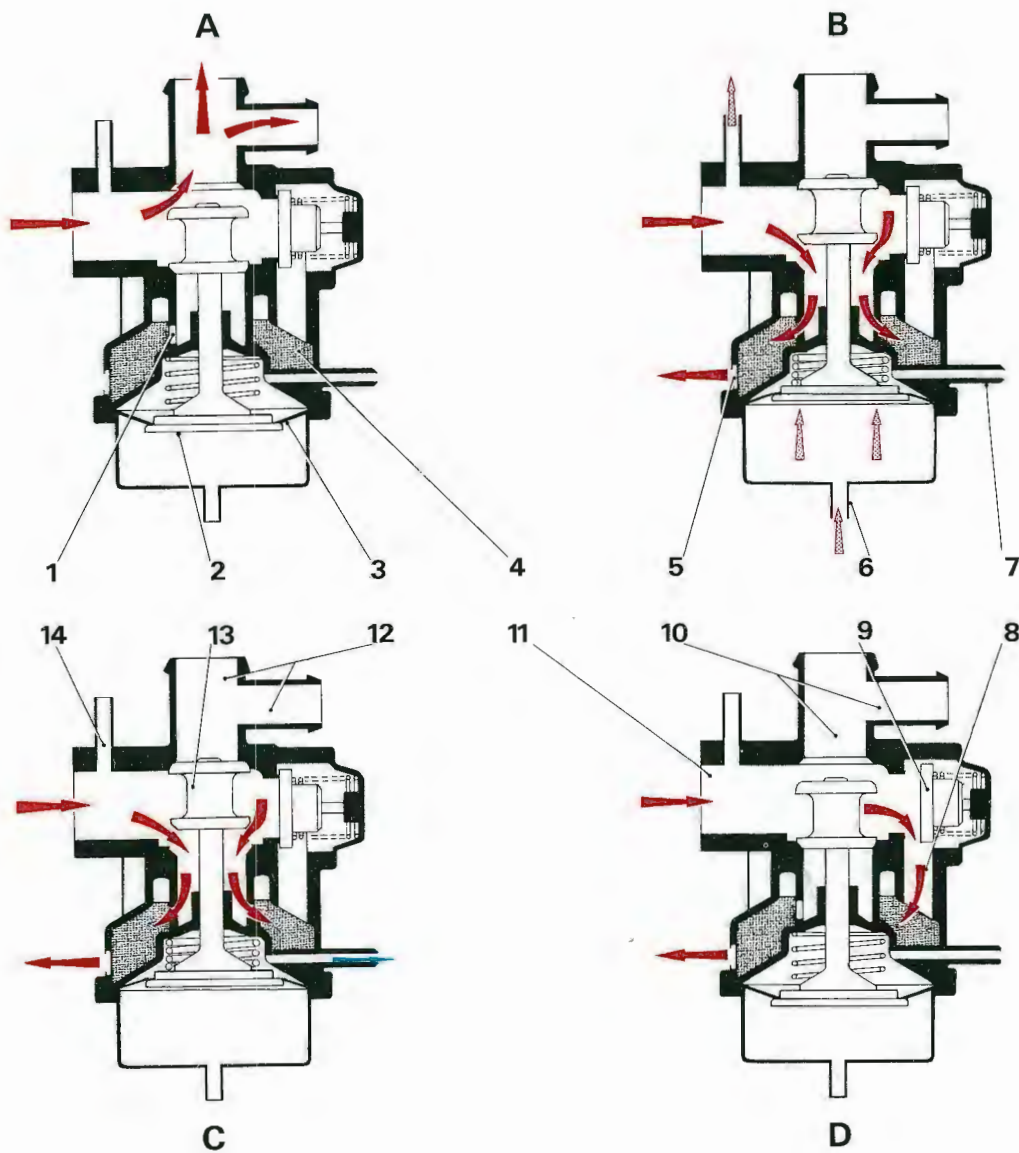
The air diverter valve is a non-serviceable component. If the operation of the component is suspect, the following checks should be carried out before it is replaced.

1. Ensure that the parking brake is firmly applied and the vehicle is in 'Park'.
2. Start and run the engine at 2 000 r.p.m.
3. Ensure that **air does not escape** from the air diverter valve exhaust ports situated around the body of the air diverter valve (*see Fig. 3*).

If air does escape from the air diverter valve during Operation 3 check the following.

- (a) Check the setting of the **air diverter valve vacuum operated micro-switch assembly**, refer to Page U175 of this Supplement.
- (b) Check the operation of the **air diverter valve cut-out solenoid**, refer to Page U176 of this Supplement.
- (c) Check the **hose** (*see Fig. 5*) from the air diverter valve cover to the solenoid in the air diverter valve vacuum operated micro-switch assembly, rectify any air leaks.

Chapter U



- AIR PUMP PRESSURE
- AIR PUMP PRESSURE (Transmitted via vacuum control solenoid line)
- HIGH MANIFOLD VACUUM (Overrun)

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FIG. 3 AIR DIVERTER VALVE

- A Normal operation
- B Catalyst over temperature protection
- C Backfire protection
- D Relief valve operation

- 1 Exhaust to internal silencer
- 2 Timing valve
- 3 Lower diaphragm
- 4 Internal silencer

- 5 Exhaust to atmosphere
- 6 Air pump pressure via solenoid valve
- 7 Manifold vacuum signal
- 8 Excess air
- 9 Relief valve
- 10 Valve outlets restricted
- 11 Valve inlet
- 12 Valve outlets to air manifolds
- 13 Metering valve
- 14 Air pump pressure to solenoid valve

(d) Repeat Operations 1 to 3 inclusive.

If air still escapes from the exhaust ports the air diverter valve assembly is faulty due to either a failed relief valve or a seized shuttle and must be replaced.

After fitting a new air diverter valve, ensure that the component operates satisfactorily.

4. Release the throttle linkage sharply so that the engine speed rapidly falls from 2 000 r.p.m., ensure that **air does escape** from the air diverter valve exhaust ports for a short period of time.

If air does not escape from the exhaust ports of the air diverter valve during Operation 4 check the following.

- The condition of the hose (see Fig. 5) from the air diverter valve to the vacuum manifold.
- The condition of any hose connected to the vacuum manifold (see Fig. 5).
- Repeat Operation 4.

If air still does not escape during Operation 4 the air diverter valve assembly is faulty due to either a diaphragm or timing valve failure and must be replaced.

After fitting a new air diverter valve, ensure that the component operates satisfactorily.

5. Allow the engine to idle at 600 r.p.m. Ensure that **no air escapes** from the air diverter valve exhaust ports.

Air diverter valve—To remove

Before commencing to remove the air diverter valve observe the following points.

- When disconnecting the various hoses ensure that each is suitably labelled to assist identification when assembling.
- Ensure that all open ends of pipes and hoses are suitably blanked off to prevent the ingress of dirt, etc.

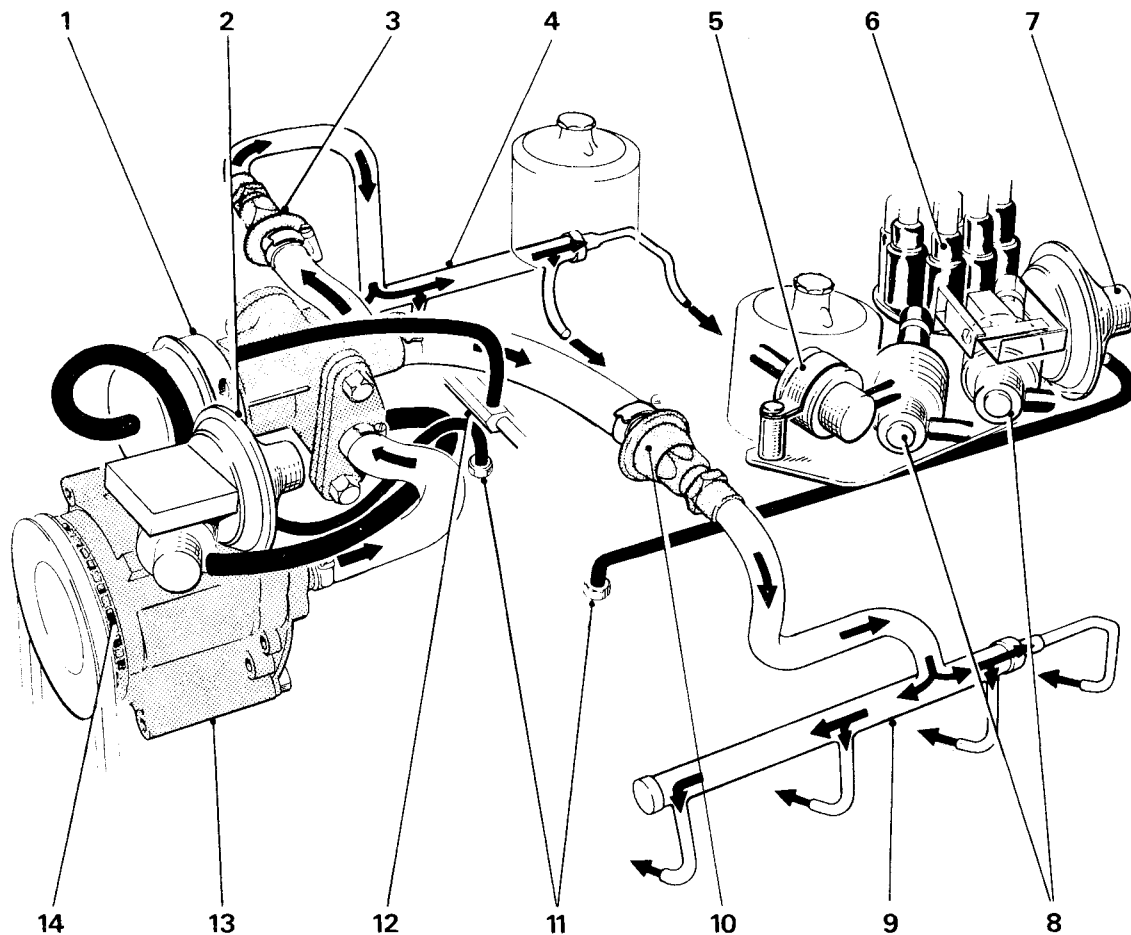


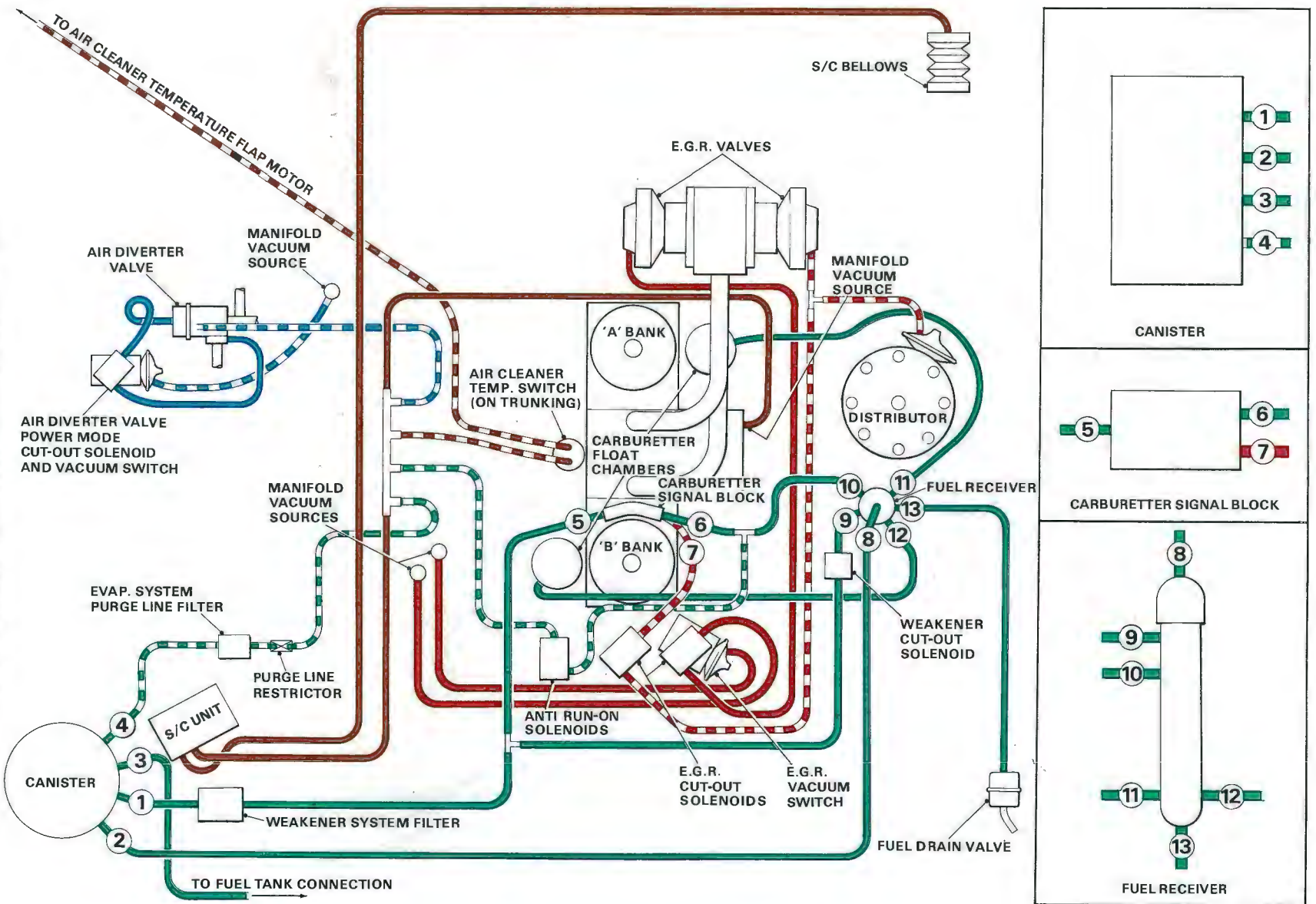
FIG. 4 AIR INJECTION SYSTEM

- Air diverter valve
- Air diverter valve vacuum operated micro-switch assembly
- Check valve
- 'A' bank air manifold

- Anti 'run-on' solenoid
- Ignition distributor
- Secondary valve micro-switch assembly
- Exhaust gas recirculation solenoids

- 'B' bank air manifold
- Check valve
- Inlet manifold tappings
- Vacuum manifold
- Air pump
- Air pump intake

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FIG. 5 HOSE ROUTING DIAGRAM—1976 MODELS

To remove the air diverter valve proceed as follows

1. Unscrew the three worm drive clips which secure the three larger diameter rubber hoses to the air diverter valve and withdraw the hoses. Two of the hoses connect to their respective air manifold check valves and the third hose to the air pump.

2. Withdraw the three smaller diameter rubber hoses from the air diverter valve.

The hose fitted to the front of the air diverter valve connects to the solenoid of the air diverter valve vacuum operated micro-switch assembly. The hose fitted to the rear of the assembly connects to the solenoid inlet and the hose fitted on the top of the assembly connects to the vacuum manifold. The hose connections are illustrated in Figure 4.

3. Using a $\frac{7}{16}$ in. A/F spanner unscrew and remove the two nuts which secure the air diverter valve to the mounting plate. Collect the two washers.

4. Hold the air diverter valve and withdraw the two bolts from the mounting plate, taking care not to lose the washer situated under the head of each bolt.

5. Remove the air diverter valve together with the spacer plate and gasket.

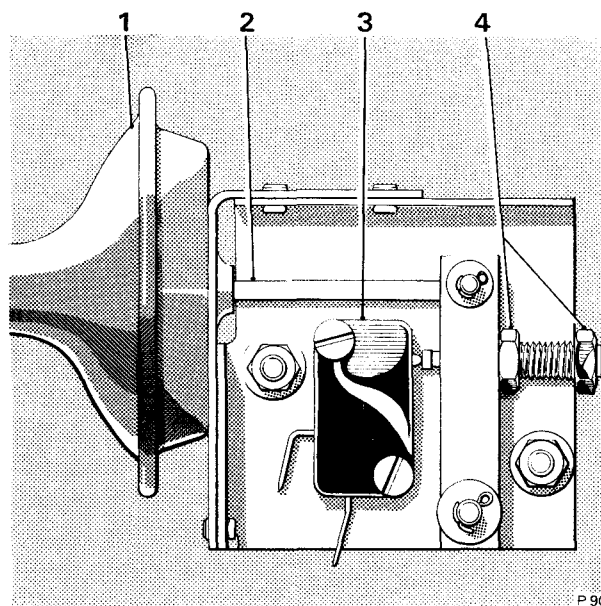


FIG. 6 VACUUM OPERATED CUT-IN SWITCH

- 1 Vacuum unit
- 2 Actuating link
- 3 Micro-switch
- 4 Adjustment screws

Air diverter valve—To fit

Fit the air diverter valve by reversing the procedure given for removal, noting the following points.

1. Ensure that all joint faces are clean.
2. Ensure that the gasket is in a good condition.
3. Always ensure that the spacer plate is fitted with the spigot projecting through the mounting plate into the hose which connects to the air pump and that the gasket is fitted to the opposite side of the mounting plate from the spigot.

EXHAUST GAS RECIRCULATION SYSTEM

A proportion of the exhaust gas from the 'A' bank exhaust downtake pipe is recirculated through vacuum operated metering valves into the carburettor 'Tee' piece, just downstream of the throttle plates. This exhaust gas mixes with the inlet charge in the induction manifold and is distributed to the cylinders thus lowering the peak combustion temperature and reducing the formation of oxides of nitrogen emissions.

A 'dual valve' exhaust gas recirculation system is used, employing a **primary valve** with a tapered metering pintle which gives an increase in flow area for an increased valve lift, and a **secondary valve** which has a reverse tapered pintle and gives a minimum flow area at full valve lift.

The vacuum signal for the **primary exhaust gas recirculation valve** is taken from a series of drillings in the carburettor body, just upstream of the throttle edge. As the throttle is opened the signal strength is progressively increased.

The **secondary valve** vacuum signal is taken from the induction manifold via a **solenoid valve** which is controlled by a vacuum switch; the secondary valve only receives the vacuum signal when a predetermined manifold depression is reached.

When the throttle is opened the **primary valve** opens progressively as the vacuum signal increases. The valve is fully open at the point where the vacuum signal equals manifold depression.

Continued opening of the throttle lowers the manifold depression and actuates the **secondary valve** which immediately moves to the full valve lift position. Further opening of the throttle continues to reduce the manifold depression and consequently, the signal to both exhaust gas recirculation valves.

The reduced signal and valve lift reduces the flow area through the **primary valve** and increases the flow area through the **secondary valve**.

At very low vacuum signal strength both valves are seated and the flow is zero; in this way the recirculated exhaust gas is metered in proportion to the engine requirements for a reduction of oxides of nitrogen whilst retaining acceptable drivability.

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FIG. 7 EXHAUST GAS RECIRCULATION SYSTEM

- | | | |
|---|---|-------------------------------------|
| A Hoses to be detached when removing carburetters | 3 Feed for distributor capsule | 5 Secondary valve solenoid assembly |
| 1 Primary valve | 4 Secondary valve vacuum operated micro-switch assembly | 6 Fuel mixture weakening device |
| 2 Secondary valve | | 7 Primary valve solenoid assembly |
| | | 8 Inlet manifold vacuum tappings |

To improve starting and driveaway quality at low temperatures solenoid valves activated by lock-out switches (see Fig. 15), interrupt the vacuum signals to both exhaust gas recirculation valves, ensuring that they remain in the closed position, until predetermined coolant temperatures are reached. The **secondary valve** cuts in at a higher coolant temperature than the **primary valve**.

A micro-switch operated by the throttle lever (see Fig. 8) also controls the cut-off solenoids to provide exhaust gas recirculation cut-off at full throttle. This feature of the system prevents the secondary valve remaining open under full throttle, high speed operation, as this would be detrimental to performance and fuel consumption.

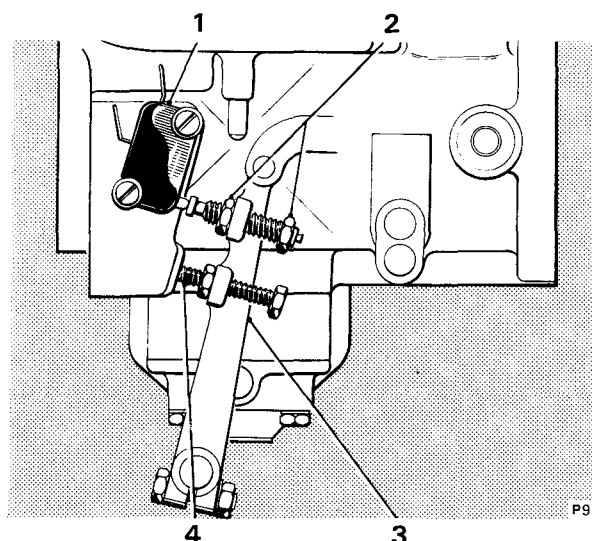


FIG. 8 FULL THROTTLE CUT-OFF MICRO-SWITCH

- 1 Micro-switch
- 2 Adjusting screws
- 3 Throttle lever
- 4 Full throttle stop

Exhaust gas recirculation valve—To remove

1. Detach the small diameter rubber hose from the valve.
2. Using a $\frac{1}{2}$ in. A/F spanner slacken the three nuts which retain the heat shield.
3. Withdraw the heat shield.
4. **Primary valve**—Unscrew and remove the two $\frac{1}{2}$ in. A/F nuts and washers retaining the valve to the mounting flange.

Secondary valve—Using a $\frac{1}{2}$ in. A/F spanner slacken the remaining nut and then unscrew and remove both retaining nuts and washers. Unscrew the $\frac{7}{16}$ in. A/F nut retaining the mounting bracket to the 'A' bank carburettor bracket; collect the washer and withdraw the bolt.

5. Withdraw the valve and remove the gasket from the mounting flange face.

Exhaust gas recirculation valve—To fit

Fit the valve by reversing the procedure given for removal, noting the following points.

1. Ensure that the valve pintle is secure on the valve stem.
2. Ensure that the valve and mounting flange joint faces are clean and free from carbon deposits.
3. Always use a new mounting flange gasket.

Exhaust gas recirculation valve—To clean

1. Remove the valve as described in Exhaust gas recirculation valve—To remove.
2. Using a scraper, remove all carbon film from the valve and mounting flange faces; complete the operation with a wire brush.

3. Clean the carbon from the valve using a wire brush fitted into a portable drill. Take care not to damage the valve seating area.

4. Thoroughly blow out the valve with compressed air to ensure that all loose carbon particles are removed.

5. Upon completion of the cleaning operations, fit the valve to the engine mounting flange as described in Exhaust gas recirculation valve—To fit.

Exhaust gas recirculation valves—Preliminary check

To carry out preliminary checks on the operation of both **primary** and **secondary** exhaust gas recirculation valves proceed as follows.

1. Connect an electric impulse tachometer to the engine in accordance with the manufacturer's instructions.
2. Ensure that the parking brake is firmly applied and that the gear range selector is in the 'Park' position.
3. Start the engine and run until normal operating temperature is attained.
4. Allow the engine to return to the idle speed.
5. Increase the engine speed slowly noting the operation of the exhaust gas recirculation valves.

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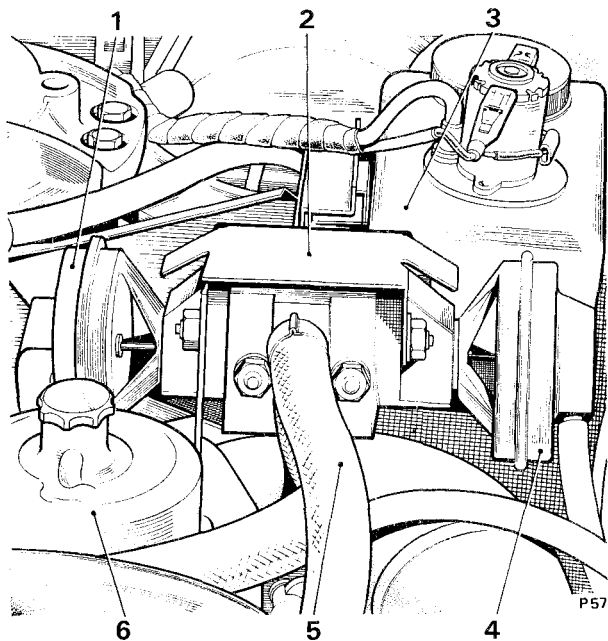


FIG. 9 EXHAUST GAS RECIRCULATION VALVES

- 1 Secondary valve
- 2 Heat shield
- 3 Windscreen washer reservoir
- 4 Primary valve
- 5 Distribution pipes
- 6 'A' bank carburetter

6. When the engine speed has reached 2 000 r.p.m. the diaphragm of the primary exhaust gas recirculation valve should have moved to the 'full valve lift' position.

7. Stop the engine. Disconnect the hose from the secondary valve cut-in solenoid vacuum unit. Blank off the open end of both the unit and the hose.

8. Disconnect the hose from the primary valve and blank off the open end of both the valve and the hose.

9. Start the engine and note that the secondary valve also moves to the full lift position. It may be necessary to increase the engine speed to prevent stalling.

If both diaphragms **have moved** to 'full valve lift' position in their respective tests, stop the engine and remove the tachometer as the test is complete.

Remove the blanks from the hoses; fit the vacuum unit hose and primary valve hose to their respective connections.

If the diaphragms **have not moved** to the required position stop the engine and proceed as follows.

Exhaust gas recirculation valve signal strength—To check

1. Remove the pressure tapping cap from 'A' bank carburetter to vent the float chambers.

2. Disconnect at the signal block the exhaust gas recirculation cut-out solenoid hose. Connect a mercury manometer 0 to 10 in. Hg. (0 to 25,4 cm. Hg.) to the signal line tube.

3. Fit dial gauge assemblies RH8841 to the carburetters in place of the dampers.

4. Zero the gauges with the engine stationary.

5. Lightly tighten the clamp screws of the dial gauge assemblies.

6. Start the engine and allow to run at an idle speed of 600 r.p.m., ensure that the piston lift of the carburetters shown on the dial gauge assemblies is equal (within 10%), adjust by using the eccentric adjuster on the carburetter throttle linkage.

7. Raise the engine speed using the idle speed adjusting screw until 'B' bank carburetter dial gauge reads 0.25 in. (6,35 mm.). 'A' bank carburetter dial gauge should also read 0.25 in. (6,35 mm.) with a tolerance of plus or minus 0.010 in. (0,254 mm.).

Note The suction chambers of both carburetters should be lightly tapped with a non-metallic object (wooden handle of a small screw-driver) during this operation.

8. Adjust the exhaust gas recirculation signal to 3.2 in. Hg. (8,13 cm. Hg.) using the adjusting screw (see Fig. 19, item 15).

9. If difficulty is experienced in obtaining the signal reading, ensure that air is not leaking at the signal block joint.

10. Disconnect the manometer and connect the exhaust gas recirculation solenoid hose to the signal tube.

Note If it is necessary to adjust the E.G.R. signal by more than 0.2 in. Hg. (0,51 cm. Hg.), refer to Operation 8, Page U187—Float chamber depression—To check and ensure that the maximum steady manometer reading is still obtainable within an engine speed range of 1 300 r.p.m. to 1 600 r.p.m.

Primary valve

11. Disconnect the solenoid to exhaust gas recirculation primary valve hose at the valve. Connect the hose to the manometer.

12. Repeat Operation 7.

13. Ensure that the exhaust gas recirculation signal shown on the manometer is between 3.0 in. Hg. (7,6 cm. Hg.) and 3.4 in. Hg. (8,6 cm. Hg.).

A **low** or **zero** reading may be caused by:

- a. Blockage in the hose from the signal tube to the cut-out solenoid.
 - b. Blockage in the hose between the cut-out solenoid and primary E.G.R. valve.
 - c. Air leak at the signal block joint face or hose connections.
 - d. Low engine temperature below 14°C. (57°F.), a faulty exhaust gas recirculation cut-off solenoid or lock-out switch (in thermostat outlet).
14. Disconnect the manometer and connect the hose to the exhaust gas recirculation valve.
 15. Check the operation of the valve by running the engine at 2 000 r.p.m. ensuring that the valve opens by observing the movement of the diaphragm.

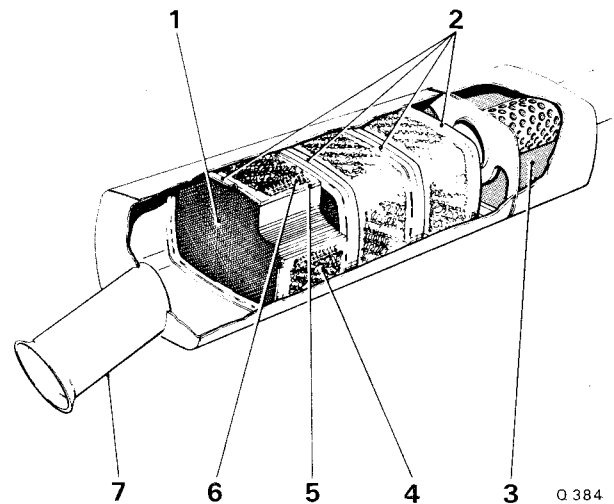


FIG. 10 CATALYTIC CONVERTER

- 1 Monolithic catalyst
- 2 Catalyst retaining plates
- 3 Silencing chamber
- 4 Stainless steel wire mesh
- 5 Fireclay coating
- 6 Ceramic tape
- 7 Inlet pipe

Secondary valve

11. Disconnect the rubber hose from the induction manifold to the vacuum operated micro-switch, at the micro-switch end and blank off the hose.
12. Detach the secondary valve to solenoid hose at the secondary valve.
13. Connect a suitable mercury manometer 0 to 10 in. Hg. (0 to 25.4 cm. Hg.) to the hose.
14. Disconnect the hose from the inlet manifold tapping to the secondary valve solenoid at the solenoid. Blank off the hose.
15. Disconnect the hose from the low temperature exhaust gas recirculation solenoid to the primary valve, at the valve.
16. Connect the primary valve hose to the open connection on the secondary valve solenoid.
17. Repeat Operation 7.
18. Ensure that the exhaust gas recirculation signal shown on the manometer is between 3.0 in. Hg. (7.6 cm. Hg.) and 3.4 in. Hg. (8.6 cm. Hg.).

A **low** or **zero** reading may be caused by:

- a. A blockage in the hose from the secondary valve solenoid to the exhaust gas recirculation secondary valve.
 - b. A faulty exhaust gas recirculation secondary valve solenoid.
 - c. Low engine temperature below 44°C. (111°F.), or a faulty exhaust gas recirculation lock-out switch (in thermostat housing).
19. Disconnect the mercury manometer and connect the hoses to their respective connections, leaving only the hose to the vacuum operated micro-switch disconnected and blanked off.

20. Check the operation of the valve by running the engine and observing the movement of the diaphragm.

If the secondary valve does not move, it may be due to a blockage in the hose from the manifold to the secondary valve solenoid.

21. Connect the hose to the vacuum operated micro-switch after first removing the blank.

OXIDATION CATALYST SYSTEM

A catalytic converter, in place of the conventional front silencer is situated in the exhaust system to the rear of the point in the system where both exhaust manifold downtake pipes combine.

The box unit contains three catalyst blocks and has sufficient volume to perform the dual functions of both converter and silencer (see Fig. 10). A platinum group metal catalyst on a ceramic monolith support is used for optimum conversion efficiency and rapid warm-up. Three separate blocks are used to minimise the effect of thermal shock and are positioned to ensure good gas distribution and effective utilisation of the catalyst volume.

The catalyst promotes reaction between the residual hydrocarbons and carbon monoxide in the exhaust and the secondary air injected into the exhaust ports. After completion of the oxidation process the exhaust gas is discharged to the atmosphere from the tailpipe.

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Catalytic converter protection

To protect the catalytic converter from possible damage the following precautions should be taken.

(i) **Unleaded gasoline**

Use unleaded gasoline only. The use of leaded gasoline will result in a **substantial reduction in the performance of the catalyst**. Under no circumstances add fuel system cleaning agents to either the fuel tank or carburettors for induction into the engine, as these materials may have a **detrimental effect on the catalytic converter**.

(ii) **Engine malfunction**

If the engine misfires or suffers from a lack of power which could be attributed to a malfunction of either the ignition or fuel systems, the vehicle **should be driven only at low speed** and the fault rectified as soon as possible by an authorised Dealer. Driving at high speeds with a malfunction in either of these systems could cause overheating and consequent damage to the catalyst.

(iii) **Fuel**

Do not allow the engine to run out of fuel. If the engine does run out of fuel at a high speed possible **damage to the catalyst could result**.

Catalytic converter—To remove

1. Unscrew the self-tapping screws that secure the shield below the catalytic converter assembly. Withdraw the shield.

2. Unscrew the $\frac{7}{16}$ in. A/F nuts that secure the two shields to the exhaust pipe on either side of spherical joint, situated to the rear of the body crossmember.

3. Collect the washers, withdraw the bolts and remove the shields.

Note Take care when removing the shields as the edges are sharp and could cause injury to the hands.

4. Support the weight of the exhaust pipe which passes into the expansion box.

5. Using a $\frac{1}{2}$ in. A/F spanner unscrew and remove the nut retaining the exhaust mounting around the exhaust pipe (situated behind the body crossmember).

6. Remove the nut and withdraw the bolt, collect the washer.

7. Open the mount and slide it over the exhaust pipe.

8. Slacken the two $\frac{9}{16}$ in. A/F nuts retaining the exhaust clamp around the spherical joint to the rear of the body cross-member and catalytic converter assembly.

9. Unscrew the nuts completely and withdraw the bolts; collect the washers.

10. Remove the two halves of the clamp joint from the exhaust pipe. Free the two sections of the pipe from each other and collect the sealing ring.

11. Allow the forward section of the exhaust to rest on the body cross-member and repeat Operations 8 to 10 inclusive on the spherical exhaust joint situated in front of the catalytic converter assembly. Hold the forward end of the assembly as the front joint is freed.

12. Withdraw the catalytic converter assembly in a forward and downwards direction.

Catalytic converter—To Fit

Fit the catalytic converter assembly by reversing the procedure given for removal, noting the following points.

1. The seal rings and pipe flares must be thoroughly clean and free from scale and may be lightly dressed with fine emery cloth if required.

2. The clamp bolt threads should be lightly oiled to prevent binding during assembly and the spherical faces of the sealing rings and the grooves in the clamps should be smeared with a graphite lubricant, to ensure correct alignment of the pieces on assembly.

3. Fit the pipe and catalytic converter assembly complete with seal rings, then loosely fit the joint clamps and the 'handcuff' clamp.

4. The joints must not be fully tightened until the pipe has been manoeuvred to obtain the best run (free from possible fouls) and good joint alignment.

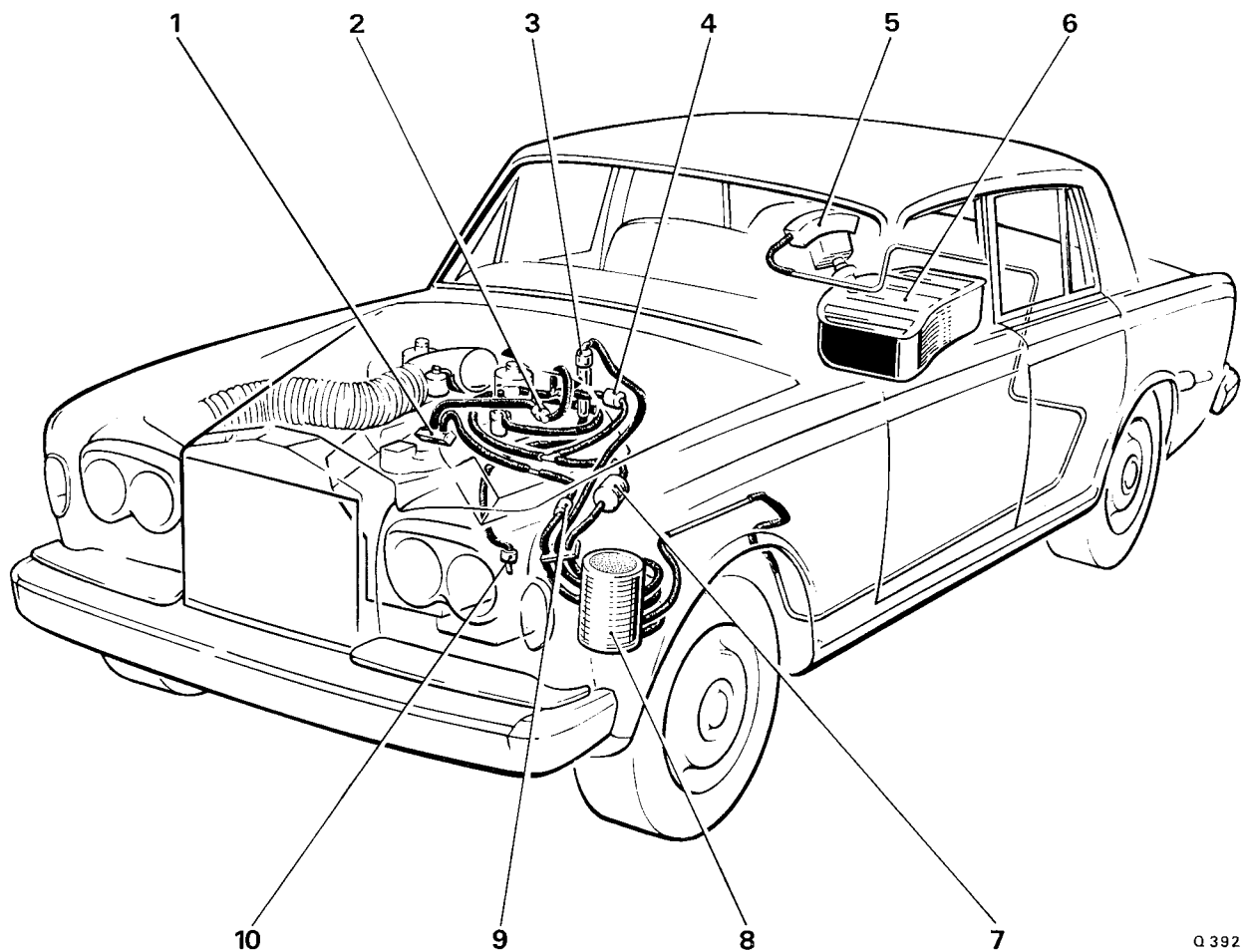
Note The pipe joints must not be 'sprung' or 'clamped' into position.

5. When the pipe run is satisfactory, torque tighten the joint clamp nuts in accordance with the standard torque figures given in Chapter P then 'set' the 'Vibrashock' mount to allow for expansion in the exhaust system, when hot.

'Vibrashock' exhaust mount—To set

This exercise is carried out by holding the 'handcuff' clamp forward whilst tightening the pinch bolt. This has the effect of misaligning the centre of the mount and this misalignment should be approximately 0.187 in. (4.76 mm.) at the mount centre.

FUEL EVAPORATION EMISSION CONTROL SYSTEM



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FIG. 11 FUEL EVAPORATION EMISSION CONTROL SYSTEM—GENERAL VIEW

- | | |
|-----------------------------|-------------------------------------|
| 1 Vacuum manifold | 6 Fuel tank assembly |
| 2 Anti 'run-on' solenoid | 7 Weakener filter |
| 3 Float chamber vent valve | 8 Evaporative loss control canister |
| 4 Weakener cut-off solenoid | 9 Purge line filter |
| 5 Fuel trap assembly | 10 Float chamber drain valve |

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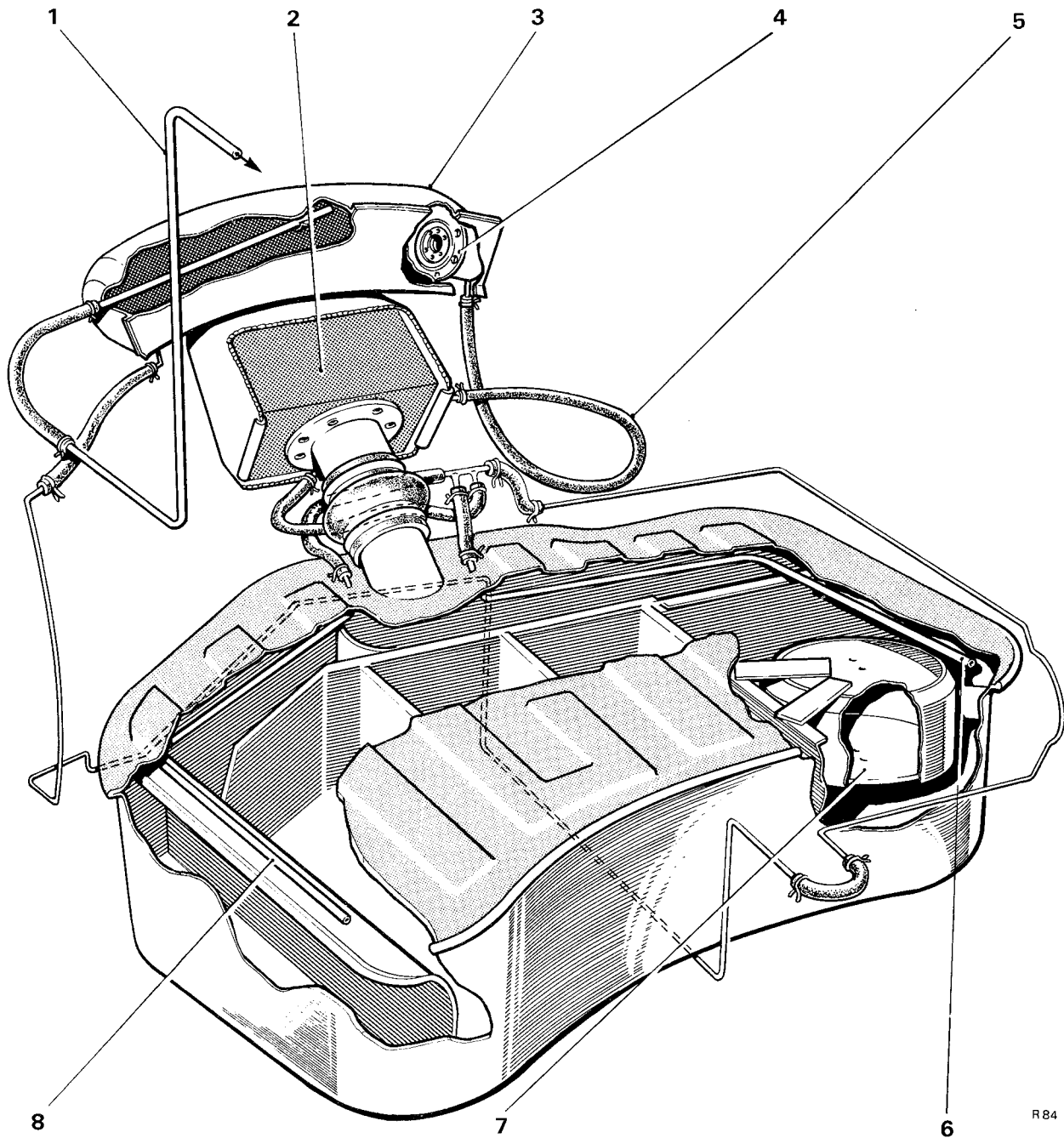
Fuel tank assembly

The fuel tank assembly consists of the fuel tank, expansion tank and fuel trap assembly (see Fig. 12).

The fuel tank is vented from three positions to a fuel trap assembly which is mounted above the fuel filler. One vent is from the fuel filler neck and the other two vents from the fuel tank.

The three vent lines join at a common junction block situated adjacent to the fuel filler neck, the main vent line then encircles the fuel tank before passing to the fuel trap assembly.

From the fuel trap, a vent line passes under the floor of the car to the evaporation loss control canister.



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FIG. 12 FUEL EVAPORATION EMISSION CONTROL SYSTEM—FUEL TANK

- 1 Connection to evaporation loss control canister
- 2 Fuel filler box

- 3 Fuel trap
- 4 Combined relief and vacuum valve

- 5 Valve vent
- 6 Vent pipe
- 7 Expansion tank
- 8 Vent pipe

Purge line

The purge line consists of a rubber hose, passing from the lowest connection on the canister through the valance junction piece to the vacuum manifold. Incorporated into this hose is the purge line filter and restrictor.

When the engine is running, air drawn through the canister filter and carbon picks up the stored fuel vapours and passes them via the hose, to the induction manifold. The restrictor in the line controls the flow rate at between 50 cu. ft. per hr. and 70 cu. ft. per hr. (1.41 cu. m. per hr. and 1.98 cu. m. per hr.) to maintain carburettor metering accuracy and the paper element line filter is fitted to prevent blockage of the restrictor.

Purge line filter—To remove

1. Using special pliers (RH 8090) remove the two steel retaining clips situated on either side of the unit.
2. Slacken the setscrew which secures the nylon retaining clip.
3. Withdraw the component from the clip.

Purge line filter—To fit

Fit the purge line filter by reversing the procedure given for removal noting the following points.

1. Ensure that the rubber hoses are in a good condition and new hose retaining clips are used.

Purge flow rate—To check

Check the purge flow rate as follows.

1. Disconnect the hose from the engine side of the purge line filter and insert a flowmeter and stand assembly (RH 8725) into the line. The flowmeter is a rotameter type capable of measuring between 50 cu. ft/hr. and 70 cu. ft/hr. (1.41 cu. m/hr. and 1.98 cu. m/hr.). The pressure drop across the meter is not to exceed 2 in. Hg. (5.08 cm. Hg.).
2. Start and run engine at idle speed, the flowmeter reading should be between 50 cu. ft/hr. and 70 cu. ft/hr. (1.41 cu. m/hr. and 1.98 cu. m/hr.).
3. If the flow is less than 50 cu. ft/hr. (1.41 cu. m/hr.) stop the engine and remove the purge line restrictor (see Fig. 5). Fit a piece of straight metal pipe with an internal bore larger than 0.187 in. (4.76 mm.), in the place of the restrictor.

4. Start and run the engine at idle speed, ensure that the flow is now in excess of 70 cu. ft/hr. (1.98 cu. m/hr.).
5. If the flow is less than 70 cu. ft/hr. (1.98 cu. m/hr.) check the following.
 - (i) an air leak in any of the vacuum hoses connected to the vacuum manifold (see Fig. 5).
 - (ii) a blockage in the vacuum manifold or any of the connecting hoses (see Fig. 5).
6. Rectify any air leaks or blockages found in the system. Repeat Operation 4.
7. Stop the engine and fit the purge line restrictor.
8. Start the engine and check the flow rate as detailed in Operation 2.
9. If the flow is still incorrect fit a new restrictor and again repeat Operation 2.
10. Stop the engine, remove the flowmeter assembly and connect the hoses.

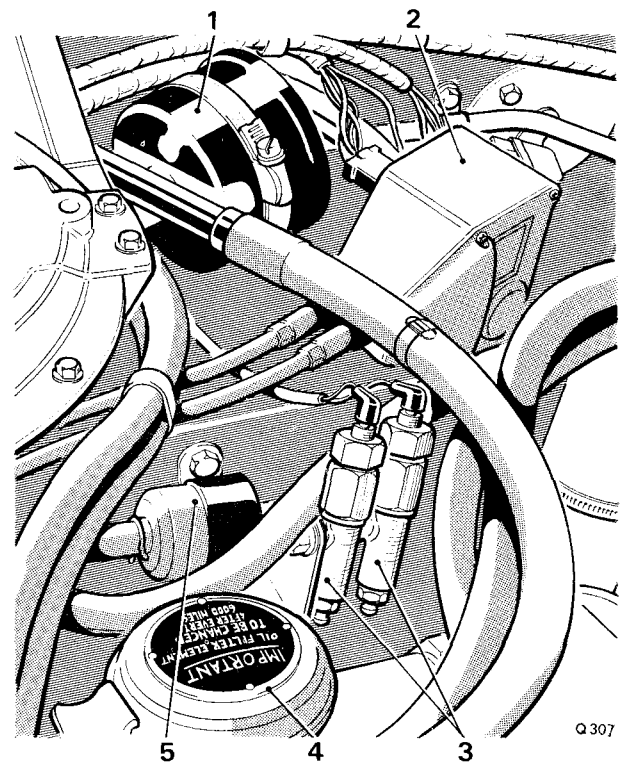


FIG. 13 POSITION OF MIXTURE WEAKENING DEVICE FILTER AND PURGE LINE FILTER

- 1 Weaker filter
- 2 Speed control system regulator
- 3 Hydraulic fluid accumulator pressure switches
- 4 Engine oil filler
- 5 Purge line filter

CRANKCASE EMISSION CONTROL SYSTEM

Crankcase emissions are controlled by a recirculatory closed breather system (see Fig. 14).

An insulated draught tube connects the crankcase via the oil filler which is fitted with a sealed cap, to the choke housing upstream of both the choke butterfly and the carburetters. A flame trap capsule containing three wire mesh discs is fitted in a housing at the crankcase end of the draught tube. Engine emission (blow-by) is drawn into the induction system via the draught tube, due to the depression in the choke housing.

Maintenance

1. The flame trap fitted to the breather pipe should be cleaned in the following manner, at the specified mileage.

2. Unscrew the setscrew securing the breather pipe connection to the oil filler pedestal; withdraw the connection from the pedestal (slight resistance may be felt due to the rubber 'O' ring connections).

3. Withdraw the connection from the pipe flange and collect the restrictor.

4. Wash the flame trap assembly in clean petrol, then dry with a high pressure air line. The flame trap assembly consists of 3 gauzes crimped together as shown in Figure 14.

5. To clean the adapter fitted to the choke housing, remove the single setscrew from the breather pipe end connection and detach the pipe.

6. Clean the adapter fitted to the choke housing and ensure that the holes in the adapter are clear.

7. Assembly of the flame trap and breather pipe is in the reverse order, ensuring that the 'O' rings are in good condition.

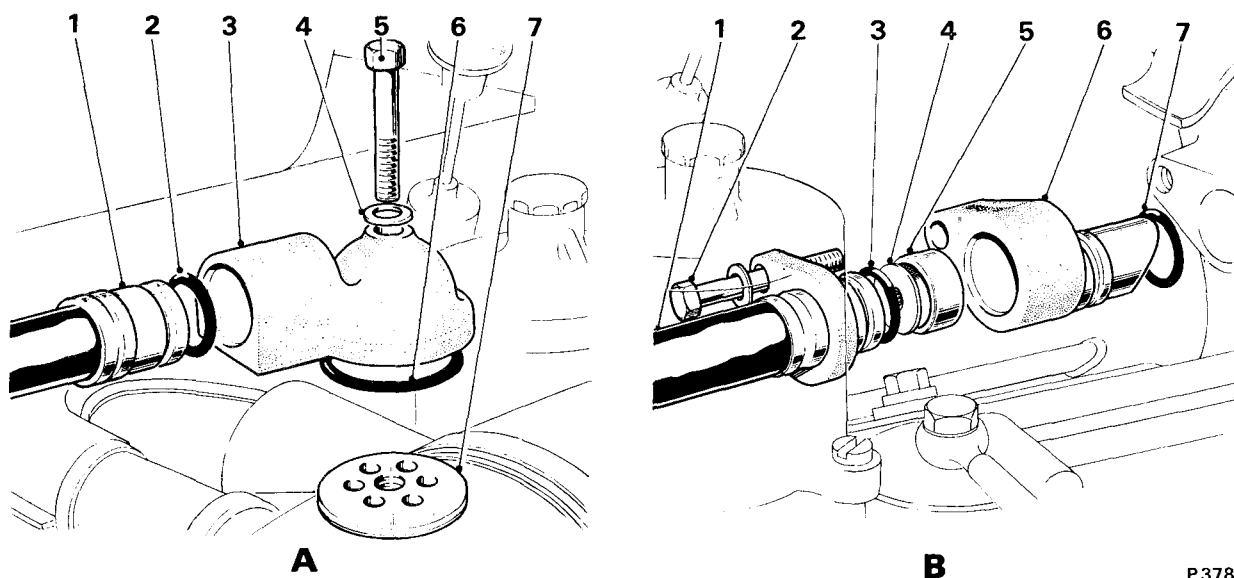


FIG. 14 EXPLODED VIEW OF CRANKCASE EMISSION CONTROL PIPE

Diagram A
 1 Pipe
 2 'O' ring
 3 Connection
 4 Washer
 5 Setscrew
 6 'O' ring
 7 Adapter

Diagram B
 1 Pipe
 2 Setscrew
 3 'O' ring
 4 Restrictor
 5 Flame trap
 6 Connection
 7 'O' ring

EMISSION CONTROL SYSTEMS (ELECTRICAL COMPONENTS)

The electrical components described in this section would normally appear in Chapter M—Electrical System, however, as they are only used in connection with the emission control system it is thought more practical to include the information in this Chapter.

The components concerned are as follows.

- (i) The exhaust gas recirculation primary valve lock-out switch.
- (ii) The exhaust gas recirculation secondary valve lock-out switch.
- (iii) The exhaust gas recirculation valve cut-off solenoids.
- (iv) The air diverter valve vacuum operated micro-switch.
- (v) The air diverter valve cut-out solenoid.
- (vi) The anti 'run-on' solenoid.
- (vii) The weakener cut-off solenoid valve.
- (viii) The weakener cut-off solenoid switch.

Note The temperatures quoted throughout this section for the various switches are nominal operating temperatures and in service, a plus or minus tolerance of a few degrees may be found.

Exhaust gas recirculation lock-out switch —To remove

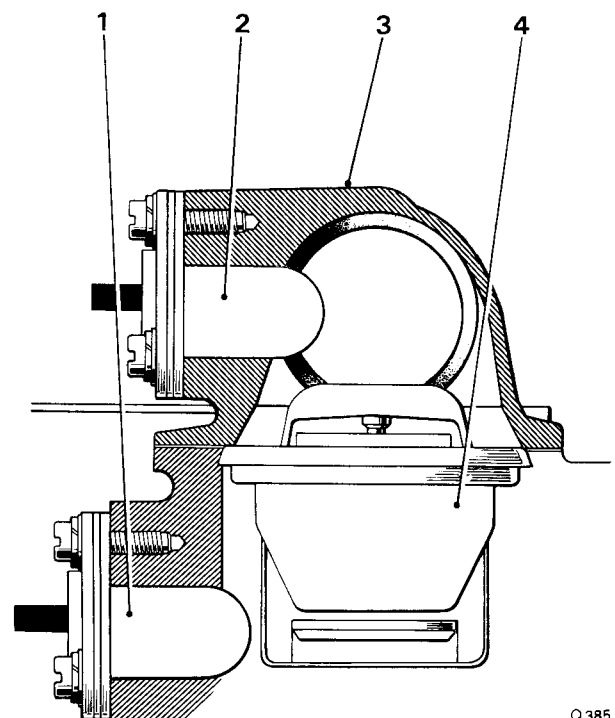
The bi-metal lock-out switches are situated in the engine coolant thermostat housing and outlet elbow (see Fig. 15).

1. Remove the radiator filler cap and drain the engine coolant.
2. Disconnect the electrical lead.
3. Unscrew and remove the three 2 B.A. setscrews, spring washers and plain washers from the appropriate switch.
4. Free the joint and withdraw the respective lock-out switch.

Exhaust gas recirculation lock-out switch —To fit

Fit the lock-out switch by reversing the procedure given for removal, noting the following points.

1. Each setscrew has one spring and one plain washer.
2. The joint faces must be clean and a new gasket fitted.



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**FIG. 15 EXHAUST GAS RECIRCULATION
LOCK-OUT SWITCHES**

- 1 Secondary valve lock-out switch
- 2 Primary valve lock-out switch
- 3 Thermostat outlet elbow
- 4 Engine coolant thermostat

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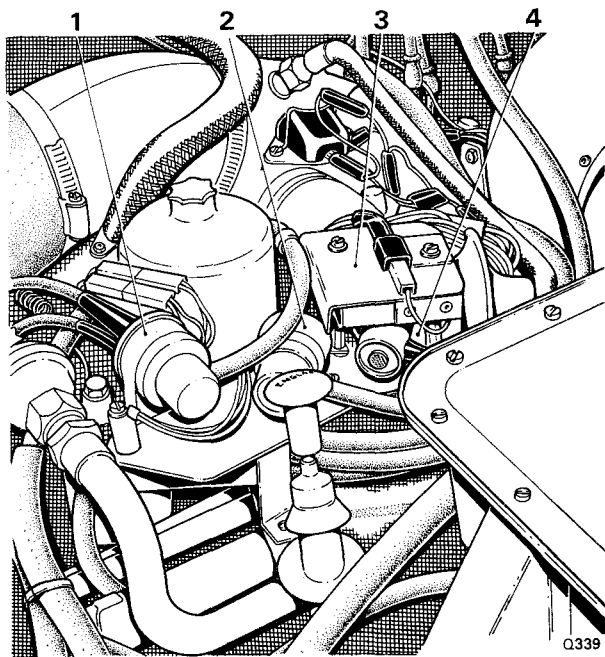


FIG. 16 SOLENOID PLATFORM

- 1 Anti 'run-on' solenoid
- 2 E.G.R. primary valve cut-out solenoid
- 3 E.G.R. secondary valve micro-switch assembly
- 4 E.G.R. secondary valve cut-out solenoid

**Exhaust gas recirculation lock-out switch
—To check**

1. Disconnect the electrical connection from the switch.
2. Connect one side of a test lamp to the switch contact of the lock-out switch to be tested and the other side to a known good electrical supply.
3. Ensure that the engine is cold and switch on the ignition.
4. Check that the test lamp bulb is illuminated.
5. **Primary valve lock-out switch**—Start and run the engine, as the coolant temperature rises to 14°C. (57°F.) the test lamp bulb should extinguish.
6. Stop the engine and allow to cool, noting that as the coolant temperature drops to 12°C. (54°F.) the test lamp bulb again illuminates.
5. **Secondary valve lock-out switch**—Start and run the engine, as the coolant temperature rises to 44°C. (111°F.) the test lamp bulb should extinguish.
6. Stop the engine and allow to cool, noting that as the coolant temperature drops to 42°C. (108°F.) the test lamp bulb again illuminates.

Note Do not leave the ignition switched on for long periods of time when the engine is not running.

Exhaust gas recirculation primary valve cut-off solenoid

The exhaust gas recirculation primary valve cut-off solenoid is the middle solenoid of three solenoids situated on a small platform, adjacent to the 'B' bank carburetter (see Fig. 16).

Exhaust gas recirculation primary valve cut-off solenoid—To remove

1. Detach the electrical connections, noting the position of the connections to assist identification when assembling.
2. Unscrew the two 'cheese-headed' mounting screws and withdraw the solenoid.

Exhaust gas recirculation primary valve cut-off solenoid—To fit

Fit the cut-off solenoid by reversing the procedure given for removal.

**Exhaust gas recirculation primary valve cut-off solenoid circuit wiring
—To check**

1. Connect a test lamp across the two Lucar connections to the solenoid.

Note Do not disconnect the two Lucar connections.

2. Ensure that the engine is cold.
3. Switch on the ignition and start the engine, noting that the bulb of the test lamp is illuminated.
4. Start and run the engine, as the coolant temperature rises to 14°C. (57°F.) the test lamp bulb should extinguish.
5. Depress the full throttle cut-out micro-switch plunger and check to ensure that the test lamp bulb illuminates. Release the plunger and the test lamp bulb should be extinguished.
6. Stop the engine and allow to cool, noting that as the coolant temperature drops to 12°C. (54°F.) the test lamp bulb again illuminates.

Note Do not leave the ignition switched on for long periods of time when the engine is not running.

Exhaust gas recirculation primary valve cut-off solenoid—To check

1. Detach the solenoid hose at the weakener unit
2. Clean the end of the hose.
3. Switch on the ignition.

Note Do not leave the ignition switched on for long periods of time when the engine is not running.

4. Place the hose in the mouth and apply suction.
5. If the operation of the solenoid is correct note that the following conditions apply and connect the hose to the weakener.

- (i) With an engine coolant temperature of below 14°C. (57°F.) sucking on the hose should not prompt any movement of the exhaust gas recirculation valve.

Disconnect the hose from the exhaust gas recirculation valve. Clean the end of the hose, place in the mouth and blow; it should be possible to blow down this hose as the solenoid is vented to atmosphere. Connect the hose to the exhaust gas recirculation valve.

- (ii) With an engine coolant temperature of above 14°C. (57°F.) sucking on the hose from the weakener unit should move the exhaust gas recirculation valve.
 - (iii) As the engine coolant temperature falls to 12°C. (54°F.) the conditions described in (i) should again apply.
6. If the operation of the solenoid is suspect, fit a new unit.

Exhaust gas recirculation secondary valve cut-in solenoid and vacuum operated micro-switch

This assembly is situated rearmost of the three solenoid assemblies mounted on a platform, adjacent to the 'B' bank carburetter (see Figs. 7 and 16).

Exhaust gas recirculation secondary valve cut-in solenoid and vacuum operated micro-switch—To remove

1. Detach the rubber hoses from the solenoid, solenoid vent and vacuum unit.

Note Each rubber hose should be labelled as it is detached, to facilitate identification during assembly.

2. Disconnect the electrical leads at their Lucar connections.
3. Unscrew and remove the two 2 B.A. screws which retain the micro-switch cover in position. Withdraw the cover.
4. Unscrew the two reach-nuts and withdraw the micro-switch assembly.
5. Unscrew and remove the two support pillars. Withdraw the solenoid assembly.
6. Collect the two distance pieces situated beneath the solenoid feet.

Exhaust gas recirculation secondary valve cut-in solenoid and vacuum operated micro-switch—To fit

Fit the secondary valve cut-in solenoid and vacuum operated micro-switch assembly by reversing the procedure given for removal.

Exhaust gas recirculation secondary valve cut-in solenoid and vacuum operated micro-switch circuit wiring—To check

1. Connect a test lamp across the two Lucar connections to the solenoid.

Note Do not disconnect the two Lucar connections.

2. Ensure that the engine is cold.
3. Switch on the ignition and start the engine, noting that the bulb of the test lamp is illuminated.
4. Start and run the engine until the coolant temperature rises to 44°C. (111°F.).
5. Stop the engine.
6. Switch on the ignition and note that the test lamp bulb is extinguished.
7. Start the engine and run at the idle speed, noting that the bulb of the test lamp is illuminated.

Exhaust gas recirculation secondary valve cut-in solenoid and vacuum operated micro-switch—To check

1. Disconnect the rubber hose from the vacuum unit.

2. Connect a suitable hand operated vacuum pump with a scale calibrated in ins. of Hg. (RH 8800) to the vacuum unit connection.

3. Draw a vacuum of at least 12 in. Hg. (30,5 cm. Hg.) and note that the micro-switch 'clicks' at approximately 10 in. Hg. (25,4 cm. Hg.) vacuum.

4. Allow the 12 in. Hg. (30,5 cm. Hg.) vacuum to decrease slowly and note that the micro-switch 'clicks' again as the vacuum falls to between 9.0 in. Hg. and 8.5 in. Hg. (22,9 cm. Hg. and 21,6 cm. Hg.).

5. Release the vacuum and remove the pump assembly. Re-connect the rubber hose

Exhaust gas recirculation secondary valve cut-in solenoid and vacuum operated micro-switch—To set

1. Unscrew and remove the two 2 B.A. screws which retain the micro-switch cover in position.
2. Remove the cover.

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3. Disconnect the rubber hose from the vacuum unit.
4. Connect a suitable hand operated vacuum pump with a scale calibrated in ins. of Hg. (RH 8800) to the vacuum unit connection.
5. Draw a vacuum of 12 in. Hg. (30.5 cm. Hg.) with the pump. Allow the vacuum to decrease to 8.75 in. Hg. (22.2 cm. Hg.) and then seal the vacuum line to maintain the vacuum at the micro-switch.
6. Release the lock-nut and screw the spring

loaded plunger assembly in until the micro-switch is fully depressed (*see Fig. 6*).

7. Screw the spring loaded plunger assembly out until the micro-switch 'clicks'. Tighten the lock-nut.

8. Check the operation of the vacuum operated micro-switch as detailed in Exhaust gas recirculation secondary valve cut-in solenoid and vacuum operated micro-switch—To check.

9. Fit the micro-switch cover. Remove the vacuum pump and re-connect the rubber hose to the vacuum unit.

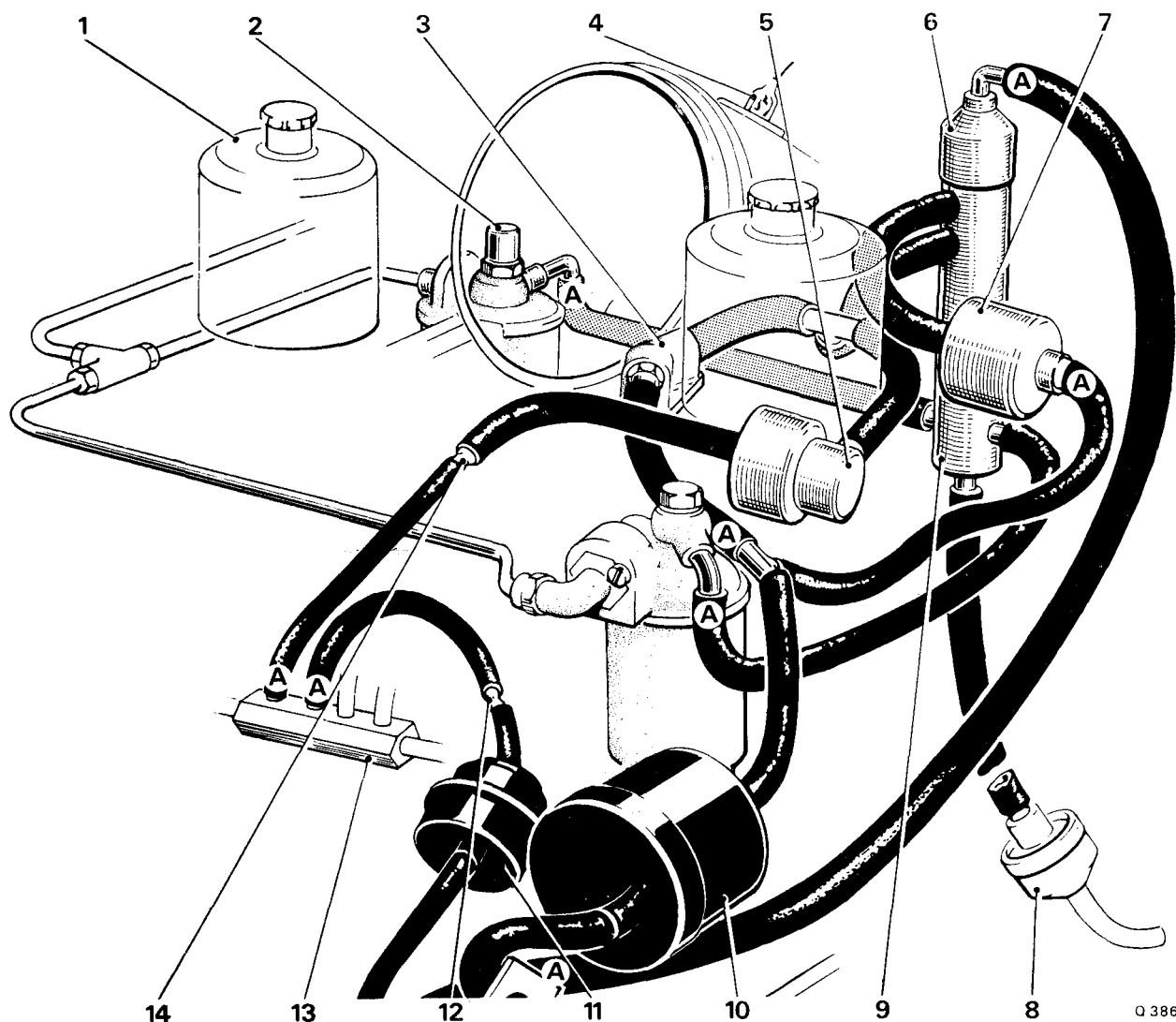


FIG. 17 CARBURETTER WEAKENING DEVICE

- | | |
|--|---|
| <p>A Hoses to be detached when removing carburetters</p> <p>1 'A' bank carburetter</p> <p>2 Float chamber pressure tapping</p> <p>3 Weakening device</p> <p>4 Bi-metal switch</p> <p>5 Anti 'run-on' solenoid</p> <p>6 Float chamber vent valve</p> | <p>7 Weakening device cut-off solenoid</p> <p>8 Float chamber drain valve</p> <p>9 Fuel receiver</p> <p>10 Weakener filter</p> <p>11 Purge line filter</p> <p>12 Purge line restrictor</p> <p>13 Vacuum manifold</p> <p>14 Restrictor</p> |
|--|---|

Exhaust gas recirculation full throttle cut-off micro-switch—To remove

1. Detach the two electrical leads at their Lucar connections.
2. Unscrew and remove the two small nuts and bolts which retain the micro-switch in position on the mounting bracket.
3. Withdraw the micro-switch.

Exhaust gas recirculation full throttle cut-off micro-switch—To fit

Fit the micro-switch by reversing the procedure given for removal. Finally, set the micro-switch.

Exhaust gas recirculation full throttle cut-off micro-switch circuit wiring—To check

1. Start and run the engine until normal operating temperature is attained.
2. Switch off the ignition.
3. Connect a test lamp in turn across the two Lucar connections to the primary and secondary exhaust gas recirculation cut-off solenoids.

Note Do not disconnect the Lucar connections.

4. Switch on the ignition and check that the test lamp bulb is extinguished.
5. Open the throttles to the full throttle position to activate the full throttle cut-off micro-switch and thereby, illuminate the test lamp bulb.

Exhaust gas recirculation full throttle cut-off micro-switch—To set

Prior to setting the exhaust gas recirculation system cut-off micro-switch, ensure that the following are correctly set.

- (i) Throttle linkage (*refer to Chapter K*).
- (ii) Carburettor linkage (*refer to page U181 of this Supplement*).
- (iii) Kick-down micro-switch (*refer to Chapter U*).

To set the cut-off micro-switch proceed as follows.

1. Depress the accelerator pedal until it touches the toeboard mounted kick-down micro-switch (further depression of the pedal requires increased effort).
2. Hold the throttle linkage in the position described in Operation 1 and release the lock-nut (*Fig. 8, item 2*) on the throttle lever (*item 3*).
3. Screw the spring loaded operating button away from the micro-switch.
4. When there is clearance at this point screw the spring loaded operating button toward the micro-switch until the micro-switch is heard to 'click'.

5. Tighten the lock-nut.
6. Depress the accelerator pedal further to operate the toeboard mounted kick-down micro-switch.
7. Adjust the full throttle stop (*Fig. 8, item 4*) to prevent overloading of the kick-down micro-switch. The full throttle stop should be set so that all throttle movement is stopped just prior to the operating button spring becoming fully compressed.

Air diverter valve vacuum operated micro-switch

This assembly is situated adjacent to the air diverter valve and air injection pump assemblies (*see Fig. 2, item 8*). The purpose of the unit is to assist in the protection of the exhaust catalyst (*see Catalyst over temperature protection on Page U157 of this Supplement*).

Air diverter valve vacuum operated micro-switch—To remove

To remove the assembly, carry out the procedure given on Page U173 of this Supplement under the heading 'Exhaust gas recirculation secondary valve cut-in solenoid and vacuum operated micro-switch—To remove'.

Air diverter valve vacuum operated micro-switch—To fit

Fit the assembly by reversing the procedure given for removal.

Air diverter valve vacuum operated micro-switch circuit wiring—To check

1. Connect a test lamp across the Lucar connections to the solenoid.

Note Do not disconnect the Lucar connections.

2. Start and run the engine at idle speed, noting that under these conditions (i.e. idle speed which produces a high manifold depression) the test lamp bulb illuminates.
3. Stop the engine, switch on the ignition and note that the test lamp bulb is extinguished.
4. Remove the test lamp.

Air diverter valve vacuum operated micro-switch—To check

1. Disconnect the hose from the induction manifold to the vacuum operated micro-switch, at the switch.
2. Connect a suitable hand operated vacuum pump (RH 8800) to the vacuum switch.

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3. Draw a vacuum of at least 6 in. Hg. (15,24 cm. Hg.) and note that the switch 'clicks' at approximately 3 in. Hg. (7,62 cm. Hg.).
4. Allow the 6 in. Hg. (15,24 cm. Hg.) vacuum to decrease slowly and note that the micro-switch 'clicks' again as the vacuum falls to between 2.7 in. Hg. (6,8 cm. Hg.) and 2.2 in. Hg. (5,58 cm. Hg.).
5. Release the vacuum and remove the pump assembly. Re-connect the rubber hose.

Air diverter valve vacuum operated micro-switch—To set

1. Unscrew and remove the two 2 B.A. screws which retain the micro-switch cover in position.
2. Remove the cover.
3. Disconnect the hose from the induction manifold to the vacuum operated micro-switch, at the switch.
4. Connect a suitable hand operated vacuum pump (RH 8800) to the vacuum switch.
5. Draw a vacuum of 6 in. Hg. (15,24 cm. Hg.) on the hand pump and then allow the vacuum to decrease to 2.5 in. Hg. (6,35 cm. Hg.), seal the vacuum line to maintain this vacuum at the micro-switch.
6. Release the lock-nut (*see Fig. 6*) and screw the spring loaded plunger in until the micro-switch is fully depressed.
7. Screw the spring loaded plunger assembly out until the micro-switch 'clicks'. Tighten the lock-nut.
8. Check the operation of the vacuum operated micro-switch as detailed in Air diverter valve vacuum operated micro-switch—To check.
9. Fit the hose to the vacuum operated micro-switch.

Air diverter valve cut-out solenoid—To check

1. Disconnect the hose from the air diverter valve (*see Fig. 3, item 14*) and attach an extension to the hose.
2. Switch on the ignition and apply a suction to the hose; air should pass freely down the hose.

Note If the suction is applied to the hose by the mouth, it must be for a short period only as vapour from the induction manifold will be inhaled.

3. Start and run the engine at idle speed. Apply a suction to the hose extension piece, noting that air cannot be drawn down the hose.
4. Stop the engine, remove the extension and re-connect the hose to the air diverter valve.

Anti 'run-on' solenoid

The anti 'run-on' solenoid is situated on a platform adjacent to 'B' bank carburetter; it is the foremost of the three solenoids fitted on the platform.

The use of low octane fuel often causes an engine to 'diesel' (i.e. continue to run-on after the ignition has been switched off, particularly when the engine is hot). To prevent this condition arising an anti 'run-on' solenoid is connected to the weakener unit signal line (*see Fig. 17*).

When the ignition is switched off the solenoid opens and connects the weakener system to the induction manifold, thus creating a high float chamber depression which cuts off the supply of fuel.

Anti 'run-on' solenoid—To remove

1. Disconnect the rubber hose from either side of the solenoid.
2. Disconnect the two electrical leads at their Lucar connections.
3. Unscrew and remove the two screws situated one on either side of the solenoid body.
4. Withdraw the anti 'run-on' solenoid.

Anti 'run-on' solenoid—To fit

Fit the anti 'run-on' solenoid by reversing the procedure given for removal.

Anti 'run-on' solenoid circuit wiring—To check

1. Connect a test lamp across the two Lucar connections to the solenoid.

Note Do not disconnect the two Lucar connections.

2. Switch on the ignition and check that the test lamp bulb illuminates.
3. Switch off the ignition and check that the test lamp bulb is extinguished.

Anti 'run-on' solenoid—To check

1. Detach the hose from the solenoid to the 'Tee' piece at the solenoid end and connect a piece of hose of identical internal diameter but of suitable length, to the solenoid.
2. Clean the open end of the hose.
3. Switch on the ignition.
4. Place the hose in the mouth and blow down the hose.

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5. If the operation of the solenoid is correct note that the following conditions apply and connect the original hose to the solenoid.

- (i) With the ignition switched on it should not be possible to blow down the hose.
- (ii) With the ignition switched off the solenoid is de-energised and it should be possible to blow down the hose.

6. Replace hose that was removed in Operation 1.

If the operation of the solenoid is suspect, carry out the following test before fitting a new unit.

1. Remove the cap from the pressure tapping on 'A' bank carburetter float chamber. Connect a manometer, capable of measuring between 0 in. and 6 in. (0 cm. and 15.24 cm.), to the pressure tapping connection.

2. Start and run the engine at idle speed (600 r.p.m.).

3. Switch off the ignition and observe the reading on the manometer. The reading should increase momentarily to approximately 6 in. (15.24 cm.) of H₂O as the engine stops.

If the reading does not increase check the following.

- (a) A blockage in the hose from the 'Tee' piece in the weakener hose to the anti run-on solenoid.
- (b) A blockage in the hose route (2 hoses joined by a restrictor/connector from the anti 'run-on' solenoid to the vacuum manifold.
- (c) Incorrect wiring to the anti 'run-on' solenoid.

Weakener cut-off solenoid

Refer to page U21

Weakener valve cut-off switch

Refer to page U21

THE CARBURETTERS AND AUTOMATIC CHOKE SYSTEM

CARBURETTER

CARBURETTER MIXTURE WEAKENING DEVICE

Data

Description

Carburetters	Two S.U. HD8 diaphragm type.
Choke size	2.00 in. (5.08 cm.).
Jet size—		
spring loaded needle type	0.100 in. (2.44 mm.).
Jet needle—		
spring loaded type	..	BCQ.
Carburetter—		
air valve piston spring		Red/Blue.

In addition to the description given on pages U24 and U25, the following information is applicable.

Anti-diesel device (anti 'run-on' solenoid)

The use of low octane fuel causes the engine to 'diesel' (i.e. continue to run-on after the ignition has been switched off) when it is hot. To prevent this from happening an anti 'run-on' solenoid valve is fitted into the weakener signal line. When the ignition is switched off this valve opens and connects the weakening system to the induction manifold thus creating a high float chamber depression which cuts off the fuel supply.

Chapter U

Carburettor overrun valves

During overrun (i.e. when decelerating with the throttles closed), insufficient mixture is supplied to the engine to maintain satisfactory combustion. The overrun valves alleviate this condition by allowing some mixture to pass through the throttle plates (butterflies) at high inlet manifold depressions.

An overrun valve consists of a small disc retained in each throttle plate by a spring loaded plunger. Under normal conditions the disc is seated against the throttle plate. When the throttle is suddenly closed, the increased inlet manifold depression lifts

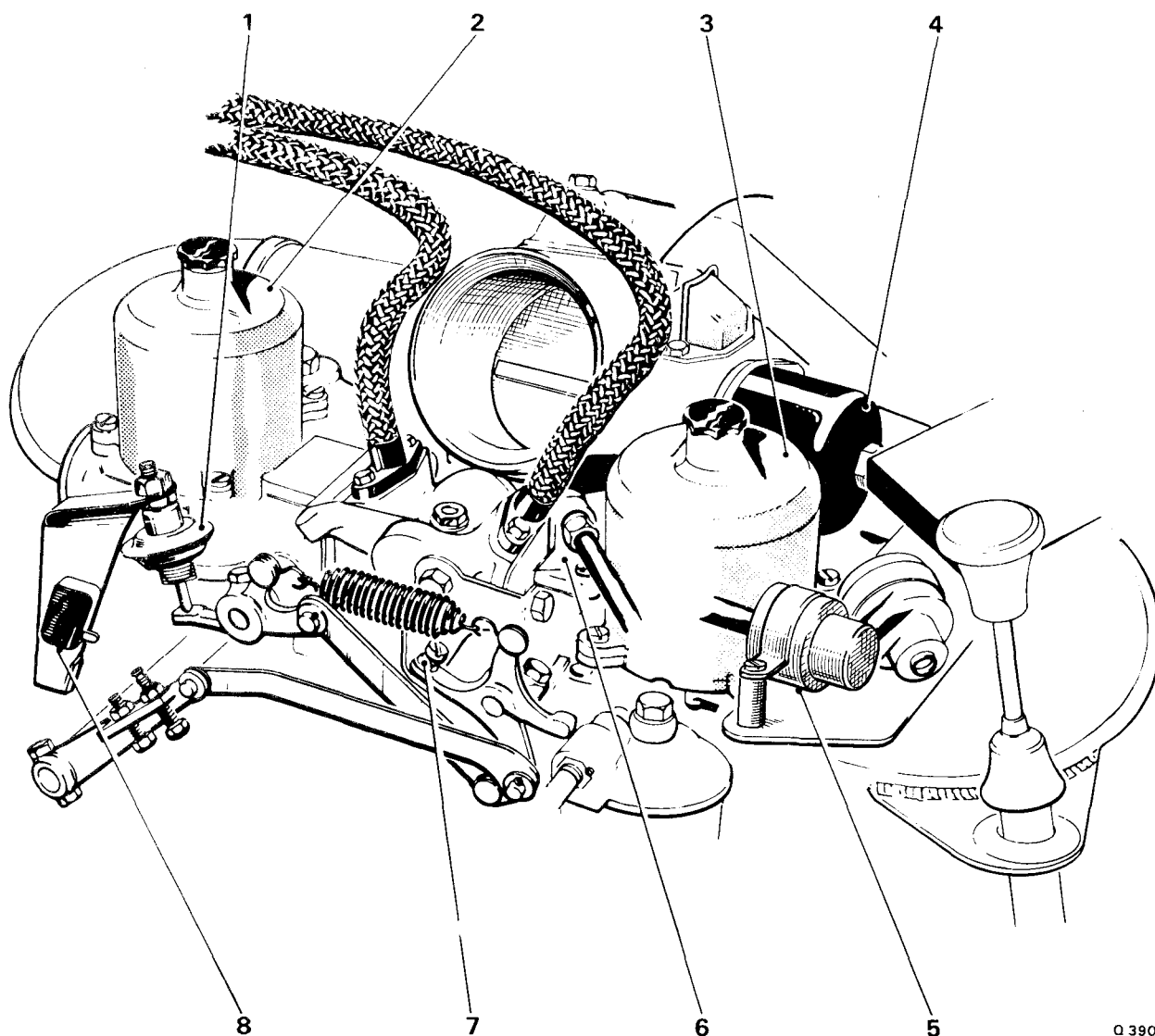
the disc from its seating and allows a metered quantity of air/fuel mixture to pass through the throttle plate.

The action of the overrun valves maintains satisfactory combustion on overrun, thus reducing hydrocarbon emissions and controlling catalyst temperatures.

After the sudden closure of the throttles and as soon as the manifold depression falls, the overrun valve disc returns to its seat on the throttle plate.

Throttle damper

The throttle damper prevents rapid throttle closure which would suddenly drop the inlet manifold



Q 390

FIG. 18 VIEW OF CARBURETTERS

- | | |
|--------------------------|---|
| 1 Throttle damper | 5 Anti 'run-on' solenoid |
| 2 'A' bank carburettor | 6 Mixture weakening device |
| 3 'B' bank carburettor | 7 Idle stop |
| 4 Choke bi-metal housing | 8 Full throttle (E.G.R.) cut-off micro-switch |

pressure causing vapourisation of fuel from the manifold walls and a sudden increase in mixture strength.

Temperature controlled air intake

To ensure rapid warm-up and improve control of the air/fuel ratio a temperature controlled air intake is fitted (*see Fig. 22*).

A vacuum operated blending valve attached to the air cleaner assembly is controlled by a thermal sensor in the air intake elbow. This valve blends hot air from a pick-up point (scoop) adjacent to the exhaust manifold with cold air from under the front wing; thus maintaining a constant temperature of the intake air as it enters the carburetters.

Temperature controlled air intake—To check

1. Disconnect the air intake hose at the butterfly housing and check that the correct temperature sensor is fitted, this should be colour coded green.
2. Disconnect the hose from the temperature sensor to the underwing air silencer, at the temperature sensor.
3. Clean the end of the hose, place in the mouth and apply a vacuum by sucking. Check that there is no air leak. Release the vacuum sharply and listen for the vacuum motor within the wing to 'click' open.
4. Reconnect the hoses.

Note If there is an air leak or the operation of the temperature controlled air intake is suspect, remove the right-hand front underwing sheet and check the hose connection to the vacuum motor; also observe the operation of the temperature flap.

Throttle stop vacuum actuator assembly

The throttle stop vacuum actuator assembly is not fitted to cars produced to the 1976 specification.

OVERHAUL

Carburetters—To remove

Before commencing to remove the carburetters observe the following points.

1. When disconnecting the various hoses, pipes and wiring connections ensure that they are suitably labelled to assist identification when assembling.
2. Ensure that **all** open ends of pipes, hoses, etc., are suitably blanked off to prevent the ingress of dirt, etc.

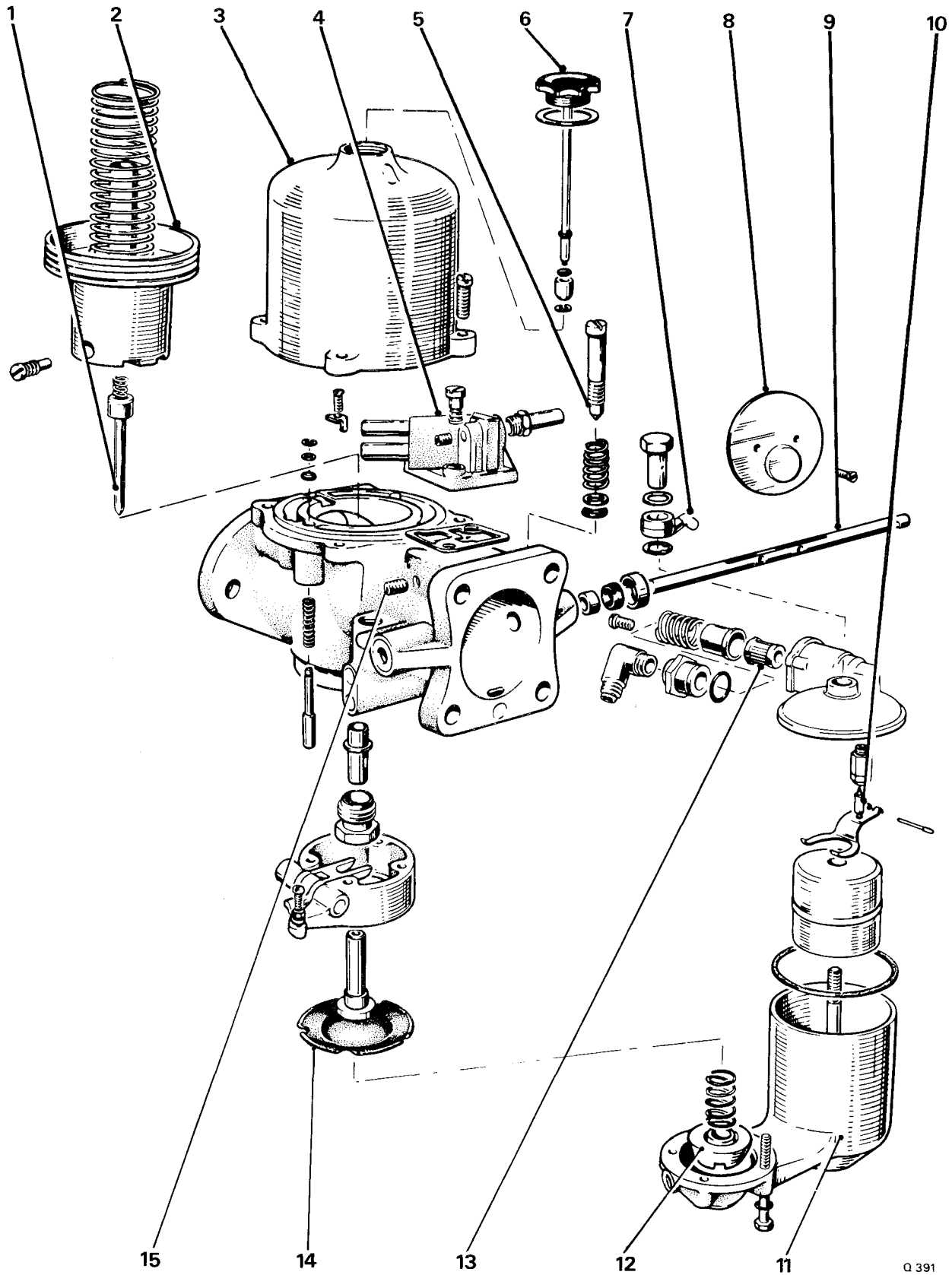
To remove the carburetters proceed as follows.

1. Disconnect the battery.
2. Unscrew and remove the two $\frac{7}{16}$ in. A/F nuts from the joint in the small diameter exhaust pipe, situated below the exhaust gas recirculation valves. Free the joint.

3. Detach the following rubber hoses (*see Fig. 17*).
 - (i) The hose from the weakening device cut-off solenoid to the small diameter 'tee' piece, at the solenoid.
 - (ii) The hose from the float chamber vent valve to the valance connection block, at both ends.
 - (iii) The hose from the weakening device to the 'tee' piece.
 - (iv) The hose from the vacuum manifold to the anti 'run-on' solenoid.
 - (v) The overflow hoses from the carburetter float chambers to the fuel receiver.
 - (vi) Both hoses from the inlet manifold tappings (*see Fig. 7*).
4. Detach the following electrical connections.
 - (i) The two connections at the full throttle E.G.R. cut-out micro-switch, also release the two rubber clips which hold the loom to the 'B' bank float chamber fuel feed pipe.
 - (ii) The two connections to the anti 'run-on' solenoid, including the earth wires from beneath one of the solenoid mounting feet. Also, release the loom from the clip situated on the solenoid mounting platform.
 - (iii) The two connections to the E.G.R. secondary valve cut-in micro-switch and one connection above the micro-switch assembly.
 - (iv) The connections to both E.G.R. cut-out solenoids at the Lucar connection block.
 - (v) The choke solenoid connections, also release the wires from the adjacent clip.
 - (vi) The weakener cut-off bi-metal switch.
5. Remove the crankcase breather pipe from the choke butterfly housing; withdraw the connection from the end of the pipe.
6. Disconnect the choke stove pipe from the choke housing.
7. Disconnect the choke stove pipe from the choke bi-metal coil housing connection.
8. Unscrew the worm drive clips securing the air intake hose in position; remove the hose.

Unscrew the worm drive clip securing the metal intake elbow to the butterfly choke housing. Disconnect the two rubber hoses connected to the thermal sensor situated inside the metal elbow. Withdraw the elbow.
9. Remove the engine oil dipstick.
10. Unscrew and remove the 2 B.A. bolt, nut and washer securing the throttle linkage to the 'fore and aft' manifold shaft lever; this connection is adjacent to the 'A' bank carburetter.
11. Withdraw the throttle linkage from the manifold shaft.
12. Disconnect the main fuel feed pipe.

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FIG. 19 'B' BANK CARBURETTER

- | | | |
|--|------------------|--|
| 1 'Swing' needle assembly | 6 Damper | 11 Float chamber |
| 2 Piston | 7 Overflow pipe | 12 Anti-boiling device |
| 3 Suction chamber | 8 Throttle plate | 13 Filter element |
| 4 Mixture weakening device
('B' bank carburetter only) | 9 Spindle | 14 Jet diaphragm |
| 5 Volume screw | 10 Float needle | 15 E.G.R. signal adjusting screw
('B' bank carburetter only) |

13. Remove the air horns, choke butterfly housing carburetters and 'Tee' piece as one complete assembly. The assembly is secured to the induction manifold by a $\frac{1}{2}$ in. A/F setscrew situated centrally on the carburetter 'Tee' piece and located by two dowel pins.

14. Before lifting the carburetters assembly from the engine check to ensure that no wires, hoses or other joints have been left connected.

Dismantle the carburetters from the 'Tee' piece and air horns as follows.

15. Unscrew the four setscrews retaining the E.G.R. distribution pipes in position on the carburetter 'Tee' piece.

16. Remove the exhaust gas recirculation valves from the carburetters assembly (*refer to Exhaust gas recirculation valves—To remove in this Supplement*) noting that the distribution pipes can be left connected to the E.G.R. valves.

17. Slacken the pinch bolt and remove the fast-idle lever from the 'A' bank carburetter butterfly spindle.

18. Unscrew and remove the two $\frac{1}{2}$ in. A/F nuts from the two setscrews securing the air horn to 'B' bank carburetter. Disconnect the rubber hoses from the solenoids. Unscrew the cheese-headed screw from the solenoid platform mounting foot adjacent to the engine oil dipstick tube, collect the nut and washer, and withdraw the solenoid platform assembly.

19. Remove the four setscrews securing the two air horns to the carburetters, collect the full throttle stop bracket assembly with the throttle damper from 'A' bank carburetter. Remove the air horns.

20. Disconnect the fuel feed pipe from the float chambers.

21. Disconnect and remove the throttle spring.

22. Completely remove the two pinch bolts securing the throttle levers to the 'A' and 'B' bank carburetter butterfly spindles; remove the levers.

23. Remove the nuts and washers securing both carburetters to the 'Tee' piece, remove the carburetters.

Carburetters—To fit

Fit the carburetters by reversing the procedure given for their removal noting the following points.

1. Fit new gaskets and washers to all joints.
2. Examine the floats for damage or punctures; fit the floats to their respective float chambers.
3. Renew the lid gaskets.
4. Fit the gaskets to the lids then fit the lids to the chambers.
5. Secure the lids and pipes to the float chambers.
6. Examine the paper filter elements for cleanliness and damage; renew if necessary.

7. Ensure that the 'O' rings on the petrol inlet unions are in good condition; renew if necessary. Fit the paper filter elements, spring retainers, springs and inlet unions to each float chamber lid. Secure the inlet unions with the retaining screws.

8. Fill the damper piston with an approved oil; the oil level should be approximately 0.5 in. (12.7 mm.) below the top of the piston rod. Do not overfill.

Carburetters—To set

The carburetters fitted to these cars are adjusted at the factory using **special equipment** to ensure that their settings comply with the current emission control regulations.

Under normal circumstances the carburetters should not require adjustment in service.

If however, adjustment is found necessary due to inadvertent disturbance or replacement of a component, set the carburetters by carrying out the following operations in the sequence given.

- A. Set throttle linkage and temporarily set engine idle speed. Check linkage clearances.
- B. Set cold start 'fast-idle' cam.
- C. Tune carburetters.
- D. Set cold start 'fast-idle' speed.
- E. Set the throttle damper plunger.
- F. Set the kick-down micro-switch.
- G. Set full throttle stop and full throttle E.G.R. cut-off micro-switch.

Contra-rotating throttles—To fit and set (see Fig. 20)

1. Assemble 'A' bank and 'B' bank throttle levers (*items 7 and 13*) onto the carburetter spindles.
2. Fit the setting jig (RH 8880) into position on the throttle levers.
3. Fully close 'B' bank carburetter butterfly (*item 8*).
4. Tighten the pinch bolt securing 'B' bank throttle lever.
5. Fully close 'A' bank carburetter butterfly (*item 3*).
6. Tighten the pinch bolt securing 'A' bank throttle lever.
7. Fit the throttle spring (*item 4*) to the throttle levers.
8. Remove the setting jig from the throttle levers.
9. Fit the cross link (*item 12*) and the eccentric throttle adjuster (*item 5*) onto the throttle levers, ensuring that both throttle butterflies are closed when adjusting and tightening the eccentric adjuster.

Note The eccentric pin should be set in the lowest position possible.

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10. Ensure that the tang of the throttle guard (*item 6*) has a clearance of between 0.050 in. (1.27 mm.) and 0.070 in. (1.78 mm.) with the cross link and also that the tang does not foul the throttle spring. If necessary bend the tang to give these clearances.
11. Check that the throttle linkage moves freely.
12. Fit the idle stop screw (*item 10*) and adjust until it just contacts the stop bracket (*item 11*) with the throttle butterflies remaining in the closed throttle position.
13. Screw down the idle stop screw $\frac{1}{2}$ turn and tighten the lock-nut.
14. Screw both of the carburetter volume screws (*items 2 and 9*) fully in.
15. Fit the throttle damper (*item 1*) with the damper spindle compressed 0.187 in. (4.75 mm.) when throttle lever (*item 13*) is in the closed position. Ensure that the damper rod contacts the throttle lever centrally 0.20 in. (5.1 mm.) from the outer edge.
16. Connect the drive link (*item 14*) to the manifold shaft lever (*item 15*).
17. Operate the linkage to ensure free movement.
18. With the throttles in the closed position check that the 'A' bank control shaft to control rod lever

(*item 16*) on the rear of the manifold shaft is in line with the front manifold shaft lever (*item 15*). Tighten the securing bolts on both levers.

19. Operate the mechanism; check for freedom of movement within the linkage and also clearance with the various engine components.

20. To set the remainder of the linkage from the control rod lever on the rear of the manifold shaft to the accelerator pedal refer to Chapter T—Part 2.

CARBURETTER TUNING

Preliminary checks

Before tuning the carburetters the following checks should be carried out.

Ensure that the vehicle is in 'Park', the parking brake firmly applied and that the gear range actuator thermal cut-off has been removed from the main fusebox.

1. Check the condition of the spark plugs.
2. Check the ignition timing.
3. Check the flow through the choke stove pipe.
4. Check the entire induction system for air leaks.

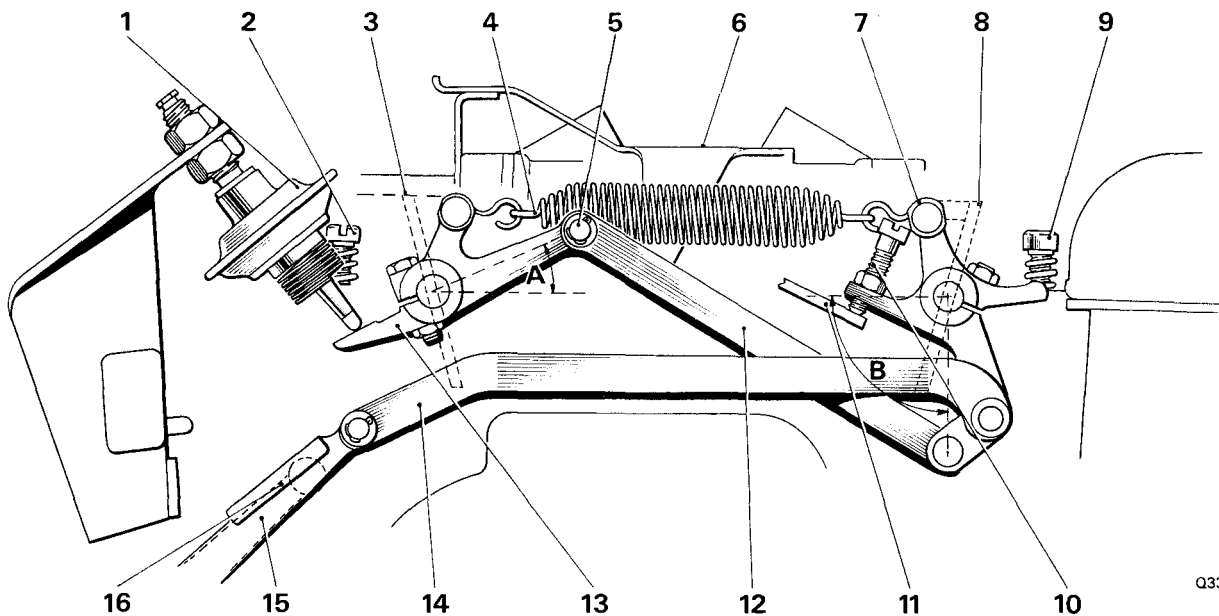


FIG. 20 CONTRA-ROTATING THROTTLE CONTROLS

- | | |
|--|---|
| A = Reference angle 22° | 8 'B' bank carburetter throttle plate |
| B = Reference angle 90° | 9 'B' bank carburetter volume screw |
| 1 Throttle damper | 10 Idle stop screw |
| 2 'A' bank carburetter volume screw | 11 Closed throttle bracket |
| 3 'A' bank carburetter throttle plate | 12 Cross link |
| 4 Throttle spring | 13 'A' bank carburetter throttle lever |
| 5 Eccentric throttle adjuster | 14 Drive link |
| 6 Throttle guard | 15 Front manifold shaft lever |
| 7 'B' bank carburetter throttle lever | 16 Rear manifold shaft lever |

5. Check the purge line flow rate.
6. Ensure that the air conditioning system is switched off.
7. Start the engine and warm up; allow to run for at least 5 minutes after the thermostat has opened.
8. Stop the engine, ensure that the choke butterfly valve is fully open and the choke 'fast-idle' off.
9. Connect an electric impulse tachometer in accordance with manufacturer's instructions.
10. Check the float chamber depression.
11. Check the exhaust gas recirculation signal strength.
12. Check the operation of the secondary exhaust gas recirculation valve and the vacuum operated micro-switch.
13. Check and set the full throttle exhaust gas recirculation cut-out micro-switch.

Tuning procedure

1. Remove the air intake hose, blank off the hot idle compensator feed drilling (see Fig. 21) and replace the hose.
 2. Remove the air hoses from the check valves and fit blanks over the valves (suitable blanks may be produced from two short lengths of rubber hose with one end plugged).
- Note** The air injection system is inoperative when the air hoses are disconnected from the check valves. The valves must be blanked to prevent air being drawn into the exhaust port by pulsations in the exhaust system since this would affect the idle CO reading.
3. Disconnect the exhaust gas recirculation (E.G.R.) cut-out solenoid to E.G.R. valve hoses at the E.G.R. valve ends and blank off the hoses.
 4. Remove the pressure tapping cap from 'A' bank carburetter float chamber to vent the float chambers to atmosphere.

5. Remove the carburetter dampers and fit a dial gauge assembly (RH 8841) in place of the damper. Ensure that both gauges read zero with the engine stopped. Start the engine and allow to idle at 600 r.p.m. noting that the piston lift shown on the dial gauge assemblies is equal (within 10%), adjust using the eccentric adjuster on the carburetter throttle linkage.

Note The average carburetter piston lift is between 0.035 in. (0.89 mm.) and 0.050 in. (1.27 mm.).

6. Ensure that the engine has run for at least 25 minutes after the thermostat has opened.

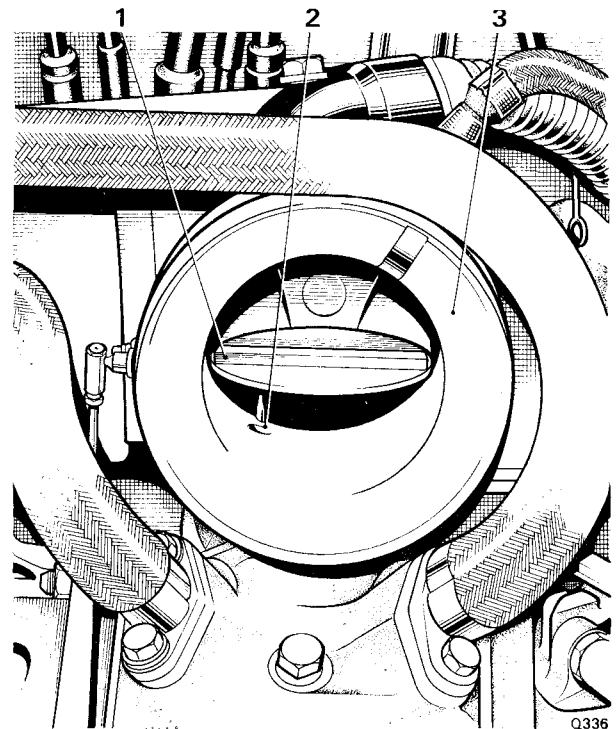


FIG. 21 HOT IDLE MIXTURE COMPENSATOR FEED

- 1 Choke butterfly
- 2 Hot idle compensator feed
- 3 Butterfly housing

7. To set 'A' bank carburetter mixture strength, remove the forward of the two blanks on the 'A' bank air manifold (see Fig. U20—Page U32); fit adapter (RH 8621) and connect to the CO meter.

8. Purge the engine at 2 000 r.p.m. in Neutral for $\frac{1}{4}$ minute, check the idle speed and reset to 600 r.p.m. using the throttle stop screw (Fig. 18, item 7).

9. Slacken the jet adjusting screw lock-nut on 'A' bank carburetter using spanner RH 8050 and set the CO meter reading to between $3\frac{3}{4}\%$ and $4\frac{1}{4}\%$ by adjusting the jet screw on 'A' bank carburetter (turning the screw clockwise richens the mixture). Tighten the lock-nut.

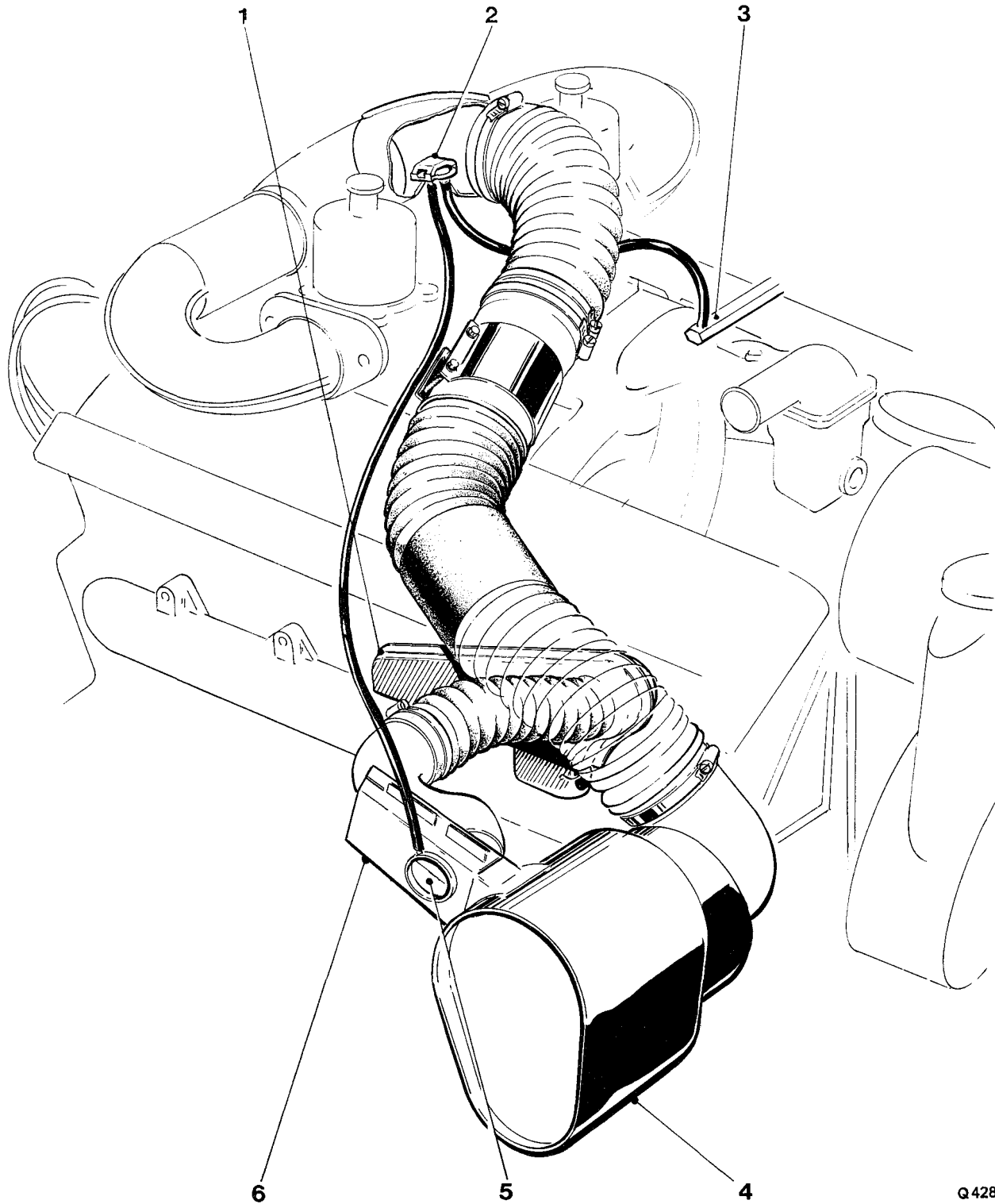
10. Remove the adapter RH 8621 from the air manifold and fit the blanking plug.

11. To set the mixture strength of 'B' bank carburetter, remove the rear blanking plug of the two blanking plugs on the 'A' bank air manifold (see Fig. U20—Page U32); fit adapter RH 8621 and connect to the CO meter.

12. Purge the engine at 2 000 r.p.m. in Neutral for $\frac{1}{4}$ minute, check the idle speed and reset to 600 r.p.m. using the throttle stop screw (Fig. 18, item 7).

13. Slacken the jet adjusting screw lock-nut on 'B' bank carburetter using spanner RH 8050 and set

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FIG. 22 TEMPERATURE CONTROLLED AIR INTAKE

- | | |
|----------------------|------------------------|
| 1 Hot air scoop | 4 Air cleaner/silencer |
| 2 Temperature sensor | 5 Air blending valve |
| 3 Vacuum manifold | 6 Cold air intake |

the CO meter reading to between $3\frac{3}{4}\%$ and $4\frac{1}{4}\%$ by adjusting the jet screw on 'B' bank carburetter (turning the screw clockwise richens the mixture). Tighten the lock-nut.

14. Remove the adapter RH 8621 from the air manifold and refit the blanking plug.

15. If setting the mixture strength involves adjusting 'B' bank carburetter jet adjusting screw by more than $\frac{3}{16}$ of a turn, the setting operations should be repeated again on 'A' bank carburetter (*Operations 7 to 9 inclusive*).

16. Check the mixture balance by raising each piston lift pin in turn. If the mixture balance is correct, the engine response for each carburetter piston lift will be identical.

If the response from each carburetter is not identical repeat Operations 6 to 16 inclusive.

17. Stop the engine and fit the probe of a suitable CO meter into the exhaust pipe in accordance with the manufacturer's instructions (a suitable CO meter is the Horiba Mexa 200).

18. Start the engine and run at idle speed until a steady CO reading is obtained (minimum time $\frac{1}{2}$ minute). The correct reading is between $3\frac{3}{4}\%$ and $4\frac{1}{4}\%$.

19. If the CO reading is not correct, slacken both jet adjusting screw lock-nuts with spanner RH 8050. Turn both jet adjusting screws by equal amounts in the same direction (up to a maximum of $\frac{1}{4}$ turn) until a CO meter reading of between $3\frac{3}{4}\%$ and $4\frac{1}{4}\%$ is obtained (turning the screws clockwise richens the mixture). Tighten the lock-nuts.

20. Fit the pressure tapping to 'A' bank carburetter float chamber, fitting a new washer if necessary. Remove the blanks from the air hoses and connect the hoses to the check valves. Remove the blanks from the E.G.R. cut-out hoses and connect the hoses to their respective E.G.R. valves.

21. Check the engine idle speed and if necessary adjust to 600 r.p.m. using the throttle stop screw.

22. Stop the engine. Remove the air intake hose and the blank from the hot idle compensator feed; fit the air intake hose.

23. Fit the gear range actuator thermal cut-out to the main fusebox.

Note The tuning operations should be carried out in the shortest possible time. If the time exceeds 3 minutes, run the engine at 2 000 r.p.m. in Neutral for $\frac{1}{4}$ minute and then resume the tuning operations. Repeat this purging operation if a further period of 3 minutes is exceeded.

After purging the system gently tap all around the neck of the carburetter suction chamber with a lightweight non-metallic object (i.e. the wooden handle of a small screwdriver), to eliminate carburetter piston hysteresis. The engine is to be run on Indolene Clear (HO) reference fuel or equivalent (Unleaded gasoline only).

Throttle damper plunger—To set

1. Move the cold start 'fast-idle' to the off position.
2. Slacken both nuts securing the throttle damper to its bracket. Back off the nuts until they are well clear of the bracket.
3. Press the damper towards the 'A' bank throttle lever until the damper is fully compressed and the lever is just clear of the throttle stop screw.
4. Screw the lower securing nut until it is 0.025 in. (0.63 mm.) clear of the underside of the bracket. Release the damper and tighten the upper securing nut.
5. Ensure that the damper spindle is at the maximum possible radius, whilst maintaining adequate contact with the throttle lever pad. This can be achieved by adjusting the angle of the bracket.

Automatic choke stove pipe—To check

To check the stove pipe for any blockage, carry out the following procedure.

1. Start the engine and run until normal operating temperature is attained.
2. Disconnect the union at the butterfly housing and connect a flowmeter to the pipe via connector RH 8945. The flowmeter must be a rotameter type capable of measuring up to 100 cu. ft/hr. (2,83 cu. m/hr.).
3. Start the engine and run at idle speed (i.e. 600 r.p.m.); observe the flowmeter reading which should be between 50 cu. ft/hr. and 55 cu. ft/hr. (1,41 cu. m/hr. and 1,55 cu. m/hr.).
4. If the flowmeter reading is below 50 cu. ft/hr. (1,41 cu. m/hr.), stop the engine, remove the choke stove pipe and stove assembly to check for leaks.
5. If the flowmeter reading is above 55 cu. ft/hr. (1,55 cu. m/hr.) fit a new restrictor in the end of the choke bi-metal housing (*see Fig. 18*).
6. Fit the choke stove pipe and stove assembly, start the engine and again observe the flowmeter reading at idle speed.

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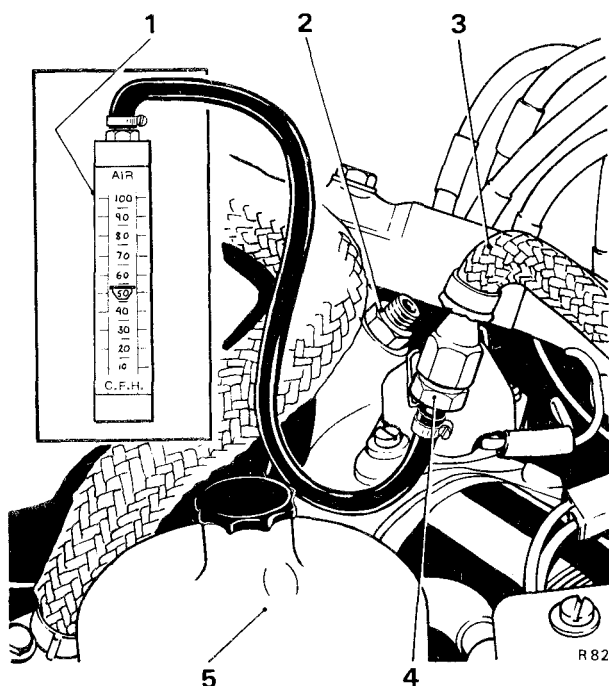


FIG. 23 CHECKING THE FLOW THROUGH THE CHOKE STOVE PIPE

- 1 Flowmeter
- 2 Choke stove pipe connection
- 3 Choke stove pipe
- 4 Adapter
- 5 'B' bank carburetter

7. Disconnect the flowmeter assembly and fit the choke stove pipe to the connection on the butterfly housing.

AUTOMATIC CHOKE—TO SET

Adjustment to kick diaphragm

Refer to Chapter K, Section K4.

Adjustment of the kick gap

Refer to Chapter K, Section K4.

Solenoid air gap

Refer to Chapter K, Section K4.

Solenoid lever spring tension

Refer to Chapter K, Section K4.

'Fast-idle' cam—To set

1. Fit the 'fast-idle' mechanism; do not tighten the 'fast-idle' lever clamping bolt.
2. Ensure that the 'fast-idle' adjustment screw is directly over the cam.
3. With the throttles closed, insert a 0.100 in. (2.54 mm.) diameter rod between the top of the 'fast-idle' cam and the boss under the 'fast-idle' adjustment screw. Tighten the clamping bolt on the 'fast-idle' lever.
4. Ensure that the throttles are closed; screw in the 'fast-idle' adjustment screw until it just makes contact with the top step of the 'fast-idle' cam.
5. Insert a 0.050 in. (1.27 mm.) diameter drill between the leading edge of the choke butterfly valve and the choke housing.
6. With the butterfly valve in this position, adjust the length of the butterfly rod so that the tip of the 'fast-idle' screw is in line with the start of the top step of the 'fast-idle' cam, (i.e. the position when the tip of the adjustment screw is about to fall from the top step to the bottom step of the cam.)
Remove the 0.050 in. (1.27 mm.) diameter drill from the choke housing.
7. With the throttles closed and the choke partly open, adjust the 'fast-idle' adjustment screw to just contact the start or bottom step of the 'fast-idle' cam, screw in a further $\frac{3}{4}$ turn and tighten the lock-nut ensuring that the adjustment screw does not move.

Thermocoil

Refer to Chapter K, Section K4.

Cold start 'fast-idle'—To set

1. Stop the engine and disconnect both solenoid to exhaust gas recirculation valve hoses at the valve ends. Blank the hoses. Disconnect the signal hose to the distributor vacuum capsule at the capsule and blank off the hose. Remove the pressure tapping cap to vent the float chambers; open the throttles and close the choke butterfly against the bi-metal coil tension by means of the butterfly link lever, release the throttles. The 'fast-idle' adjusting screw will now be resting on the high step of the 'fast-idle' cam and the throttles are in the cold start position.
2. Start the engine and check the 'fast-idle' speed. If the speed is not between 1 900 r.p.m. and 2 100 r.p.m., stop the engine, open the throttles to gain access to the adjusting screw and adjust $\frac{1}{8}$ turn for each 100 r.p.m. outside the required speed.

3. Tighten the lock-nut and check the 'fast-idle' speed. If correct open the throttles to release the 'fast-idle' cam mechanism.

4. Remove the blanks from both solenoid to the exhaust gas recirculation valve hoses and connect the hoses to their respective exhaust gas recirculation valves. Fit the pressure tapping cap to 'A' bank carburetter float chamber cover.

5. Remove the blank from the distributor advance vacuum signal hose and connect the hose to the capsule.

Float chamber depression—To check

Refer to Page U37 noting the following information.

- (i) The hose referred to in Operations 1 and 7 is now two hoses, one for each exhaust gas recirculation valve.
- (ii) The correct reading to be obtained on the manometer is 2.0 in. (5.08 cm.).
- (iii) **Operation 8 should read.**

8. Raise the engine speed slowly noting the manometer and tachometer readings. The maximum steady manometer reading should be obtained between 1 300 r.p.m. and 1 600 r.p.m. If the maximum depression occurs below 1 300 r.p.m. it is permissible to screw out the idle bleed screws on the carburetters by equal amounts (maximum 2.5 turns) to obtain this speed.

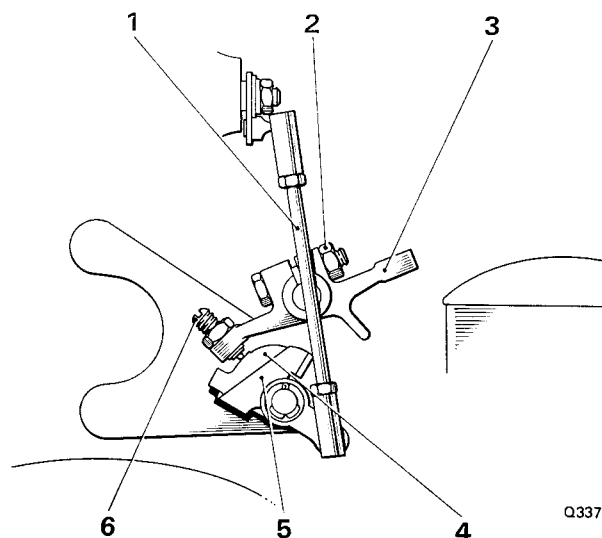


FIG. 24 'FAST-IDLE' MECHANISM

- 1 Butterfly rod
- 2 Lever clamp bolt
- 3 'Fast-idle' lever
- 4 Cam
- 5 Cam link
- 6 Adjusting screw

Exhaust gas recirculation signal strength —To check

Refer to Page U164 in this Supplement

Exhaust gas recirculation secondary valve cut-in solenoid and vacuum operated micro-switch—To check and set

Refer to Page U173 in this Supplement

Exhaust gas recirculation full throttle cut-off micro-switch—To set

Refer to Page U175 in this Supplement

IGNITION SYSTEM, DISTRIBUTOR, IGNITION COIL AND SPARKING PLUGS

Data

Ignition timing .. 9° B.T.D.C. (Static) 15° B.T.D.C. at 1 200 r.p.m. (stroboscopic) in Neutral with the vacuum advance disconnected. (Approach 1 200 r.p.m. from a higher speed).

Ignition control system

The ignition system utilises an Opus distributor (in which an oscillator pick-up and control unit replace the conventional contact breaker), a low inductance ignition coil and a ballast resistor. The control unit comprises an electronic oscillator, amplifier and power transistor.

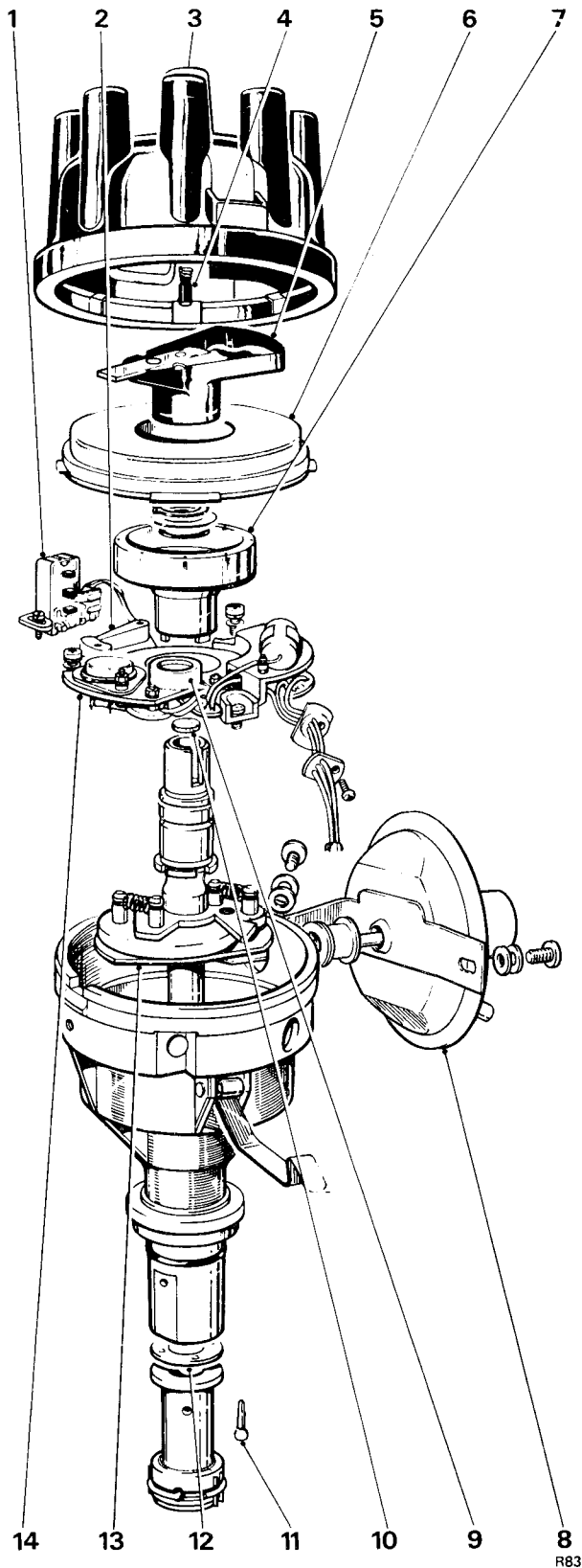


FIG. 25 EXPLODED VIEW OF DISTRIBUTOR

- 1 Pick-up module
- 2 Pick-up arm
- 3 Distributor cover/cap
- 4 High tension brush and spring
- 5 Rotor arm
- 6 Flash over shield (dust cover)
- 7 Timing rotor
- 8 Vacuum unit
- 9 Control unit
- 10 Lubrication pad
- 11 Driving dog and pin
- 12 Thrust washer
- 13 Automatic advance mechanism
- 14 Electronic module assembly

pick-up, this signal is then amplified and used to switch-off the normally conducting power transistor in the primary coil circuit thus inducing a high voltage in the secondary winding which is distributed to the sparking plugs in the normal manner.

In addition to the normal centrifugal advance mechanism the ignition distributor is fitted with a vacuum advance capsule. The E.G.R. gated orifice vacuum signal is applied to the capsule to advance the ignition timing for part throttle fuel economy during open road cruising. The vacuum signal is inhibited by a solenoid valve until a predetermined coolant temperature is reached.

This ignition control system provides increased accuracy of timing and increased service life before maintenance is required.

Ignition—To time (using a stroboscope)

The ignition is timed on A1 cylinder which is located at the front left-hand side of the engine (viewed from the front of the car).

Note If the ignition timing is to be set, ensure that the sparking plugs are in good condition before running the engine; if they require cleaning or renewal the sparking plugs gap should be set to 0.035 in. (0.9 mm.).

1. To check the ignition timing commence by running the engine until normal operating temperature is attained and the choke 'fast-idle' is in the off position. Switch off the engine.

2. Connect a stroboscope and a tachometer to the engine as described in the instructions supplied with the respective equipment. Disconnect the feed hose at the vacuum advance capsule; blank off the feed hose.

3. Start the engine and adjust the throttle stop screw to give an idle speed of 1 200 r.p.m. When setting the engine idle speed reduce from a higher speed to 1 200 r.p.m.

4. Direct the flashing light of the stroboscope onto the crankshaft damper timing marks and timing

A drum with eight ferrite rods (one per cylinder) moulded into the outer edge is mounted onto the distributor drive-shaft. As the drum rotates a voltage is created each time a ferrite rod passes the oscillator

pointer; the pointer is positioned on the right-hand side of the crankshaft damper when viewed from the front of the engine.

5. If the timing pointer does not coincide with the 15° B.T.D.C. mark on the crankshaft damper adjust the ignition timing as follows.

6. Release the clamp screw on the distributor and rotate the head of the distributor in the appropriate direction until the correct timing is obtained. Clockwise rotation of the distributor head advances the ignition and conversely anti-clockwise rotation retards the ignition. After adjustment has been carried out tighten the clamp screw and again check to ensure that the timing has not altered whilst tightening the clamp screw.

7. Set the engine idle speed to 600 r.p.m.

8. Direct the flashing light of the stroboscope onto the crankshaft damper timing marks and timing pointer. Check that the ignition timing is approximately 9° B.T.D.C.

9. Stop the engine.

10. Disconnect the hose from the vacuum manifold to the purge line restrictor at the restrictor (see Fig. 5). Connect a suitable length of hose between this hose and the connection on the distributor vacuum capsule.

11. Start the engine and set the idle speed to 600 r.p.m.

12. Direct the flashing light of the stroboscope onto the crankshaft damper timing marks and timing pointer. Check that the ignition timing has advanced to approximately 19° B.T.D.C. If the ignition timing has not advanced, the distributor assembly is faulty.

13. Stop the engine.

14. Fit all hoses to their correct connections.

15. Start the engine and set the idle speed to 600 r.p.m.

16. Stop the engine and remove all the test equipment.

Setting the engine idle speed

Ensure that the engine is at normal operating temperature and that the choke 'fast-idle' is in the off position.

The air conditioning system must be switched off and a tachometer connected to the engine in accordance with the manufacturer's instructions.

1. Stop the engine, remove the air intake hose and blank off the hot idle compensator feed drilling (see Fig. 21); replace the air intake hose.

2. Start the engine and, if necessary, adjust the engine idle speed to 600 r.p.m. using the throttle stop screw; tighten the lock-nut.

3. Stop the engine and remove the air intake hose. Remove the blank from the hot idle compensator feed drilling and detach the tachometer and stroboscopic timing equipment (if fitted). Fit the air intake hose.

Sparking plugs

The sparking plugs approved for this car are Champion RN. 14.Y. Before fitting the plugs, set the gaps with the aid of a feeler gauge to 0.035 in. (0.9 mm.) and lightly smear the threads with 'Graphogen' grease.

LUBRICATION AND MAINTENANCE

The 'Essential' maintenance which is listed in the following schedules is the minimum servicing which must be carried out at the appropriate distance/time intervals, in order to comply with the Rolls-Royce Motors Limited* warranty and the U.S. Federal and California Emission Regulations.

The 'Preventive' maintenance listed, is aimed at securing the maximum life and efficiency for the vehicle and will be carried out on request.

*In the U.S.A. this warranty is given by Rolls-Royce Motors Inc.

ESSENTIAL MAINTENANCE INITIAL SERVICE

This service will be carried out by the Dealer after the first 3 000 miles (5 000 km.) or 3 months whichever is the earlier.

Items marked * will be carried out free of charge.

INITIAL 3 000 MILES (5 000 km.) OR 3 MONTHS SERVICE WHICHEVER IS THE EARLIER

*Air injection pump

Check belt tension and reset if necessary.

*Automatic choke

Check the flow through the choke stove pipe and check for correct operation.

*Carburettors

Check oil level in air valve dampers and if necessary top-up to correct level. Check tightness of float chamber covers. Check float chamber depression. Check and if necessary reset the idle speed. Check and if necessary reset the choke 'fast-idle' speed.

Chapter U

Engine

Change engine oil.

***Fuel evaporation emission control system**

Check the purge rate: this should be between 50 cu. ft. per hr. and 70 cu. ft. per hr. (1.41 cu. m. per hr. and 1.98 cu. m. per hr.) at 600 r.p.m. in Neutral. Pressure test the fuel tank and evaporation loss line and if necessary rectify any leaks.

***Ignition system**

Check ignition timing using stroboscope and adjust if necessary; the ignition timing should be 15° B.T.D.C. with the engine running at 1200 r.p.m., the vacuum capsule disconnected and the feed hose blanked off.

Belt tension

Check the tension of all driving belts.

Engine cooling system

Tighten wormdrive clips of all coolant hoses.

Torque converter transmission

Check fluid level and top-up if necessary.

When checking the fluid level, avoid contact with the exhaust gas recirculation valves, heat shield and associated pipes as these components will be **hot**.

**EVERY 3 000 MILES (5 000 km.) OR
3 MONTHS WHICHEVER
IS THE EARLIER**

If the car is used for constant stop/start operation change the engine oil.

**EVERY 6 000 MILES (10 000 km.) OR
6 MONTHS WHICHEVER
IS THE EARLIER**

Engine

Change engine oil and renew oil filter element.

Battery

Check the level of the electrolyte in the battery; if necessary top-up with distilled water.

Belt tension

Check the tension of all driving belts.

Brakes

Inspect footbrake and parking brake pad linings. When changing footbrake pads examine condition of dust excluders on calipers. Manually adjust the parking brake pads. Inspect pipes and connections, rectify if necessary.

Fluid levels

Check all fluid levels.

Torque converter transmission

Check fluid level and top-up if necessary.

When checking the fluid level, avoid contact with the exhaust gas recirculation valves, heat shield and associated pipes as these components will be **hot**.

**EVERY 12 500 MILES (20 000 km.) OR
12 MONTHS SERVICE WHICHEVER
IS THE EARLIER**

Air injection pump

Check tension of pump pulley driving belt.

Air silencer

Fit a new paper filter element.

Carburettors

Top-up oil level in air valve dampers. Check tightness of float chamber covers. Check float chamber depression. Check and if necessary reset the idle speed. Check and if necessary, reset the choke 'fast-idle' speed.

Crankcase emission control system

Remove and clean gauze flame traps in the crankcase breather tube. Clean the adapter in the choke butterfly housing.

Engine

Change engine oil and renew oil filter element.

Fuel evaporation emission control system

Check the condition of the pipes and connections.

Ignition system

Fit new sparking plugs ensuring that the gaps are set to 0.035 in. (0.9 mm.).

Lubricate distributor spindle (shaft bearings) and automatic advance mechanism with engine oil.

Check the ignition timing using a stroboscope and adjust if necessary; the ignition timing should be 15° B.T.D.C. with the engine running at 1 200 r.p.m., the vacuum capsule disconnected and the feed hose blanked off.

Battery

Check the level of the electrolyte in the battery; if necessary top-up with distilled water.

Belt tension

Check the tension of all driving belts.

Brakes

Inspect footbrake and parking brake pad linings. When changing footbrake pads examine condition of dust excluders on calipers. Manually adjust parking brake pads. Inspect pipes and connections, rectify if necessary.

Final drive unit

Check oil level and top-up if necessary.

Fluid levels

Check all fluid levels.

Front suspension

The front suspension ball joints are sealed for life and no maintenance is required until renewal is necessary or the ball joint rubber covers are damaged. Inspect the rubber covers on the front suspension ball joints; if the covers are found to be damaged new joints and covers should be fitted.

Steering ball joints

Lubricate the six grease nipples. Inspect the rubber covers on the ball joints; if the covers are found to be damaged the joints should be dismantled and new parts fitted as necessary.

Torque converter transmission

Renew transmission fluid.

When checking the fluid level, avoid contact with the exhaust gas recirculation valves, heat shield and associated pipes as these components will be **hot**.

EVERY 18 500 MILES (30 000 km.) OR 18 MONTHS SERVICE WHICHEVER IS THE EARLIER

Engine

Change engine oil and renew oil filter element.

Battery

Check the level of the electrolyte in the battery; if necessary top-up with distilled water.

Belt tension

Check the tension of all driving belts.

Brakes

Inspect footbrake and parking brake pad linings. When changing footbrake pads examine condition of dust excluders on calipers. Manually adjust the parking brake pads. Inspect pipes and connections, rectify if necessary.

Fluid levels

Check all fluid levels.

Torque converter transmission

Check fluid level and top-up if necessary.

When checking the fluid level, avoid contact with the exhaust gas recirculation valves, heat shield and associated pipes as these components will be **hot**.

EVERY 25 000 MILES (40 000 km.) OR 2 YEARS SERVICE WHICHEVER IS THE EARLIER

Air injection pump

Check tension of pump pulley driving belt.

Air injection system

Check air injection system for leaks and correct functioning. Renew any defective items.

Air silencer

Fit a new paper filter element.

Automatic choke

Check the air flow through the choke stove pipe and check the system for correct functioning.

Carburettors

Clean air valves. Remove inlet unions from the float chamber covers and fit new paper filter elements. Top-up oil level in air valve dampers. Check tightness of float chamber covers. Check float chamber depression. Check and if necessary, reset the idle speed. Check and if necessary, reset choke 'fast-idle' speed.

Carburetter mixture weakening device

Renew air filter element for the carburetter mixture weakening device.

Chapter U

Crankcase emission control system

Remove and clean gauze flame traps in crankcase breather tube. Clean the adapter in choke butterfly housing.

Engine

Change engine oil and renew oil filter element.

Engine cooling system

Fit a new engine coolant thermostat and heater tap feed hose. Check the condition of all coolant hoses: fit new hoses as necessary.

Fuel evaporation emission control system

Renew the foam filter element in the evaporation loss control canister. Check the purge rate; this should be between 50 cu. ft. per hr. and 70 cu. ft per hr. (1,41 cu. m. per hr. and 1,98 cu. m. per hr.) at 600 r.p.m. in Neutral. Renew the purge line filter if necessary.

Ignition system

Fit new sparking plugs ensuring that the gaps are set to 0.035 in. (0,9 mm.).

Lubricate distributor spindle (shaft bearings) and automatic advance mechanism with engine oil.

Check the ignition timing using a stroboscope and adjust if necessary; the ignition timing should be 15° B.T.D.C. with the engine running at 1 200 r.p.m.. the vacuum capsule disconnected and the feed hose blanked off. Check the vacuum advance mechanism.

Battery

Check the level of the electrolyte in the battery; if necessary top-up with distilled water.

Belt tension

Check the tension of all driving belts.

Brakes

Inspect footbrake and parking brake pad linings. When changing footbrake pads examine condition of dust excluders on calipers. Manually adjust parking brake pads. Inspect pipes and connections: rectify if necessary.

Final drive unit

Change oil.

Fluid levels

Check all fluid levels.

Front suspension

The front suspension ball joints are sealed for life and no maintenance is required until renewal is necessary or the ball joint rubber covers are damaged. Inspect the rubber covers on the front suspension ball joints; if the covers are found to be damaged new joints and covers should be fitted.

Fuel pumps

Remove the fuel pumps and check for pumping efficiency. fit new pumps if necessary.

Hydraulic systems

Completely drain the fluid from the hydraulic circuits. Thoroughly clean the brake fluid reservoirs and sight glasses, ensure that no foreign matter enters the systems. Fill the hydraulic systems with new approved fluid. Bleed the brakes and height control systems.

Rear wheel drive-shafts

Lubricate the rear wheel drive-shaft outer universal couplings with approved grease.

Steering ball joints

Lubricate the six grease nipples. Inspect the rubber covers on the ball joints; if the covers are found to be damaged the joints should be dismantled and new parts fitted as necessary.

Torque converter transmission

Change transmission fluid.

Fit a new intake strainer.

When checking the fluid level, avoid contact with the exhaust gas recirculation valves, heat shield and associated pipes as these components will be **hot**.

SERVICING AFTER 25 000 MILES (40 000 km.) OR 2 YEARS WHICHEVER IS THE EARLIER

After 25 000 miles (40 000 km.) or 2 years, servicing is still due at the following intervals.

31 000 MILES (50 000 km.) OR 2½ YEARS WHICHEVER IS THE EARLIER

Carry out the 6 000 miles (10 000 km.) service.

**37 500 MILES (62 000 km.) OR
3 YEARS WHICHEVER IS THE
EARLIER**

Carry out the 12 500 miles (20 000 km.) service.

**43 500 MILES (70 000 km.) OR
3½ YEARS WHICHEVER IS
THE EARLIER**

Carry out the 6 000 miles (10 000 km.) service.

**50 000 MILES (80 000 km.) OR
4 YEARS WHICHEVER IS
THE EARLIER**

Carry out the 25 000 miles (40 000 km.) service and in addition the following operations.

Exhaust gas recirculation system

Remove and clean the exhaust gas recirculation valves and feed pipes. Clean the orifices in the carburetter 'Tee' piece. Check the exhaust gas recirculation valves for correct operation.

PREVENTIVE MAINTENANCE

INITIAL SERVICE

This service should be carried out by the Dealer after the first 3 000 miles (5 000 km.) or 3 months whichever is earlier.

Steering pump

Check the oil level in the reservoir; top-up if necessary.

Test

Road test the car for satisfactory performance.

**EVERY 6 000 MILES (10 000 km.) OR
6 MONTHS WHICHEVER IS
THE EARLIER**

Carburetters

Check the oil level in the air valve dampers and top-up if necessary.

Control linkages

Apply a few drops of engine oil to the accelerator linkage and to the gear range selector controls adjacent to the transmission casing.

Electrical system

Check all interior lamps, exterior lamps, instruments warning lamps and devices for correct operation; rectify as necessary.

Parking brake linkage

Lubricate the pivot pins and pulleys in the parking brake system with approved grease.

Tyres

Check the tread depth of all tyres, inspect all tyres for signs of damage. Check all tyre pressures when cold, adjust if necessary.

Note Include the spare tyre.

Test

Road test the car for satisfactory performance.

**EVERY 12 500 MILES (20 000 km.) OR
12 MONTHS WHICHEVER IS
THE EARLIER**

Control linkage

Apply a few drops of engine oil to the accelerator linkage and to the gear range selector controls adjacent to the transmission casing.

Electrical system

Check all interior lamps, exterior lamps, instruments, warning lamps and devices for correct operation; rectify as necessary.

Parking brake linkage

Lubricate the pivot pins and pulleys in the parking brake system with approved grease.

Spare wheel

Lubricate the spare wheel lowering bolt and mechanism.

Tyres

Check the tread depth of all the tyres, inspect all tyres for signs of damage. Check all tyre pressures when cold, adjust if necessary.

Note Include the spare tyre.

Test

Road test the car for satisfactory performance.

Chapter U

EVERY 18 500 MILES (30 000 km.) OR 18 MONTHS WHICHEVER IS THE EARLIER

Carburettors

Check the oil level in the air valve dampers and top-up if necessary.

Control linkages

Apply a few drops of engine oil to the accelerator linkage and to the gear range selector controls adjacent to the transmission casing.

Electrical system

Check all interior lamps, exterior lamps, instruments, warning lamps and devices for correct operation; rectify as necessary.

Parking brake linkage

Lubricate the pivot pins and pulleys in the parking brake system with approved grease.

Tyres

Check the tread depth of all tyres, inspect all tyres for signs of damage. Check all tyre pressures when cold, adjust if necessary.

Note Include the spare tyre.

Test

Road test the car for satisfactory performance.

EVERY 25 000 MILES (40 000 km.) OR 2 YEARS WHICHEVER IS THE EARLIER

Control linkage

Apply a few drops of engine oil to the accelerator linkage and to the gear range selector controls adjacent to the transmission casing.

Electrical system

Check all interior lamps, exterior lamps, instruments, warning lamps and devices for correct operation; rectify as necessary.

Fuel filter

Renew the main line filter element and clean the filter bowl.

Fuel tank

Slacken the drain plug one or two turns and allow any accumulated water to drain away. Tighten the drain plug.

Height control mechanism

Disconnect the control valve linkage ball joints. Clean, grease and refit the ball joints.

Parking brake linkage

Lubricate the pivot pins and pulleys in the parking brake system with approved grease.

Spare wheel

Lubricate the spare wheel lowering bolt and mechanism.

Tyres

Check the tread depth of all the tyres, inspect all tyres for signs of damage. Check all tyre pressures when cold, adjust if necessary.

Note Include the spare tyre.

Test

Road test the car for satisfactory performance.

SERVICING AFTER 25 000 MILES (40 000 km.) OR 2 YEARS WHICHEVER IS THE EARLIER

After 25 000 miles (40 000 km.) or 2 years, servicing is still due at the following intervals.

31 000 MILES (50 000 km.) OR 2½ YEARS WHICHEVER IS THE EARLIER

Carry out the 6 000 miles (10 000 km.) service.

37 500 MILES (60 000 km.) OR 3 YEARS WHICHEVER IS THE EARLIER

Carry out the 12 500 miles (20 000 km.) service

**43 500 MILES (70 000 km.) OR
3½ YEARS WHICHEVER IS
THE EARLIER**

Carry out the 6 000 miles (10 000 km.) service.

**50 000 MILES (80 000 km.) OR
4 YEARS WHICHEVER IS
THE EARLIER**

Carry out the 25 000 miles (40 000 km.) service.

**SEASONAL SCHEDULES
EVERY 12 MONTHS**

Engine cooling system

Drain the coolant from the radiator and the engine crankcase. Clean any debris from the surfaces of the refrigeration condenser and radiator matrices by reverse flushing with a hose. This should be carried out just prior to the Autumn. Fill the system with the correct anti-freeze mixture (*refer to Chapter L—Engine Cooling System of this Workshop Manual T.S.D. 2476 and the latest Service Bulletin*).

Air conditioning system

Ensure that the foam filter element fitted to the scuttle intake grille is free from obstruction. On Long Wheelbase cars fitted with a centre division, check that the foam filter element fitted to the intake grille in the rear decking panel is free from obstruction.

Check the refrigeration system for correct operation, rectify as necessary. Any work must be carried out by an experienced engineer.

Body

Check that the body drain holes are free from foreign matter.

EVERY 2 YEARS

In addition to the 12 monthly schedule, carry out the following.

Engine cooling system

Drain the coolant from the radiator and engine crankcase. Thoroughly reverse flush the coolant passages with a continuous flow of water. Change the coolant hoses where necessary. Fill the system with the correct anti-freeze mixture.

SERVICE RECOMMENDATIONS

50 000 Miles (80 000 km.)

Brake and hydraulic system

At this mileage and under normal motoring conditions it is recommended that the following servicing is carried out.

Renew the front and rear accumulator to frame connector block hoses.

Examine the sub-frame to brake caliper hoses for chafing or surface cracking; renew if necessary.

Completely drain the fluid from the hydraulic circuits. Thoroughly clean the brake fluid reservoirs and sight glasses, ensuring that no foreign matter is allowed to enter during the operation.

Fill the hydraulic system with Castrol RR 363 Brake Fluid. This fluid exceeds specification S.A.E. J 1703b in many respects and complies with D.O.T. 3 grade of FMVSS 116. Bleed the braking systems and automatic height control system.

100 000 Miles (160 000 km.)

Brake and hydraulic system

At this mileage and under normal motoring conditions it is recommended that the following servicing is carried out.

Renew all the flexible hoses to the braking systems and the automatic height control system. Fit new seals to the disc brake calipers and the deceleration conscious pressure limiting valve.

Completely drain the fluid from the hydraulic circuits. Thoroughly clean the brake fluid reservoirs and sight glasses, ensuring that no foreign matter is allowed to enter during the operation.

Fill the hydraulic system with Castrol RR 363 Brake Fluid. This fluid exceeds specification S.A.E. J 1703b in many respects and complies with D.O.T. 3 grade of FMVSS 116. Bleed the braking systems and automatic height control system.

Fuel system

Fit a new convoluted rubber hose between the fuel filler head and fuel tank assembly. Examine all flexible fuel pipes and renew any which show signs of deterioration.

SPECIAL PRECAUTIONS

Should the car be used in very cold temperatures, drain the engine sump when thoroughly warm and also drain the carburettor air valve dampers. The engine sump and carburettor air valve dampers should then be filled with oil having the following viscosity.

For constant temperatures of between 0°C. and —23°C. (32°F. and —10°F.), use a 10W/30 grade oil.

For constant temperatures of —23°C. (—10°F.) and below, use a 5W/20 grade oil.

Chapter U

FAULT DIAGNOSIS

SYMPTOMS	POSSIBLE CAUSE
<p>1. Engine will not start. (Starter motor operating).</p>	<p>1. (a) Ignition circuit broken. (b) Failed anti 'run-on' solenoid or failure of electrical supply circuit. (c) Ignition system faulty. (d) Damaged or contaminated ignition high-tension circuit. (e) Fault in fuel feed line or fouled float chamber filters. (f) Faulty choke bi-metal coil. (g) Choke solenoid inoperative. (h) Faulty choke 'fast-idle' mechanism. (i) Air leak into induction system. (j) Faulty hot idle mixture compensator. (k) Weakening device filter blocked or blockage in rubber connecting hoses. (l) Faulty weakener cut-off solenoid or failure of electrical supply circuit. (m) Faulty weakening device control switch or failure of electrical supply circuit. (n) Dislodged venturi in weakener device. (o) Flooding of carburetter float chamber or jet. (p) Fouled carburetter float chamber or jet. (q) Exhaust gas recirculation valve(s) failed. (r) Faulty exhaust gas recirculation secondary valve control switch or failure of electrical supply circuit. (s) Failed secondary exhaust gas recirculation valve cut-out solenoid or electrical supply circuit.</p>
<p>2. Engine idles very roughly.</p>	<p>2. (a) Ignition system faulty. (b) Fouled sparking plugs. (c) Damaged or contaminated ignition high-tension circuit. (d) Air leak into induction system. (e) Faulty hot idle compensator. (f) Weakening device filter blocked or blockage in rubber connecting hoses. (g) Dislodged venturi in weakener device. (h) Badly worn or damaged carburetter control linkage. (i) Flooding of carburetter float chamber or jet. (j) Sticking carburetter piston. (k) Fouled carburetter float chamber or jet. (l) Air leak into exhaust gas recirculation vacuum control circuit. (m) Exhaust gas recirculation valve(s) failed. (n) Faulty exhaust gas recirculation secondary valve control switch or failure of electrical supply circuit. (o) Failed secondary exhaust gas recirculation valve cut-out solenoid or electrical supply circuit. (p) Faulty air diverter valve. (q) Incorrect operation of temperature controlled air intake system.</p>
<p>3. Engine stalls.</p>	<p>3. (a) Ignition circuit broken. (b) Failed anti 'run-on' solenoid or failure of electrical supply circuit. (c) Ignition system faulty. (d) Damaged or contaminated ignition high-tension circuit. (e) Fault in fuel feed line or fouled float chamber filters. (f) Air leak into induction system. (g) Faulty hot idle mixture compensator. (h) Weakening device filter blocked or blockage in rubber connecting hoses. (i) Dislodged venturi in weakening device. (j) Badly worn or damaged carburetter control linkage. (k) Flooding of carburetter float chamber or jet. (l) Sticking carburetter piston. (m) Fouled carburetter float chamber or jet. (n) Air leak into exhaust gas recirculation vacuum control circuit. (o) Exhaust gas recirculation valve(s) failed. (p) Faulty exhaust gas recirculation secondary valve control switch or failure of electrical supply circuit. (q) Failed secondary exhaust gas recirculation valve cut-out solenoid or electrical supply circuit. (r) Faulty air diverter valve.</p>

SYMPTOMS	POSSIBLE CAUSE
4. (i) Engine shows signs of power loss, evident at high speeds and loading. (ii) Engine misfires particularly on hard acceleration from low speed.	4. (a) Ignition system faulty. (b) Fouled sparking plugs. (c) Damaged or contaminated ignition high-tension circuit. (d) Fault in fuel feed line or fouled float chamber filters. (e) Choke system operation incorrect. (f) Sticking carburetter piston. (g) Fouled carburetter float chamber or jet. (h) Faulty exhaust gas recirculation full throttle cut-out switch or failure of electrical supply circuit. (i) Exhaust gas recirculation valve(s) failed. (j) Failed primary exhaust gas recirculation valve cut-out solenoid or electrical supply circuit. (k) Failed secondary exhaust gas recirculation valve cut-out solenoid or electrical supply circuit.
5. Engine hesitates or misfires under light load.	5. (a) Failed anti 'run-on' solenoid or failure of electrical supply circuit. (b) Ignition system faulty. (c) Fouled sparking plugs. (d) Damaged or contaminated ignition high-tension circuit. (e) Fault in fuel feed line or fouled float chamber filters. (f) Air leak into induction system. (g) Faulty hot idle mixture compensator. (h) Weakening device filter blocked or blockage in rubber connecting hoses. (i) Dislodged venturi in weakening device. (j) Flooding of carburetter float chamber or jet. (k) Sticking carburetter piston. (l) Fouled carburetter float chamber or jet. (m) Incorrect purge flow rate. (n) Exhaust gas recirculation valve(s) failed. (o) Faulty exhaust gas recirculation secondary valve control switch or failure of electrical circuit. (p) Failed secondary exhaust gas recirculation valve cut-out solenoid or electrical supply circuit. (q) Faulty air diverter valve. (r) Incorrect operation of temperature controlled air intake system.
6. Increase in fuel consumption.	6. (a) Ignition system faulty. (b) Faulty choke bi-metal coil. (c) Choke system operation incorrect. (d) Air leak into induction system. (e) Faulty hot idle mixture compensator. (f) Weakening device filter blocked or blockage in rubber connecting hoses. (g) Faulty weakener cut-off solenoid or failure of electrical supply circuit. (h) Faulty weakening device control switch or failure of electrical supply circuit. (i) Air leaks in mixture weakening system. (j) Flooding of carburetter float chamber or jet. (k) Sticking carburetter piston. (l) Incorrect purge flow rate. (m) Exhaust gas recirculation valve(s) failed. (n) Faulty exhaust gas recirculation secondary valve control switch or failure of electrical supply circuit. (o) Failed secondary exhaust gas recirculation valve cut-out solenoid or electrical supply circuit. (p) Faulty air diverter valve.
7. Decrease in fuel consumption.	7. (a) Air leaks in mixture weakening system. (b) Incorrect purge flow rate. (c) Faulty exhaust gas recirculation temperature control switch or failure of electrical supply circuit. (d) Air leak into exhaust gas recirculation vacuum control circuit. (e) Exhaust gas recirculation valve(s) failed. (f) Faulty exhaust gas recirculation secondary valve control switch or failure of electrical supply circuit.

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SYMPTOMS	POSSIBLE CAUSE
8. Engine 'backfires' on overrun.	8. (a) Ignition system faulty. (b) Air leak into induction system. (c) Exhaust gas recirculation valve(s) failed. (d) Failed secondary exhaust gas recirculation valve cut-out solenoid or electrical supply circuit.
9. Sudden increase in engine idle speed.	9. (a) Faulty choke 'fast-idle' mechanism. (b) Failed carburetter overrun valve.
10. Excessive noise from air injection pump or system.	10. (a) Faulty air diverter valve. (b) Faulty or damaged air injection pump.

WORKSHOP TOOLS

Tool Number Description

RH 8050 Spanner—Carburetter Jet Screw

RH 8087 Spanner—Weakener Cut-off Valve

RH 8089 Jet Centring Tool

RH 8090 Pliers—Wire Hose Clips

RH 8383 Positioning Tool—Throttle Spindle Seal

RH 8621 Adapter—Air Manifold to CO Meter

RH 8800 Vacuum Pump—Hand Operated

RH 8841 Dial Gauge—Carburetter Piston Lift

RH 8880 Setting Jig—Throttle Levers

RH 8945 Connector—Choke Stove Pipe

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Chapter U

Section U10

SUPPLEMENTS

No. 7 Japan 1976

Workshop personnel should refer to Chapter U (Part 2) and the Supplements Nos. 5 and 7 for servicing information applicable to 1976 model year cars.

Rolls-Royce Silver Shadow and Bentley T Series motor cars and Rolls-Royce and Bentley Corniche motor cars destined for Japan and built to the 1976 specification, have the following changes from the previous year's specification.

Changes from the 1975 Specification to the 1976 Specification.

1. Single exhaust system with a catalytic converter replacing the front silencer.
2. Heatshields for underside insulation above the catalytic converter.
3. New exhaust downtake pipe to match up with the catalytic converter.

4. Label for 'unleaded fuel' requirement fitted to the inner flap of the fuel filler compartment.
5. Unleaded gasoline only label fitted either in or adjacent to the fuel gauge on the fascia.
6. Sensors fitted to the catalytic converter and body floor to activate a warning buzzer if overheating occurs.
7. Metal temperature switch fitted to 'A' bank cylinder head.
8. Additional electrically operated booster fan fitted between the radiator grille and refrigeration matrix.
9. Fuel cooler fitted adjacent to the refrigeration compressor
10. Positions of the fuel filter and fuel pump are reversed.
11. Thermostat outlet elbow with two lock-out switches fitted.
12. Radiator grille with modified vanes to accommodate booster fan mentioned in item 8.
13. Galvanised mesh heatshields beneath the exhaust system.
14. Fuel integrity system fitted to fuel tank.

Chapter U

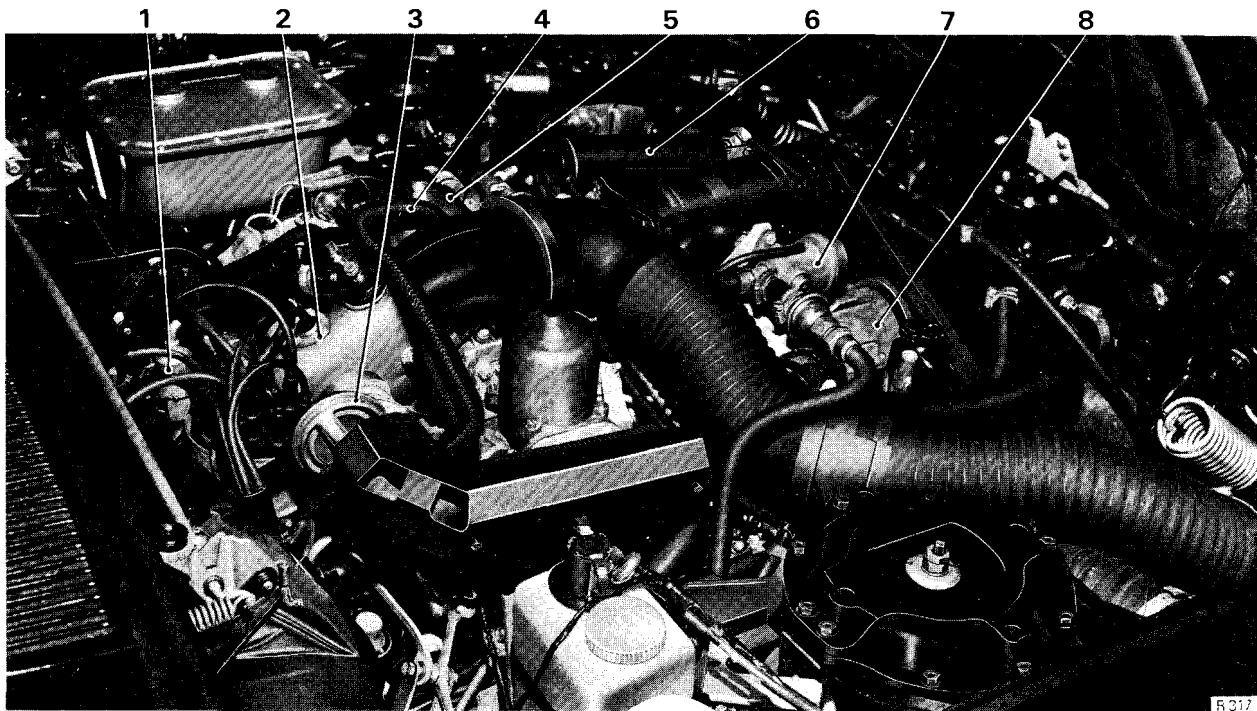


FIG. 1 VIEW INSIDE ENGINE COMPARTMENT (From Right-hand Side of Car)

- | | |
|--|------------------------|
| 1 Fuel receiver and float chamber vent valve | 5 'B' bank carburetter |
| 2 Weaker system cut-off switch | 6 Fuel cooler |
| 3 E.G.R. valve | 7 Air diverter valve |
| 4 E.G.R. distribution pipes | 8 Air pump |

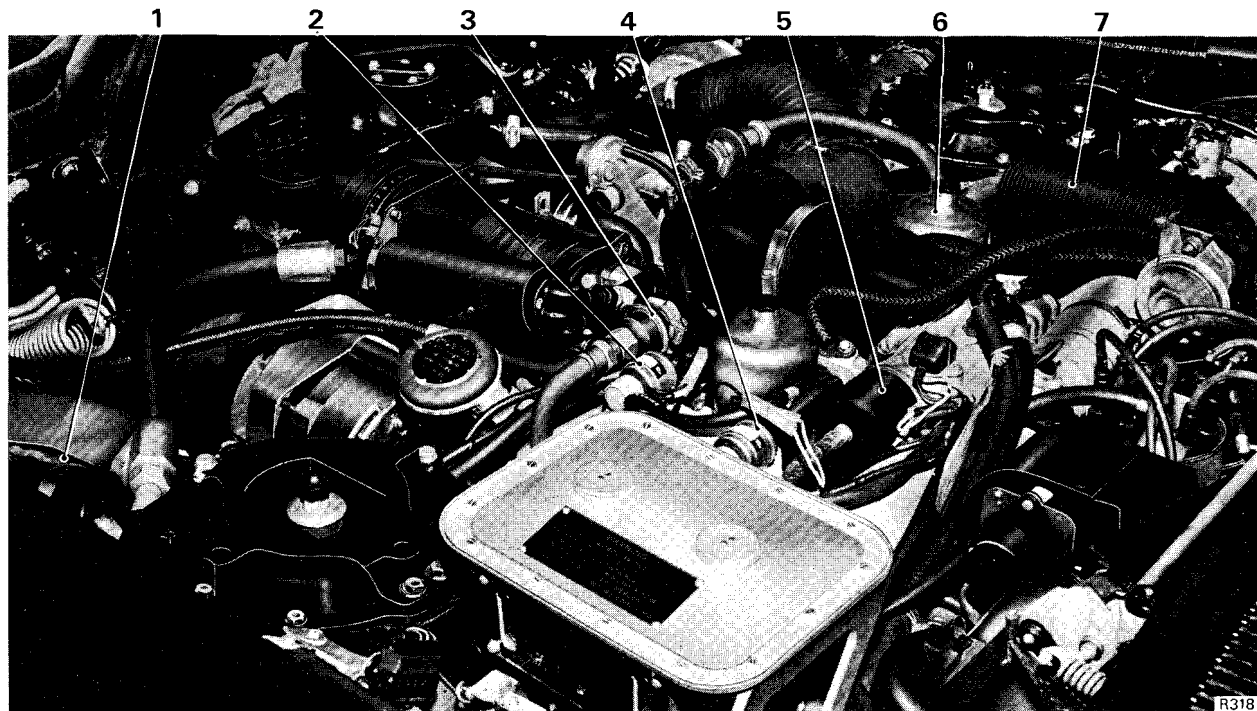


FIG. 2 VIEW INSIDE ENGINE COMPARTMENT (From Left-hand Side of Car)

- | | |
|---------------------------|-----------------------------|
| 1 Weaker filter | 5 Choke thermo-coil housing |
| 2 Anti 'run-on' solenoid | 6 'A' bank carburetter |
| 3 Check valve | 7 E.G.R. cooler |
| 4 E.G.R. cut-out solenoid | |

EXHAUST EMISSION CONTROL SYSTEM

AIR INJECTION SYSTEM

As 1975 Specification—see Supplement No. 5, except for the following.

The air diverter valve is not serviceable. If the operation of the component is suspect, the following checks should be carried out before it is replaced.

1. Ensure that the handbrake/parking brake is firmly applied and that the vehicle is in Park.
2. Start and run the engine at 2 000 r.p.m.
3. Ensure that **air does not escape** from the air diverter valve exhaust ports situated around the body of the air diverter valve.

If air escapes from the exhaust ports the air diverter valve assembly is faulty due to either a failed relief valve or a seized shuttle and must be replaced with a new unit.

4. Release the throttle linkage sharply so that the engine speed rapidly falls from 2 000 r.p.m., ensure that **air escapes** from the air diverter valve exhaust ports for a short period of time.

If air does not escape from the exhaust ports of the air diverter valve during Operation 4 check the following.

- (a) The condition of the hose from the air diverter valve to the vacuum manifold.
- (b) The condition of any hose connected to the vacuum manifold.
- (c) Repeat Operation 4.

If air still does not escape during Operation 4 the air diverter valve assembly is faulty due to either a diaphragm or timing valve failure and must be replaced.

After fitting a new air diverter valve, ensure that the component operates satisfactorily.

5. Allow the engine to idle at 600 r.p.m. Ensure that **air does not escape** from the air diverter valve exhaust ports.

EXHAUST GAS RECIRCULATION SYSTEM

As 1975 Specification—see Supplement No. 5 except for Figure 4 which provides additional information.

OXIDATION CATALYST SYSTEM

A catalytic converter, in place of the conventional front silencer is situated in the exhaust system to the rear of the point in the system where both exhaust manifold downtake pipes combine.

The box unit contains three catalyst blocks and has sufficient volume to perform the dual functions of

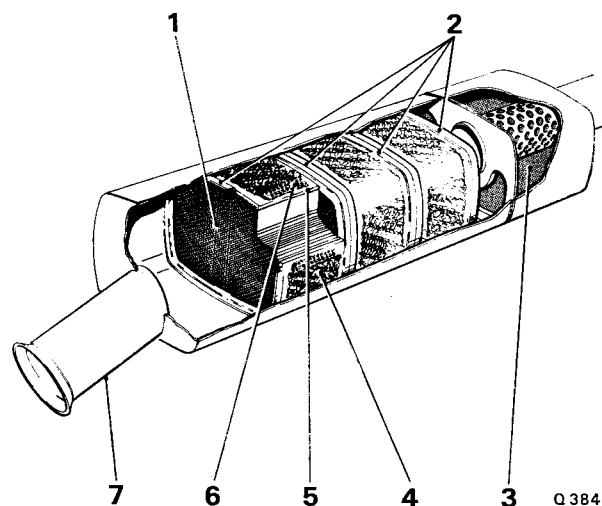
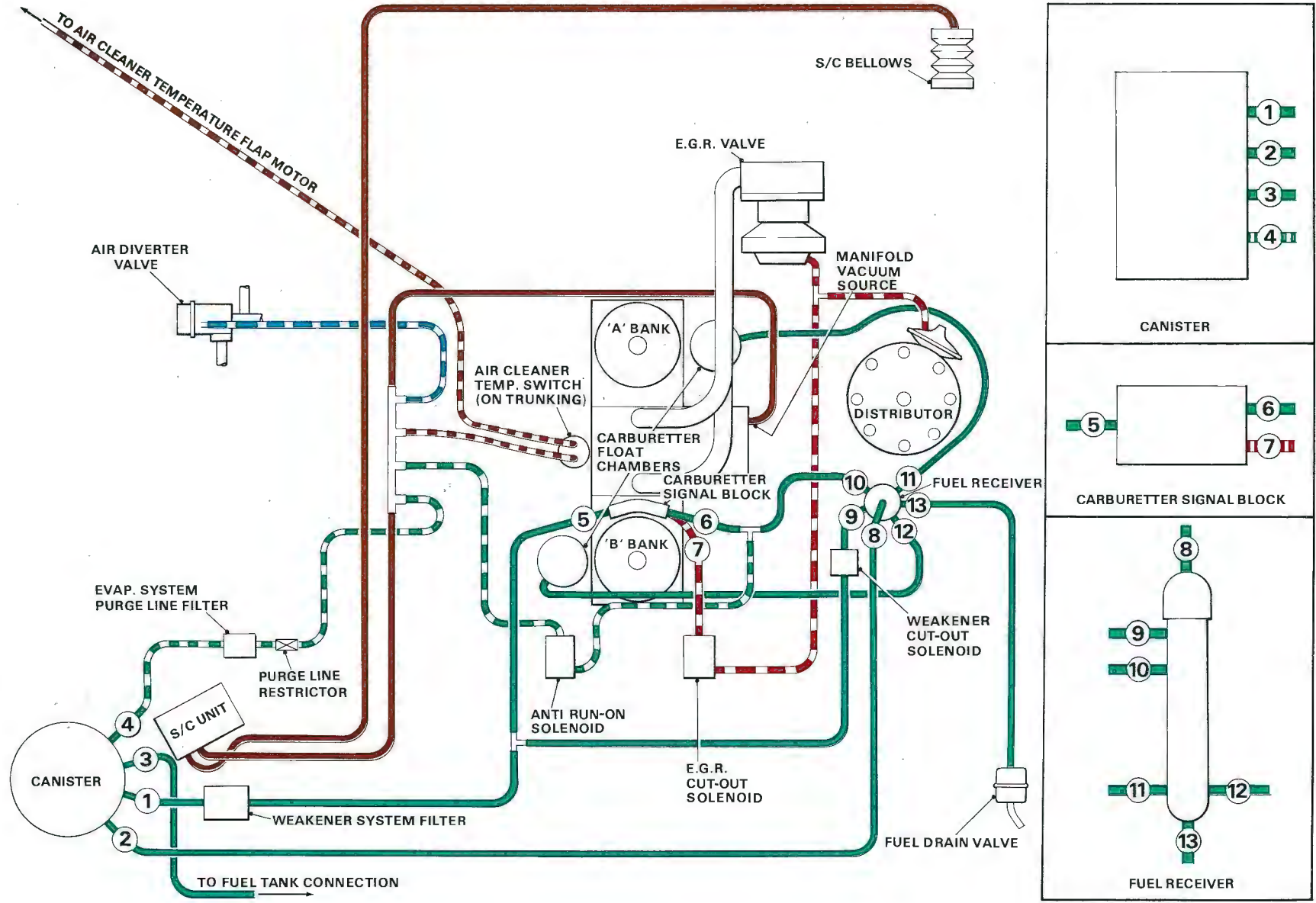


FIG. 3 CATALYTIC CONVERTER

- 1 Monolithic catalyst
- 2 Catalyst retaining plates
- 3 Silencing chamber
- 4 Stainless steel wire mesh
- 5 Fireclay coating
- 6 Ceramic tape
- 7 Inlet pipe



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FIG. 4 HOSE ROUTING DIAGRAM

both converter and silencer (see Fig. 3). A platinum group metal catalyst on a ceramic monolith support is used for optimum conversion efficiency and rapid warm-up. Three separate blocks are used to minimise the effect of thermal shock and are positioned to ensure good gas distribution and effective utilisation of the catalyst volume.

The catalyst promotes reaction between the residual hydrocarbons and carbon monoxide in the exhaust and the secondary air injected into the exhaust ports. After completion of the oxidation process the exhaust gas is discharged to the atmosphere from the tailpipe.

Catalytic converter protection

To protect the catalytic converter from possible damage the following precautions should be taken.

(i) **Unleaded gasoline**

Use unleaded gasoline only. The use of leaded gasoline will result in a **substantial reduction in the performance of the catalyst**. Under no circumstances add fuel system cleaning agents to either the fuel tank or carburettors for induction into the engine, as these materials may have a **detrimental effect on the catalytic converter**.

(ii) **Engine malfunction**

If the engine misfires or suffers from a lack of power which could be attributed to a malfunction of either the ignition or fuel systems, the vehicle **should be driven only at low speed** and the fault rectified as soon as possible by an authorised dealer. Driving at high speeds with a malfunction in either of these systems could cause overheating and consequent damage to the catalyst.

(iii) **Fuel**

Do not allow the engine to run out of fuel. If the engine does run out of fuel at a high speed possible **damage to the catalyst could result**.

For information concerning the protection of the catalytic converter from damage due to overheating, refer to—Catalytic converter and body floor overheat warning system.

Catalytic converter—To remove

1. Unscrew the self-tapping screws that secure the shield below the catalytic converter assembly. Withdraw the shield.

2. Unscrew the $\frac{7}{16}$ in. A/F nuts that secure the two shields to the exhaust pipe on either side of spherical joint, situated to the rear of the body cross-member.

3. Collect the washers, withdraw the bolts and remove the shields.

Note Take care when removing the shields as the edges are sharp and could cause injury to the hands.

4. Remove the thermocouple from the catalytic converter assembly [refer to Emission Control Systems (Electrical Components) in this Supplement].

5. Support the weight of the exhaust pipe which passes into the expansion box.

6. Using a $\frac{1}{2}$ in. A/F spanner unscrew and remove the nut retaining the exhaust mounting around the exhaust pipe (situated behind the body cross-member).

7. Remove the nut and withdraw the bolt, collect the washer.

8. Open the mount and slide it over the exhaust pipe.

9. Slacken the two $\frac{9}{16}$ in. A/F nuts retaining the exhaust clamp around the spherical joint to the rear of the body cross-member and catalytic converter assembly.

10. Unscrew the nuts completely and withdraw the bolts; collect the washers.

11. Remove the two halves of the clamp joint from the exhaust pipe. Free the two sections of the pipe from each other and collect the sealing ring.

12. Allow the forward section of the exhaust to rest on the body cross-member and repeat Operations 9 to 11 inclusive on the spherical exhaust joint situated in front of the catalytic converter assembly. Hold the forward end of the assembly as the front joint is freed.

13. Withdraw the catalytic converter assembly in a forward and downwards direction.

Catalytic converter—To fit

Fit the catalytic converter assembly by reversing the procedure given for removal, noting the following points.

1. The seal rings and pipe flares must be thoroughly clean and free from scale and may be lightly dressed with fine emery cloth if required.

2. The clamp bolt threads should be lightly oiled to prevent binding during assembly and the spherical faces of the sealing rings and the grooves in the clamps should be smeared with a graphite lubricant, to ensure correct alignment of the pieces on assembly.

3. Fit the pipe and the catalytic converter assembly complete with seal rings, then loosely fit the joint clamps and the 'handcuff' clamp.

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4. The joints must not be fully tightened until the pipe has been manoeuvred to obtain the best run (free from possible fouls) and good joint alignment.

Note The pipe joints must not be 'sprung' or 'clamped' into position.

5. When the pipe run is satisfactory, torque tighten the joint clamp nuts in accordance with the standard torque figures given in Chapter P then 'set' the 'Vibrashock' mount to allow for expansion in the exhaust system, when hot.

6. Fit the thermocouple to the catalytic converter assembly [refer to Emission Control Systems (Electrical Components) in this Supplement].

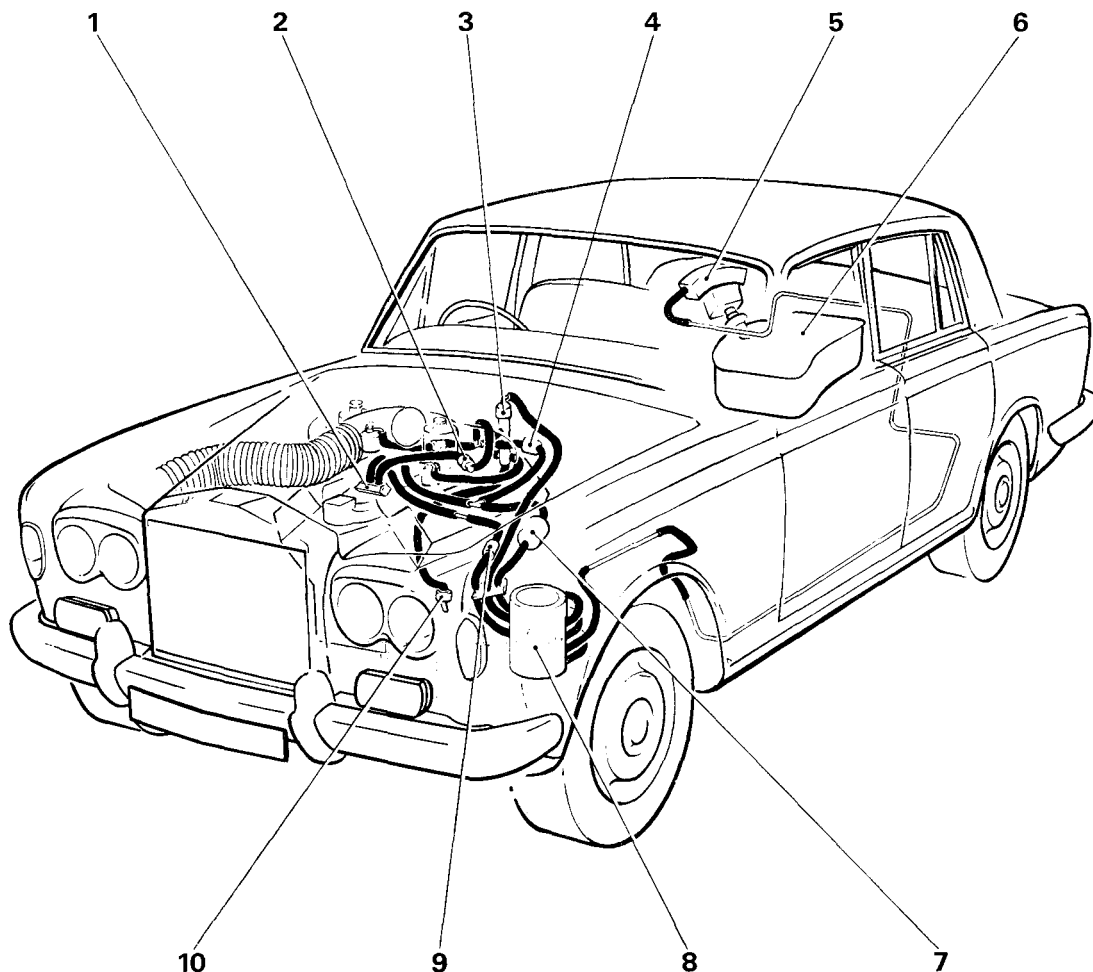
**Catalytic converter and body floor
overheat warning system**

For all information associated with catalytic converter overheating and the overheat warning buzzer sounding, refer to Emission Control Systems (Electrical Components) in this Supplement.

'Vibrashock' exhaust mount—To set

This exercise is carried out by holding the 'handcuff' clamp forward whilst tightening the pinch bolt. This has the effect of misaligning the centre of the mount and this misalignment should be approximately 4,76 mm. (0.187 in.) at the mount centre.

FUEL EVAPORATION EMISSION CONTROL SYSTEM



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FIG. 5 FUEL EVAPORATION EMISSION CONTROL SYSTEM—GENERAL VIEW

- | | |
|-----------------------------|-------------------------------------|
| 1 Vacuum manifold | 6 Fuel tank assembly |
| 2 Anti 'run-on' solenoid | 7 Weakener filter |
| 3 Float chamber vent valve | 8 Evaporative loss control canister |
| 4 Weakener cut-off solenoid | 9 Purge line filter |
| 5 Fuel trap assembly | 10 Float chamber drain valve |

Fuel tank assembly

The fuel tank assembly consists of the fuel tank, expansion tank and fuel trap assembly (see Fig. 6).

The fuel tank is vented from three positions to a fuel trap assembly which is mounted above the fuel filler. One vent is from the fuel filler neck and the other two vents from the fuel tank.

The three vent lines join at a common junction block situated adjacent to the fuel filler neck, the main vent line then encircles the fuel tank before passing to the fuel trap assembly.

From the fuel trap, a vent line passes under the floor of the car to the evaporation loss control canister.

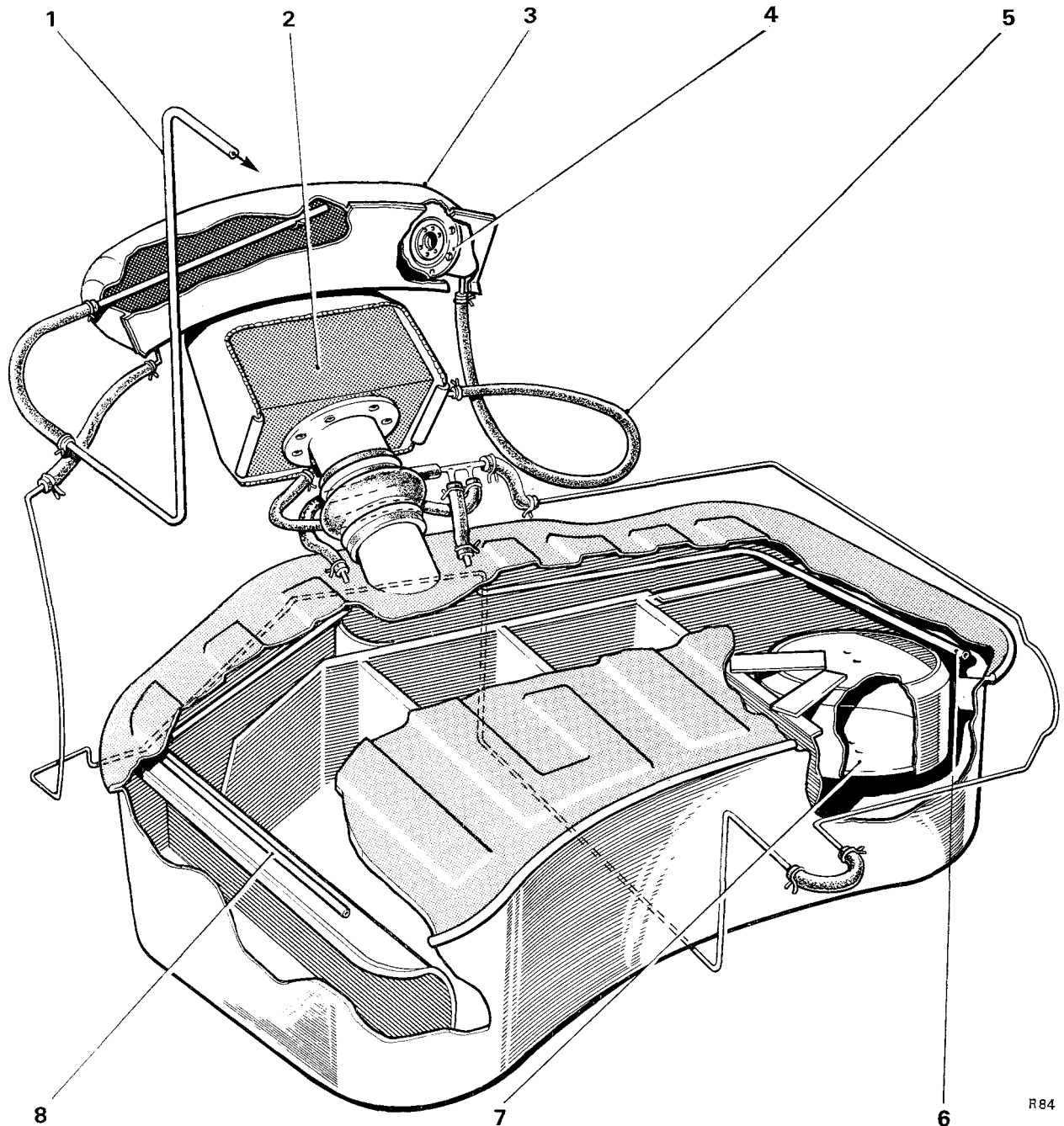


FIG. 6 FUEL EVAPORATION EMISSION CONTROL SYSTEM—FUEL TANK

1 Connection to evaporation loss control canister
2 Fuel filler box

3 Fuel trap
4 Combined relief and vacuum valve

5 Valve vent
6 Vent pipe
7 Expansion tank
8 Vent pipe

Chapter U

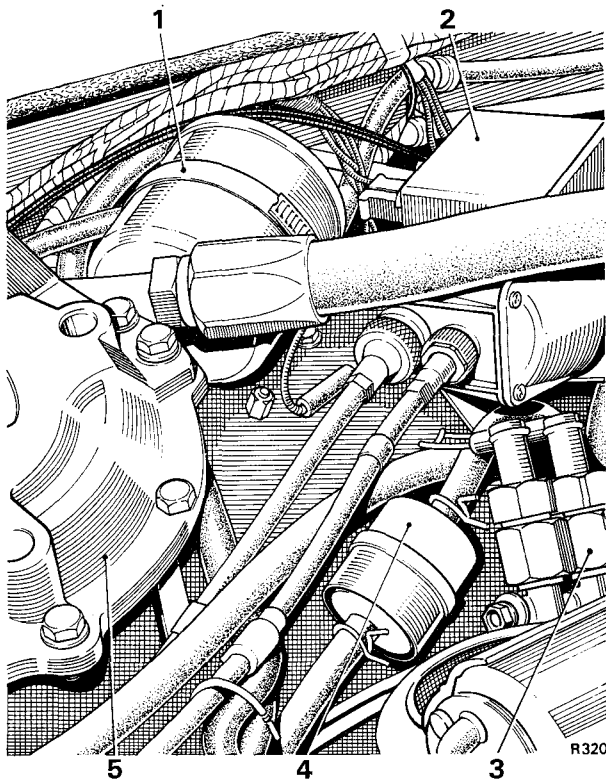


FIG. 7 POSITION OF MIXTURE WEAKENING DEVICE FILTER AND PURGE LINE FILTER

- 1 Weakener filter
- 2 Speed control system regulator
- 3 Hydraulic fluid pressure switches
- 4 Purge line filter
- 5 Road spring top cover

Purge line

The purge line consists of a rubber hose, passing from the lowest connection on the canister through the valance junction piece to the vacuum manifold. Incorporated into this hose is the purge line filter and restrictor.

When the engine is running, air drawn through the canister filter and carbon picks up the stored fuel vapours and passes them via the hose, to the induction manifold. The restrictor in the line controls the flow rate at between 1,41 cu. m./hr. and 1,98 cu. m./hr. (50 cu. ft./hr. and 70 cu. ft./hr.) to maintain carburettor metering accuracy and the paper element line filter is fitted to prevent blockage of the restrictor.

Purge line filter—To remove

1. Using special pliers (RH 8090) remove the two steel retaining clips situated on either side of the unit.

2. Slacken the setscrew which secures the nylon retaining clip.
3. Withdraw the component from the clip.

Purge line filter—To fit

Fit the purge line filter by reversing the procedure given for removal noting the following point.

1. Ensure that the rubber hoses are in a good condition and new hose retaining clips are used.

Purge flow rate—To check

Check the purge flow rate as follows.

1. Disconnect the hose from the engine side of the purge line filter and insert a flowmeter and stand assembly (RH 8725) into the line. The flowmeter is a rotameter type capable of measuring between 1,41 cu. m/hr. and 1,98 cu. m/hr. (50 cu. ft/hr. and 70 cu. ft/hr.). The pressure drop across the meter is not to exceed 5,08 cm. Hg. (2 in. Hg.).
2. Start and run the engine at idle speed, the flowmeter reading should be between 1,41 cu. m/hr. and 1,98 cu. m/hr. (50 cu. ft/hr. and 70 cu. ft/hr.).
3. If the flow is less than 1,41 cu. m/hr. (50 cu. ft/hr.) stop the engine and remove the purge line restrictor (see Fig. 4). Fit a piece of straight metal pipe with an internal bore larger than 4,76 mm. (0.187 in.), in place of the restrictor.
4. Start and run the engine at idle speed, ensure that the flow is now in excess of 1,98 cu. m/hr. (70 cu. ft/hr.).
5. If the flow is less than 1,98 cu. m/hr. (70 cu. ft/hr.) check the following.
 - (i) an air leak in any of the vacuum hoses connected to the vacuum manifold (see Fig. 4).
 - (ii) a blockage in the vacuum manifold or any of the connecting hoses (see Fig. 4).
6. Rectify any air leaks or blockages found in the system. Repeat Operation 4.
7. Stop the engine and fit the purge line restrictor.
8. Start the engine and check the flow rate as detailed in Operation 2.
9. If the flow is still incorrect fit a new restrictor and again repeat Operation 2.
10. Stop the engine, remove the flowmeter assembly and connect the hoses.

CRANKCASE EMISSION CONTROL SYSTEM

For details of this system refer to Chapter U (Part 2) and the Supplement No. 5.

EMISSION CONTROL SYSTEMS (ELECTRICAL COMPONENTS)

For servicing details of the emission related electrical components fitted to the 1976 model year car, **not** listed in this Section, refer to Chapter U (Part 2)—Section U4.

- (i) The exhaust gas recirculation valve cut-in switch.
- (ii) Electrically operated cooling system booster fan.
- (iii) Catalytic converter and body floor overheat warning system.

Exhaust gas recirculation cut-in switch

The servicing details for the component are identical to those given in Chapter U (Part 2)—Section U4. However, an additional switch has been added to the thermostat outlet elbow and therefore, reference should be made to Figure 4 in this Supplement for identification purposes.

Cooling system booster fan

A cooling system booster fan is fitted to increase the flow of air through the radiator matrix at high coolant temperatures (e.g. if the engine is allowed to run at idle for long periods).

Important Under certain conditions it is possible for the cooling system booster fan to start when the engine is not running.

The fan installation is illustrated in Figure 9.

The switch to activate the fan is illustrated in Figure 8.

Cooling system booster fan—To remove

1. Disconnect the battery and remove the radiator grille (refer to Chapter 5).
2. Disconnect the electrical feed to the fan by detaching the two 'Lucar' connections situated to the left of the steering pump oil cooler (see Fig. 9).

3. Remove the four screws retaining the outer ends of the cross-stays that carry the booster fan assembly. Withdraw the fan assembly taking care not to damage the refrigeration condenser.

Cooling system booster fan—To dismantle

1. Release the clip securing the electrical feed cables to the upper cross-stay.
2. Remove the screws retaining the fan to the drive hub. Withdraw the fan.
3. Slacken the small grub screw and withdraw the fan drive hub from the fan motor shaft.

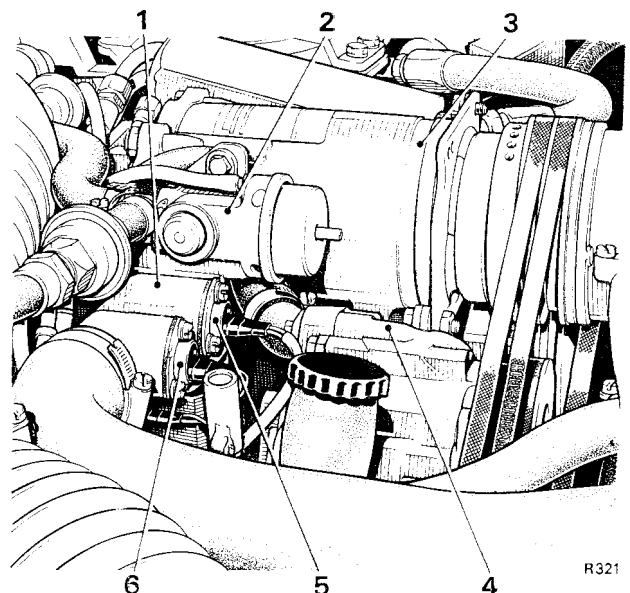


FIG. 8 THERMOSTAT ELBOW CUT-IN SWITCHES

- 1 Thermostat outlet elbow
- 2 Air diverter valve
- 3 Refrigeration compressor
- 4 Air pump
- 5 Cooling system booster fan switch
- 6 E.G.R. cut-in switch

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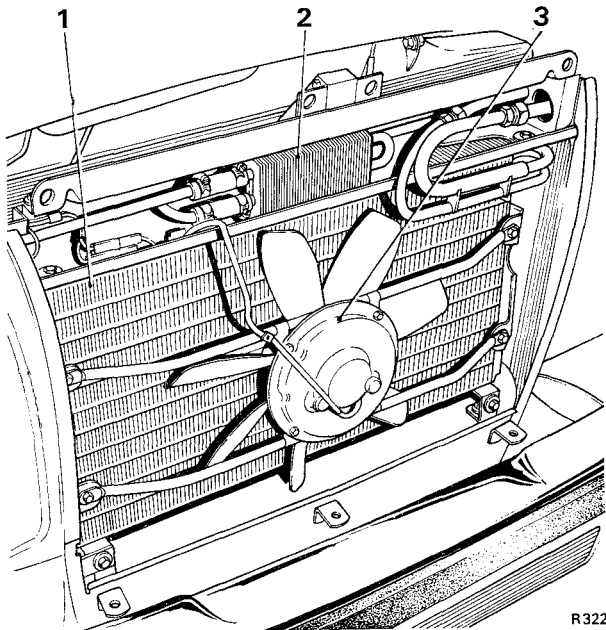


FIG. 9 COOLING SYSTEM BOOSTER FAN

- 1 Refrigeration condenser matrix
- 2 Steering pump oil cooler
- 3 Cooling system electric booster fan

4. Unscrew the four screws securing the electric fan motor to the cross-stays.

Cooling system booster fan—To assemble

Assemble the fan by reversing the procedure given for dismantling, noting the following.

- 1. Ensure that the fan drive hub flange is 'flush' with the end of the drive-shaft. Tighten the grub screw.

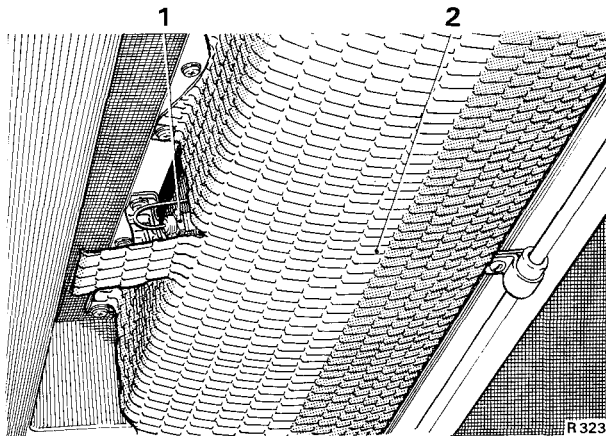


FIG. 10 CATALYTIC CONVERTER OVERHEAT PROBE

- 1 Thermocouple probe
- 2 Grass-fire heatshield

Cooling system booster fan—To fit

Fit the fan assembly by reversing the procedure given for removal.

Cooling system booster fan—To check

- 1. Disconnect the electrical socket from the booster fan cut-in switch (see Fig. 8).
 - 2. Connect a short length of cable between the two connections in the socket, the fan motor should start.
- Should this test prove satisfactory, but the operation of the system still be suspect, drain the coolant and replace the cut-in switch with a new unit.

Note When fitting a new cut-in switch, always ensure that the unit is the correct part as there may be similar switches fitted to the engine with different temperature settings.

Catalytic converter and body floor overhear warning system

To satisfy Japanese regulations an audible warning system is fitted to both the exhaust catalytic converter and car body floor (luggage compartment) to alert the driver if temperatures in these two areas become excessive.

The sensor for each system is shown in Figure 10 and 11 respectively.

Both warning systems utilise the same feed of the catalyst control unit (mounted under the front left-hand wing above the under wing sheet) and warning buzzer situated between the front seats (below the centre console on coachbuilt cars or below the stowage compartment on Silver Shadow cars).

If the temperature of either the catalytic converter or the car floor become excessive a warning buzzer will sound inside the car.

Overheat warning

Should an exhaust overheat condition be signalled the speed of the vehicle must be reduced to 50 k.p.h. (30 m.p.h.) immediately and this speed must not be exceeded until the cause of the overheat warning has been investigated and corrected.

Before carrying out a full diagnostic inspection two possible causes should be explored as follows:

- (a) Ensure that the vehicle did not run out of fuel.
- (b) In an ambient air temperature of above 30°C. (86°F.) ensure that the air conditioning system upper air facia switch is turned towards the 'cold

quadrant' (situated on the left-hand side and coloured blue) to activate the fuel cooler.

If the overheat warning buzzer sounds for reasons other than those detailed above a fault has occurred in:

- (a) The various systems that lead into the exhaust (i.e. fuel system, air injection system, etc.) or in the exhaust itself particularly the catalytic converter. Any faults in these areas can be determined as **system faults**.
- (b) The overheat warning circuit (i.e. faulty converter thermocouple, wiring, connections, sensors, etc.) causing the buzzer to sound although the system is operating satisfactorily. These faults can be determined as **circuit faults**.

Further conditions may apply when investigating possible faults with the overheat warning system, as follows:

- (a) The car has been returned with the warning **buzzer sounding**.
- (b) The car has been returned for investigation when the warning buzzer has sounded, but is **not sounding at the time of the investigation**.

Buzzer sounding

1. Ensure that the normal safety precautions (i.e. handbrake or parking brake is firmly applied, etc.) are carried out and the ignition is switched on.

2. Carefully observe if the vehicle appears **exceptionally hot** particularly in the area of the catalyst converter. If hotter than is usual for a car fitted with a catalyst suspect a **system fault**.

3. Raise the car bonnet, locate the Lucar connections for the catalyst converter thermocouple and disconnect the brown cable. The connections are situated adjacent to the front left-hand road spring pot cover and the valance. The two cables one brown and one blue, together with the control box loom enter the engine compartment from under the front wing (see Fig. 13).

4 (a) If the buzzer ceases to operate a **system fault** can be suspected, proceed to Operation 5.

(b) If the buzzer continues to operate a **circuit fault** can be suspected, proceed to Operation 5.

After Operation 4 connect the brown cable.

5. Open the luggage compartment and carefully pull the carpet and felt from the floor at the forward end to determine if the metal floor in the area of the sensor is hot (see Fig. 11).

Note The floor temperature in this area could be extremely high and therefore, care must be taken when carrying out this test to avoid personal injury.

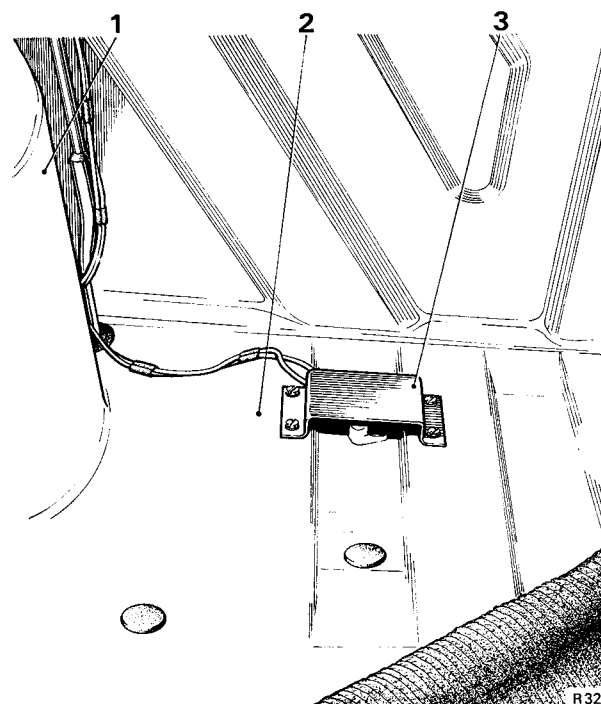


FIG. 11 BODY FLOOR TEMPERATURE SENSOR

- 1 Rear spring housing
- 2 Luggage compartment floor
- 3 Overheat sensor

6. (a) If the luggage compartment floor is very hot a **system fault** could be causing excessively high temperatures in the exhaust.

(b) If the luggage compartment floor is cool or warm proceed to Operation 7.

7. Remove the metal cover fitted over the luggage compartment floor sensor and disconnect one of the Lucar connections to the sensor. If the buzzer ceases to operate the sensor should be tested (see Service Checks—Luggage compartment floor temperature sensor) and if found suspect in any way, renewed.

8. If the buzzer continues to operate refit all components in the luggage compartment.

9. Position the car on a ramp and carry out Operation 1.

10. From beneath the car, carefully observe the area around the catalyst converter assembly. The catalytic converter and surrounding area will normally be very hot, however, excessive temperature caused by a **system fault** will result in the overheat warning buzzer sounding.

11. Switch off the ignition and allow the car to cool down. When the car is cold switch on the ignition and check the buzzer as follows.

(a) If the buzzer is still sounding suspect a **warning circuit fault** and check out the circuits as detailed in the service checks.

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(b) If the buzzer is not sounding suspect a fault in one of the systems feeding into the exhaust (**system fault**).

From the evidence gained by carrying out Operations 1 to 11 inclusive it can be determined if the vehicle has a **system fault** or a **warning circuit fault** and the information listed in the appropriate section should be consulted.

Buzzer not sounding at the time of investigation

1. Ensure that the normal safety precautions (i.e. handbrake or parking brake is firmly applied, etc.) are carried out and the ignition is switched on.
2. Raise the car bonnet and carry out service checks on the **catalytic converter thermocouple** and **control box**.
3. Open the luggage compartment and carry out service checks on the **floor overhear warning system** wiring and switch.
4. If all the service checks on the warning circuits prove satisfactory a **system fault** should be suspected.

From the evidence gained by carrying out Operations 1 to 4 inclusive it can be determined if the vehicle has a **system fault** or a **warning circuit fault** and the information listed in the appropriate section should be consulted.

System faults

The following is a list of components and systems that may contribute to a malfunction in the exhaust resulting in overheating of the catalytic converter or luggage compartment floor.

Note Any condition resulting in an engine misfire or uneven running should always be investigated first as this condition could result in the catalytic converter overheating.

1. Faulty air injection system.
2. Faulty air diverter valve.
3. Ignition system faulty (including ignition timing).
4. Fouled sparking plugs.
5. Incorrect float chamber depression.
6. Air conditioning system faulty.
7. Blocked fuel feed line.
8. Fouled float chamber filters.
9. Choke system operation incorrect (including choke hold solenoid).
10. Sticking carburetter piston.
11. Fouled carburetter float chamber or jet.
12. Exhaust gas recirculation valve failed.
13. Air leak into induction system.
14. Failed exhaust gas recirculation cut-in solenoid, cut-in switch or electrical supply circuit.
15. Failed anti 'run-on' solenoid or electrical supply circuit.
16. Faulty hot idle mixture compensator.

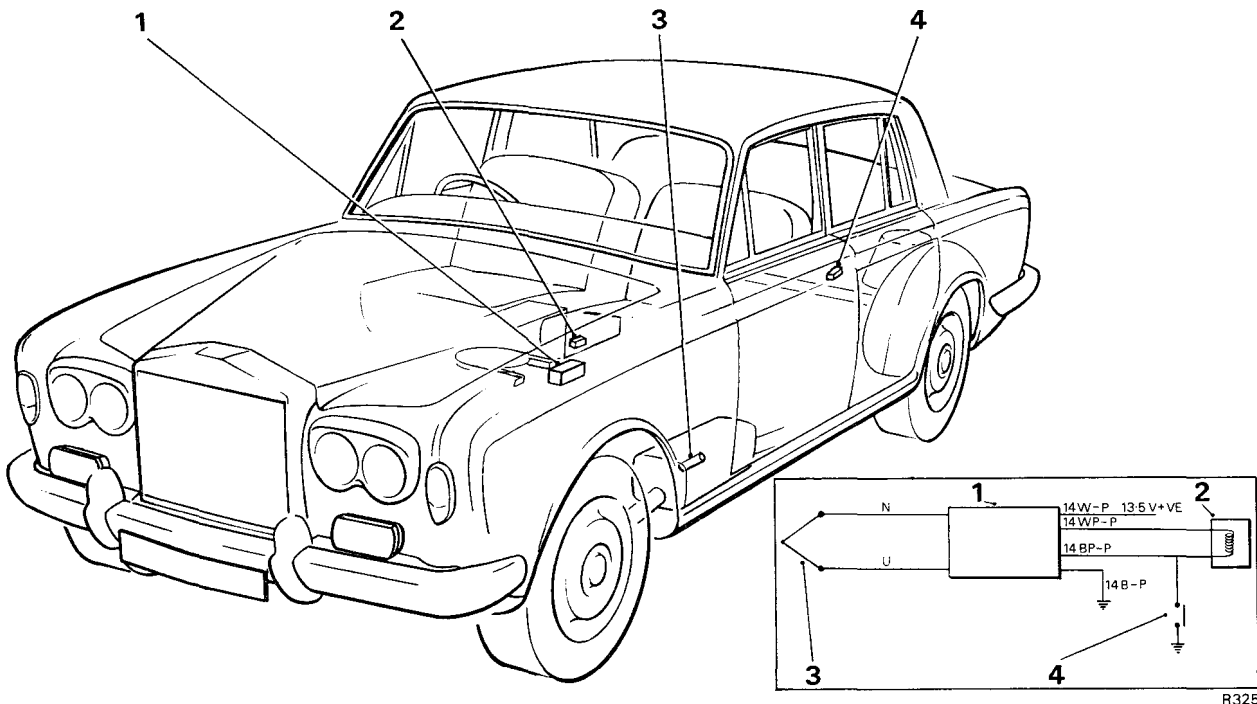


FIG. 12 OVERHEAT WARNING SYSTEM

1 Control unit
2 Warning buzzer

3 Catalyst thermocouple probe

4 Luggage compartment floor temperature sensor

17. Weakening device filter blocked or blockage in rubber connecting hoses.
18. Flooding of carburettor float chamber or jet.
19. Incorrect operation of temperature controlled air intake system.
20. Incorrect purge flow rate.

Note Should the overheat warning buzzer sound while testing is in progress, disconnect and blank off the air injection system check valves. This action should prevent overheating of the catalyst whilst the remaining tests are completed.

Warning circuit faults

The following is a list of components within the overheat warning system that may contribute to a malfunction of the warning system.

A theoretical wiring diagram of the warning circuits is illustrated in Figure 12.

1. Catalyst overheat warning control box and wiring.
2. Catalyst thermocouple probe and wiring.
3. Luggage compartment floor temperature sensor and wiring.
4. Warning buzzer.

These components together with the necessary wiring and connections can be checked by carrying out the relevant service checks.

SERVICE CHECKS

Catalyst overheat warning control box and buzzer—To check

1. Raise the car bonnet, locate the control box loom and the two catalyst thermocouple cables on the left-hand valance adjacent to the front road spring pot cover (see Fig. 13).
2. Identify the two catalyst thermocouple cables, one is brown and the other is blue.
3. Disconnect the blue cable at the Lucar connection and connect the end from the control box through a 9 k resistor to Positive (this can be the white wire in the control box loom).
4. Switch on the ignition, if the control and wiring is correct the warning buzzer will sound.
5. Remake the electrical connections.

Catalyst thermocouple probe—To check

1. Raise the car bonnet, locate the control box loom and the two catalyst thermocouple cables on the left-hand valance adjacent to the front road spring pot cover (see Fig. 13).

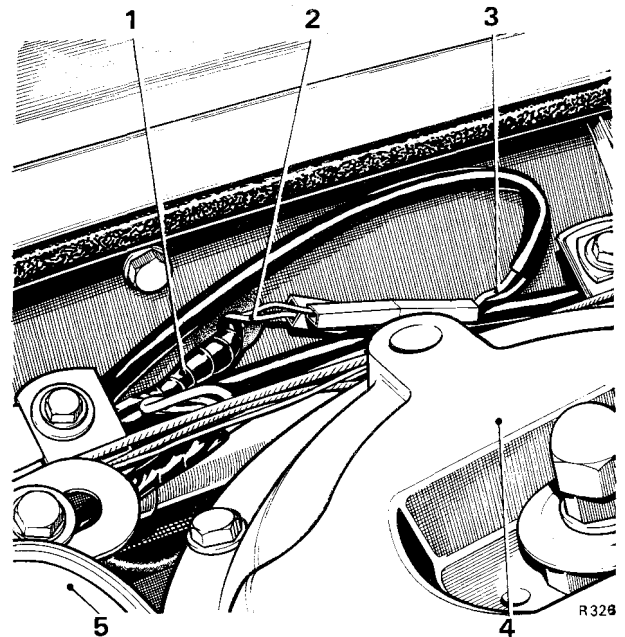


FIG. 13 CATALYTIC CONVERTER THERMOCOUPLE PROBE CABLES AND CONTROL BOX LOOM

- 1 Control box loom
- 2 Catalyst thermocouple cable (blue)
- 3 Catalyst thermocouple cable (brown)
- 4 Left-hand front road spring cover
- 5 Hydraulic systems reservoirs

2. Identify the two catalyst thermocouple cables, one is brown and the other blue.

3. Disconnect the two cables at their Lucar connections and using suitable equipment (e.g. an Avometer) ensure that the thermocouple probe is not open circuit.

4. Providing the thermocouple probe is not open circuit it is considered serviceable, however, should it be suspect for other reasons a new unit must be fitted.

5. Remake the electrical connections.

Luggage compartment floor temperature sensor—To check

1. Open the luggage compartment and pull the carpet and felt from the floor of the luggage compartment at the forward end (see Fig. 11).

2. Remove the four screws and withdraw the cover from above the sensor.

3. Detach the two cables from the sensor and using an additional short length of cable, connect the two together. If the buzzer sounds, the wiring and buzzer are satisfactory.

4. Remove the sensor from the car.

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5. Using suitable test facilities (e.g. heated oil bath, oven, etc.) ensure that the sensor will operate at $110^{\circ}\text{C.} \pm 5^{\circ}\text{C.}$ ($230^{\circ}\text{F.} \pm 10^{\circ}\text{F.}$).

Should the switch operate within the prescribed limits it is satisfactory.

6. Fit the switch and the other components to the luggage compartment.

Catalyst thermocouple probe— To remove and fit

Refer to Page U203 of this Supplement, Catalytic converter—To remove, noting that the lock-nuts on the thermocouple mounting in front of the converter must be released and the thermocouple freed from the mounting.

Luggage compartment floor temperature sensor—To remove and fit

Refer to Page U211 of this Supplement, Luggage compartment floor temperature sensor—To check.

Catalyst overheat warning control box—To remove

1. Ensure that the normal safety precautions (i.e. handbrake or parking brake is firmly applied, etc.) are carried out. Firmly chock the wheels.

2. Raise the front of the car on a jack and position stands beneath the car.

3. Remove the front left-hand road wheel.

4. Remove the underwing sheet.

5. Raise the car bonnet, locate the control box loom and two catalyst thermocouple cables on the left-hand valance adjacent to the front road spring pot cover (see Fig. 13).

6. Disconnect the cables mentioned at their Lucar connectors and carefully feed them through the valance.

7. Remove the mounting setscrews and withdraw the control box from beneath the wing.

Catalyst overheat warning control box—To fit

1. Fit the control box by reversing the procedure given for removal, ensuring that the rubber grommet is correctly fitted to the hole in the wing valance and the cables are correctly connected in the engine compartment.

Overheat warning buzzer—To remove

The warning buzzer is situated between the front seats either beneath the centre console (Coachbuilt cars) or stowage compartment (4 Door Saloons).

1. To gain access to the buzzer it will be necessary to remove the front seats and stowage compartment/centre console (see Chapter S).

2. Detach the two electrical connections from the buzzer and unscrew the retaining screw.

Overheat warning buzzer—To fit

Fit the warning buzzer by reversing the procedure given for removal.

Anti 'run-on' solenoid—To check

1. Detach the hose from the solenoid to the 'Tee' piece at the solenoid end and connect a piece of hose of identical internal diameter, but of suitable length, to the solenoid.

2. Clean the open end of the hose.

3. Switch on the ignition.

4. Place the hose in the mouth and blow down the hose.

5. If the operation of the solenoid is correct note that the following conditions apply and connect the original hose to the solenoid.

(i) With the ignition switched on it should not be possible to blow down the hose.

(ii) With the ignition switched off the solenoid is de-energised and it should be possible to blow down the hose.

6. Replace the hose removed in Operation 1. If the operation of the solenoid is suspect, carry out the following test before fitting a new unit.

7. Remove the cap from the pressure tapping on 'A' bank carburettor float chamber. Connect a manometer, capable of measuring between 0 cm. and 15,24 cm. (0 in. and 6 in.), to the pressure tapping connection.

8. Start and run the engine at idls speed (600 r.p.m.).

9. Switch off the ignition and observe the reading on the manometer. The reading should increase momentarily to approximately 15,24 cm. (6 in.) of H_2O as the engine stops.

If the reading does not increase check the following:

(a) Blockage in the hose from the 'Tee' piece in the weakener hose to the anti 'run-on' solenoid.

(b) Blockage in the hose route (2 hoses joined by a restrictor/connector) from the anti 'run-on' solenoid to the vacuum manifold.

(c) Incorrect wiring to the anti 'run-on' solenoid.

THE CARBURETTORS AND AUTOMATIC CHOKE SYSTEM

Automatic choke stove pipe—To check

To check the stove pipe for any blockage, carry out the following procedure:

1. Start the engine and run until normal operating temperature is attained.
2. Disconnect the union at the butterfly housing (see Fig. 14) and connect a flowmeter to the pipe via connector RH 8945. The flowmeter must be a rotameter type capable of measuring up to 2,83 cu. m/hr. (100 cu. ft/hr.).
3. Start the engine and run at idle speed (i.e. 600 r.p.m.); observe the manometer reading which should be between 1,41 cu. m/hr. and 1,55 cu. m/hr. (50 cu. ft/hr. and 55 cu. ft/hr.).
4. If the manometer reading is below 1,41 cu.m/hr. (50 cu. ft/hr.), stop the engine, remove the choke stove pipe and stove assembly to check for leaks.
5. If the flowmeter reading is above 1,55 cu. m/hr. (55 cu. ft/hr.) fit a new restrictor in the end of the choke bi-metal housing.
6. Fit the choke stove pipe and stove assembly, start the engine and again observe the flowmeter reading at idle speed.
7. Disconnect the flowmeter assembly and fit the choke stove pipe to the connection on the butterfly housing.

Temperature controlled air intake

To ensure rapid warm-up and improve control of the air/fuel ratio a temperature controlled air intake is fitted (see Fig. 15).

A vacuum operated blending valve attached to the air cleaner assembly is controlled by a thermal sensor in the air intake elbow. This valve blends hot air from a pick-up point (scoop) adjacent to the exhaust manifold with cold air from under the front wing; thus maintaining a constant temperature of the intake air as it enters the carburettors.

Fuel cooler

A cooler is fitted into the fuel system and using the same refrigerant as the air conditioning system, cools the fuel before it enters the carburetter float chambers. The fuel cooler is situated adjacent to the refrigeration compressor and is illustrated in Figure 16.

Fuel cooler—To remove

1. Discharge the refrigerant (see Chapter C).
2. Unscrew the two unions connecting the cooler to the fuel pipes.

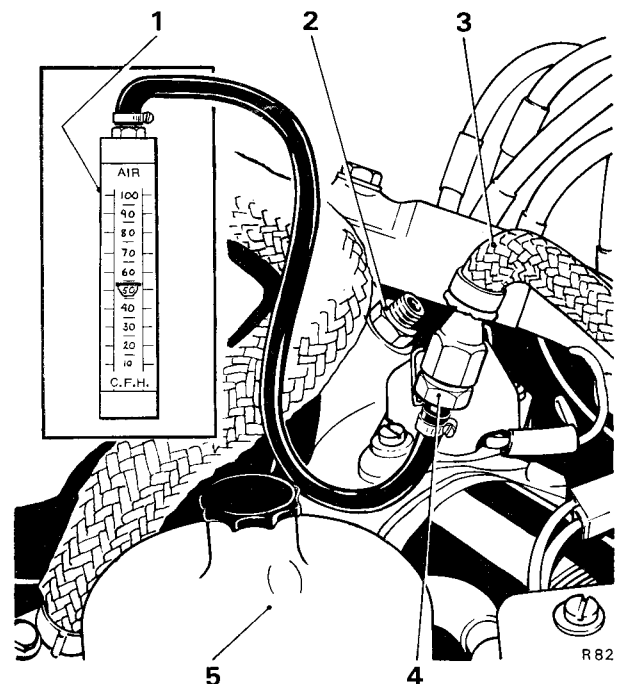
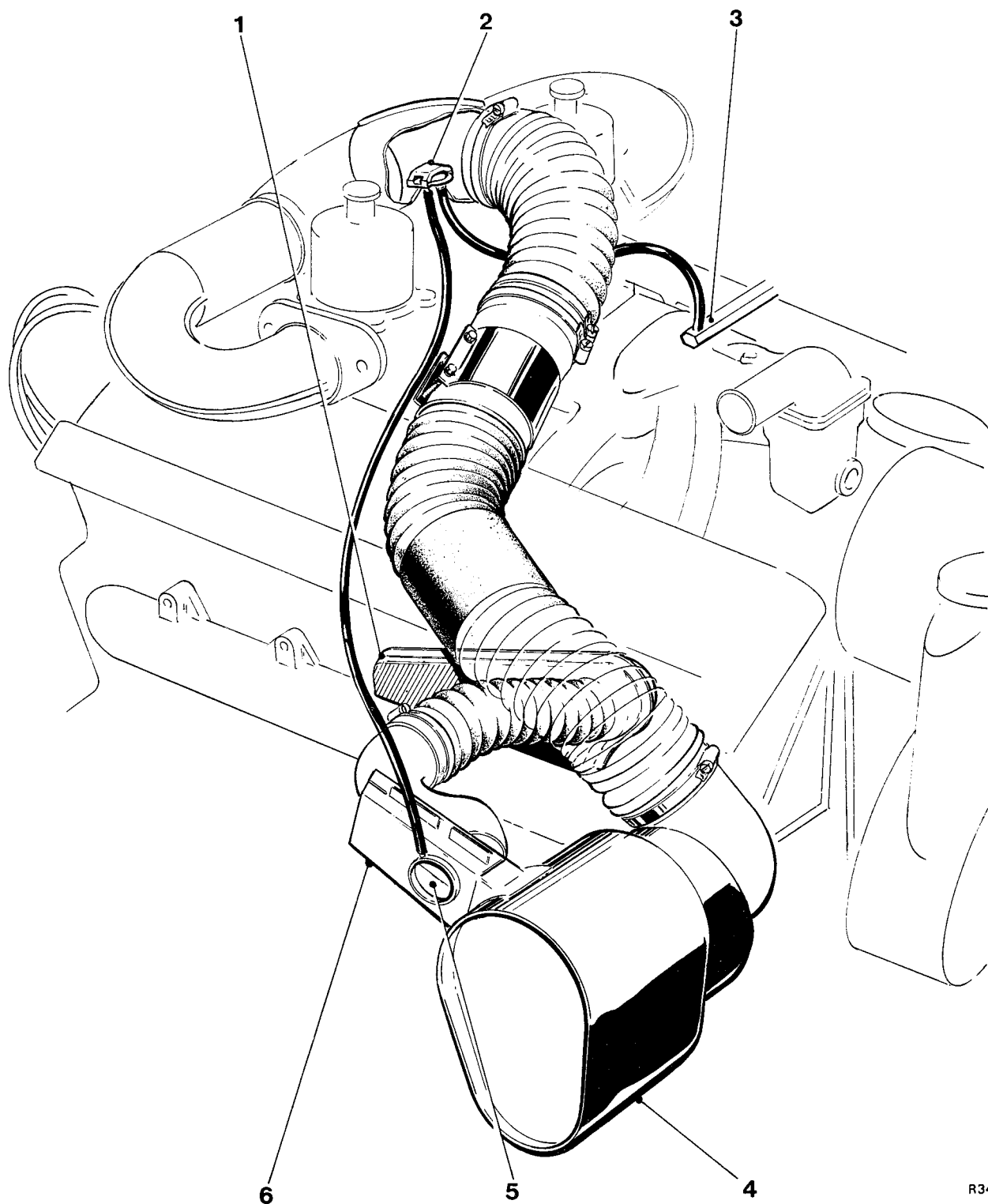


FIG. 14 CHECKING THE CHOKE STOVE PIPE DEPRESSION

- 1 Flowmeter
- 2 Choke stove pipe connection
- 3 Choke stove pipe
- 4 Adapter
- 5 'B' bank carburetter

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FIG. 15 TEMPERATURE CONTROLLED AIR INTAKE

- | | |
|----------------------|------------------------|
| 1 Hot air scoop | 4 Air cleaner/silencer |
| 2 Temperature sensor | 5 Air blending valve |
| 3 Vacuum manifold | 6 Cold air intake |

3. Disconnect the refrigeration pipe from the front of the cooler.

4. Unscrew and remove the setscrew that secures the clamp plate to the rear face of the compressor.

5. Withdraw the clamp plate from the rear face of the compressor.

6. Unscrew and remove the cooler mounting setscrews situated at the forward end of the assembly; free the refrigeration pipes from the rear of the assembly. Withdraw the cooler.

Fuel cooler—To fit

To fit the fuel cooler reverse the procedure given for removal noting the following points.

1. Fit new rubber 'O' rings between the rear face of the compressor and the unions of the refrigeration pipes.

2. After fitting the cooler the full procedure of evacuation and sweeping must be carried out before the refrigeration system is charged, details are given in Chapter C.

Cold start 'fast-idle'—To set

1. Stop the engine and disconnect the solenoid to exhaust gas recirculation valve hose at the valve end. Blank the hoses. Disconnect the signal hose to the distributor vacuum capsule at the capsule and blank off the hose.

Remove the pressure tapping cap to vent the float chambers; open the throttles and close the choke butterfly against the bi-metal coil tension by means of the butterfly link lever, release the throttles.

The 'fast-idle' adjusting screw should now be resting on the high step of the 'fast-idle' cam and the throttles in the cold start position.

2. Start the engine and check the 'fast-idle' speed. If the speed is not between 1 900 r.p.m. and 2 100 r.p.m., stop the engine, open the throttles to gain

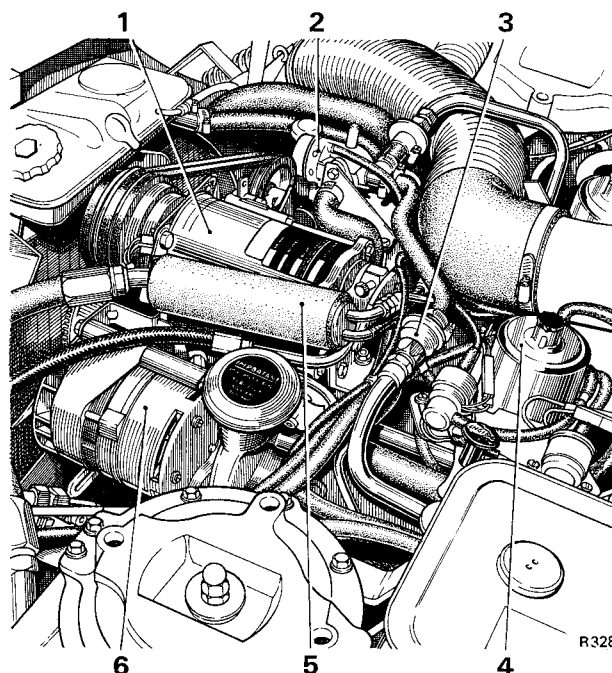


FIG. 16 FUEL COOLER

- 1 Refrigeration compressor
- 2 Air diverter valve
- 3 Check valve
- 4 'B' bank carburetter
- 5 Fuel cooler
- 6 Alternator

access to the adjusting screw and adjust $\frac{1}{8}$ turn for each 100 r.p.m. outside the required speed.

3. Tighten the lock-nut and check the 'fast-idle' speed. If the speed is correct open the throttles to release the 'fast-idle' cam mechanism.

4. Remove the blank from the solenoid to exhaust gas recirculation valve hose and connect the hose to exhaust gas recirculation valve. Fit the tapping cap to 'A' bank carburetter float chamber cover.

5. Remove the blank from the distributor advance vacuum signal hose and connect the hose to the capsule.

IGNITION SYSTEM, DISTRIBUTOR, IGNITION COIL AND SPARKING PLUGS

Data

Ignition timing 4° B.T.D.C. (static) 15° B.T.D.C. at 1 600 r.p.m. (stroboscopic) in Neutral vacuum advance disconnected and the feed hose blanked off. (Approach 1 600 r.p.m. from a higher speed).

Ignition control system

The ignition system utilises an Opus distributor (in which an oscillator pick-up and control unit replace the conventional contact breaker), a low inductance ignition coil and a ballast resistor. The control unit comprises an electronic oscillator, amplifier and power transistor.

A drum with eight ferrite rods (one per cylinder) moulded into the outer edge is mounted onto the distributor drive-shaft. As the drum rotates a voltage is created each time a ferrite rod passes the oscillator pick-up, this signal is then amplified and used to switch-off the normally conducting power transistor in the primary coil circuit thus inducing a high voltage in the secondary winding which is distributed to the sparking plugs in the normal manner.

In addition to the normal centrifugal advance mechanism the ignition distributor is fitted with a vacuum advance capsule. The E.G.R. gated orifice vacuum signal is applied to the capsule to advance the ignition timing for part throttle fuel economy during open road cruising. The vacuum signal is inhibited by a solenoid valve until a predetermined coolant temperature is reached.

This ignition control system provides increased accuracy of timing and increased service life before maintenance is required.

Ignition—To time (using a stroboscope)

The ignition is timed on A1 cylinder which is located at the front left-hand side of the engine (viewed from the front of the car).

Note If the ignition timing is to be set, ensure that the sparking plugs are in good condition before running the engine; if they require cleaning or renewal the sparking plugs gap should be set to 0,9 mm. (0.035 in.).

1. To check the ignition timing commence by running the engine until normal operating temperature is attained and the choke 'fast-idle' is in the off position. Switch off the engine.

2. Connect a stroboscope and a tachometer to the engine as described in the instructions supplied with the respective equipment. Disconnect the feed hose at the vacuum advance capsule; blank off the feed hose.

3. Start the engine and adjust the throttle stop screw to give an idle speed of 1 600 r.p.m. When setting the engine idle speed reduce from a higher speed to 1 600 r.p.m.

4. Direct the flashing light of the stroboscope onto the crankshaft damper timing marks and timing pointer; the pointer is positioned on the right-hand side of the crankshaft damper when viewed from the front of the engine.

5. If the timing pointer does not coincide with the 15° B.T.D.C. mark on the crankshaft damper adjust the ignition timing as follows.

6. Release the clamp screw on the distributor and rotate the head of the distributor in the appropriate direction until the correct timing is obtained. Clockwise rotation of the distributor head advances the ignition and conversely anti-clockwise rotation retards the ignition. After adjustment has been carried out tighten the clamp screw and again check to ensure that the timing has not altered whilst tightening the clamp screw.

7. Set the engine idle speed to 600 r.p.m.

FIG. 17 IGNITION DISTRIBUTOR

- 1 Pick-up module
- 2 Pick-up arm
- 3 Distributor cover cap
- 4 High tension brush and spring
- 5 Rotor arm
- 6 Flash over shield (dust cover)
- 7 Timing rotor
- 8 Vacuum unit
- 9 Control unit
- 10 Lubrication pad
- 11 Driving dog and pin
- 12 Thrust washer
- 13 Automatic advance mechanism
- 14 Electronic module assembly

8. Direct the flashing light of the stroboscope onto the crankshaft damper timing marks and timing pointer. Check that the ignition timing is approximately 4° B.T.D.C.

9. Stop the engine.

10. Disconnect the hose from the vacuum manifold to the purge line restrictor at the restrictor (see Fig. 4). Connect a suitable length of hose between this hose and the connection on the distributor vacuum capsule.

11. Start the engine and set the idle speed to 600 r.p.m.

12. Direct the flashing light of the stroboscope onto the crankshaft damper timing marks and timing pointer. Check that the ignition timing has advanced to approximately 14° B.T.D.C. If the ignition timing has not advanced, the distributor assembly is faulty.

13. Stop the engine.

14. Fit all hoses to their correct connections.

15. Start the engine and set the idle speed to 600 r.p.m.

16. Stop the engine and remove all the test equipment.

Setting the engine idle speed

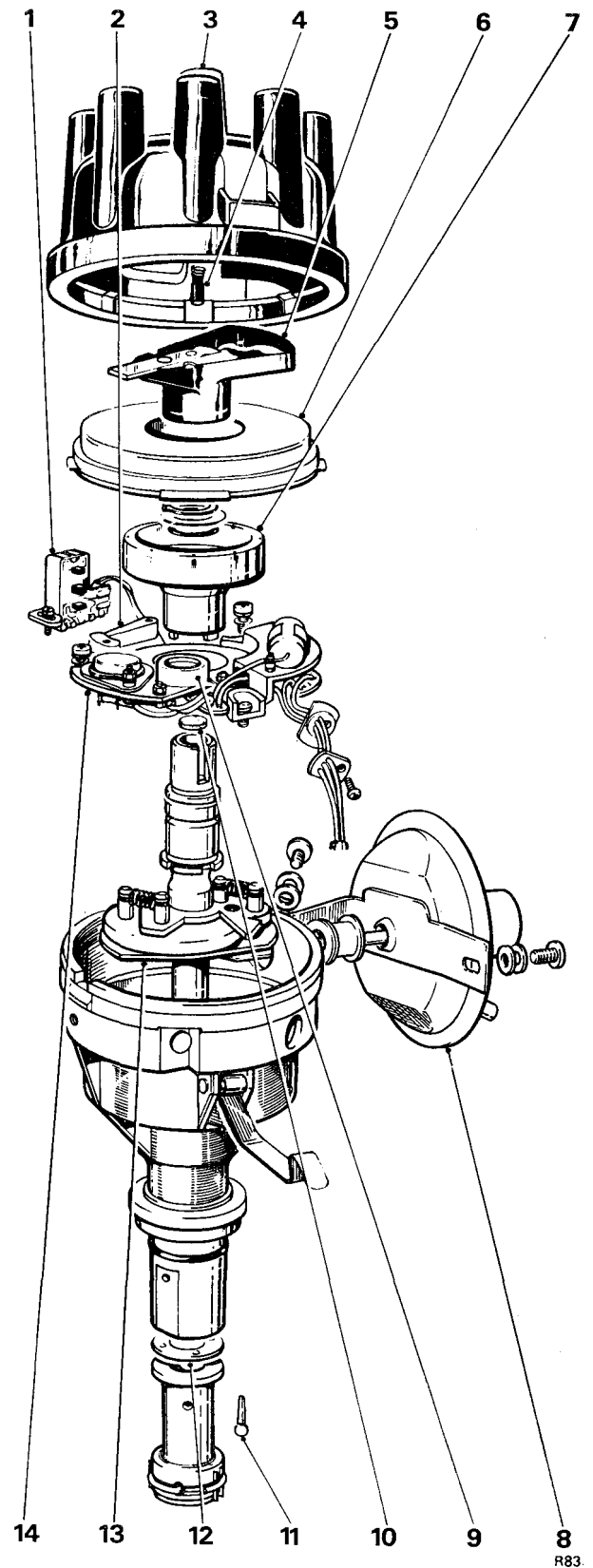
Ensure that the engine is at normal operating temperature and that the choke 'fast-idle' is in the off position.

The air conditioning system must be switched off and a tachometer connected to the engine in accordance with the manufacturer's instructions.

1. Stop the engine, remove the air intake hose and blank off the hot idle compensator feed drilling; replace the air intake hose.

2. Start the engine and, if necessary, adjust the engine idle speed to 600 r.p.m. using the throttle stop screw; tighten the lock-nut.

3. Stop the engine and remove the air intake hose. Remove the blank from the hot idle compensator feed drilling and detach the tachometer and stroboscopic timing equipment (if fitted). Fit the air intake hose.



Sparkling plugs

The sparking plugs approved for this car are Champion RN.14.Y. Before fitting the plugs, set the gaps to 0,9 mm. (0.035 in.) and lightly smear the threads with 'Graphogen' grease.

LUBRICATION AND MAINTENANCE

The 'Essential' maintenance which is listed in the following schedules is the minimum servicing which must be carried out at the appropriate distance/time intervals in order to comply with the Rolls-Royce new car Warranty and the Japanese Emission Regulations.

The 'Preventive' maintenance listed, is aimed at securing the maximum life and efficiency for the vehicle and will be carried out on request.

The schedules marked 'Regular' maintenance should be carried out either by the Owner, his chauffeur, or by a Distributor or Retailer.

REGULAR MAINTENANCE

Carburettors

Monthly, check the oil level in the reservoirs of the automatic air valve dampers; top-up if necessary.

Engine

Weekly or every 800 km. (500 miles), whichever is the earlier, check the oil level by means of the dipstick; top-up if necessary.

Hydraulic reservoirs

Monthly, check the level of fluid in the reservoirs for the braking and automatic levelling systems; the engine should be run for 4 minutes before checking the fluid level. Top-up if necessary to the indicated level. If frequent topping-up is required check the hydraulic systems for leaks and rectify if necessary.

Lamp units

Weekly, check all lamp bulbs for correct operation and replace any faulty bulbs.

Radiator

Every 3 months, check the level of coolant in the radiator header tank; if necessary, top-up with the correct anti-freeze/water mixture or inhibited solution.

Tyres

Weekly, check the tyre pressures; adjust if necessary. Also check the spare wheel tyre pressure; adjust if necessary. Check the tread depth of all tyres and inspect the tyres for signs of damage.

Windscreen washer

Weekly, top-up the reservoir if necessary.

ESSENTIAL MAINTENANCE

INITIAL SERVICE

This service will be carried out by the Distributor/Retailer after the first 5 000 km. (3 000 miles) or 3 months whichever is the earlier.

Items marked * will be carried out free of charge.

INITIAL 5 000 KM. (3 000 MILES) OR 3 MONTHS SERVICE WHICHEVER IS THE EARLIER

*Air injection pump

Check belt tension and reset if necessary.

*Automatic choke

Check the flow through the choke stove pipe and check for correct operation, rectify if necessary.

*Carburettors

Check oil level in air valve dampers and if necessary top-up to correct level. Check tightness of float chamber covers. Check float chamber depression, rectify if necessary. Check and if necessary reset the idle speed. Check and if necessary reset the choke 'fast-idle' speed.

Engine

Change engine oil.

*Fuel evaporation emission control system

Check the purge rate; this should be between 1,41 cu. m/hr. and 1,98 cu. m/hr. (50 cu. ft/hr. and 70 cu. ft/hr.) at 600 r.p.m. in Neutral. Pressure test the fuel tank and evaporation loss line and if necessary rectify any leaks.

*Ignition system

Check ignition timing using stroboscope and adjust if necessary; the ignition timing should be 15° B.T.D.C. with the engine running at 1 600 r.p.m. with the vacuum capsule disconnected and the feed hose blanked off.

Belt tension

Check the tension of all driving belts.

Engine cooling system

Tighten worm-drive clips of all coolant hoses.

Torque converter transmission

Check fluid level and top-up if necessary.

When checking the fluid level, avoid contact with the exhaust gas recirculation valve, heatshield and associated pipes as these components will be hot.

EVERY 5 000 KM. (3 000 MILES) OR 3 MONTHS WHICHEVER IS THE EARLIER

If the car is used for constant stop/start operation, change the engine oil.

EVERY 10 000 KM. (6 000 MILES) OR 6 MONTHS WHICHEVER IS THE EARLIER

Air conditioning system

Check the refrigeration system for correct operation, rectify as necessary. Any work must be carried out by an experienced engineer.

Engine

Change engine oil and renew oil filter element.

Exhaust system

Check grass-fire heatshields for damage. Rectify or renew shields to ensure that a minimum clearance of 5 mm. (0.20 in.) is maintained between the heatshields and exhaust pipes.

Battery

Check the level of the electrolyte in the battery; if necessary top-up with distilled water.

Belt tension

Check the tension of all driving belts.

Chapter U

Brakes

Inspect footbrake and handbrake/parking brake pad linings. When changing footbrake pads examine condition of dust excluders on calipers. Manually adjust the handbrake/parking brake pads. Inspect pipes and connections, rectify if necessary.

Fluid levels

Check all fluid levels.

Torque converter transmission

Check fluid levels and top-up if necessary.

When checking the fluid level, avoid contact with the exhaust gas recirculation valve, heatshield and associated pipes as these components will be **hot**.

**EVERY 20 000 KM. (12 000 MILES)
OR 12 MONTHS SERVICE
WHICHEVER IS THE EARLIER**

Air conditioning system

Check the refrigeration system for correct operation, rectify as necessary. Any work must be carried out by an experienced engineer.

Air injection pump

Check tension of pump pulley driving belt.

Air silencer

Fit a new paper filter element.

Carburettors

Top-up oil level in air valve dampers. Check tightness of float chamber covers. Check float chamber depression, rectify if necessary. Check and if necessary reset the idle speed. Check and if necessary, reset choke 'fast-idle' speed.

Crankcase emission control system

Remove and clean gauze flame traps in the crankcase breather tube. Clean the adapter in choke butterfly housing.

Engine

Change engine oil and renew oil filter element.

Exhaust system

Check grass-fire heatshields for damage. Rectify or renew shields to ensure that a minimum clearance of 5 mm. (0.20 in.) is maintained between the heatshields and exhaust pipes.

Fuel evaporation emission control system

Check the condition of the pipes and connections.

Ignition system

Fit new sparking plugs ensuring that the gaps are set to 0.9 mm. (0.035 in.).

Lubricate distributor spindle (shaft bearings) and automatic advance mechanism with engine oil.

Check the ignition timing using a stroboscope and adjust if necessary; the ignition timing should be 15° B.T.D.C. with the engine running at 1 600 r.p.m. the vacuum capsule disconnected and the feed hose blanked off.

Battery

Check the level of the electrolyte in the battery; if necessary top-up with distilled water.

Belt tension

Check the tension of all driving belts.

Brakes

Inspect footbrake and handbrake/parking brake pad linings. When changing footbrake pads examine condition of dust excluders on calipers. Manually adjust handbrake/parking brake pads. Inspect pipes and connections, rectify if necessary.

Final drive unit

Check oil level and top-up if necessary.

Fluid levels

Check all fluid levels.

Front suspension

The front suspension ball joints are sealed for life and no maintenance is required until renewal is necessary or the ball joint rubber covers are damaged. Inspect the rubber covers on the front suspension ball joints; if the covers are found to be damaged new joints and covers should be fitted.

Steering ball joints

Lubricate the six grease nipples. Inspect the rubber covers on the ball joints; if the covers are found to be damaged the joints should be dismantled and new parts fitted as necessary.

Torque converter transmission

Renew transmission fluid.

When checking the fluid level, avoid contact with the exhaust gas recirculation valve, heatshield and associated pipes as these components will be **hot**.

**EVERY 30 000 KM. (18 000 MILES)
OR 18 MONTHS SERVICE
WHICHEVER IS THE EARLIER**

Air conditioning system

Check the refrigeration system for correct operation, rectify as necessary. Any work must be carried out by an experienced engineer.

Engine

Change engine oil and renew oil filter element.

Exhaust system

Check grass-fire heatshields for damage. Rectify or renew shields to ensure that a minimum clearance of 5 mm. (0.20 in.) is maintained between the heatshields and exhaust pipes.

Battery

Check the level of electrolyte in the battery; if necessary top-up with distilled water.

Belt tension

Check the tension of all driving belts.

Brakes

Inspect footbrake and handbrake/parking brake pad linings. When changing footbrake pads examine condition of dust excluders on calipers. Manually adjust the handbrake/parking brake pads. Inspect pipes and connections, rectify if necessary.

Fluid levels

Check all fluid levels.

Torque converter transmission

Check fluid level and top-up if necessary.

When checking the fluid level, avoid contact with the exhaust gas recirculation valve, heatshield and associated pipes as these components will be **hot**.

**EVERY 40 000 KM. (24 000 MILES)
OR 2 YEARS SERVICE
WHICHEVER IS THE EARLIER**

Air conditioning system

Check the refrigeration system for correct operation, rectify as necessary. Any work must be carried out by an experienced engineer.

Air injection pump

Check tension of pump pulley driving belt.

Air injection system

Check air injection system for leaks and correct functioning. Renew any defective items.

Air silencer

Fit a new paper filter element.

Automatic choke

Check the flow through the choke stove pipe and check the system for correct functioning.

Carburettors

Clean air valves. Remove inlet unions from the float chamber covers and fit new paper filter elements. Top-up oil level in air valve dampers. Check tightness of float chamber covers. Check float chamber depression. Check and if necessary, reset the idle speed. Check and if necessary, reset choke 'fast-idle' speed.

Carburettor mixture weakening device

Renew air filter element for the carburettor mixture weakening device.

Chapter U

Crankcase emission control system

Remove and clean gauze flame traps in crankcase breather tube. Clean the adapter in choke butterfly housing.

Engine

Change engine oil and renew oil filter element.

Engine cooling system

Fit a new engine coolant thermostat and heater tap feed hose. Check the condition of all coolant hoses. Fit new hoses as necessary.

Exhaust system

Check grass-fire heatshields for damage. Rectify or renew shields to ensure that a minimum clearance of 5 mm. (0.20 in.) is maintained between the heatshields and exhaust pipes.

Fuel evaporation emission control system

Renew the foam filter element in the evaporation loss control canister. Check the purge rate; this should be between 1,41 cu. m/hr. and 1,98 cu. m/hr. (50 cu.ft/hr. and 70 cu. ft/hr.) at 600 r.p.m. in Neutral. Renew the purge line filter if necessary.

Ignition system

Fit new sparking plugs ensuring that the gaps are set to 0,9 mm. (0.035 in.).

Lubricate distributor spindle (shaft bearings) and automatic advance mechanism with engine oil.

Check the ignition timing using a stroboscope and adjust if necessary; the ignition timing should be 15° B.T.D.C. with the engine running at 1 600 r.p.m. the vacuum capsule disconnected and the feed hose blanked off. Check the vacuum advance mechanism.

Battery

Check the level of the electrolyte in the battery; if necessary top-up with distilled water.

Belt tension

Check the tension of all driving belts.

Brakes

Inspect footbrake and handbrake/parking brake pad linings. When changing footbrake pads examine condition of dust excluders on calipers. Manually adjust handbrake/parking brake pads. Inspect pipes and connections; rectify if necessary.

Final drive unit

Change oil.

Fluid levels

Check all fluid levels.

Front suspension

The front suspension ball joints are sealed for life and no maintenance is required until renewal is necessary or the ball joint rubber covers are damaged. Inspect the rubber covers on the front suspension ball joints; if the covers are found to be damaged new joints and covers should be fitted.

Fuel pumps

Remove the fuel pumps and check for pumping efficiency, fit new pumps if necessary.

Hydraulic systems

Completely drain the fluid from the hydraulic circuits. Thoroughly clean the brake fluid reservoirs and sight glasses, ensure that no foreign matter enters the systems. Fill the hydraulic systems with new approved fluid. Bleed the brakes and height control systems.

Rear wheel drive-shafts

Lubricate the rear wheel drive-shaft outer universal couplings with approved grease.

Steering ball joints

Lubricate the six grease nipples. Inspect the rubber covers on the ball joints; if the covers are found to be damaged the joints should be dismantled and new parts fitted as necessary.

Torque converter transmission

Change transmission fluid.

Fit a new intake strainer.

When checking the fluid level, avoid contact with the exhaust gas recirculation valve, heatshield and associated pipes as these components will be **hot**.

**SERVICING AFTER 40 000 KM.
(24 000 MILES) OR 2 YEARS
WHICHEVER IS THE EARLIER**

After 40 000 km. (24 000 miles) or 2 years, servicing is still due at the following intervals.

**50 000 KM. (30 000 MILES)
OR 2½ YEARS
WHICHEVER IS THE EARLIER**

Carry out the 10 000 km. (6 000 miles) service.

**60 000 KM. (36 000 MILES)
OR 3 YEARS
WHICHEVER IS THE EARLIER**

Carry out the 20 000 km. (12 000 miles) service.

**70 000 KM. (42 000 MILES)
OR 3½ YEARS
WHICHEVER IS THE EARLIER**

Carry out the 10 000 km. (6 000 miles) service.

**80 000 KM. (48 000 MILES)
OR 4 YEARS
WHICHEVER IS THE EARLIER**

Carry out the 40 000 km. (24 000 miles) service and in addition the following operations.

Exhaust gas recirculation system

Remove and clean the exhaust gas recirculation valve and feed pipes. Clean the orifices in the carburetter 'Tee' piece. Check the exhaust gas recirculation valve for correct operation.

Exhaust system

Fit a new catalytic converter assembly. Inspect the condition of the catalytic converter thermocouple and wiring, renew if there is visual evidence of damage.

PREVENTIVE MAINTENANCE

INITIAL SERVICE

This service should be carried out by the Distributor/Retailer after the first 5 000 km. (3 000 miles) or 3 months whichever ever is earlier.

Steering pump

Check the oil level in the reservoir; top-up if necessary.

Test

Road test the car for satisfactory performance.

**EVERY 10 000 KM. (6 000 MILES)
OR 6 MONTHS
WHICHEVER IS THE EARLIER**

Carburetters

Check the oil level in the air valve dampers and top-up if necessary.

Control linkages

Apply a few drops of engine oil to the accelerator linkage and to the gear range selector controls adjacent to the transmission casing.

Electrical system

Check all interior lamps, exterior lamps, instruments, warning lamps and devices for correct operation, rectify as necessary.

Handbrake/Parking brake

Lubricate the pivot pins and pulleys in the handbrake/parking brake system with approved grease.

Tyres

Check the tread depth of all tyres, inspect all tyres for signs of damage. Check all tyre pressures when cold, adjust if necessary.

Note Include the spare tyre.

Test

Road test the car for satisfactory performance.

Chapter U

EVERY 20 000 KM. (12 000 MILES) OR 12 MONTHS WHICHEVER IS THE EARLIER

Control linkage

Apply a few drops of engine oil to the accelerator linkage and to the gear range selector controls adjacent to the transmission casing.

Handbrake/Parking brake

Lubricate the pivot pins and pulleys in the handbrake/parking brake system with approved grease.

Spare wheel

Lubricate the spare wheel lowering bolt and mechanism.

Electrical system

Check all interior lamps, exterior lamps, instruments, warning lamps and devices for correct operation, rectify as necessary.

Tyres

Check the tread depth of all tyres, inspect all tyres for signs of damage. Check all tyre pressures when cold, adjust if necessary.

Note Include the spare tyre.

Test

Road test the car for satisfactory performance.

EVERY 30 000 KM. (18 000 MILES) OR 18 MONTHS WHICHEVER IS THE EARLIER

Carburettors

Check the oil level in the air valve dampers and top-up if necessary.

Control linkages

Apply a few drops of engine oil to the accelerator linkage and to the gear range selector controls adjacent to the transmission casing.

Electrical system

Check all interior lamps, exterior lamps, instruments, warning lamps and devices for correct operation, rectify as necessary.

Handbrake/Parking brake

Lubricate the pivot pins and pulleys in the handbrake/parking brake system with approved grease.

Tyres

Check the tread depth of all tyres, inspect all tyres for signs of damage. Check all tyre pressures when cold, adjust if necessary.

Note Include the spare tyre.

Test

Road test the car for satisfactory performance.

EVERY 40 000 KM. (24 000 MILES) OR 2 YEARS WHICHEVER IS THE EARLIER

Control linkage

Apply a few drops of engine oil to the accelerator linkage and to the gear range selector controls adjacent to the transmission casing.

Electrical system

Check all interior lamps, exterior lamps, instruments, warning lamps and devices for correct operation, rectify as necessary.

Fuel filter

Renew the main line filter element and clean the filter bowl.

Fuel tank

Slacken the drain plug one or two turns and allow any accumulated water to drain away. Tighten the drain plug.

Height control mechanism

Disconnect the control valve linkage ball joints. Clean, grease and refit the ball joints.

Handbrake/Parking brake

Lubricate the pivot pins and pulleys in the handbrake/parking brake system with approved grease.

Spare wheel

Lubricate the spare wheel lowering bolt and mechanism.

Tyres

Check the tread depth of all tyres, inspect all tyres for signs of damage. Check all tyre pressures when cold, adjust if necessary.

Note Include the spare tyre.

Test

Road test the car for satisfactory performance.

**SERVICING AFTER 40 000 KM.
(24 000 MILES) OR 2 YEARS
WHICHEVER IS THE EARLIER**

After 40 000 km. (24 000 miles) or 2 years, servicing is still due at the following intervals.

**50 000 KM. (30 000 MILES)
OR 2½ YEARS
WHICHEVER IS THE EARLIER**

Carry out the 10 000 km. (6 000 miles) service.

**60 000 KM. (36 000 MILES)
OR 3 YEARS
WHICHEVER IS THE EARLIER**

Carry out the 20 000 km. (12 000 miles) service.

**70 000 KM. (42 000 MILES)
OR 3½ YEARS
WHICHEVER IS THE EARLIER**

Carry out the 10 000 km. (6 000 miles) service.

**80 000 KM. (48 000 MILES)
OR 4 YEARS
WHICHEVER IS THE EARLIER**

Carry out the 40 000 km. (24 000 miles) service.

SEASONAL SCHEDULES**EVERY 12 MONTHS****Air conditioning system**

Ensure that the foam filter element fitted to the scuttle intake grille is free from obstruction. On Long Wheelbase cars fitted with a centre division, check that the foam filter element fitted to the intake grille in the rear decking panel is free from obstruction.

Body

Check that the body drain holes are free from foreign matter.

Engine cooling system

Drain the coolant from the radiator and the engine crankcase. Clean any debris from the surfaces of the refrigeration condenser and radiator matrices by reverse flushing with a hose. This should be carried out just prior to the Autumn. Fill the system with the correct anti-freeze mixture (*refer to Chapter L—Engine Cooling System of this Workshop Manual T.S.D. 2476 and the latest Service Bulletin*).

EVERY 2 YEARS

In addition to the 12 monthly schedule, carry out the following.

Engine cooling system

Drain the coolant from the radiator and engine crankcase. Thoroughly reverse flush the coolant passages with a continuous flow of water. Change the coolant hoses where necessary. Fill the system with the correct anti-freeze mixture.

SERVICE RECOMMENDATIONS**80 000 KM. (48 000 MILES)**

At this mileage and under normal motoring conditions it is recommended that the following servicing is carried out.

Chapter U

Hydraulic systems

Renew the front and rear accumulator to frame connector block hoses.

Examine the sub-frame to brake caliper hoses for chafing or surface cracking; renew if necessary.

160 000 KM. (96 000 MILES)

At this mileage and under normal motoring conditions it is recommended that the following servicing is carried out.

Hydraulic systems

Renew all the flexible hoses to the braking systems and the automatic height control system. Fit new seals to the disc brake calipers and the deceleration conscious pressure limiting valve.

Fuel system

Fit a new convoluted rubber hose between the fuel filler head and fuel tank assembly. Examine all flexible fuel pipes and renew any which show signs of deterioration.

SPECIAL PRECAUTIONS

Should the car be used in very cold temperatures, drain the engine sump when thoroughly warm and also drain the carburetter air valve dampers. The engine sump and carburetter air valve dampers should then be filled with oil having the following viscosity.

For constant temperatures of between 0°C. and -23°C. (32°F. and -10°F.), use a 10W/30 grade oil.

For constant temperatures of -23°C. (-10°F.) and below, use a 5W/20 grade oil.

FAULT DIAGNOSIS

SYMPTOMS	POSSIBLE CAUSE
<p>1. Engine will not start. (Starter motor operating).</p>	<p>1. (a) Ignition circuit broken. (b) Failed anti 'run-on' solenoid or failure of electrical supply circuit. (c) Ignition system faulty. (d) Damaged or contaminated ignition high-tension circuit. (e) Fault in fuel feed line or fouled float chamber filters. (f) Faulty choke bi-metal coil. (g) Choke solenoid inoperative. (h) Faulty choke 'fast-idle' mechanism. (i) Air leak into induction system. (j) Faulty hot idle mixture compensator. (k) Weakening device filter blocked or blockage in rubber connecting hoses. (l) Faulty weakener cut-off solenoid or failure of electrical supply circuit. (m) Faulty weakening device control switch or failure of electrical supply circuit. (n) Dislodged venturi in weakener device. (o) Flooding of carburetter float chamber or jet. (p) Fouled carburetter float chamber or jet. (q) Exhaust gas recirculation valve failed.</p>
<p>2. Engine idles very roughly.</p>	<p>2. (a) Ignition system faulty. (b) Fouled sparking plugs. (c) Damaged or contaminated ignition high-tension circuit. (d) Air leak into induction system. (e) Faulty hot idle compensator. (f) Weakening device filter blocked or blockage in rubber connecting hoses. (g) Dislodged venturi in weakener device. (h) Badly worn or damaged carburetter control linkage. (i) Flooding of carburetter float chamber or jet. (j) Sticking carburetter piston. (k) Fouled carburetter float chamber or jet. (l) Air leak into exhaust gas recirculation vacuum control circuit. (m) Exhaust gas recirculation valve failed. (n) Faulty air diverter valve. (o) Incorrect operation of temperature controlled air intake system.</p>
<p>3. Engine stalls.</p>	<p>3. (a) Ignition circuit broken. (b) Failed anti 'run-on' solenoid or failure of electrical supply circuit. (c) Ignition system faulty. (d) Damaged or contaminated ignition high-tension circuit. (e) Fault in fuel feed line or fouled float chamber filters. (f) Air leak into induction system. (g) Faulty hot idle mixture compensator. (h) Weakening device filter blocked or blockage in rubber connecting hoses. (i) Dislodged venturi in weakening device. (j) Badly worn or damaged carburetter control linkage. (k) Flooding of carburetter float chamber or jet. (l) Sticking carburetter piston. (m) Fouled carburetter float chamber or jet. (n) Air leak into exhaust gas recirculation vacuum control circuit. (o) Exhaust gas recirculation valve failed. (p) Faulty air diverter valve.</p>

Chapter U

SYMPTOMS	POSSIBLE CAUSE
<p>4. (i) Engine shows signs of power loss, evident at high speeds and loading. (ii) Engine misfires particularly on hard acceleration from low speed.</p>	<p>4. (a) Ignition system faulty. (b) Fouled sparking plugs. (c) Damaged or contaminated ignition high-tension circuit. (d) Fault in fuel feed line or fouled float chamber filters. (e) Choke system operation incorrect. (f) Sticking carburetter piston. (g) Fouled carburetter float chamber or jet. (h) Exhaust gas recirculation valve failed. (i) Failed exhaust gas recirculation valve cut-out solenoid or electrical supply circuit.</p>
<p>5. Engine hesitates or misfires under light load.</p>	<p>5. (a) Failed anti 'run-on' solenoid or failure of electrical supply circuit. (b) Ignition system faulty. (c) Fouled sparking plugs. (d) Damaged or contaminated ignition high-tension circuit. (e) Fault in fuel feed line or fouled float chamber filters. (f) Air leak into induction system. (g) Faulty hot idle mixture compensator. (h) Weakening device filter blocked or blockage in rubber connecting hoses. (i) Dislodged venturi in weakening device. (j) Flooding of carburetter float chamber or jet. (k) Sticking carburetter piston. (l) Fouled carburetter float chamber or jet. (m) Incorrect purge flow rate. (n) Exhaust gas recirculation valve failed. (o) Faulty air diverter valve. (p) Incorrect operation of temperature controlled air intake system.</p>
<p>6. Increase in fuel consumption.</p>	<p>6. (a) Ignition system faulty. (b) Faulty choke bi-metal coil. (c) Choke system operation incorrect. (d) Air leak into induction system. (e) Faulty hot idle mixture compensator. (f) Weakening device filter blocked or blockage in rubber connecting hoses. (g) Faulty weakener cut-off solenoid or failure of electrical supply circuit. (h) Faulty weakening device control switch or failure of electrical supply circuit. (i) Air leaks in mixture weakening system. (j) Flooding of carburetter float chamber or jet. (k) Sticking carburetter piston. (l) Incorrect purge flow rate. (m) Exhaust gas recirculation valve failed. (n) Faulty air diverter valve.</p>
<p>7. Decrease in fuel consumption.</p>	<p>7. (a) Air leaks in mixture weakening system. (b) Incorrect purge flow rate. (c) Faulty exhaust gas recirculation temperature control switch or failure of electrical supply circuit. (d) Air leak into exhaust gas recirculation vacuum control circuit. (e) Exhaust gas recirculation valve failed.</p>
<p>8. Engine 'backfires' on overrun.</p>	<p>8. (a) Ignition system faulty. (b) Air leak into induction system. (c) Exhaust gas recirculation valve failed.</p>
<p>9. Sudden increase in engine idle speed.</p>	<p>9. (a) Faulty choke 'fast-idle' mechanism. (b) Failed carburetter overrun valve.</p>
<p>10. Excessive noise from air injection pump or system.</p>	<p>10. (a) Faulty air diverter valve. (b) Faulty or damaged air injection pump.</p>

WORKSHOP TOOLS

Tool Number Description

RH 8050	Spanner—Carburetter Jet Screw
RH 8087	Spanner—Weakener Cut-off Valve
RH 8089	Jet Centring Tool
RH 8090	Pliers—Wire Hose Clips
RH 8383	Positioning Tool—Throttle Spindle Seal
RH 8621	Adapter—Air Manifold to CO Meter
RH 8841	Dial Gauge—Carburetter Piston Lift
RH 8880	Setting Jig—Throttle Levers
RH 8945	Connector—Choke Stove Pipe

Chapter U

Chapter U

Section U10
SUPPLEMENTS

No. 8 Australia 1976

For general details of the emission control systems Workshop Personnel should refer to Chapter U (Part 2). However, changes from Chapter U (Part 2) applicable to cars destined for Australia and built to the 1976 Specification are contained within this Supplement.

Information contained within this Supplement includes the following.

1. Exhaust Gas Recirculation System (E.G.R.—Single valve system).
2. Fuel Evaporation Emission Control System.
3. Crankcase Emission Control System.
4. Emission Control Systems (Electrical Components).
5. Carburetters and Automatic Choke System.
6. Ignition System, Distributor, Ignition Coil and Sparking Plugs.
7. Lubrication and Maintenance.

It should also be noted that the engine compression ratio has been reduced to 8.0:1 on cars produced to this specification.

Vehicle identification

Rolls-Royce motor cars conforming to the appropriate emission control regulations and produced to the 1976 specification can be readily identified as follows.

A 1976 Emission Control Certification Label (illustrated) fitted to the wing valance to the rear of the right-hand front suspension spring cover.

VEHICLE EMISSION CONTROL INFORMATION



Rolls-Royce Motors Limited

This vehicle conforms to ADR27A regulations applicable to cars sold after 1 July 1976.

Engine displacement: 6750ml.
Engine family identification: No.1.

Engine tune up specification

All settings are to be checked on a hot engine with transmission in neutral, ACU switched off, EGR and vacuum advance hoses disconnected and blanked off.

Idle speed: 600rpm.

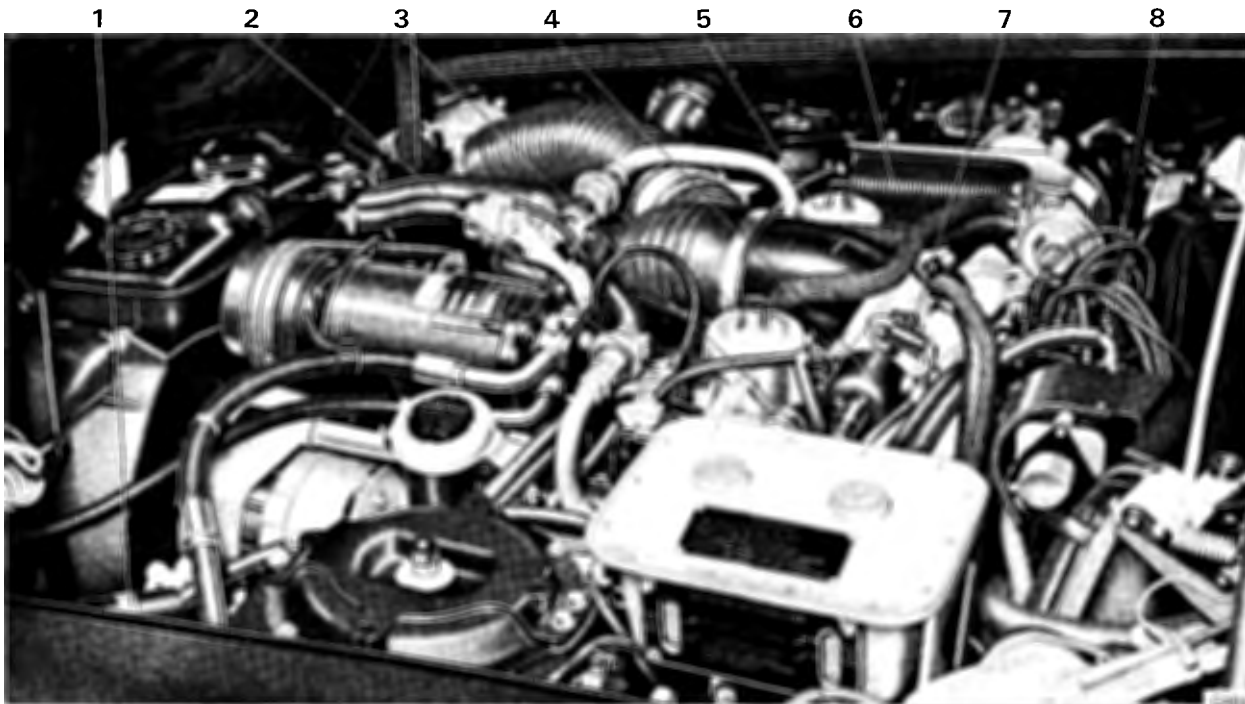
Ignition timing: 15° BTDC at 1600rpm.

Idle CO: Preset at factory (5.0-5.5% at 600rpm with air injection disconnected, float chambers vented, and hot idle mixture compensator blanked off)

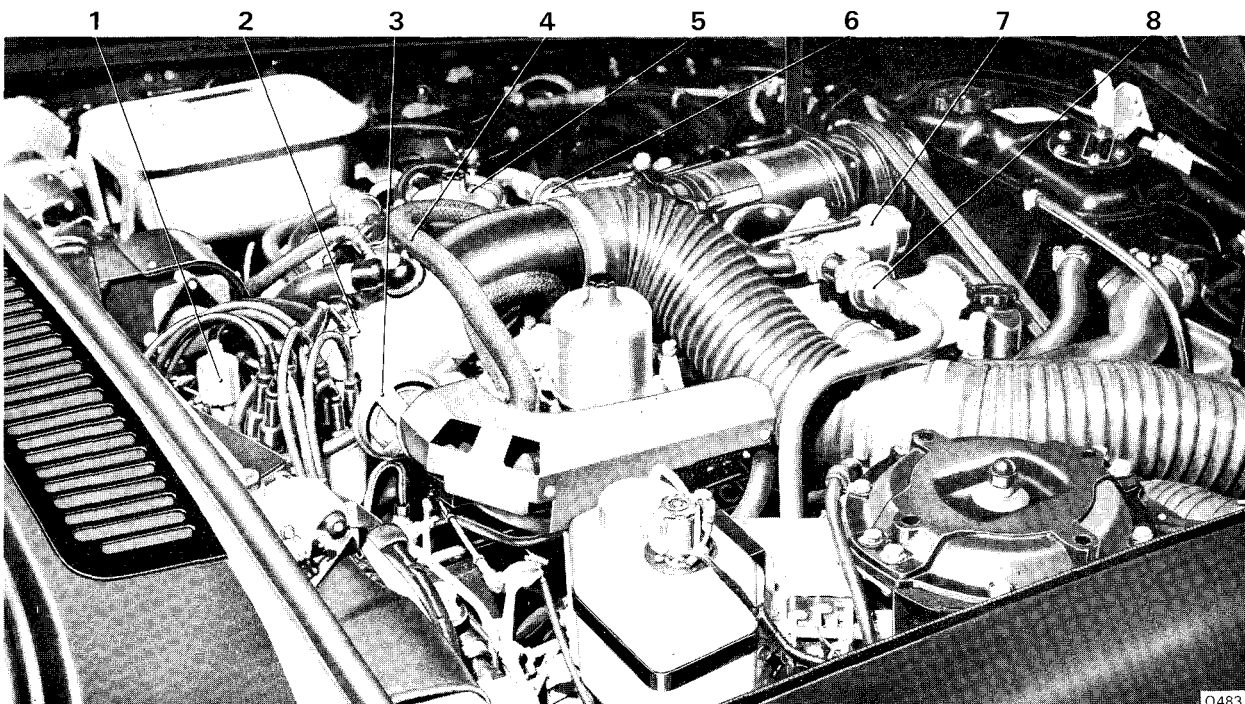
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1976 EMISSION CONTROL CERTIFICATION LABEL

U231

Chapter U**FIG. 1 VIEW INSIDE ENGINE COMPARTMENT (From Left-hand side of Car)**

- | | |
|--------------------------------------|------------------------------------|
| 1 Weaker filter | 5 'A' bank carburetter |
| 2 Anti 'run-on' solenoid | 6 Exhaust gas recirculation cooler |
| 3 Exhaust gas recirculation solenoid | 7 Choke solenoid |
| 4 Choke thermo-coil housing | 8 Ignition distributor |

**FIG. 2 VIEW INSIDE ENGINE COMPARTMENT (From Right-hand side of Car)**

- | | |
|--|------------------------|
| 1 Fuel receiver and float chamber vent valve | 5 'B' bank carburetter |
| 2 Weaker system cut-off switch | 6 Check valve |
| 3 Exhaust gas recirculation valve | 7 Air diverter valve |
| 4 Exhaust gas recirculation distribution pipes | 8 Check valve |

EXHAUST EMISSION CONTROL SYSTEM

AIR INJECTION SYSTEM

Air injection system relief valve

The relief valve located in the discharge cavity of the air pump is changed from Chapter U (Part 2) and is as follows.

Air pump relief valve

A spring loaded relief valve is located within the diverter valve housing and permits excess air to bypass the air injection system when the check valves are closed. The by-pass system prevents damage to the pump vanes and excessive exhaust temperatures under extreme operating conditions.

Air diverter valve

The air diverter valve is located at the front of the engine above the air pump (*see Fig. 2*) and performs the following important function in addition to housing the pressure relief valve for the air pump.

(i) **Backfire protection** (*see Fig. 3*)

Following rapid throttle closure, the inlet manifold pressure drops suddenly, causing fuel to be vapourised from the manifold walls which results in a mixture too rich to burn in the cylinders. This mixture combined with the air injected into the exhaust ports could cause backfiring.

To prevent backfiring, the diverter valve, triggered by manifold depression diverts the injected air from the exhaust ports for a short period of time.

Air diverter valve—To check

The air diverter valve is a non-serviceable component. If the operation of the component is suspect, the following checks should be carried out before it is replaced.

1. Ensure that the parking brake is firmly applied and the vehicle is in 'Park'.
2. Start and run the engine at 2 000 r.p.m.
3. Ensure that **air does not escape** from the air diverter valve exhaust ports situated around the body of the air diverter valve (*see Fig. 3*).

If air still escapes from the exhaust ports the air diverter valve assembly is faulty due to either a failed relief valve or a seized shuttle and must be replaced.

After fitting a new air diverter valve, ensure that the component operates satisfactorily.

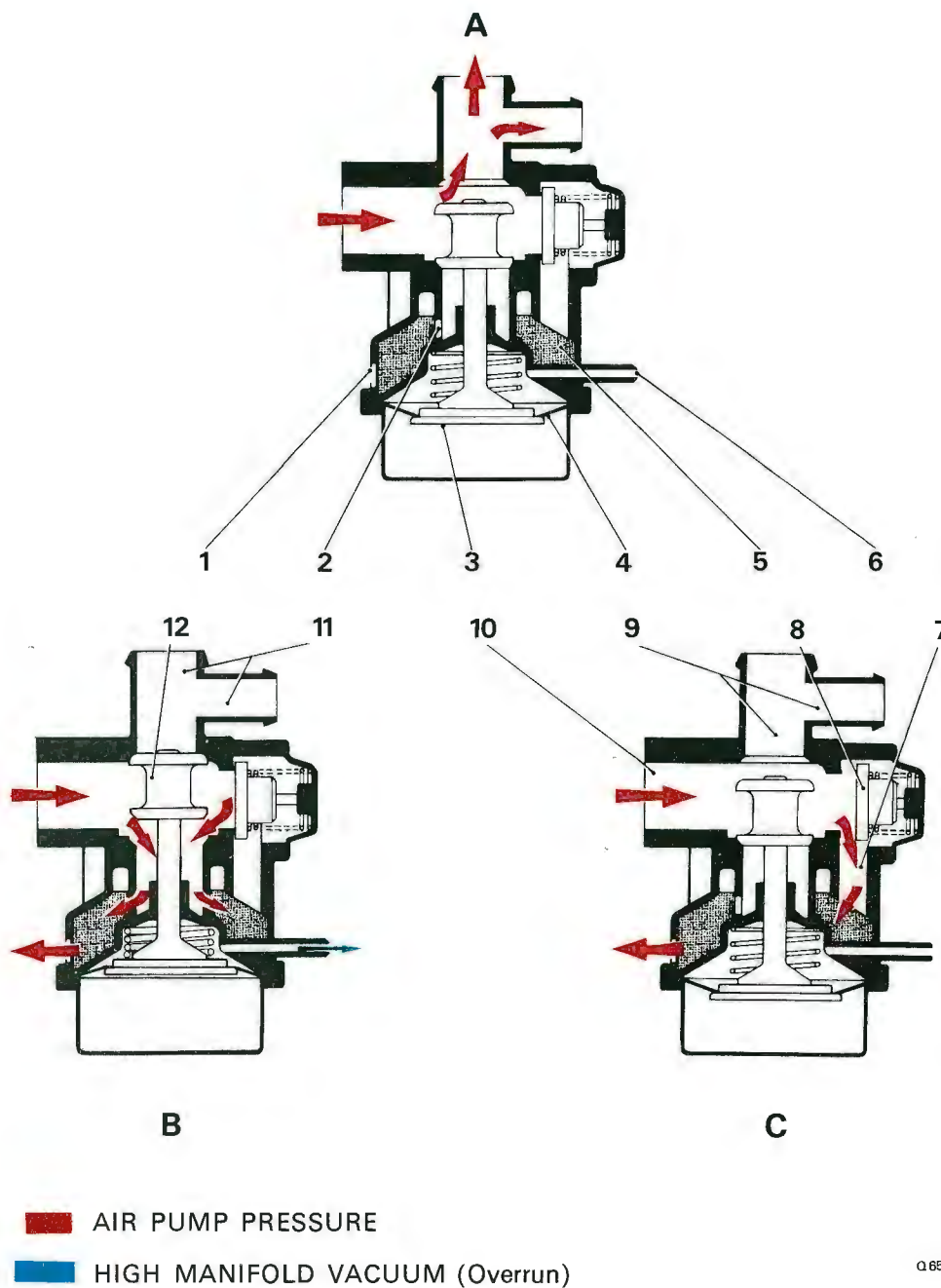
4. Release the throttle linkage sharply so that the engine speed rapidly falls from 2 000 r.p.m., ensure that **air escapes** from the air diverter valve exhaust ports for a short period of time.

If air does not escape from the exhaust ports of the air diverter valve during Operation 4 check the following.

- (a) The condition of the hose from the air diverter valve to the vacuum manifold (*see Fig. 5*).
- (b) The condition of any hose connected to the vacuum manifold (*see Fig. 5*).
- (c) Repeat Operation 4.

If air still does not escape during Operation 4 the air diverter valve assembly is faulty due to either a diaphragm or timing valve failure and must be replaced.

After fitting a new air diverter valve, ensure that the component operates satisfactorily.



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FIG. 3 AIR DIVERTER VALVE

- | | |
|--|---|
| <ul style="list-style-type: none"> A Normal operation B Backfire protection C Relief valve operation | <ul style="list-style-type: none"> 5 Internal silencer 6 Manifold vacuum signal 7 Excess air 8 Relief valve 9 Valve outlets restricted 10 Valve inlet 11 Valve outlets to air manifolds 12 Metering valve |
|--|---|

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5. Allow the engine to idle at 600 r.p.m. Ensure that **air does not escape** from the air diverter valve exhaust ports.

Air diverter valve—To remove

Before commencing to remove the air diverter valve observe the following points.

1. When disconnecting the various hoses ensure that each is suitably labelled to assist identification when assembling.
2. Ensure that all open ends of pipes and hoses are suitably blanked off to prevent the ingress of dirt, etc.

To remove the air diverter valve proceed as follows

1. Unscrew the three worm drive clips which secure the three larger diameter rubber hoses to the air

diverter valve and withdraw the hoses. Two of the hoses connect to their respective air manifold check valves and the third hose to the air pump.

2. Withdraw the small diameter rubber hose from the air diverter valve.
3. Using a $\frac{7}{16}$ in. A/F spanner unscrew and remove the two nuts which secure the air diverter valve to the mounting plate. Collect the two washers.
4. Hold the air diverter valve and withdraw the two bolts from the mounting plate, taking care not to lose the washer situated under the head of each bolt.
5. Remove the air diverter valve together with the spacer plate and gasket.

Air diverter valve—To fit

Fit the air diverter valve by reversing the procedure given for removal, noting the following points.

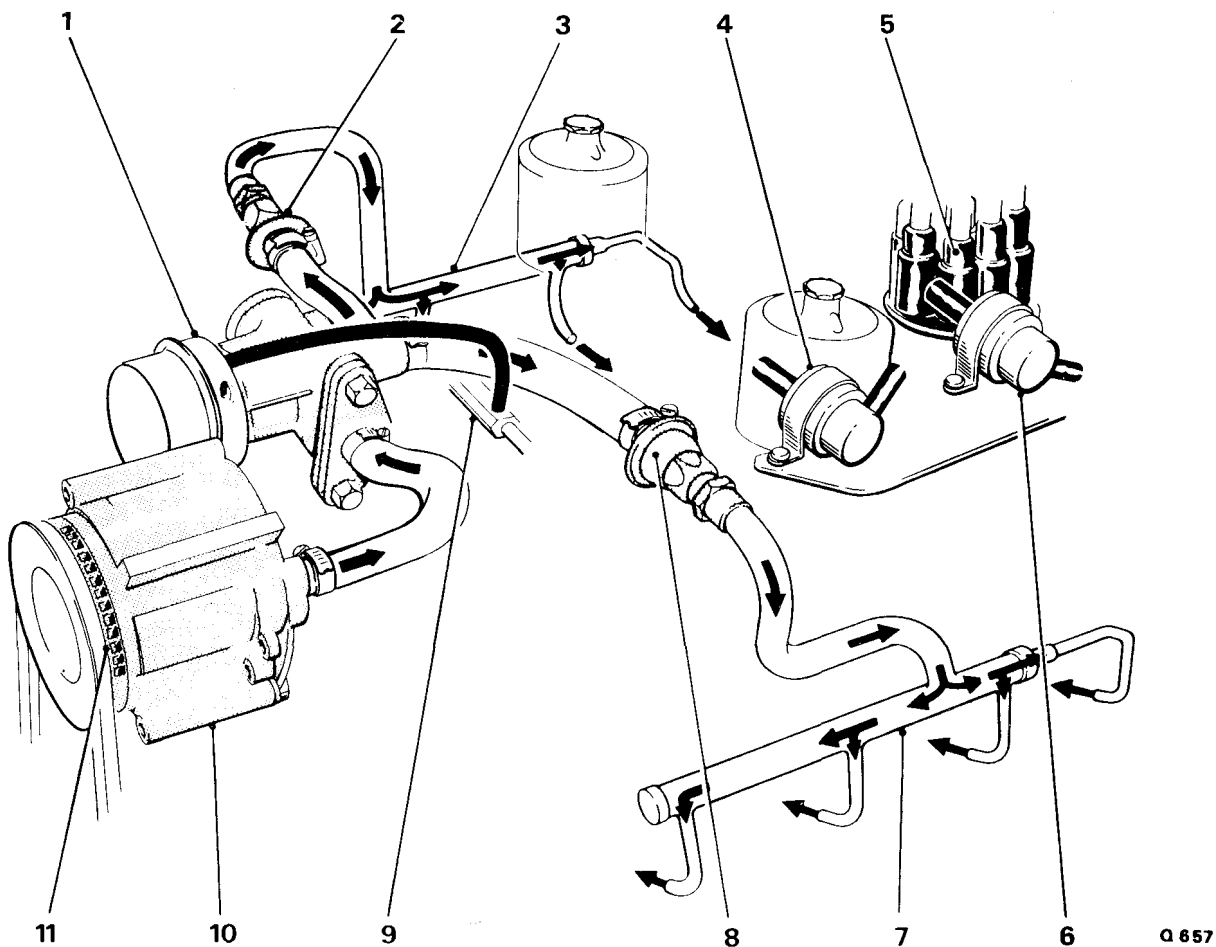
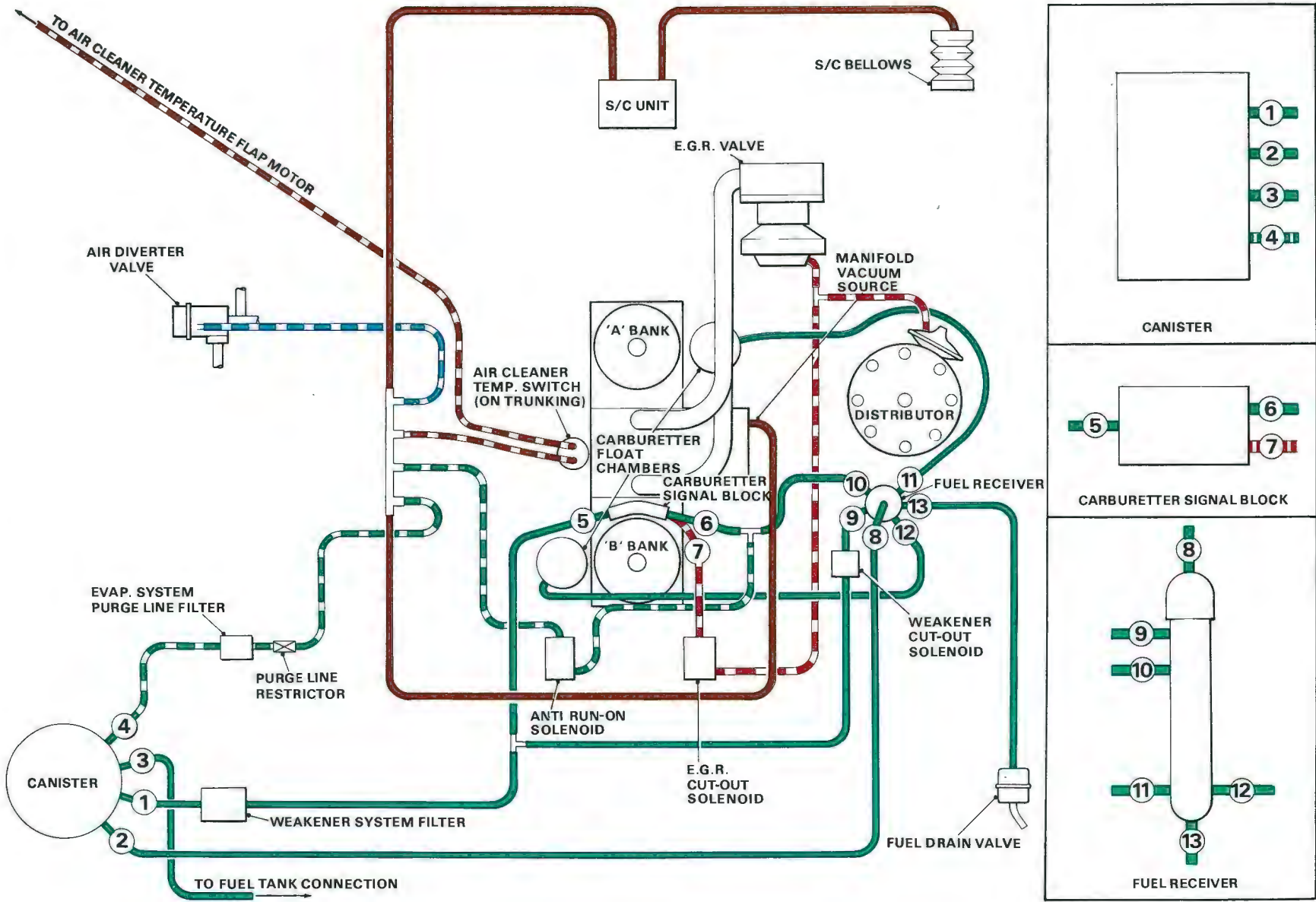


FIG. 4 AIR INJECTION SYSTEM

- | | | |
|--------------------------|-----------------------------|--------------------|
| 1 Air diverter valve | 5 Ignition distributor | 8 Check valve |
| 2 Check valve | 6 Exhaust gas recirculation | 9 Vacuum manifold |
| 3 'A' bank air manifold | 7 'B' bank air manifold | 10 Air pump |
| 4 Anti 'run-on' solenoid | | 11 Air pump intake |

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FIG. 5 HOSE ROUTING DIAGRAM—1976 MODELS

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1. Ensure that all joint faces are clean.
2. Ensure that the gasket is in a good condition.
3. Always ensure that the spacer plate is fitted with the spigot projecting through the mounting plate into the hose which connects to the air pump and that the gasket is fitted to the opposite side of the mounting plate from the spigot.

For details of the remainder of the Air Injection System see **Workshop Manual T.S.D. 2476—Chapter U (Part 2)**.

EXHAUST GAS RECIRCULATION SYSTEM

This system is similar to the system detailed in Chapter U except that the 'A' bank exhaust manifold has the exhaust gas recirculation system take-off flange above the manifold as shown in Figure 6.

The exhaust gas recirculation system cooler is situated above the engine on the 'A' bank side and a large heat shield is fitted around the cooler as shown in Figure 2.

As a result of these changes the pipe run between the exhaust manifold and cooler has changed.

CAUTION

When carrying out any work in or around the area of the exhaust gas recirculation system cooler (e.g. when checking the torque converter transmission fluid level), avoid contact with the various components and pipes of the system as they contain **hot** exhaust gases when the engine is running.

A second change from Chapter U (Part 2) is the E.G.R. Full Throttle Cut-off Micro-switch, details of which are as follows.

A micro-switch operated by the throttle lever (see Fig. 7) controls the cut-off solenoid to provide exhaust gas recirculation cut-off at full throttle. This feature of the system prevents the E.G.R. valve remaining open under full throttle high speed operation, as this would be detrimental to performance and fuel consumption.

For details of the remainder of the Exhaust Gas Recirculation System see **Workshop Manual T.S.D. 2476 —Chapter U (Part 2)**.

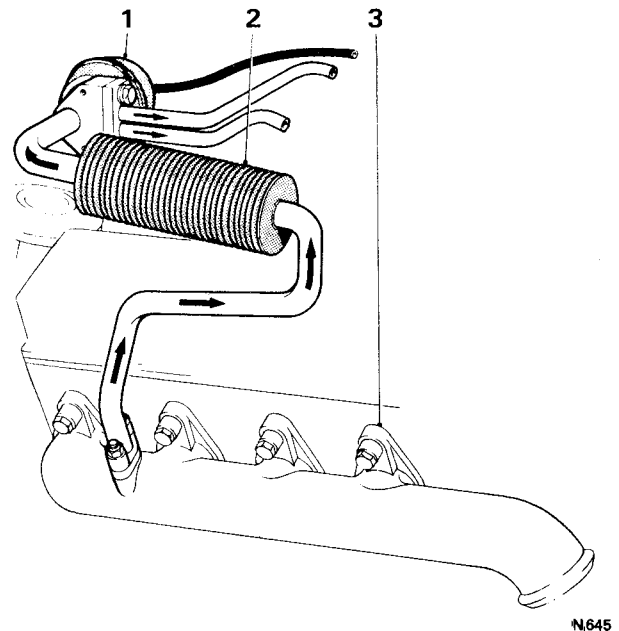


FIG. 6 EXHAUST GAS RECIRCULATION SYSTEM PIPE RUN FROM EXHAUST MANIFOLD TO EXHAUST GAS RECIRCULATION VALVE

- 1 Exhaust gas recirculation valve
- 2 Exhaust gas recirculation cooler
- 3 'A' bank exhaust manifold

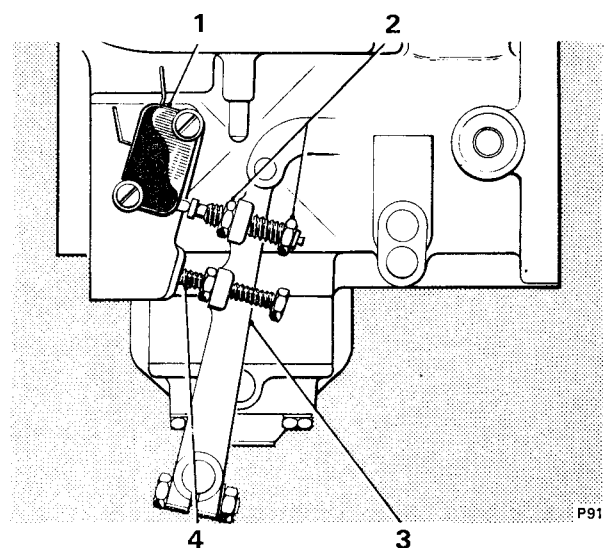
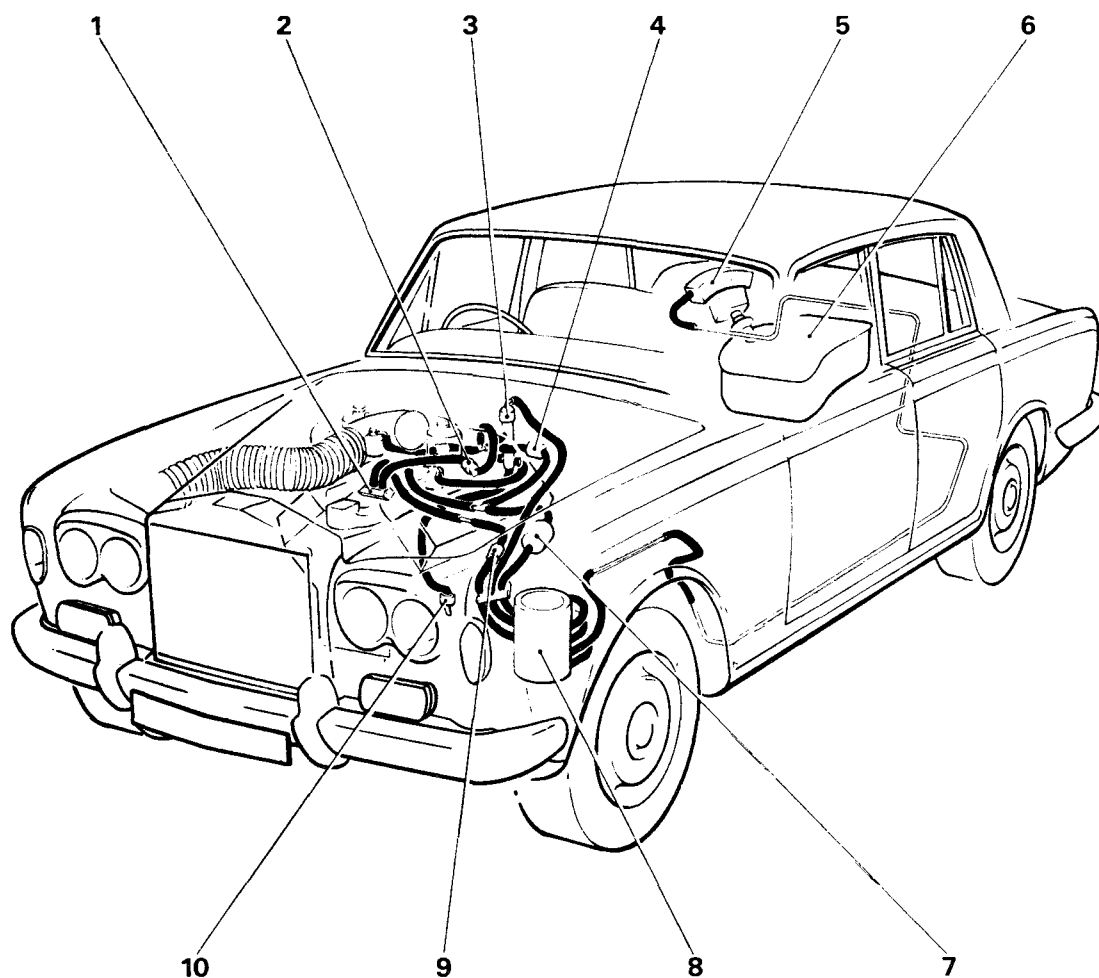


FIG. 7 FULL THROTTLE CUT-OFF MICRO-SWITCH

- 1 Micro-switch
- 2 Adjusting screws
- 3 Throttle lever
- 4 Full throttle stop

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FUEL EVAPORATION EMISSION CONTROL SYSTEM



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FIG. 8 FUEL EVAPORATION EMISSION CONTROL SYSTEM—GENERAL VIEW

- 1 Vacuum manifold
- 2 Anti 'run-on' solenoid
- 3 Float chamber vent valve
- 4 Weakener cut-off solenoid
- 5 Fuel trap assembly

- 6 Fuel tank assembly
- 7 Weakener filter
- 8 Evaporative loss control canister
- 9 Purge line filter
- 10 Float chamber drain valve

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Fuel tank assembly

The fuel tank assembly consists of the fuel tank, expansion tank and fuel trap assembly (see Fig. 9).

The fuel tank is vented from three positions to a fuel trap assembly which is mounted above the fuel filler. One vent is from the fuel filler neck and the other two vents from the fuel tank.

The three vent lines join at a common junction block situated adjacent to the fuel filler neck, the main vent line then encircles the fuel tank before passing to the fuel trap assembly.

From the fuel trap, a vent line passes under the floor of the car to the evaporation loss control canister.

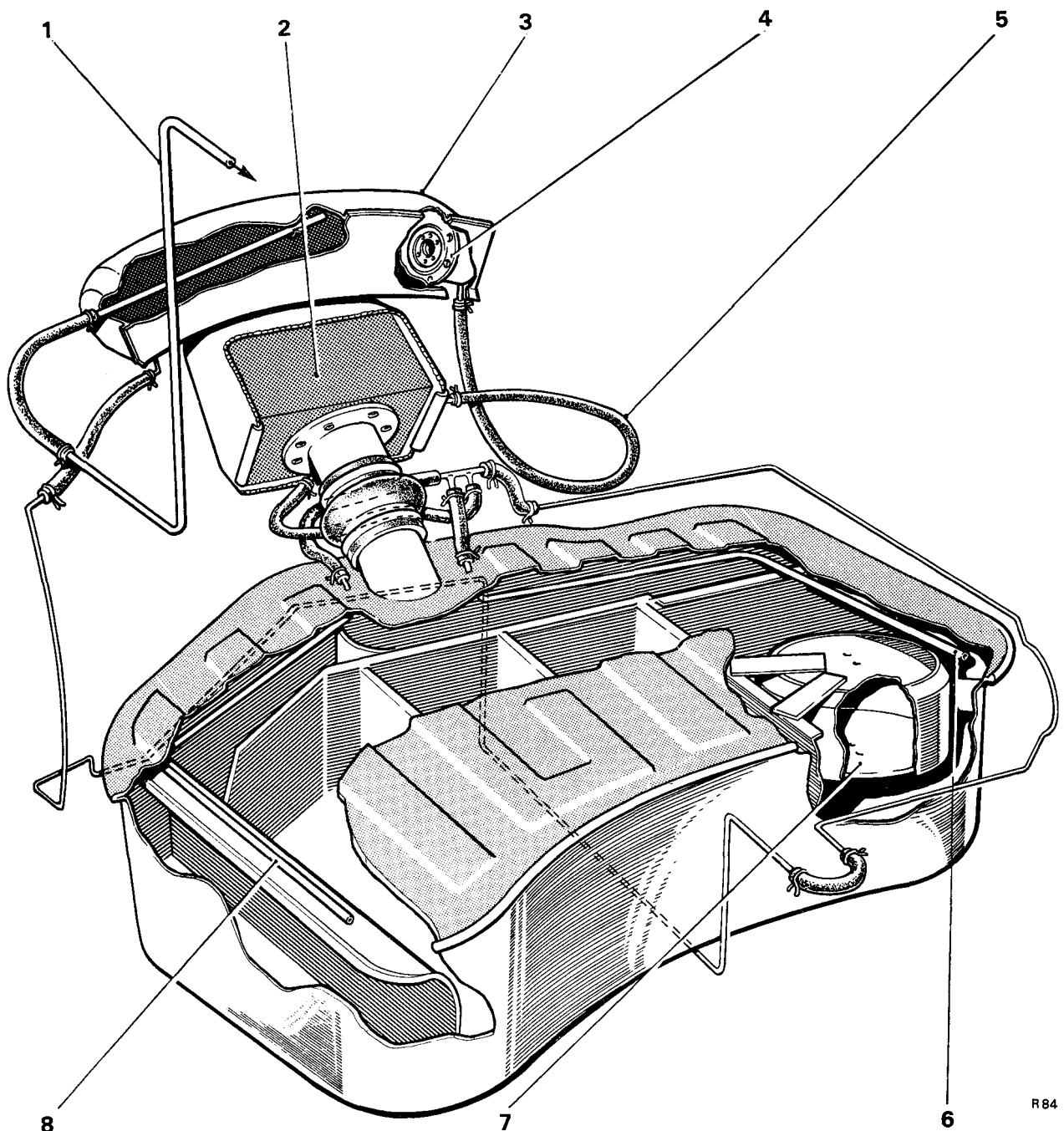


FIG. 9 FUEL EVAPORATION EMISSION CONTROL SYSTEM—FUEL TANK

- | | | |
|---|------------------------------------|------------------|
| 1 Connection to evaporation loss control canister | 3 Fuel trap | 5 Valve vent |
| 2 Fuel filler box | 4 Combined relief and vacuum valve | 6 Vent pipe |
| | | 7 Expansion tank |
| | | 8 Vent pipe |

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Purge line

The purge line consists of a rubber hose, passing from the lowest connection on the canister through the valance junction piece to the vacuum manifold. Incorporated into this hose is the purge line filter and restrictor.

When the engine is running, air drawn through the canister filter and carbon picks up the stored fuel vapours and passes them via the hose, to the induction manifold. The restrictor in the line controls the flow rate at between 1,41 cu. m. per/hr. and 1,98 cu. m. per/hr. (50 cu. ft. per/hr. and 70 cu. ft. per/hr.) to maintain carburettor metering accuracy and the paper element line filter is fitted to prevent blockage of the restrictor.

Purge line filter—To remove

- Using special pliers (RH 8090) remove the two steel retaining clips situated on either side of the unit.

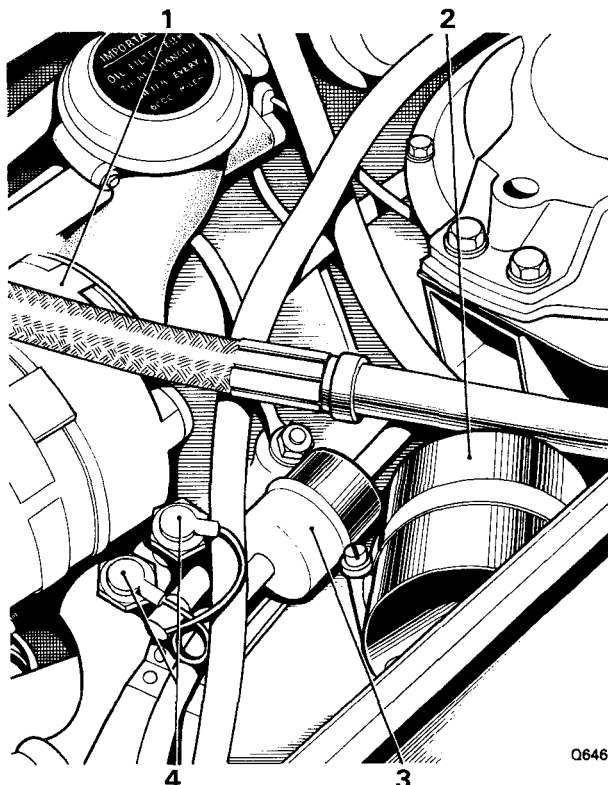


FIG. 10 POSITION OF MIXTURE WEAKENING DEVICE FILTER AND PURGE LINE FILTER

- Alternator
- Weaker filter
- Purge line filter
- Hydraulic fluid accumulator pressure switches

- Slacken the setscrew which secures the nylon retaining clip.
- Withdraw the component from the clip.

Purge line filter—To fit

Fit the purge line filter by reversing the procedure given for removal noting the following points.

- Ensure that the rubber hoses are in a good condition and new hose retaining clips are used.

Purge flow rate—To check

Check the purge flow rate as follows.

- Disconnect the hose from the engine side of the purge line filter and insert a flowmeter and stand assembly (RH 8725) into the line. The flowmeter is a rotameter type capable of measuring between 1,41 cu. m/hr. and 1,98 cu. m/hr. (50 cu. ft/hr. and 70 cu. ft/hr.). The pressure drop across the meter is not to exceed 5,08 cm. Hg. (2 in. Hg.).
- Start and run the engine at idle speed, the flowmeter reading should be between 1,41 cu. m/hr. and 1,98 cu. m/hr. (50 cu. ft/hr. and 70 cu. ft/hr.).
- If the flow is less than 1,41 cu. m/hr. (50 cu. ft/hr.) stop the engine and remove the purge line restrictor (see Fig. 5). Fit a piece of straight metal pipe with an internal bore larger than 4,76 mm. (0.187 in.), in the place of the restrictor.
- Start and run the engine at idle speed, ensure that the flow is now in excess of 1,98 cu. m/hr. (70 cu. ft/hr.).
- If the flow is less than 1,98 cu. m/hr. (70 cu. ft/hr.) check the following.
 - an air leak in any of the vacuum hoses connected to the vacuum manifold (see Fig. 5).
 - a blockage in the vacuum manifold or any of the connecting hoses (see Fig. 5).
- Rectify any air leaks or blockages found in the system. Repeat Operation 4.
- Stop the engine and fit the purge line restrictor.
- Start the engine and check the flow rate as detailed in Operation 2.
- If the flow is still incorrect fit a new restrictor and again repeat Operation 2.
- Stop the engine, remove the flowmeter assembly and connect the hoses.

For details of the remainder of the Fuel Evaporation Emission Control System see **Workshop Manual T.S.D. 2476 — Chapter U (Part 2).**

CRANKCASE EMISSION CONTROL SYSTEM

Crankcase emissions are controlled by a recirculatory closed breather system (see Fig. 11).

An insulated draught tube connects the crankcase via the oil filler which is fitted with a sealed cap, to the choke housing upstream of both the choke butterfly and the carburetters. A flame trap capsule containing three wire mesh discs is fitted in a housing at the crankcase end of the draught tube. Engine emission (blow-by) is drawn into the induction system via the draught tube, due to the depression in the choke housing.

Maintenance

1. The flame trap fitted to the breather pipe should be cleaned in the following manner, at the specified mileage.

2. Unscrew the setscrew securing the breather pipe connection to the oil filler pedestal: withdraw the connection from the pedestal (slight resistance may be felt due to the rubber 'O' ring connections).

3. Withdraw the connection from the pipe flange and collect the restrictor.

4. Wash the flame trap assembly in clean petrol, then dry with a high pressure air line. The flame trap assembly consists of 3 gauzes crimped together as shown in Figure 11.

5. To clean the adapter fitted to the choke housing, remove the single setscrew from the breather pipe end connection and detach the pipe.

6. Clean the adapter fitted to the choke housing and ensure that the holes in the adapter are clear.

7. Assembly of the flame trap and breather pipe is in the reverse order, ensuring that the 'O' rings are in good condition.

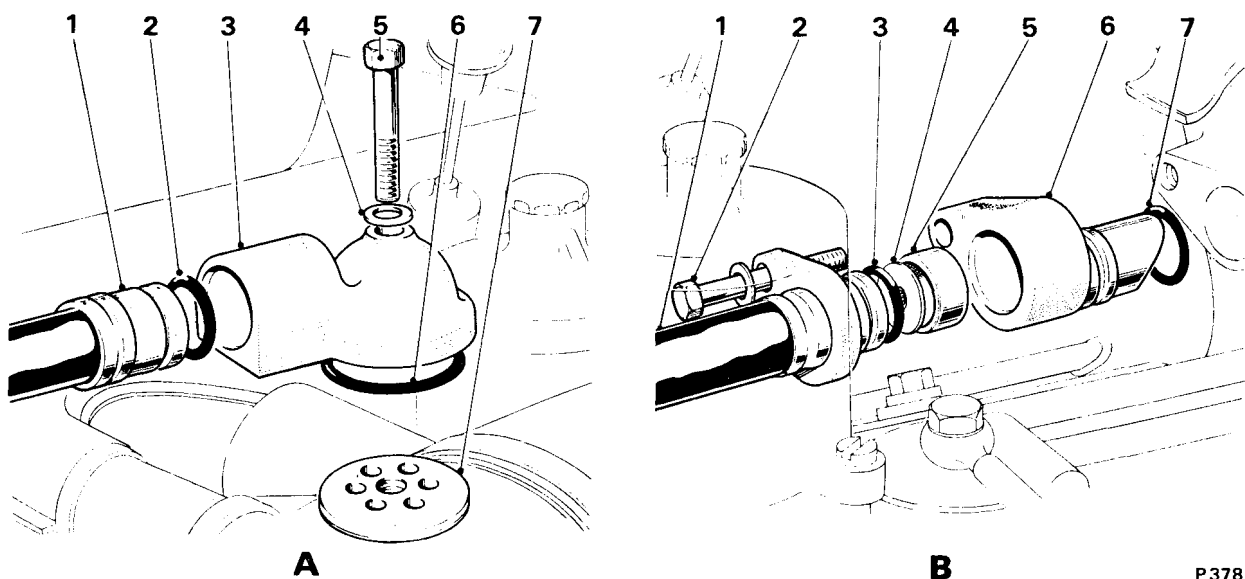


FIG. 11 EXPLODED VIEW OF CRANKCASE EMISSION CONTROL PIPE

Diagram A
 1 Pipe
 2 'O' ring
 3 Connection
 4 Washer
 5 Setscrew
 6 'O' ring
 7 Adapter

Diagram B
 1 Pipe
 2 Setscrew
 3 'O' ring
 4 Restrictor
 5 Flame trap
 6 Connection
 7 'O' ring

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EMISSION CONTROL SYSTEMS (ELECTRICAL COMPONENTS)

The electrical components covered by this section would normally appear in Chapter M — Electrical System, however, as they are only used in connection with the emission control systems it is thought more practical to include the information in this Chapter.

The components concerned are as follows.

- (i) The exhaust gas recirculation valve cut-in switch.
- (ii) The exhaust gas recirculation valve cut-off solenoid.

- (iii) The anti 'run-on' solenoid.
- (iv) The weakener cut-off solenoid valve.
- (v) The weakener cut-off solenoid switch.

For details of the remainder of the Emission Control Systems (Electrical Components) see **Workshop Manual T.S.D. 2476 — Chapter U (Part 2).**

THE CARBURETTERS AND AUTOMATIC CHOKE SYSTEM

CARBURETTER

Data

Carburetters	Two S.U. HD8 diaphragm type.
Choke size	5.08 cm. (2.00 in.).
Jet size—		
spring loaded needle		
type	2.44 mm. (0.100 in.).
Jet needle—		
spring loaded type	..	BDD
Carburetter—		
air valve piston spring		Red/Blue.

**CARBURETTER MIXTURE WEAKENING
DEVICE**

Description

In addition to the description given on pages U24 and U25, the following information is applicable.

**Anti-diesel device
(anti 'run-on' solenoid)**

The use of low octane fuel causes the engine to 'diesel' (i.e. continue to run-on after the ignition has been switched off) when it is hot. To prevent this from happening an anti 'run-on' solenoid valve is fitted into the weakener signal line. When the ignition is switched off this valve opens and connects the weakening system to the induction manifold thus creating a high float chamber depression which cuts off the fuel supply.

Carburetter overrun valves

During overrun (i.e. when decelerating with the throttles closed), insufficient mixture is supplied to the engine to maintain satisfactory combustion. The overrun valves alleviate this condition by allowing some mixture to pass through the throttle plates (butterflies) at high inlet manifold depressions.

An overrun valve consists of a small disc retained in each throttle plate by a spring loaded plunger. Under normal conditions the disc is seated against the throttle plate. When the throttle is suddenly closed, the increased inlet manifold depression lifts the disc from its seating and allows a metered quantity of air/fuel mixture to pass through the throttle plate.

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The action of the overrun valves maintains satisfactory combustion on overrun, thus reducing hydrocarbon emissions.

After the sudden closure of the throttles and as soon as the manifold depression falls, the overrun valve disc returns to its seat on the throttle plate.

Throttle damper

The throttle damper prevents rapid throttle closure which would suddenly drop the inlet manifold pressure causing vapourisation of fuel from the manifold walls and a sudden increase in mixture strength.

Temperature controlled air intake

To ensure rapid warm-up and improve control of the air/fuel ratio a temperature controlled air intake is fitted.

A vacuum operated blending valve attached to the air cleaner assembly is controlled by a thermal sensor in the air intake elbow. This valve blends hot air from a pick-up point (scoop) adjacent to the exhaust manifold with cold air from under the front wing; thus maintaining a constant temperature of the intake air as it enters the carburetters.

Throttle stop vacuum actuator assembly

The throttle stop vacuum actuator assembly is not fitted to cars produced to the 1976 specification.

Contra-rotating throttles—To fit and set (see Fig. 12)

1. Assemble 'A' bank and 'B' bank throttle levers (items 7 and 13) onto the carburetter spindles.
2. Fit the setting jig (RH 8880) into position on the throttle levers.
3. Fully close 'B' bank carburetter butterfly (item 8).
4. Tighten the pinch bolt securing 'B' bank throttle lever.
5. Fully close 'A' bank carburetter butterfly (item 3).
6. Tighten the pinch bolt securing 'A' bank throttle lever.
7. Fit the throttle spring (item 4) to the throttle levers.
8. Remove the setting jig from the throttle levers.

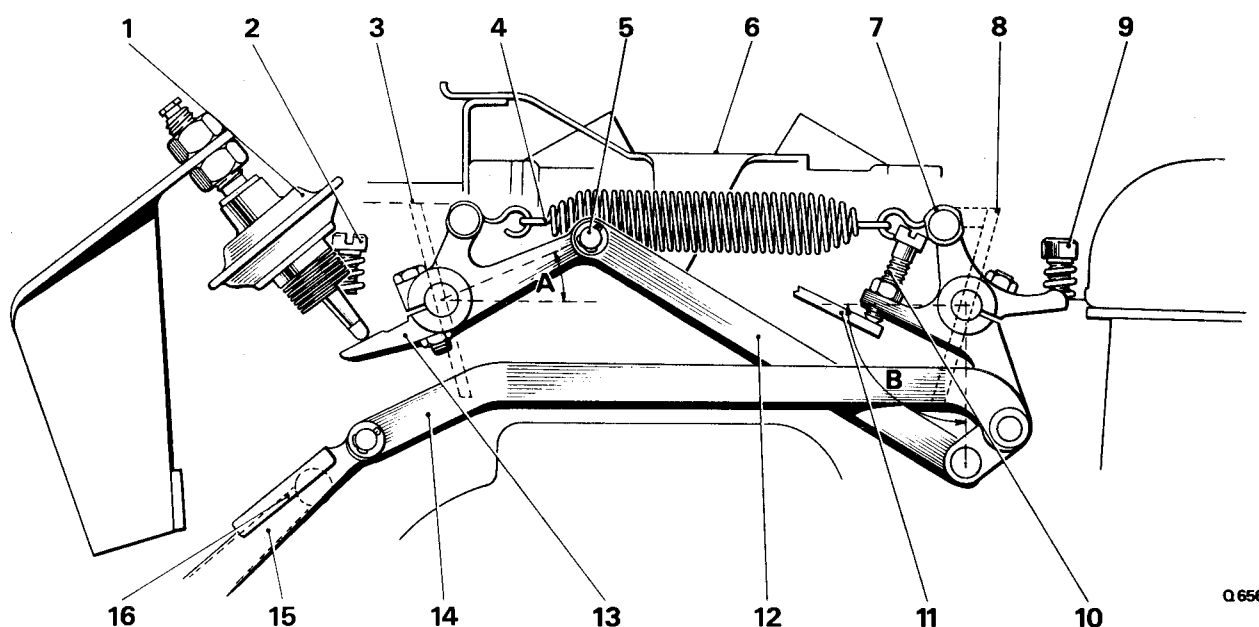
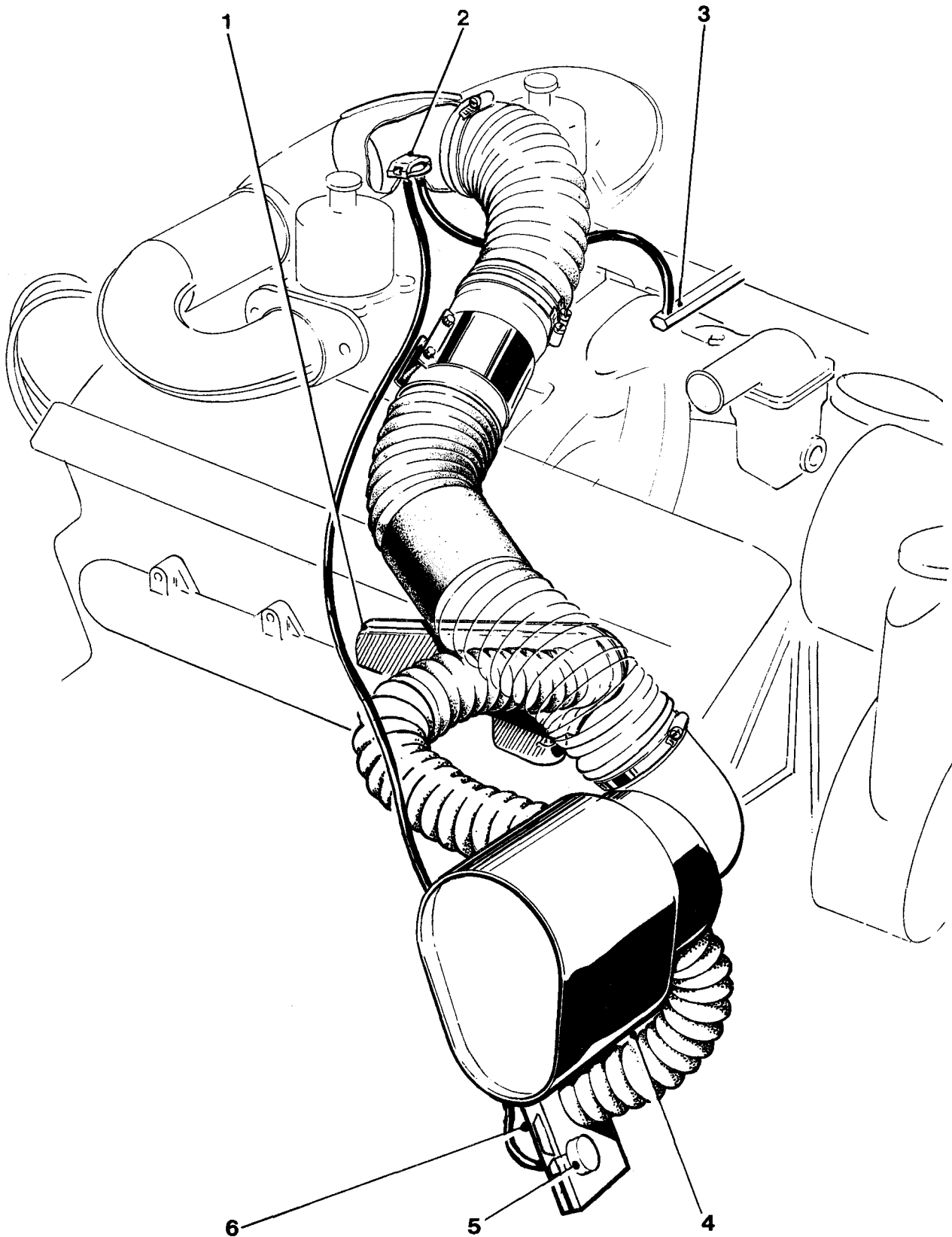


FIG. 12 CONTRA-ROTATING THROTTLE CONTROLS

- | | |
|---------------------------------------|--|
| A = Reference angle 22° | 8 'B' bank carburetter throttle plate |
| B = Reference angle 90° | 9 'B' bank carburetter volume screw |
| 1 Throttle damper | 10 Idle stop screw |
| 2 'A' bank carburetter volume screw | 11 Closed throttle bracket |
| 3 'A' bank carburetter throttle plate | 12 Cross link |
| 4 Throttle spring | 13 'A' bank carburetter throttle lever |
| 5 Eccentric throttle adjuster | 14 Drive link |
| 6 Throttle guard | 15 Front manifold shaft lever |
| 7 'B' bank carburetter throttle lever | 16 Rear manifold shaft lever |

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FIG. 13 TEMPERATURE CONTROLLED AIR INTAKE

- 1 Hot air scoop
- 2 Temperature sensor
- 3 Vacuum manifold

- 4 Air cleaner/silencer
- 5 Air blending valve
- 6 Cold air intake

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9. Fit the cross link (*item 12*) and the eccentric throttle adjuster (*item 5*) onto the throttle levers, ensuring that both throttle butterflies are closed when adjusting and tightening the eccentric adjuster.

Note The eccentric pin should be set in the lowest position possible.

10. Ensure that the tang of the throttle guard (*item 6*) has a clearance of between 1,27 mm. (0.050 in.) and 1,78 mm. (0.070 in.) with the cross link and also that the tang does not foul the throttle spring. If necessary bend the tang to give these clearances.

11. Check that the throttle linkage moves freely.

12. Fit the idle stop screw (*item 10*) and adjust until it just contacts the stop bracket (*item 11*) with the throttle butterflies remaining in the closed throttle position.

13. Screw down the idle stop screw $\frac{1}{2}$ turn and tighten the lock-nut.

14. Screw both of the carburettor volume screws (*items 2 and 9*) fully in.

15. Fit the throttle damper (*item 1*) with the damper spindle compressed 4,75 mm. (0.187 in.) when throttle lever (*item 13*) is in the closed position. Ensure that the damper rod contacts the throttle lever centrally 5,1 mm. (0.20 in.) from the outer edge.

16. Connect the drive link (*item 14*) to the manifold shaft lever (*item 15*).

17. Operate the linkage to ensure free movement.

18. With the throttles in the closed position check that the 'A' bank control shaft to control rod lever (*item 16*) on the rear of the manifold shaft is in line with the front manifold shaft lever (*item 15*). Tighten the securing bolts on both levers.

19. Operate the mechanism; check for freedom of movement within the linkage and also clearance with the various engine components.

20. To set the remainder of the linkage from the control rod lever on the rear of the manifold shaft to the accelerator pedal refer to Chapter T—Part 2.

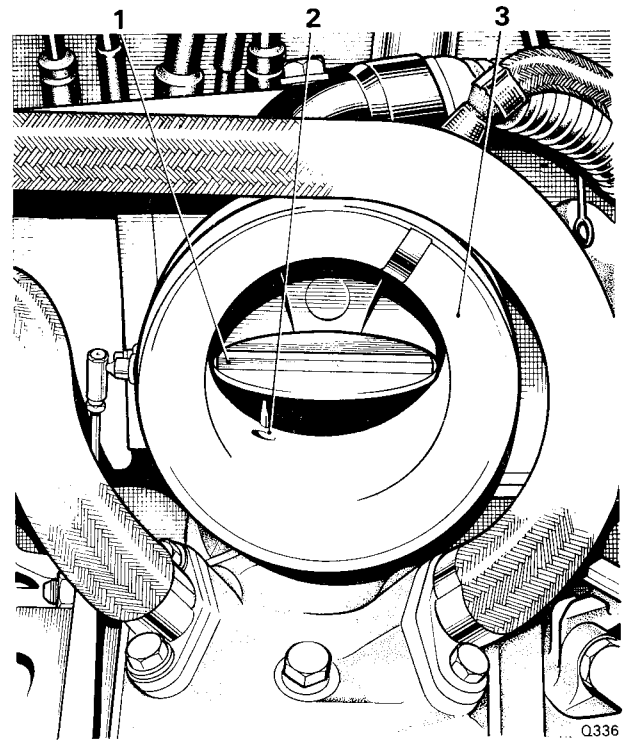


FIG. 14 HOT IDLE MIXTURE COMPENSATOR FEED

- 1 Choke butterfly
- 2 Hot idle compensator feed
- 3 Butterfly housing

Throttle damper plunger—To set

1. Move the cold start 'fast-idle' to the off position.
2. Slacken both nuts securing the throttle damper to its bracket. Back off the nuts until they are well clear of the bracket.
3. Press the damper towards the 'A' bank throttle lever until the damper is fully compressed and the lever is just clear of the throttle stop screw.
4. Screw the lower securing nut until it is 0,63 mm. (0.025 in.) clear of the underside of the bracket. Release the damper and tighten the upper securing nut.
5. Ensure that the damper spindle is at the maximum possible radius, whilst maintaining adequate contact with the throttle lever pad. This can be achieved by adjusting the angle of the bracket.

Automatic choke stove pipe—To check

To check the stove pipe for any blockage, carry out the following procedure.

Tuning procedure

The tuning procedure is given on page U32 with the following changes.

1. When blanking off the hot idle compensator feed drilling refer to Figure 14 in this Supplement.

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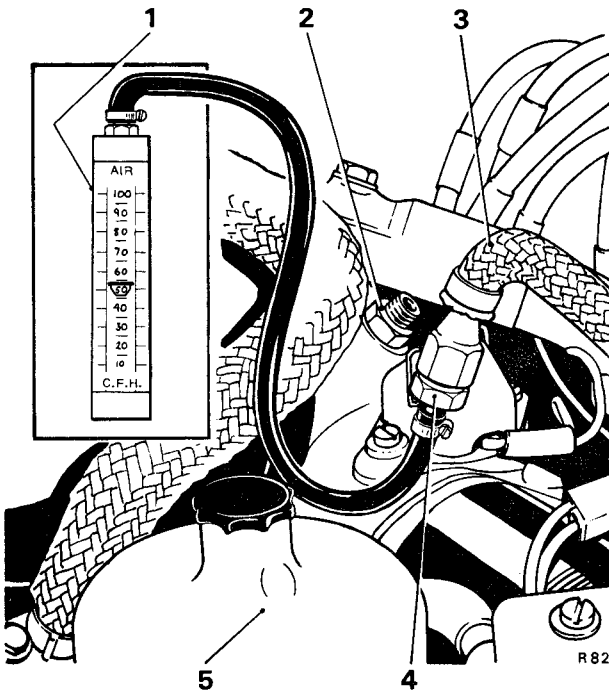


FIG. 15 CHECKING THE FLOW THROUGH THE CHOKE STOVE PIPE

- 1 Flowmeter
- 2 Choke stove pipe connection
- 3 Choke stove pipe
- 4 Adapter
- 5 'B' bank carburettor

1. Start the engine and run until normal operating temperature is attained.
2. Disconnect the union at the butterfly housing (see Fig. 15). and connect a flowmeter to the pipe via connector RH 8945. The flowmeter must be a rotameter type capable of measuring up to 2,83 cu. m/hr. (100 cu. ft./hr.).
3. Start the engine and run at idle speed (i.e. 600 r.p.m.); observe the flowmeter reading which should be between 1,41 cu. m/hr. and 1,55 cu. m/hr. (50 cu. ft./hr. and 55 cu. ft./hr.).
4. If the flowmeter reading is below 1,41 cu.m/hr. (50 cu. ft./hr.), stop the engine, remove the choke stove pipe and stove assembly to check for leaks.
5. If the flowmeter reading is above 1,55 cu. m/hr. (55 cu. ft./hr.) fit a new restrictor in the end of the choke bi-metal housing.
6. Fit the choke stove pipe and stove assembly, start the engine and again observe the flowmeter reading at idle speed.
7. Disconnect the flowmeter assembly and fit the choke stove pipe to the connection on the butterfly housing.

'Fast-idle' cam—To set

1. Fit the 'fast-idle' mechanism; do not tighten the 'fast-idle' lever clamping bolt.
2. Ensure that the 'fast-idle' adjustment screw is directly over the cam.
3. With the throttles closed, insert a 2,54 mm. (0.100 in.) diameter rod between the top of the 'fast-idle' cam and the boss under the 'fast-idle' adjustment screw. Tighten the clamping bolt on the 'fast-idle' lever.
4. Ensure that the throttles are closed; screw in the 'fast-idle' adjustment screw until it just makes contact with the top step of the 'fast-idle' cam.
5. Insert a 1,27 mm. (0.050 in.) diameter drill between the leading edge of the choke butterfly valve and the choke housing.
6. With the butterfly valve in this position, adjust the length of the butterfly rod so that the tip of the 'fast-idle' screw is in line with the start of the top step of the 'fast-idle' cam, (i.e. the position when the tip of the adjustment screw is about to fall from the top step to the bottom step of the cam).

Remove the 1,27 mm. (0.050 in.) diameter drill from the choke housing.

7. With the throttles closed and the choke partly open, adjust the 'fast-idle' adjustment screw to just contact the start or bottom step of the 'fast-idle' cam, screw in a further $\frac{3}{4}$ turn and tighten the lock-nut ensuring that the adjustment screw does not move.

Cold start 'fast-idle'—To set

1. Stop the engine and disconnect the solenoid to exhaust gas recirculation valve hose at the valve end. Blank the hose. Disconnect the signal hose to the distributor vacuum capsule at the capsule and blank off the hose. Remove the pressure tapping cap to vent the float chambers; open the throttles and close the choke butterfly against the bi-metal coil tension by means of the butterfly link lever, release the throttles. The 'fast-idle' adjusting screw will now be resting on the high step of the 'fast-idle' cam and the throttles are in the cold start position.
2. Start the engine and check the 'fast-idle' speed. If the speed is not between 1 900 r.p.m. and 2 100 r.p.m., stop the engine, open the throttles to gain access to the adjusting screw and adjust $\frac{1}{8}$ turn for each 100 r.p.m. outside the required speed.
3. Tighten the lock-nut and check the 'fast-idle' speed. If correct open the throttles to release the 'fast-idle' cam mechanism.
4. Remove the blank from the solenoid to the exhaust gas recirculation valve hose and connect the

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hose to the exhaust gas recirculation valve. Fit the tapping cap to 'A' bank carburetter float chamber cover.

5. Remove the blank from the distributor advance vacuum signal hose and connect the hose to the capsule.

Float chamber depression—To check

Refer to Page U37 noting the following information.

- (i) The correct reading to be obtained on the manometer is 7,62 cm. (3.0 in.).
- (ii) **Operation 8** should read

8. Raise the engine speed slowly noting the manometer and tachometer readings. The maximum steady manometer reading should be obtained between 1 300 r.p.m. and 1 600 r.p.m. If the maximum depression occurs below 1 300 r.p.m. it is permissible to screw out the idle bleed screws on the carburetters by equal amounts (maximum 2.5 turns) to obtain this speed.

For details of the remainder of The Carburetters and Automatic Choke System see **Workshop Manual T.S.D. 2476 —Chapter U (Part 2).**

IGNITION SYSTEM, DISTRIBUTOR, IGNITION COIL AND SPARKING PLUGS

Data

Ignition timing . . . 4° B.T.D.C. (Static) 15° B.T.D.C. at 1 600 r.p.m. (stroboscopic) in Neutral with the vacuum advance disconnected and the feed hose blanked off. (Approach 1 600 r.p.m. from a higher speed).

Ignition control system

The ignition system utilises an Opus distributor (in which an oscillator pick-up and control unit replace the conventional contact breaker), a low inductance ignition coil and a ballast resistor. The control unit comprises an electronic oscillator, amplifier and power transistor.

A drum with eight ferrite rods (one per cylinder) moulded into the outer edge is mounted onto the distributor drive-shaft. As the drum rotates a voltage is created each time a ferrite rod passes the oscillator pick-up, this signal is then amplified and used to switch-off the normally conducting power transistor in the primary coil circuit thus inducing a high voltage in the secondary winding which is distributed to the sparking plugs in the normal manner.

In addition to the normal centrifugal advance mechanism the ignition distributor is fitted with a vacuum advance capsule. The E.G.R. gated orifice

vacuum signal is applied to the capsule to advance the ignition timing for part throttle fuel economy during open road cruising. The vacuum signal is inhibited by a solenoid valve until a predetermined coolant temperature is reached.

This ignition control system provides increased accuracy of timing and increased service life before maintenance is required.

Ignition—To time (using a stroboscope)

The ignition is timed on A1 cylinder which is located at the front left-hand side of the engine (viewed from the front of the car).

Note If the ignition timing is to be set, ensure that the sparking plugs are in good condition before running the engine; if they require cleaning or renewal the sparking plugs gap should be set to 0,76 mm. (0.030 in.).

1. To check the ignition timing commence by running the engine until normal operating temperature is attained and the choke 'fast-idle' is in the off position. Switch off the engine.

2. Connect a stroboscope and a tachometer to the engine as described in the instructions supplied with the respective equipment. Disconnect the feed hose at the vacuum advance capsule; blank off the feed hose.

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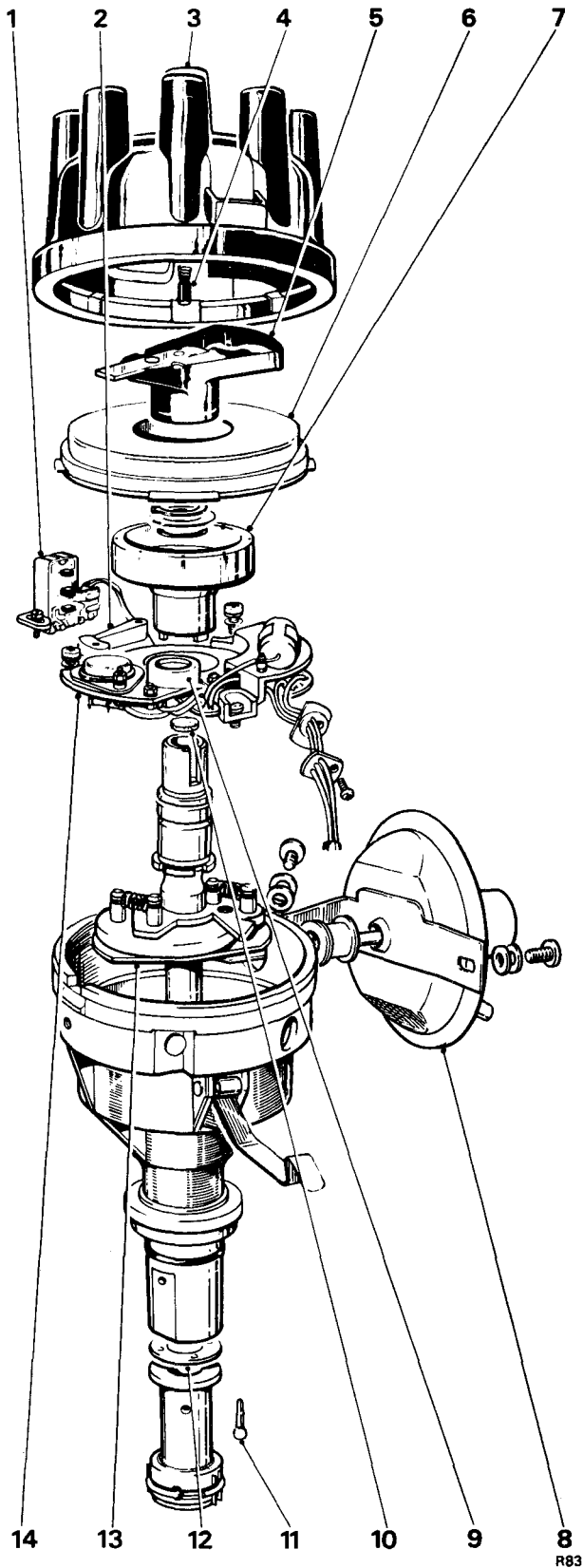


FIG. 16 EXPLODED VIEW OF DISTRIBUTOR

- 1 Pick-up module
- 2 Pick-up arm
- 3 Distributor cover/cap
- 4 High tension brush and spring
- 5 Rotor arm
- 6 Flash over shield (dust cover)
- 7 Timing rotor
- 8 Vacuum unit
- 9 Control unit
- 10 Lubrication pad
- 11 Driving dog and pin
- 12 Thrust washer
- 13 Automatic advance mechanism
- 14 Electronic module assembly

3. Start the engine and adjust the throttle stop screw to give an idle speed of 1 600 r.p.m. When setting the engine idle speed reduce from a higher speed to 1 600 r.p.m.

4. Direct the flashing light of the stroboscope onto the crankshaft damper timing marks and timing pointer; the pointer is positioned on the right-hand side of the crankshaft damper when viewed from the front of the engine.

5. If the timing pointer does not coincide with the 15° B.T.D.C. mark on the crankshaft damper adjust the ignition timing as follows.

6. Release the clamp screw on the distributor and rotate the head of the distributor in the appropriate direction until the correct timing is obtained. Clockwise rotation of the distributor head advances the ignition and conversely anti-clockwise rotation retards the ignition. After adjustment has been carried out tighten the clamp screw and again check to ensure that the timing has not altered whilst tightening the clamp screw.

7. Set the engine idle speed to 600 r.p.m.

8. Direct the flashing light of the stroboscope onto the crankshaft damper timing marks and timing pointer. Check that the ignition timing is approximately 4° B.T.D.C.

9. Stop the engine.

10. Disconnect the hose from the vacuum manifold to the purge line restrictor at the restrictor (see Fig. 5). Connect a suitable length of hose between this hose and the connection on the distributor vacuum capsule.

11. Start the engine and set the idle speed to 600 r.p.m.

12. Direct the flashing light of the stroboscope onto the crankshaft damper timing marks and timing pointer. Check that the ignition timing has advanced to approximately 14° B.T.D.C. If the ignition timing has not advanced, the distributor assembly is faulty.

13. Stop the engine.

14. Fit all hoses to their correct connections.

15. Start the engine and set the idle speed to 600 r.p.m.

16. Stop the engine and remove all the test equipment.

Chapter U

Setting the engine idle speed

Ensure that the engine is at normal operating temperature and that the choke 'fast-idle' is in the off position.

The air conditioning system must be switched off and a tachometer connected to the engine in accordance with the manufacturer's instructions.

1. Stop the engine, remove the air intake hose and blank off the hot idle compensator feed drilling (see Fig. 14). replace the air intake hose.

2. Start the engine and, if necessary, adjust the engine idle speed to 600 r.p.m. using the throttle stop screw; tighten the lock-nut.

3. Stop the engine and remove the air intake hose. Remove the blank from the hot idle compensator feed drilling and detach the tachometer and stroboscopic timing equipment (if fitted). Fit the air intake hose.

Sparking plugs

The sparking plugs approved for this car are Champion RN. 14.Y. Before fitting the plugs, set the gaps with the aid of a feeler gauge to 0,75 mm. (0.030 in.) and lightly smear the threads with 'Graphogen' grease.

LUBRICATION AND MAINTENANCE

The 'Essential' maintenance which is listed in the following schedules is the minimum servicing which must be carried out at the appropriate distance/time intervals in order to comply with the Rolls-Royce new car Warranty and the Australian Emission Regulations.

The 'Preventive' maintenance listed, is aimed at securing the maximum life and efficiency for the vehicle and will be carried out on request.

The schedules marked 'Regular' maintenance should be carried out either by the Owner, his chauffeur, or by a Distributor or Retailer.

REGULAR MAINTENANCE**Carburettors**

Monthly, check the oil level in the reservoirs of the automatic air valve dampers; top-up if necessary.

Engine

Weekly or every 800 km. (500 miles), whichever is the earlier, check the oil level by means of the dipstick; top-up if necessary.

Hydraulic reservoirs

Monthly, check the level of fluid in the reservoirs for the braking and automatic levelling systems; the engine should be run for 4 minutes before checking the fluid level. Top-up if necessary to the indicated level. If frequent topping-up is required check the hydraulic systems for leaks and rectify if necessary.

Lamp units

Weekly, check all lamp bulbs for correct operation and replace any faulty bulbs.

Radiator

Every 3 months, check the level of coolant in the radiator header tank; if necessary, top-up with the correct anti-freeze/water mixture or inhibited solution.

Tyres

Weekly, check the tyre pressures; adjust if necessary. Also check the spare wheel tyre pressure; adjust if necessary. Check the tread depth of all tyres and inspect the tyres for signs of damage.

Windscreen washer

Weekly, top-up the reservoir if necessary.

Chapter U

ESSENTIAL MAINTENANCE

INITIAL SERVICE

This service will be carried out by the Distributor/Retailer after the first 5 000 km. (3 000 miles) or 3 months whichever is the earlier.

Items marked * will be carried out free of charge.

INITIAL 5 000 km. (3 000 MILES) OR 3 MONTHS SERVICE WHICHEVER IS THE EARLIER

***Air injection pump**

Check belt tension and reset if necessary.

***Automatic choke**

Check the flow through the choke stove pipe and check for correct operation, rectify if necessary.

***Carburettors**

Check oil level in air valve dampers and if necessary top-up to correct level. Check tightness of float chamber covers. Check float chamber depression, rectify if necessary. Check and if necessary reset the idle speed. Check and if necessary reset the choke 'fast-idle' speed.

Engine

Change engine oil.

***Fuel evaporation emission control system**

Check the purge rate; this should be between 1,41 cu. m/hr. and 1,98 cu. m/hr. (50 cu. ft/hr. and 70 cu. ft/hr.) at 600 r.p.m. in Neutral. Pressure test the fuel tank and evaporation loss line and if necessary rectify any leaks.

***Ignition system**

Check ignition timing using stroboscope and adjust if necessary; the ignition timing should be 15° B.T.D.C. with the engine running at 1 600 r.p.m. the vacuum capsule disconnected and the feed hose blanked off.

Belt tension

Check the tension of all driving belts.

Engine cooling system

Tighten wormdrive clips of all coolant hoses.

Torque converter transmission

Check fluid level and top-up if necessary.

When checking the fluid level, avoid contact with the exhaust gas recirculation valve, heatshield and associated pipes as these components will be **hot**.

EVERY 5 000 KM. (3 000 MILES) OR 3 MONTHS WHICHEVER IS THE EARLIER

If the car is used for constant stop/start operation, change the engine oil.

EVERY 10 000 KM. (6 000 MILES) OR 6 MONTHS WHICHEVER IS THE EARLIER

Engine

Change engine oil and renew oil filter element.

Battery

Check the level of the electrolyte in the battery; if necessary top-up with distilled water.

Belt tension

Check the tension of all driving belts.

Chapter U

Brakes

Inspect footbrake and handbrake pad linings. When changing footbrake pads examine condition of dust excluders on calipers. Manually adjust handbrake pads. Inspect pipes and connections, rectify if necessary.

Fluid levels

Check all fluid levels.

Torque converter transmission

Check fluid levels and top-up if necessary.

When checking the fluid level, avoid contact with the exhaust gas recirculation valve, heatshield and associated pipes as these components will be **hot**.

**EVERY 20 000 KM. (12 000 MILES) OR
12 MONTHS SERVICE WHICHEVER
IS THE EARLIER**

Air injection pump

Check tension of pump pulley driving belt.

Air silencer

Fit a new paper filter element.

Carburettors

Top-up oil level in air valve dampers. Check tightness of float chamber covers. Check float chamber depression, rectify if necessary. Check and if necessary reset the idle speed. Check and if necessary, reset choke 'fast-idle' speed.

Crankcase emission control system

Remove and clean gauze flame traps in the crankcase breather tube. Clean the adapter in choke butterfly housing.

Engine

Change engine oil and renew oil filter element.

Fuel evaporation emission control system

Check the condition of the pipes and connections.

Ignition system

Fit new sparking plugs ensuring that the gaps are set to 0,75 mm. (0.030 in.).

Lubricate distributor spindle (shaft bearings) and automatic advance mechanism with engine oil.

Check the ignition timing using a stroboscope and adjust if necessary; the ignition timing should be 15° B.T.D.C. with the engine running at 1 600 r.p.m., the vacuum capsule disconnected and the feed hose blanked off.

Battery

Check the level of the electrolyte in the battery; if necessary top-up with distilled water.

Belt tension

Check the tension of all driving belts.

Brakes

Inspect footbrake and handbrake pad linings. When changing footbrake pads examine condition of dust excluders on calipers. Manually adjust handbrake pads. Inspect pipes and connections, rectify if necessary.

Final drive unit

Check oil level and top-up if necessary.

Fluid levels

Check all fluid levels.

Front suspension

The front suspension ball joints are sealed for life and no maintenance is required until renewal is necessary or the ball joint rubber covers are damaged. Inspect the rubber covers on the front suspension ball joints; if the covers are found to be damaged new joints and covers should be fitted.

Chapter U

Steering ball joints

Lubricate the six grease nipples. Inspect the rubber covers on the ball joints; if the covers are found to be damaged the joints should be dismantled and new parts fitted as necessary.

Torque converter transmission

Renew transmission fluid.

When checking the fluid level, avoid contact with the exhaust gas recirculation valve, heatshield and associated pipes as these components will be **hot**.

Torque converter transmission

Check fluid level and top-up if necessary.

When checking the fluid level, avoid contact with the exhaust gas recirculation valve, heatshield and associated pipes as these components will be **hot**.

**EVERY 30 000 KM. (18 000 MILES) OR
18 MONTHS SERVICE WHICHEVER
IS THE EARLIER**

**EVERY 40 000 KM. (24 000 MILES) OR
2 YEARS SERVICE WHICHEVER
IS THE EARLIER**

Engine

Change engine oil and renew oil filter element.

Air injection system

Check air injection system for leaks and correct functioning. Renew any defective items.

Battery

Check the level of the electrolyte in the battery; if necessary top-up with distilled water.

Air silencer

Fit a new paper filter element.

Belt tension

Check the tension of all driving belts.

Automatic choke

Check the air flow through the choke stove pipe and check the system for correct functioning.

Brakes

Inspect footbrake and handbrake pad linings. When changing footbrake pads examine condition of dust excluders on calipers. Manually adjust handbrake pads. Inspect pipes and connections, rectify if necessary.

Carburettors

Clean air valves. Remove inlet unions from the float chamber covers and fit new paper filter elements. Top-up oil level in air valve dampers. Check tightness of float chamber covers. Check float chamber depression. Check and if necessary, reset the idle speed. Check and if necessary, reset choke 'fast-idle' speed.

Fluid levels

Check all fluid levels.

Carburetter mixture weakening device

Renew air filter element for the carburetter mixture weakening device.

Chapter U

Crankcase emission control system

Remove and clean gauze flame traps in crankcase breather tube. Clean the adapter in choke butterfly housing.

Engine

Change engine oil and renew oil filter element.

Engine cooling system

Fit a new engine coolant thermostat and heater tap feed hose. Check the condition of all coolant hoses; fit new hoses as necessary.

Fuel evaporation emission control system

Renew the foam filter element in the evaporation loss control canister. Check the purge rate; this should be between 1,41 cu. m/hr. and 1,98 cu. m/hr. (50 cu.ft/hr. and 70 cu. ft/hr.) at 600 r.p.m. in Neutral. Renew the purge line filter if necessary.

Ignition system

Fit new sparking plugs ensuring that the gaps are set to 0,75 mm. (0.030 in.).

Lubricate distributor spindle (shaft bearings) and automatic advance mechanism with engine oil.

Check the ignition timing using a stroboscope and adjust if necessary; the ignition timing should be 15° B.T.D.C. with the engine running at 1 600 r.p.m., the vacuum capsule disconnected and the feed hose blanked off. Check the vacuum advance mechanism.

Battery

Check the level of the electrolyte in the battery; if necessary top-up with distilled water.

Belt tension

Check the tension of all driving belts.

Brakes

Inspect footbrake and handbrake pad linings. When changing footbrake pads examine condition of dust excluders on calipers. Manually adjust handbrake pads. Inspect pipes and connections, rectify if necessary.

Final drive unit

Change oil.

Fluid levels

Check all fluid levels.

Front suspension

The front suspension ball joints are sealed for life and no maintenance is required until renewal is necessary or the ball joint rubber covers are damaged. Inspect the rubber covers on the front suspension ball joints; if the covers are found to be damaged new joints and covers should be fitted.

Fuel pumps

Remove the fuel pumps and check for pumping efficiency, fit new pumps if necessary.

Hydraulic systems

Completely drain the fluid from the hydraulic circuits. Thoroughly clean the brake fluid reservoirs and sight glasses, ensure that no foreign matter enters the systems. Fill the hydraulic systems with new approved fluid. Bleed the brakes and height control systems.

Rear wheel drive-shafts

Lubricate the rear wheel drive-shaft outer universal couplings with an approved grease.

Steering ball joints

Lubricate the six grease nipples. Inspect the rubber covers on the ball joints; if the covers are found to be damaged the joints should be dismantled and new parts fitted as necessary.

Torque converter transmission

Change transmission fluid.

Fit a new intake strainer.

When checking the fluid level, avoid contact with the exhaust gas recirculation valve, heatshield and associated pipes as these components will be **hot**.

Chapter U

SERVICING AFTER 40 000 KM. (24 000 MILES) OR 2 YEARS WHICHEVER IS THE EARLIER

After 40 000 km. (24 000 miles) or 2 years, servicing is still due at the following intervals.

50 000 KM. (30 000 MILES) OR 2½ YEARS WHICHEVER IS THE EARLIER

Carry out the 10 000 km. (6 000 miles) service.

60 000 KM. (36 000 MILES) OR 3 YEARS WHICHEVER IS THE EARLIER

Carry out the 20 000 km. (12 000 miles) service.

70 000 KM. (42 000 MILES) OR 3½ YEARS WHICHEVER IS THE EARLIER

Carry out the 10 000 km. (6 000 miles) service.

80 000 KM. (48 000 MILES) OR 4 YEARS WHICHEVER IS THE EARLIER

Carry out the 40 000 km. (24 000 miles) service and in addition the following operation.

Exhaust gas recirculation system

Remove and clean the exhaust gas recirculation valve and feed pipes. Clean the orifices in the carburetter 'Tee' piece. Check the exhaust gas recirculation valve for correct operation.

PREVENTIVE MAINTENANCE

INITIAL SERVICE

This service should be carried out by the Distributor/ Retailer after the first 5 000 km. (3 000 miles) or 3 months whichever is the earlier.

Steering pump

Check the oil level in the reservoir; top-up if necessary.

Test

Road test the car for satisfactory performance.

EVERY 10 000 KM. (6 000 MILES) OR 6 MONTHS WHICHEVER IS THE EARLIER

Carburetters

Check the oil level in the air valve dampers and top-up if necessary.

Control linkages

Apply a few drops of engine oil to the accelerator linkage and to the gear range selector controls adjacent to the transmission casing.

Electrical system

Check all interior lamps, exterior lamps, instruments, warning lamps and devices for correct operation. rectify as necessary.

Handbrake

Lubricate the pivot pins and pulleys in the handbrake system with approved grease.

Tyres

Check the tread depth of all the tyres, inspect all tyres for signs of damage. Check all tyre pressures when cold, adjust if necessary.

Note Include the spare tyre.

Test

Road test the car for satisfactory performance.

Chapter U

**EVERY 20 000 KM. (12 000 MILES)
OR 12 MONTHS
WHICHEVER IS THE EARLIER**

Control linkage

Apply a few drops of engine oil to the accelerator linkage and to the gear range selector controls adjacent to the transmission casing.

Handbrake

Lubricate the pivot pins and pulleys in the handbrake system with approved grease.

Spare wheel

Lubricate the spare wheel lowering bolt and mechanism.

Electrical system

Check all interior lamps, exterior lamps, instruments, warning lamps and devices for correct operation, rectify as necessary.

Tyres

Check the tread depth of all the tyres, inspect all tyres for signs of damage. Check all tyre pressures when cold, adjust if necessary.

Note Include the spare tyre.

Test

Road test the car for satisfactory performance.

**EVERY 30 000 KM. (18 000 MILES)
OR 18 MONTHS
WHICHEVER IS THE EARLIER**

Carburettors

Check the oil level in the air valve dampers and top-up if necessary.

Control linkages

Apply a few drops of engine oil to the accelerator linkage and to the gear range selector controls adjacent to the transmission casing.

Electrical system

Check all interior lamps, exterior lamps, instruments, warning lamps and devices for correct operation, rectify as necessary.

Handbrake

Lubricate the pivot pins and pulleys in the handbrake system with approved grease.

Tyres

Check the tread depth of all tyres, inspect all tyres for signs of damage. Check all tyre pressures when cold, adjust if necessary.

Note Include the spare tyre.

Test

Road test the car for satisfactory performance.

**EVERY 40 000 KM. (24 000 MILES)
OR 2 YEARS
WHICHEVER IS THE EARLIER**

Control linkage

Apply a few drops of engine oil to the accelerator linkage and to the gear range selector controls adjacent to the transmission casing.

Electrical system

Check all interior lamps, exterior lamps, instruments, warning lamps and devices for correct operation, rectify as necessary.

Fuel filter

Renew the main line filter element and clean the filter bowl.

Fuel tank

Slacken the drain plug one or two turns and allow any accumulated water to drain away. Tighten the drain plug.

Height control mechanism

Disconnect the control valve linkage ball joints. Clean, grease and refit the ball joints.

Chapter U

Handbrake

Lubricate the pivot pins and pulleys in the handbrake system with approved grease.

Spare wheel

Lubricate the spare wheel lowering bolt and mechanism.

Tyres

Check the tread depth of all tyres, inspect all tyres for signs of damage. Check all tyre pressures when cold, adjust if necessary.

Note Include the spare tyre.

Test

Road test the car for satisfactory performance.

SERVICING AFTER 40 000 KM. (24 000 MILES) OR 2 YEARS WHICHEVER IS THE EARLIER

After 40 000 km. (24 000 miles) or 2 years, servicing is still due at the following intervals.

50 000 KM. (30 000 MILES) OR 2½ YEARS WHICHEVER IS THE EARLIER

Carry out the 10 000 km. (6 000 miles) service.

60 000 KM. (36 000 MILES) OR 3 YEARS WHICHEVER IS THE EARLIER

Carry out the 20 000 km. (12 000 miles) service.

70 000 KM. (42 000 MILES) OR 3½ YEARS WHICHEVER IS THE EARLIER

Carry out the 10 000 km. (6 000 miles) service.

80 000 KM. (48 000 MILES) OR 4 YEARS WHICHEVER IS THE EARLIER

Carry out the 40 000 km. (24 000 miles) service.

SEASONAL SCHEDULES

EVERY 12 MONTHS

Air conditioning system

Ensure that the foam filter element fitted to the scuttle intake grille is free from obstruction. On Long Wheelbase cars fitted with a centre division, check that the foam filter element fitted to the intake grille in the rear decking panel is free from obstruction.

Body

Check that the body drain holes are free from foreign matter.

Engine cooling system

Drain the coolant from the radiator and the engine crankcase. Clean any debris from the surfaces of the refrigeration condenser and radiator matrices by reverse flushing with a hose. This should be carried out just prior to the Autumn. Fill the system with the correct anti-freeze mixture (*refer to Chapter L—Engine Cooling System of this Workshop Manual T.S.D. 2476 and the latest Service Bulletin*).

EVERY 2 YEARS

In addition to the 12 monthly schedule, carry out the following.

Engine cooling system

Drain the coolant from the radiator and engine crankcase. Thoroughly reverse flush the coolant passages with a continuous flow of water. Change the coolant hoses where necessary. Fill the system with the correct anti-freeze mixture.

SERVICE RECOMMENDATIONS

80 000 KM. (48 000 MILES)

At this mileage and under normal motoring conditions it is recommended that the following servicing is carried out.

Chapter U

Hydraulic systems

Renew the front and rear accumulator to frame connector block hoses.

Examine the sub-frame to brake caliper hoses for chafing or surface cracking; renew if necessary.

160 000 KM. (96 000 MILES)

At this mileage and under normal motoring conditions it is recommended that the following servicing is carried out.

Hydraulic systems

Renew all the flexible hoses to the braking systems and the automatic height control system. Fit new seals to the disc brake calipers and the deceleration conscious pressure limiting valve.

Fuel system

Fit a new convoluted rubber hose between the fuel filler head and fuel tank assembly. Examine all flexible fuel pipes and renew any which show signs of deterioration.

SPECIAL PRECAUTIONS

Should the car be used in very cold temperatures, drain the engine sump when thoroughly warm and also drain the carburetter air valve dampers. The engine sump and carburetter air valve dampers should then be filled with oil having the following viscosity.

For constant temperatures of between 0°C. and -23°C. (32°F. and -10°F.), use a 10W/30 grade oil.

For constant temperatures of -23°C. (-10°F.) and below, use a 5W/20 grade oil.

Chapter U

FAULT DIAGNOSIS

SYMPTOMS	POSSIBLE CAUSE
<p>1. Engine will not start. (Starter motor operating).</p>	<p>1. (a) Ignition circuit broken. (b) Failed anti 'run-on' solenoid or failure of electrical supply circuit. (c) Ignition system faulty. (d) Damaged or contaminated ignition high-tension circuit. (e) Fault in fuel feed line or fouled float chamber filters. (f) Faulty choke bi-metal coil. (g) Choke solenoid inoperative. (h) Faulty choke 'fast-idle' mechanism. (i) Air leak into induction system. (j) Faulty hot idle mixture compensator. (k) Weakening device filter blocked or blockage in rubber connecting hoses. (l) Faulty weakener cut-off solenoid or failure of electrical supply circuit. (m) Faulty weakening device control switch or failure of electrical supply circuit. (n) Dislodged venturi in weakener device. (o) Flooding of carburetter float chamber or jet. (p) Fouled carburetter float chamber or jet. (q) Exhaust gas recirculation valve failed.</p>
<p>2. Engine idles very roughly.</p>	<p>2. (a) Ignition system faulty. (b) Fouled sparking plugs. (c) Damaged or contaminated ignition high-tension circuit. (d) Air leak into induction system. (e) Faulty hot idle compensator. (f) Weakening device filter blocked or blockage in rubber connecting hoses. (g) Dislodged venturi in weakener device. (h) Badly worn or damaged carburetter control linkage. (i) Flooding of carburetter float chamber or jet. (j) Sticking carburetter piston. (k) Fouled carburetter float chamber or jet. (l) Air leak into exhaust gas recirculation vacuum control circuit. (m) Exhaust gas recirculation valve failed. (n) Faulty air diverter valve. (o) Incorrect operation of temperature controlled air intake system.</p>
<p>3. Engine stalls.</p>	<p>3. (a) Ignition circuit broken. (b) Failed anti 'run-on' solenoid or failure of electrical supply circuit. (c) Ignition system faulty. (d) Damaged or contaminated ignition high-tension circuit. (e) Fault in fuel feed line or fouled float chamber filters. (f) Air leak into induction system. (g) Faulty hot idle mixture compensator. (h) Weakening device filter blocked or blockage in rubber connecting hoses. (i) Dislodged venturi in weakening device. (j) Badly worn or damaged carburetter control linkage. (k) Flooding of carburetter float chamber or jet. (l) Sticking carburetter piston. (m) Fouled carburetter float chamber or jet. (n) Air leak into exhaust gas recirculation vacuum control circuit. (o) Exhaust gas recirculation valve failed. (p) Faulty air diverter valve.</p>

Chapter U

SYMPTOMS	POSSIBLE CAUSE
4. (i) Engine shows signs of power loss, evident at high speeds and loading. (ii) Engine misfires particularly on hard acceleration from low speed.	4. (a) Ignition system faulty. (b) Fouled sparking plugs. (c) Damaged or contaminated ignition high-tension circuit. (d) Fault in fuel feed line or fouled float chamber filters. (e) Choke system operation incorrect. (f) Sticking carburetter piston. (g) Fouled carburetter float chamber or jet. (h) Exhaust gas recirculation valve failed. (i) Failed exhaust gas recirculation valve cut-out solenoid or electrical supply circuit.
5. Engine hesitates or misfires under light load.	5. (a) Failed anti 'run-on' solenoid or failure of electrical supply circuit. (b) Ignition system faulty. (c) Fouled sparking plugs. (d) Damaged or contaminated ignition high-tension circuit. (e) Fault in fuel feed line or fouled float chamber filters. (f) Air leak into induction system. (g) Faulty hot idle mixture compensator. (h) Weakening device filter blocked or blockage in rubber connecting hoses. (i) Dislodged venturi in weakening device. (j) Flooding of carburetter float chamber or jet. (k) Sticking carburetter piston. (l) Fouled carburetter float chamber or jet. (m) Incorrect purge flow rate. (n) Exhaust gas recirculation valve failed. (o) Faulty air diverter valve. (p) Incorrect operation of temperature controlled air intake system.
6. Increase in fuel consumption.	6. (a) Ignition system faulty. (b) Faulty choke bi-metal coil. (c) Choke system operation incorrect. (d) Air leak into induction system. (e) Faulty hot idle mixture compensator. (f) Weakening device filter blocked or blockage in rubber connecting hoses. (g) Faulty weakener cut-off solenoid or failure of electrical supply circuit. (h) Faulty weakening device control switch or failure of electrical supply circuit. (i) Air leaks in mixture weakening system. (j) Flooding of carburetter float chamber or jet. (k) Sticking carburetter piston. (l) Incorrect purge flow rate. (m) Exhaust gas recirculation valve failed. (n) Faulty air diverter valve.
7. Decrease in fuel consumption.	7. (a) Air leaks in mixture weakening system. (b) Incorrect purge flow rate. (c) Faulty exhaust gas recirculation temperature control switch or failure of electrical supply circuit. (d) Air leak into exhaust gas recirculation vacuum control circuit. (e) Exhaust gas recirculation valve failed.
8. Engine 'backfires' on overrun.	8. (a) Ignition system faulty. (b) Air leak into induction system. (c) Exhaust gas recirculation valve failed.
9. Sudden increase in engine idle speed.	9. (a) Faulty choke 'fast-idle' mechanism. (b) Failed carburetter overrun valve.
10. Excessive noise from air injection pump or system.	10. (a) Faulty air diverter valve. (b) Faulty or damaged air injection pump.

Chapter U

WORKSHOP TOOLS

<i>Tool Number</i>	<i>Description</i>
RH 8050	Spanner—Carburetter Jet Screw
RH 8087	Spanner—Weakener Cut-off Valve
RH 8089	Jet Centring Tool
RH 8090	Pliers—Wire Hose Clips
RH 8383	Positioning Tool—Throttle Spindle Seal
RH 8621	Adapter—Air Manifold to CO Meter
RH 8841	Dial Gauge—Carburetter Piston Lift
RH 8880	Setting Jig—Throttle Levers
RH 8945	Connector—Choke Stove Pipe

Chapter U

Section U10

SUPPLEMENTS

No. 6 North America 1976

FUEL EVAPORATION EMISSION CONTROL SYSTEM

Printed in Great Britain

August 1976

T.S.D. 2476

The 1976 Running Change is now incorporated into the North American 1976 model year build specification and consists of a new fuel tank fitted at the forward end of the luggage compartment behind the carpet covered sealing panel (see Fig. 1).

The new design of fuel tank does not have a fuel trap assembly. Adequate expansion volume for the fuel is provided within the fuel tank and the combined pressure/vacuum relief valve is located in the fuel filler cap. The fuel tank is illustrated in Figure 2.

A rollover valve is incorporated in the vent line from the fuel tank to the evaporative loss control canister, the purpose of this valve is to prevent fuel from reaching the canister in the event of vehicle inversion.

The nominal capacity of the fuel tank is 22.5 U.S. galls. (18.5 Imp. galls., 85 litres).

Evaporation loss control canister

The evaporation loss control canister is mounted under the front left-hand wing (fender). It is a cylindrical container filled with activated carbon granules and has the following four connections.

- (i) The mixture weakening device
- (ii) The float chamber vent
- (iii) The fuel tank vent
- (iv) The purge line

The top of the container is open to atmosphere and contains a foam air filter element.

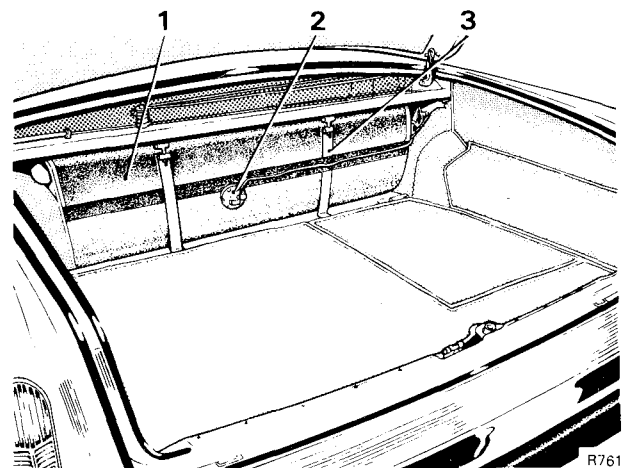


FIG. 1 POSITION OF FUEL TANK

- 1 Fuel tank
- 2 Gauge unit
- 3 Retaining strap

Chapter U - 1976 Running Change

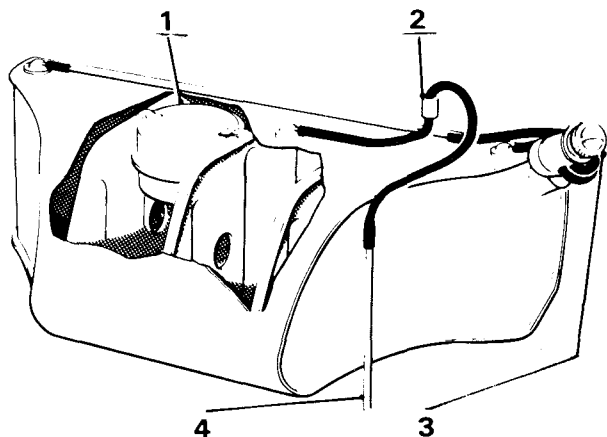


FIG. 2 FUEL TANK ASSEMBLY

- 1 Expansion tank and overfill limiter
- 2 Rollover valve
- 3 Fuel filler cap (incorporating combined pressure and vacuum relief valve)
- 4 Pipe to evaporation loss control canister

Fuel tank vent (see Fig. 2)

The fuel tank is vented via two connections to the filler neck which allows adequate venting of the tank when it is being filled.

A separate vapour line from the fuel tank passes via a rollover valve (situated on the top of the fuel tank), under the floor on the left-hand side of the car to the evaporation loss control canister.

The rollover valve prevents fuel from entering the evaporation emission control canister during harsh manoeuvres or in the event of vehicle inversion. Fuel vapour passes freely through the valve.

In the event of a blockage in the vapour line to the evaporation loss control canister, a combined pressure and vacuum relief valve in the fuel filler cap prevents any excessive build-up of pressure due to fuel vapourisation or depression as the fuel is consumed.

An expansion tank situated within the main fuel tank inhibits complete filling and thereby provides fuel expansion volume to cope with extreme temperature conditions.

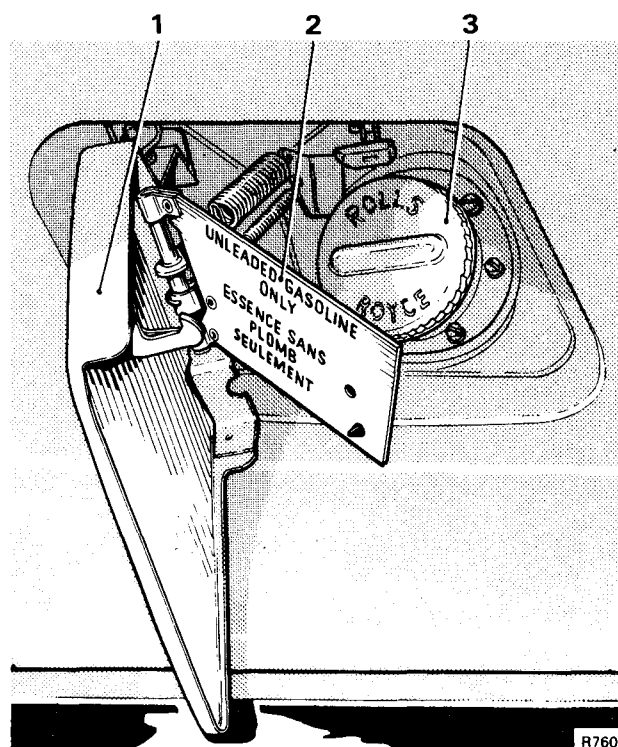


FIG. 3 FUEL FILLER (Saloon)

- 1 Filler door
- 2 Warning plate
- 3 Fuel filler cap

Fuel tank—To remove

1. Disconnect the battery.
2. Drain the fuel from the tank; this is best achieved by disconnecting the fuel pipe from the tank to the filter at the filter end.
Fit the fuel pipe to the fuel filter.
3. Unscrew the four 'Pozidrive' screws situated across the carpet covered sealing panel. Remove the screws and collect the washers.
4. Withdraw the carpet covered seal panel to reveal the fuel tank assembly.
5. Unscrew the worm drive clip securing the rollover valve assembly to the crossmember. Detach the rollover valve from the crossmember.
6. Remove the crossmember (see Figs. 4 and 5); this is secured by a $\frac{7}{16}$ in. A/F nut, bolt and washer to the bottom of each luggage compartment lid hinge assembly.
7. Disconnect the three electrical cables from the fuel tank level gauge (see Fig. 5).
8. Remove the tape from the electrical loom by peeling it back from the fuel tank. Tape the electrical loom away from the vicinity of the fuel tank.
9. Unscrew the worm drive clips securing the three rubber vent hoses to their respective connections on the fuel tank (see Fig. 6); withdraw the hoses.
10. Unscrew the worm drive clip securing the rubber filler neck hose to the fuel tank (see Fig. 5); withdraw the hose.

Blank off the fuel tank connection.

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11. From beneath the car, unscrew and detach the fuel pipe. This connection is an olive and threaded union.

Blank off the fuel tank connection.

12. Unlock and unscrew the half-nut from each of the two tank retaining strap bolts (see Fig. 6).

13. Unscrew the full nut from each of the two tank retaining strap bolts (see Fig. 6).

14. Withdraw the bolts and collect the four bridge pieces from the end of the retaining straps (see Fig. 6).

15. Bend the retaining straps and carefully withdraw the fuel tank assembly.

Fuel tank—To fit

1. Sweep clean the forward end of the luggage compartment, between the road spring pots.

If blanking plugs, nuts, washers, etc., remain in this area when the fuel tank is fitted, they could become the cause of noise which may prove difficult to eradicate once the fuel tank is in position.

Also, ensure that the battery is disconnected and the usual standard workshop precautions carried out.

2. Ensure that the self-tapping screws that secure the pipe retaining clips beneath the car do not protrude to far into the luggage compartment. Extra long self-tapping screws could puncture the fuel tank.

3. Position the strips of 'Compriband' in position. Also fit the 'Compriband' pad around the hole in the luggage compartment floor.

The 'Compriband' and the two rubber blocks [that fit approximately 5,08 cm. (2.0 in.) above the luggage compartment floor on the panel dividing the compartment from the car interior] should be secured in position using an appropriate adhesive such as 'Dunlop S81'.

The position of all mounting strips are shown in Figure 7.

4. Fit the four fuel tank securing straps to the body (see Fig. 7). The two upper mountings are similar and are shown in Figure 7—inset A. The two lower mountings are different, the left-hand mounting is shown in Figure 7—inset B, where the bolt passes through the body and is retained by a nut. The right-hand mount is shown in Figure 7—inset C, where the bolt has a distance piece and screws directly into a threaded bush attached to the body.

5. Fit the 4,8 mm. ($\frac{3}{16}$ in.) internal diameter rubber hose to the metal pipe situated on the left-hand side of the luggage compartment, adjacent to the panel dividing the luggage compartment from the car interior. (see Fig. 5).

Temporarily attach the open end of the rubber hose high in the luggage compartment so that it will be above the fuel tank.

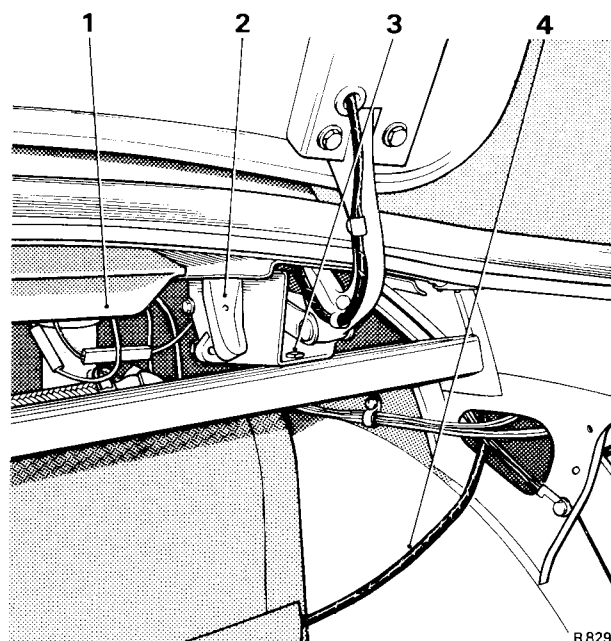


FIG. 4 LUGGAGE COMPARTMENT LID HINGE ASSEMBLY

- 1 Interior ventilation duct
- 2 Hinge assembly
- 3 Crossmember retaining bolt
- 4 Gauge unit loom

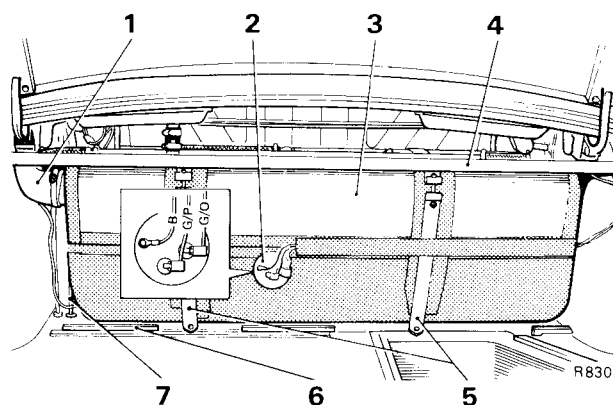


FIG. 5 FUEL TANK FITTINGS

- 1 Fuel filler hose
- 2 Gauge unit
- 3 Soundproofing panel
- 4 Crossmember
- 5 Securing straps
- 6 Carpet runner slots
- 7 Metal pipe (to evaporation loss control canister)

August 1976

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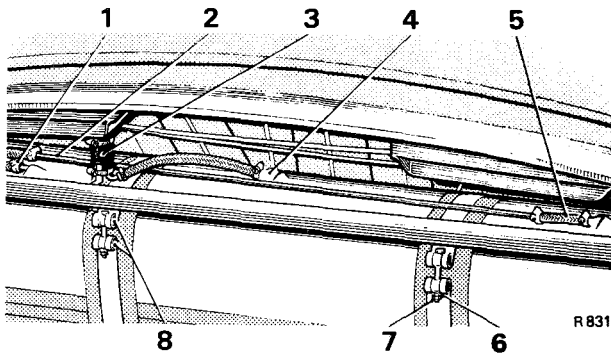


FIG. 6 FUEL TANK VENT CONNECTIONS

- 1 Vent-filler neck
- 2 Fuel tank vent metal pipe
- 3 Rollover valve
- 4 Vent - rollover valve
- 5 Vent - filler neck
- 6 Full nut
- 7 Half nut (locknut)
- 8 Bridge pieces

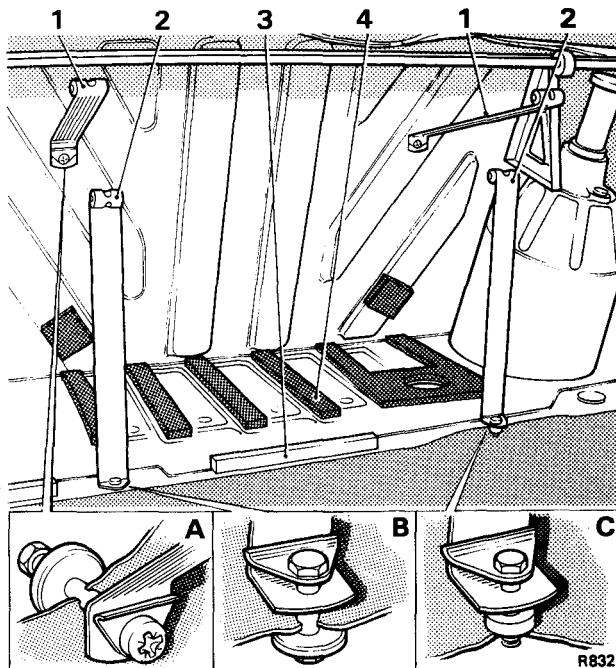


FIG. 7 LUGGAGE COMPARTMENT - FUEL TANK FITTINGS

- 1 Upper securing straps
- 2 Lower securing straps
- 3 Carpet runner slots
- 4 'Compriband' rubber

6. Fit the soundproofing panel to the fuel tank and secure in position with tape (see Fig. 5). In addition, fit two pieces of tape around the fuel tank so that the securing straps will sit on the tape when the tank is secured in position (see Fig. 5).

7. Bend the securing straps to enable the fuel tank to be fitted.

8. Fit the fuel tank into position, ensuring that the boss on the base of the tank fits into the hole in the luggage compartment floor.

9. Secure the fuel tank in position as follows (see Fig. 5).

10. Fit a bridge piece to the end of each securing strap and secure the fuel tank in position by fitting a long $\frac{7}{16}$ in. A/F bolt, downwards, through the upper and lower securing strap bridge pieces. Screw a full nut onto the bolt.

11. Repeat Operation 10 to the second set of securing straps.

12. Tighten the full nut of each set of securing straps and lock in position by fitting an additional half nut to each of the two bolts.

13. From beneath the car fit the fuel pipe to the fuel tank, this connection is provided by an olive and a threaded union.

14. Fit the rubber intake pipe to the fuel tank neck and secure the end of the hose with a worm drive clip.

15. Fit the two 8,0 mm. ($\frac{5}{16}$ in.) internal diameter rubber hoses of the fuel intake assembly to the fuel tank vents. One hose connects directly to the vent, whilst the second hose, connects to the vent on the other side of the fuel tank via a metal pipe which is fitted across the top of the tank (see Fig. 6).

Secure the ends of the hoses with worm drive clips.

16. Fit the open end of the 4,8 mm. ($\frac{3}{16}$ in.) diameter hose referred to in Operation 5 to the top of the rollover valve assembly. Fit an 8,0 mm. ($\frac{5}{16}$ in.) internal diameter hose between the centre vent in the top of the fuel tank and the bottom connection of the rollover valve (see Fig. 6).

Secure the ends of the hose with worm drive clips.

17. Fit the crossmember (see Fig. 5), attaching it to the bottom bracket of each of the two luggage compartment lid hinge assemblies with a $\frac{7}{16}$ in. A/F bolt, washer and nut (see Fig. 4).

18. Locate the fuel gauge sender unit electrical loom situated above the right-hand rear wheel arch; there are three cables in the loom and these are coloured black, green/orange and green/purple.

Tape the cables across the fuel tank until they are adjacent to the fuel gauge sender unit, as shown in Figure 5.

19. Connect the cables to the fuel gauge sender unit as shown in the inset of Figure 5.

20. Locate the base of the carpet covered panel into the wooden runner slots (see Fig. 5) and

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secure the top of the panel with four 'Pozidrive' screws and washers to the crossmember.

21. Connect the battery.

Fuel filler—To remove (Saloon cars)

1. Disconnect the battery.
2. Unscrew and remove the four 'Pozidrive' screws situated across the carpet covered sealing panel at the forward end of the luggage compartment.
3. Withdraw the carpet covered seal panel to reveal the fuel tank assembly.
4. Unscrew the worm drive clips securing the two 8,0 mm. ($\frac{5}{16}$ in.) internal diameter rubber hoses to the two outer vents on the top of the fuel tank, one hose fits directly onto a vent while the other hose fits to a metal pipe which extends across the width of the fuel tank; withdraw the hoses.
5. Unscrew the worm drive clip securing the fuel inlet hose to the fuel tank; withdraw the hose and blank off the fuel tank inlet.
6. From inside the car remove the trim panel that covers the filler assembly, this is situated adjacent to the rear window.

On 4 door saloons (except Long Wheelbase Saloons with the small rear window) unscrew the two screws from the wood finisher fitted around the rear window. Carefully withdraw the trim panel to reveal the upper connection for the fuel filler.

7. Unscrew the worm drive clip securing the fuel filler hose to the fuel filler head. Withdraw the fuel filler neck assembly downwards into the luggage compartment.

8. Open the fuel filler flap; unscrew and remove the fuel filler cap.

9. Using a screwdriver, unscrew and remove the six screws securing the fuel filler head to the body, collect the washers from the retaining screws and withdraw the fuel filler head assembly.

Fuel filler—To fit (Saloon cars)

Fit the fuel filler assembly by reversing the procedure given for removal, noting the following.

1. When fitting the fuel filler head to the body, ensure that the restrictor is in its lowest position.

Fuel filler—To remove (Convertible cars)

1. Remove the carpet covered sealing panel from the forward end of the luggage compartment.
2. Locate the fuel filler neck assembly situated on the left-hand side of the fuel tank.
3. Disconnect the two rubber hoses from the outer vents on top of the fuel tank.
4. Unscrew the upper and lower worm drive clips from the fuel filler neck assembly, withdraw the assembly and blank off the fuel tank.
5. Open the fuel filler flap and unscrew the fuel filler cap.
6. Using a screwdriver, unscrew and remove the six screws securing the fuel filler head to the body, collect the washers from beneath the heads of the screws. Withdraw the assembly.

Fuel filler—To fit (Convertible cars)

Fit the fuel filler assembly by reversing the procedure given for removal.

Chapter U - 1976 Running Change

EMISSION CONTROL SYSTEMS (ELECTRICAL COMPONENTS)

Fuel gauge—Air cored

The fuel gauge fitted to these cars is an 'air cored' instrument. The gauge operates on a slightly different principle to its predecessors in that it does not have the iron core.

The main advantage of this new type of instrument is that it is effectively damped, this characteristic does mean however, that the engine oil sump level indications on the fuel gauge will not be instantaneous and operators are advised to keep the test button on the facia depressed for approximately 5 seconds until the gauge needle has stabilized.

In the past, the facia button mentioned also tested the engine overheat buzzer (with the low coolant warning lamp also being illuminated), however, this feature is no longer included in the test circuit.

Engine overheat

warning buzzer—To test

At the intervals specified in the Service Schedules the engine overheat warning buzzer should be tested for operation as follows.

1. Locate the warning buzzer sender unit situated on 'A' bank cylinder head, between the sparking plugs of cylinders A3 and A4.
2. Detach the 'Lucar' connection (green/purple cable).
3. Switch on the ignition, the buzzer should sound whenever the 'Lucar' connection (green/purple cable) is earthed.

THE CARBURETTORS AND AUTOMATIC CHOKE SYSTEM

Fuel cooler

A cooler is fitted into the fuel system and using the same refrigerant as the air conditioning system, cools the fuel before it enters the carburettor float chambers. The fuel cooler is situated adjacent to the refrigeration compressor

Fuel cooler—To remove

1. Discharge the refrigerant (*see Chapter C*).
2. Unscrew the two unions connecting the cooler to the fuel pipes.
3. Disconnect the refrigeration pipe from the front of the cooler.
4. Unscrew and remove the setscrew that secures the clamp plate to the rear face of the compressor.

5. Withdraw the clamp plate from the rear face of the compressor.

6. Unscrew and remove the cooler mounting set-screws situated at the forward end of the assembly; free the refrigeration pipes from the rear of the assembly. Withdraw the cooler.

Fuel cooler—To fit

To fit the fuel cooler reverse the procedure given for removal noting the following points.

1. Fit new rubber 'O' rings between the rear face of the compressor and the unions of the refrigeration pipes.
2. After fitting the cooler the full procedure of evacuation and sweeping must be carried out before the refrigeration system is charged, details are given in Chapter C.

Chapter U

Section U10

SUPPLEMENTS

No. 9 North America
1968-1976 (inclusive)

PROVISION OF ALTITUDE PERFORMANCE ADJUSTMENTS

Printed in England

October 1981

Regulations concerning the provision of altitude performance adjustments, applying to all 'model years' from 1968 to 1981 inclusive, necessitate the fitting of new needles to the carburetters to improve the exhaust emissions.

These adjustments concern vehicles being operated at altitudes other than that for which the vehicle was originally certified.

High Altitude Areas are defined in the Federal Register - Volume 41 - Number 46 - Dated Monday, March 8th 1976 - as a County or Counties in the U.S.A. wholly located above 1 219 metres (4 000 feet).

These altitude performance adjustment instructions are applicable to all Rolls-Royce and Bentley vehicles manufactured for initial sale in North America (1968 - 1976 'model years' inclusive).

The following is a list of the kits available, applicable to the appropriate model year(s).

Kit Number	Model Year
RH 2819	1968
RH 2820	1969-1972 (inclusive)
RH 2821	1973
RH 2822	1974
RH 2823	1975-1976 (inclusive)

The kits consist of a pair of needles and an 'Update' label.

After the new needles have been fitted, the idle CO (carburetter mixture strength) will have to be checked and reset if necessary. Reference should be made to the appropriate 'model year' of Chapter U, for the relevant settings.

When the above work has been carried out, the Vehicle Emission Control Information Update label supplied with the kit, should be fitted under the bonnet **alongside** the existing emission control certification label, but must not be fitted to any part that can be easily detached from the vehicle.



**VEHICLE EMISSION CONTROL
INFORMATION UPDATE LABEL**

T.S.D. 2476

Chapter U

Needles - To remove

1. Thoroughly clean the outside of the carburetter.
2. Mark the suction chamber and carburetter body with a pencil, to aid assembly.
3. Unscrew and remove the damper and washer.
4. Remove the suction chamber retaining screws and remove the chamber without tilting it.
5. Remove the piston spring.
6. Carefully lift out the piston and needle assembly. Empty the oil from the piston rod.
7. **Carburetters fitted with a fixed needle.**

Remove the needle locking screw and withdraw the needle. If it cannot easily be removed, first tap the needle inwards, then pull outwards.

Carburetters fitted with a spring loaded needle.

Remove the needle guide locking screw from the piston, then withdraw the needle assembly taking care not to bend the needle.

Withdraw the needle guide from the needle and remove the spring.

Needles - To fit

Carburetters fitted with a fixed needle

1. Fit the needle to the piston assembly. The shoulder or lower edge of the groove must be level with the lower face of the piston rod (*see Fig. 1*). Fit and tighten the locking screw.
2. Invert the suction chamber and spin the piston assembly to check for concentricity of the needle.

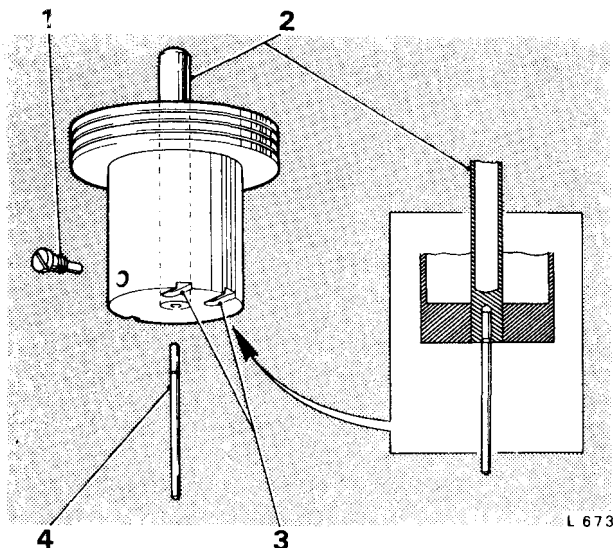


FIG.1 CORRECT POSITION OF THE FIXED NEEDLE

- 1 Needle locking screw
- 2 Piston rod
- 3 Transfer holes
- 4 Needle

3. Check that the piston key is secure in the carburetter body.
4. Fit the piston assembly to the body, then fit the piston spring over the piston rod. Fit the suction chamber taking care not to 'wind up' the piston spring. Fit and tighten the suction chamber retaining screws.
5. Ensure the upper portion of the piston rod in each carburetter is filled with the same type of oil as used in the engine. The correct level is approximately 13 mm. (0.50 in.) from the top of the tube.
6. Fit the piston damper and washer.

Carburetters fitted with a spring loaded needle

1. Fit the spring of the spring loaded needle onto the needle collar ensuring that the spring locates in the groove (*see Fig. 2*).
2. Fit the guide onto the needle so that the end with the indentation is towards the flange on the collar.

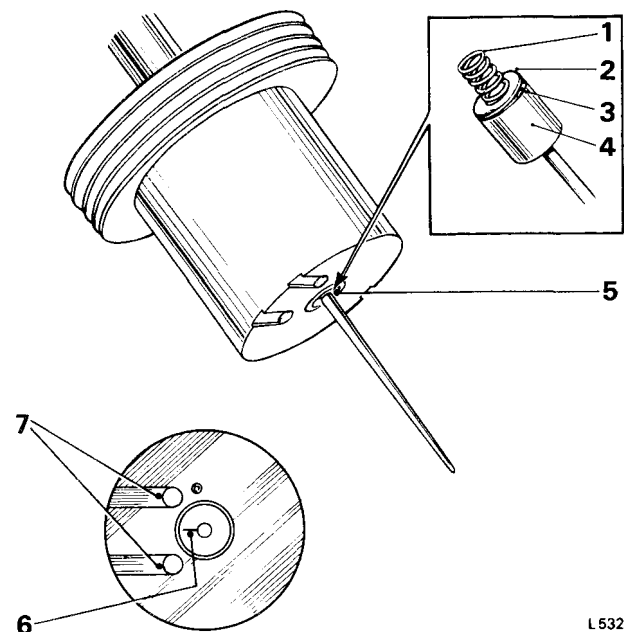


FIG.2 CORRECT POSITION OF THE SPRING LOADED NEEDLE

- 1 Spring
- 2 Collar
- 3 Indentation
- 4 Guide
- 5 Needle and guide position
- 6 Guide mark
- 7 Transfer holes and cut-outs

3. Fit the needle and guide into the piston. The lower face of the guide must be flush with the face of the piston (*see Fig. 2*), and the mark on the guide must be adjacent to the point midway between the two cut-outs in the piston.

4. Fit and tighten the guide locking screw to the piston.

5. Check that the piston key is secure in the carburetter body.

6. Fit the piston assembly to the carburetter body, carefully guiding the needle into the jet.

7. Fit the piston spring over the piston rod.

8. Fit the suction chamber, taking care not to 'wind up' the piston spring. Fit and tighten the suction chamber retaining screws.

9. Ensure the upper portion of the piston rod in each carburetter is filled with the same type of oil as used in the engine. The correct level is

approximately 13 mm. (0.50 in.) from the top of the tube.

10. Fit the piston damper and washer.

Tuning the carburetters

For the tuning and setting of the idle CO, reference should be made to the relevant 'model year' of Chapter U.

Carburetter tamperproofing (if fitted)

If during the tuning of the carburetter it is necessary to adjust the idle CO setting, then retamperproofing of the carburetter adjusters will be necessary.

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Practical	R.H.D. cars prior to Serial Number 5000	2
Theoretical	R.H.D. cars from Serial Number 5000 to 6000	3
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Theoretical All cars built to 1972 Electrical
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Theoretical and practical Rolls-Royce Silver Shadow and
Bentley 'T' series saloons built to
August 1975 Electrical Specification 16

Theoretical Rolls-Royce & Bentley Corniche with
Automatic Air Conditioning 17

Printed in England

September 1972

T.S.D. 2476

KEY TO DIAGRAMS

It should be noted that the colours indicated in the table are often combined in pairs e.g. 14GY-C. The number '14' represents the cable size, the cable comprising of 14 strands of wire, each strand being 0.010 in. diameter. The 'GY' indicates that the cable is two colour, Green and Yellow and the 'C' indicates that the cable is cotton covered.

CABLE COLOUR CODE

B = Black	S = Slate
G = Green	U = Blue
N = Brown	W = White
P = Purple	Y = Yellow
R = Red	

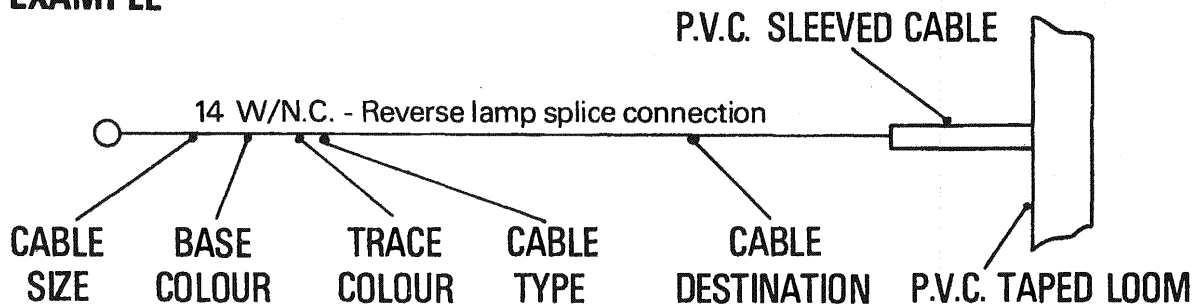
CABLE SIZES

14 = 14/.010in.
28 = 28/.012in.
44 = 44/.012in.
65 = 65/.012in.
120 = 120/.012in.

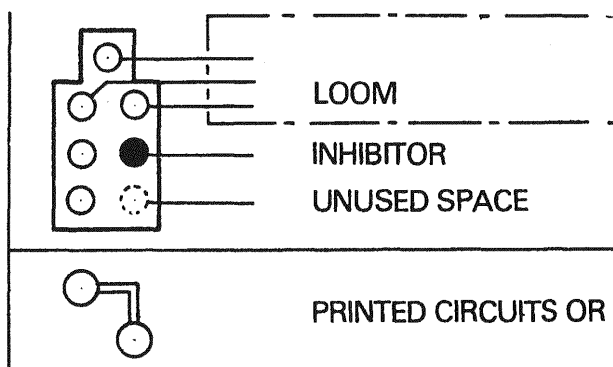
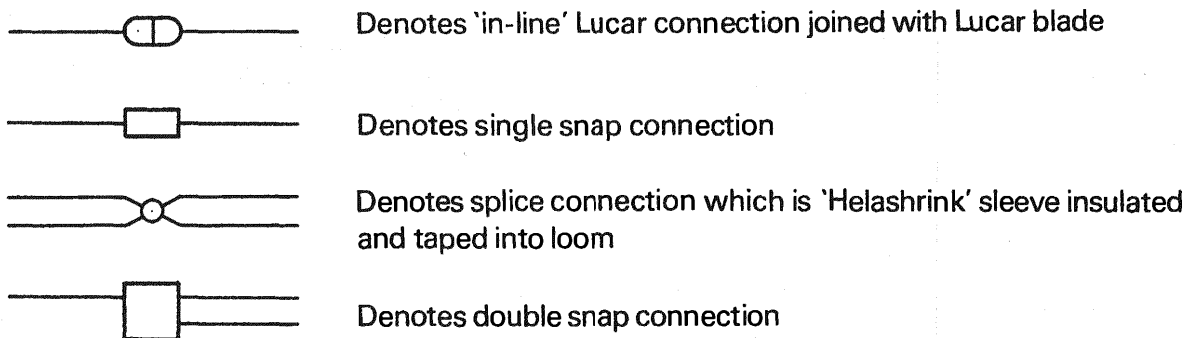
CABLE TYPE

'C' denotes cotton covered cable
'P' denotes plastic covered cable

EXAMPLE



CONNECTION DETAILS



Section 1

RIGHT-HAND DRIVE CARS PRIOR TO SERIAL NUMBER 5000

APPLICATION

SHEET No

Theoretical

1

Theoretical

2

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THEORETICAL WIRING DIAGRAM

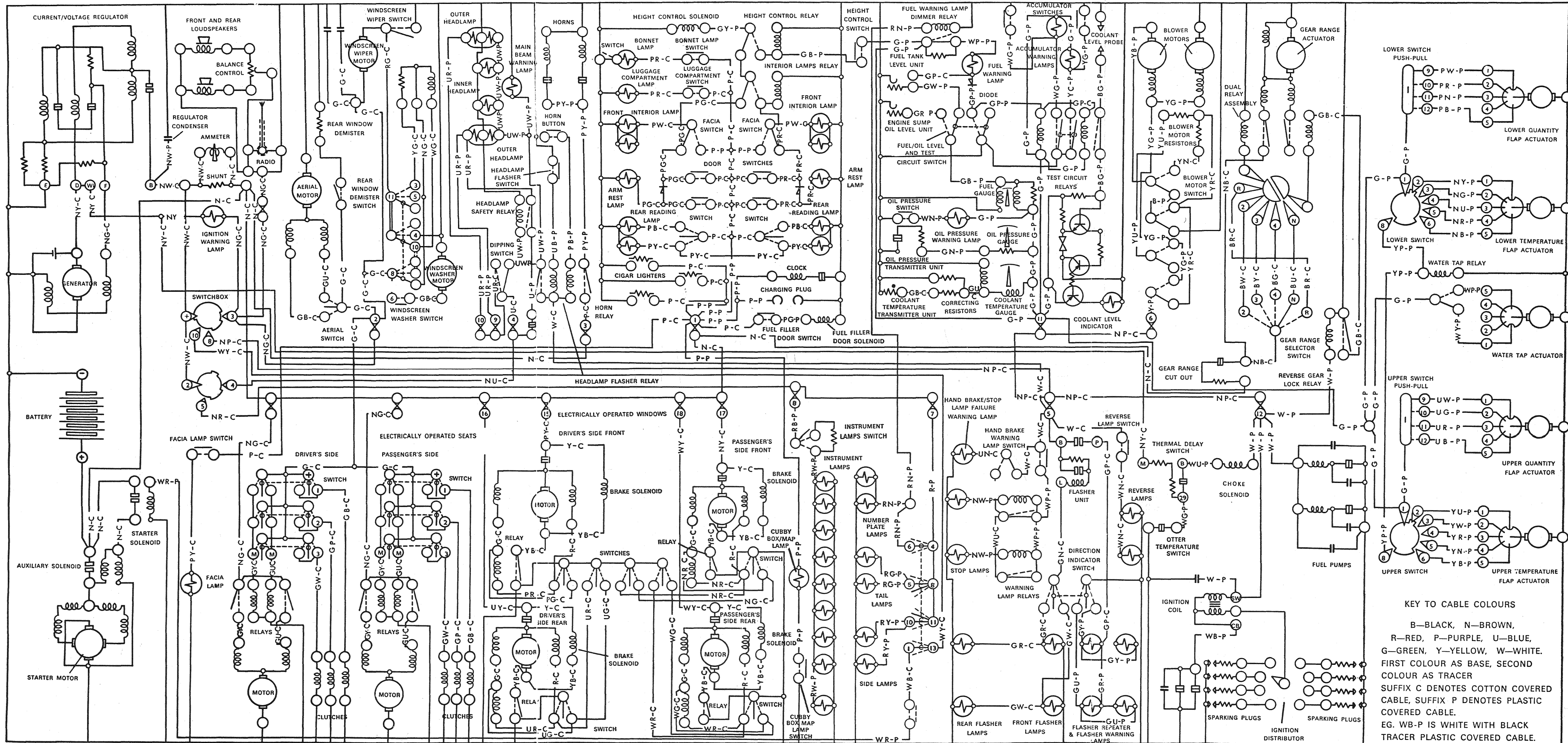
SHEET 1

ROLLS-ROYCE SILVER SHADOW AND BENTLEY T SERIES 4-DOOR SALOONS

TSD Publication 2218

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KEY TO CABLE COLOURS

B—BLACK, N—BROWN,
 R—RED, P—PURPLE, U—BLUE,
 G—GREEN, Y—YELLOW, W—WHITE.
 FIRST COLOUR AS BASE, SECOND
 COLOUR AS TRACER
 SUFFIX C DENOTES COTTON COVERED
 CABLE, SUFFIX P DENOTES PLASTIC
 COVERED CABLE.
 EG. WB-P IS WHITE WITH BLACK
 TRACER PLASTIC COVERED CABLE.

THEORETICAL WIRING DIAGRAM

SHEET 2

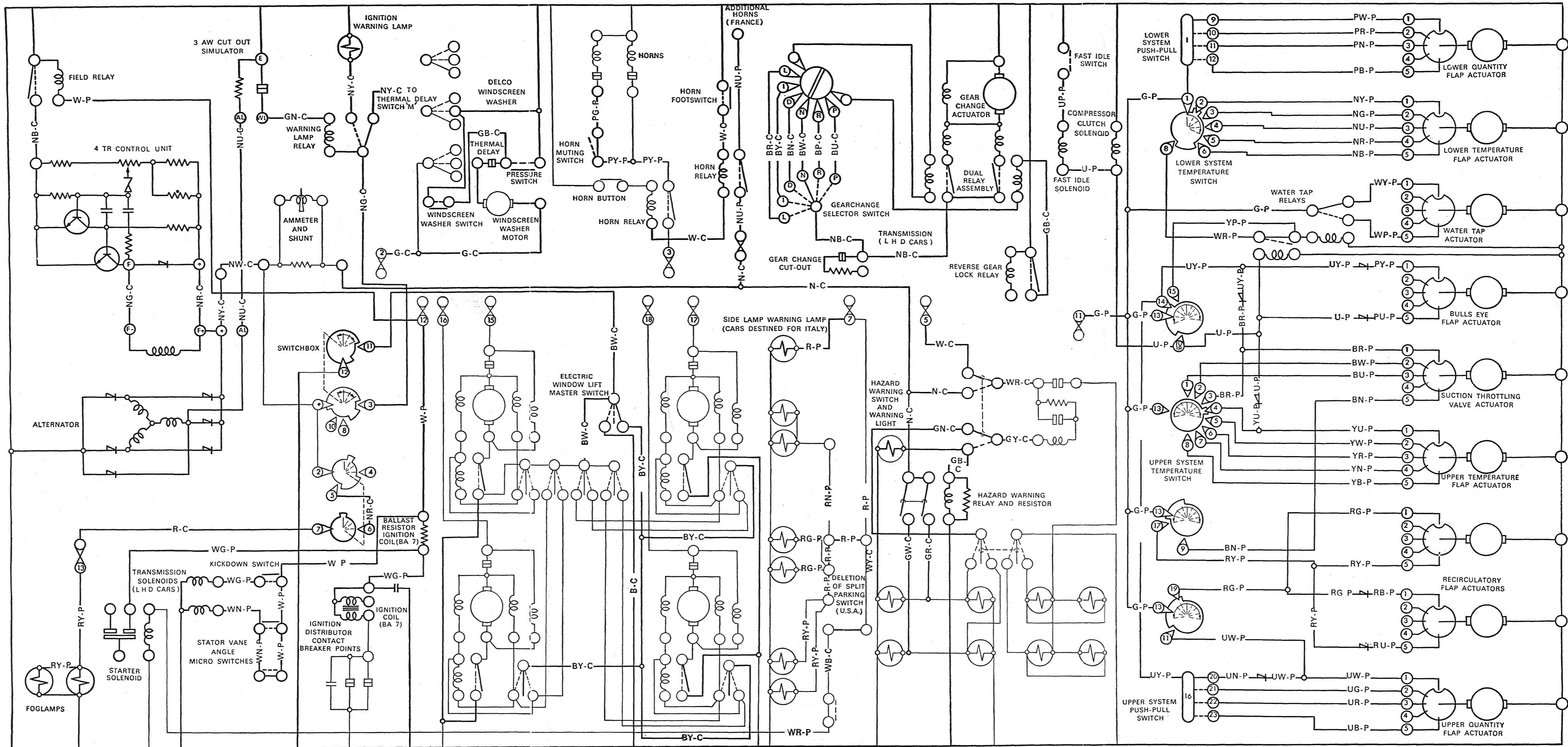
**ADDITIONAL AND ALTERNATIVE CIRCUITS
TO SHEET 1**

**ROLLS-ROYCE SILVER SHADOW
AND
BENTLEY T SERIES
4-DOOR SALOONS**

TSD Publication 2218

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Section 2

RIGHT-HAND DRIVE CARS PRIOR TO SERIAL NUMBER 5000

APPLICATION	SHEET No
Charging, Starter and Distribution	1
Engine and Instruments	2
Lighting	3
Direction Indicators and Handbrake Warning Lamp	4
Electrically Operated Windows	5
Electrically Operated Seats	6
Gear Range Selector	7
Air Conditioning Unit (A.C.U.)	8
Radio Receiver and Speakers	9
Interior Lighting	10

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SECTION 2

SHEET 1

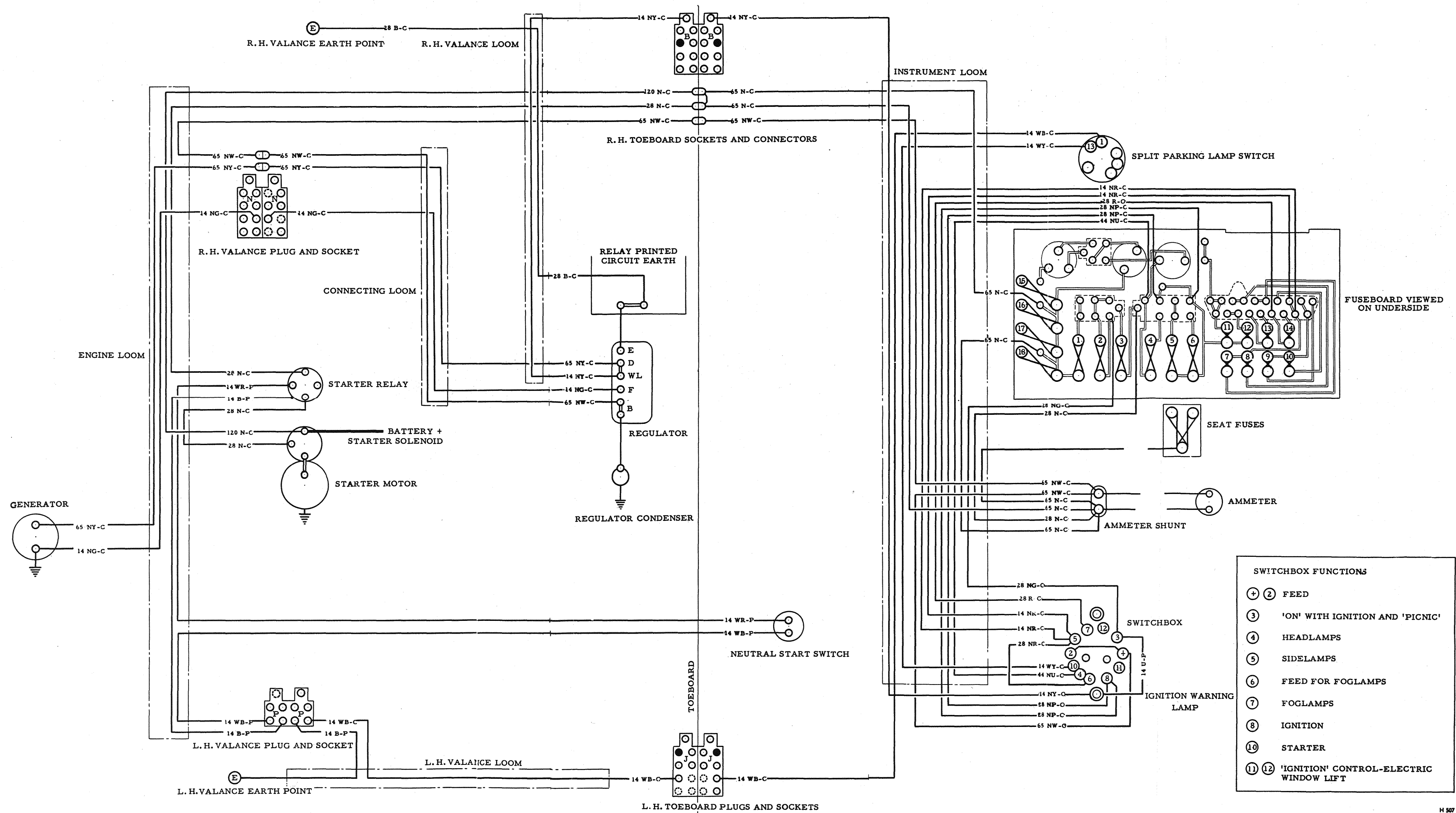
CHARGING, STARTER AND DISTRIBUTION

R.H. DRIVE CARS

FIRST EDITION

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SHEET 2

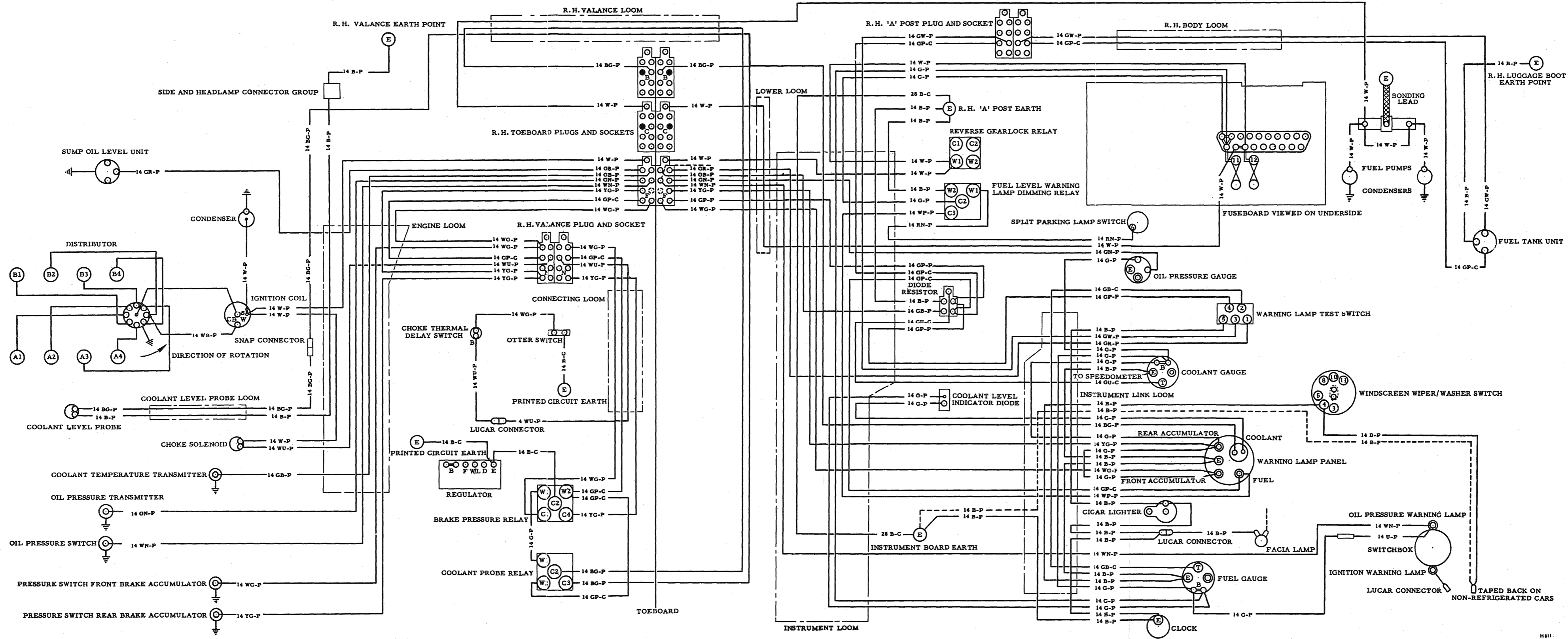
ENGINE AND INSTRUMENTS

R.H. DRIVE CARS

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SHEET 3

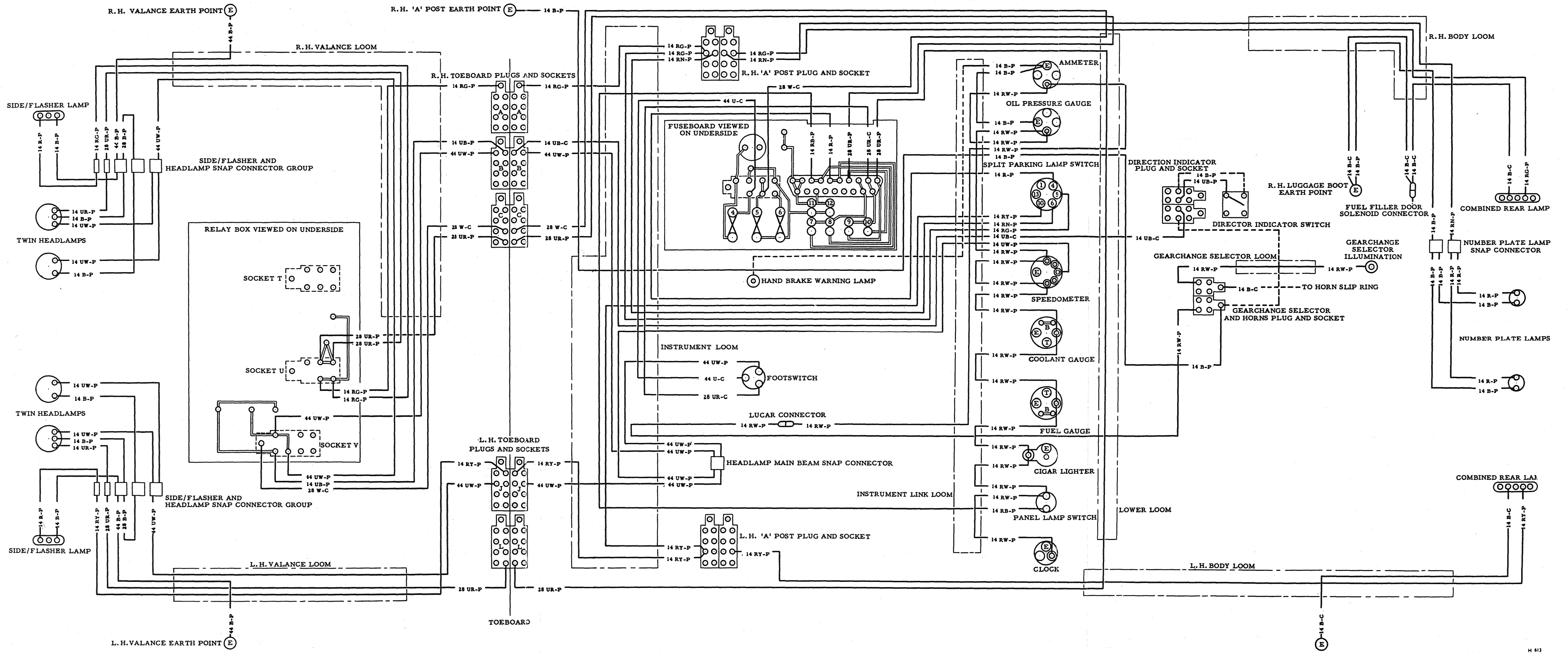
LIGHTING

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SHEET 4

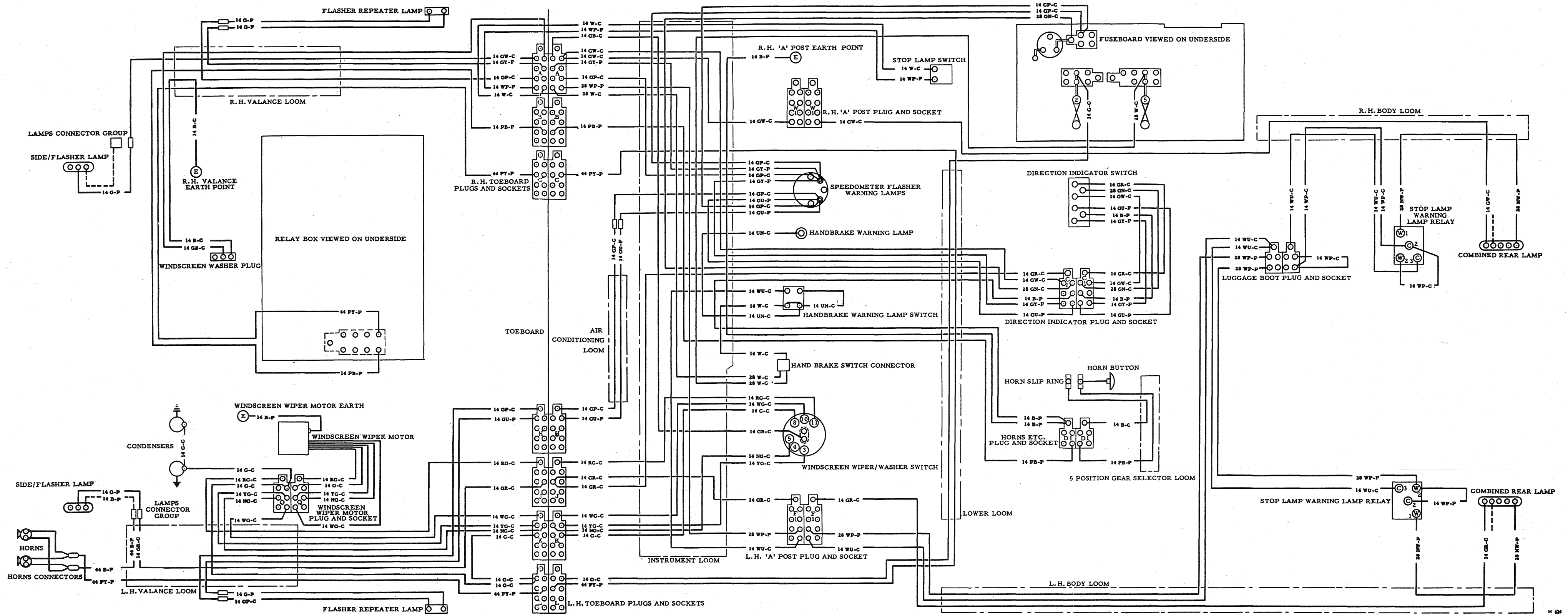
**FLASHERS, WIPERS AND
HAND BRAKE WARNING LAMP**

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SHEET 5

WINDOW LIFT

R.H. DRIVE CARS

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SHEET 6

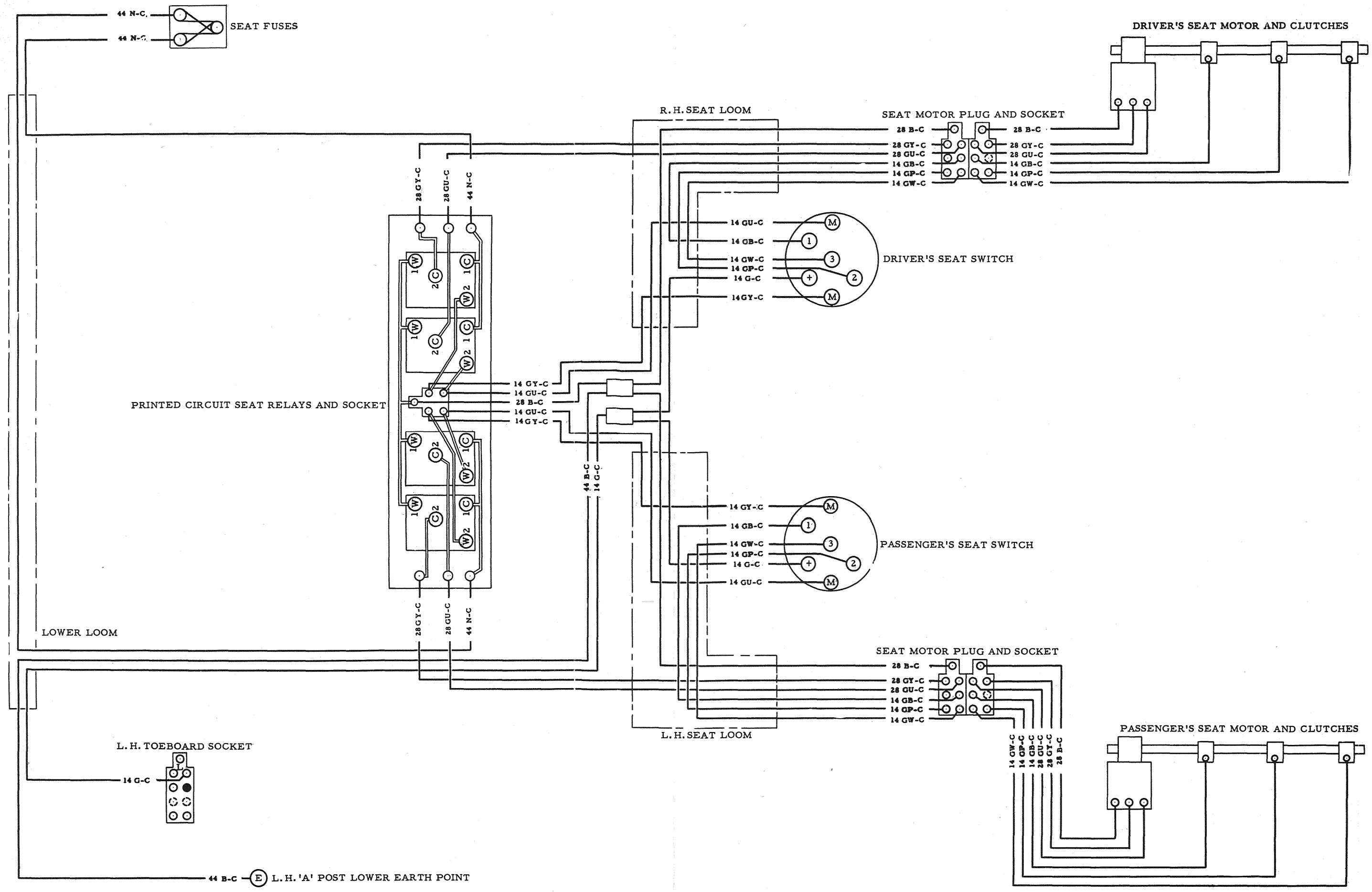
ELECTRICALLY OPERATED SEATS

R.H. DRIVE CARS

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PRACTICAL WIRING DIAGRAM

SHEET 7

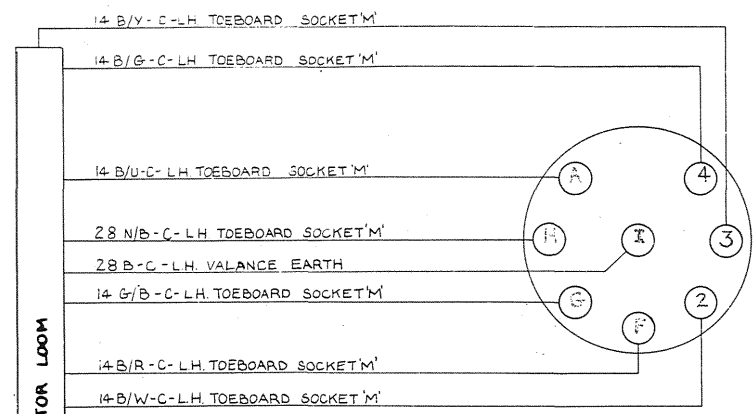
GEAR RANGE SELECTOR

ROLLS-ROYCE SILVER SHADOW
AND
BENTLEY T SERIES
RIGHT-HAND DRIVE CARS
PRIOR TO CAR SERIAL NUMBER SRH 5001

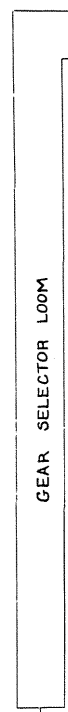
TSD Publication 2432

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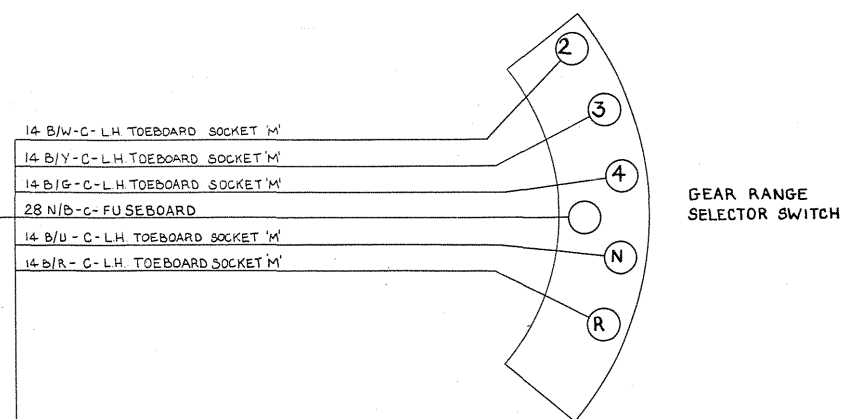
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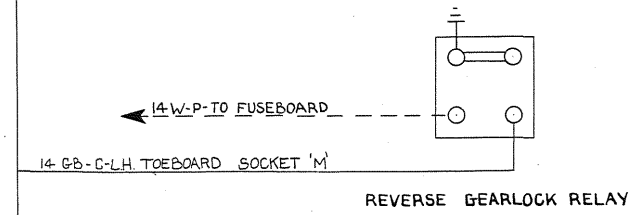
GEARBOX ACTUATOR



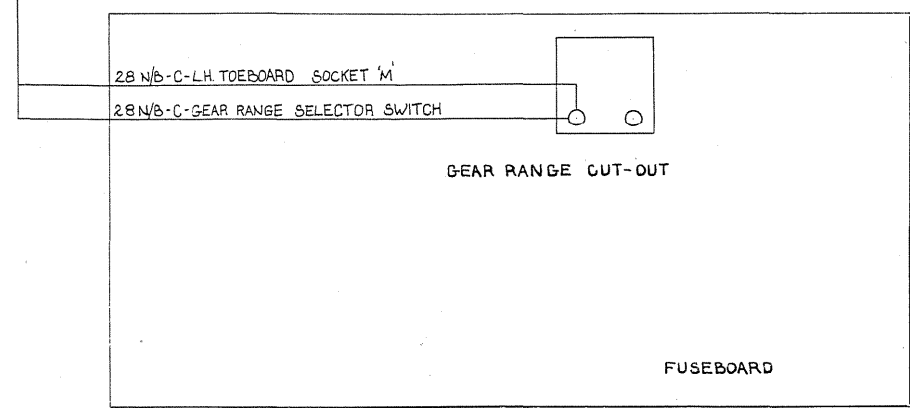
GEAR SELECTOR LOOM



GEAR RANGE SELECTOR SWITCH



REVERSE GEARLOCK RELAY



GEAR RANGE CUT-OUT

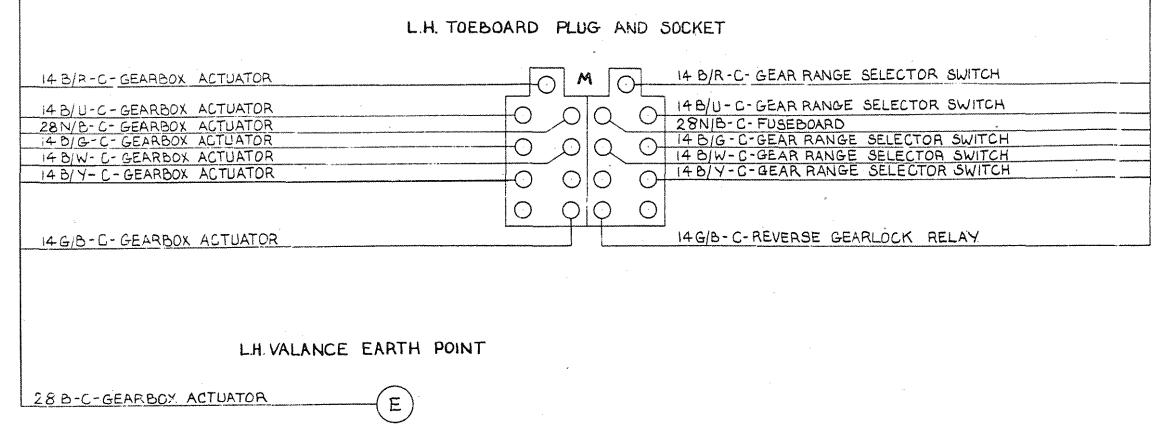
FUSEBOARD

KEY TO DIAGRAM

CABLE COLOURS

B-BLACK	N-BROWN	R-RED
P-PURPLE	U-BLUE	G-GREEN
Y-YELLOW	W-WHITE	S-SLATE

EXAMPLE UP-P
 BLUE BASE WITH PURPLE TRACER PLASTIC COVERED
 FIRST COLOUR AS BASE SECOND COLOUR AS TRACER
 SUFFIX P - PLASTIC COVERED CABLE
 SUFFIX C - COTTON COVERED CABLE



L.H. TOEBOARD PLUG AND SOCKET

L.H. VALANCE EARTH POINT

PRACTICAL WIRING DIAGRAM

SHEET 8

AIR CONDITIONING UNIT

ROLLS-ROYCE SILVER SHADOW
AND
BENTLEY T SERIES
RIGHT-HAND DRIVE CARS
PRIOR TO CAR SERIAL NUMBER SRH 5001

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KEY TO DIAGRAM

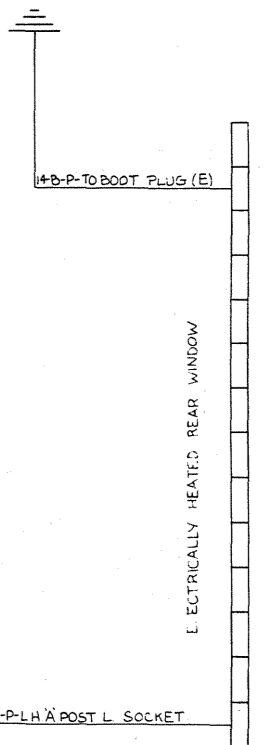
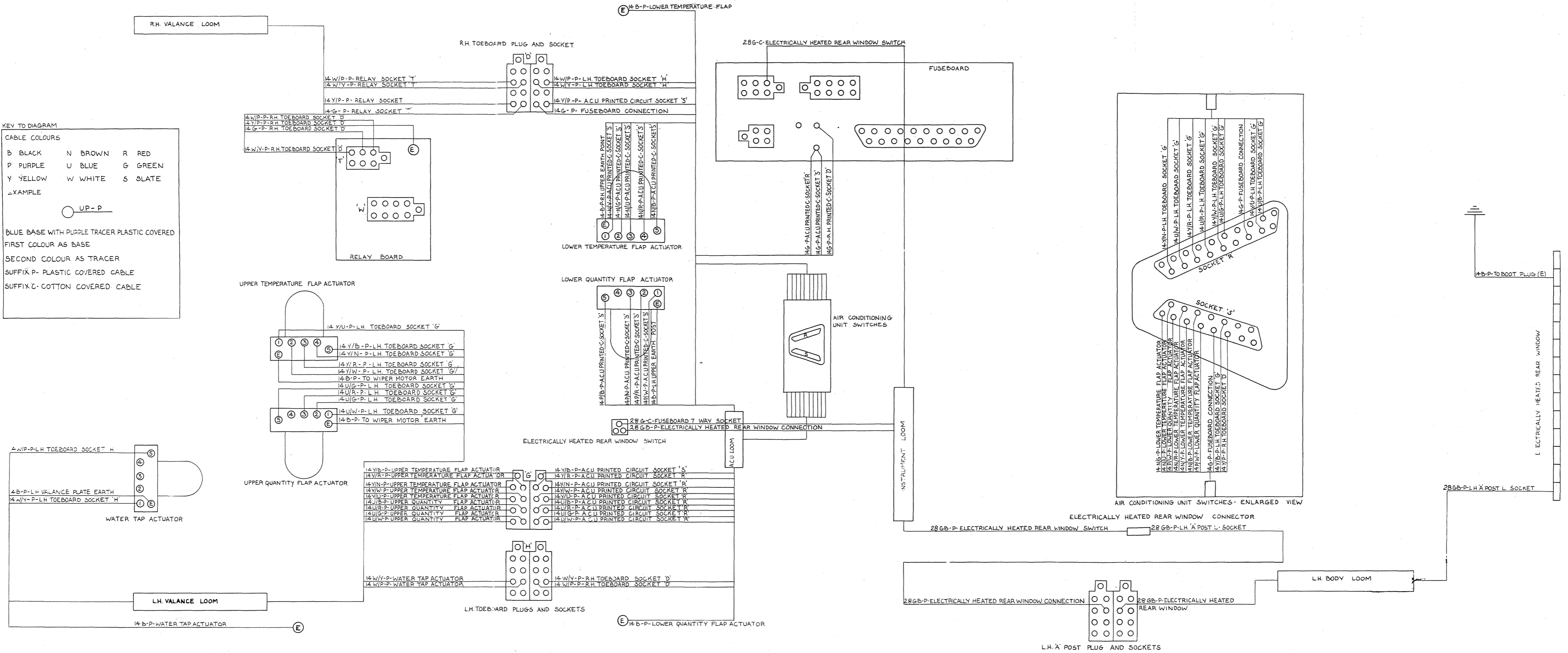
CABLE COLOURS

B BLACK	N BROWN	R RED
P PURPLE	U BLUE	G GREEN
Y YELLOW	W WHITE	S SLATE

-XAMPLE

UP - P

BLUE BASE WITH PURPLE TRACER PLASTIC COVERED
FIRST COLOUR AS BASE
SECOND COLOUR AS TRACER
SUFFIX P - PLASTIC COVERED CABLE
SUFFIX C - COTTON COVERED CABLE



PRACTICAL WIRING DIAGRAM

SHEET 9

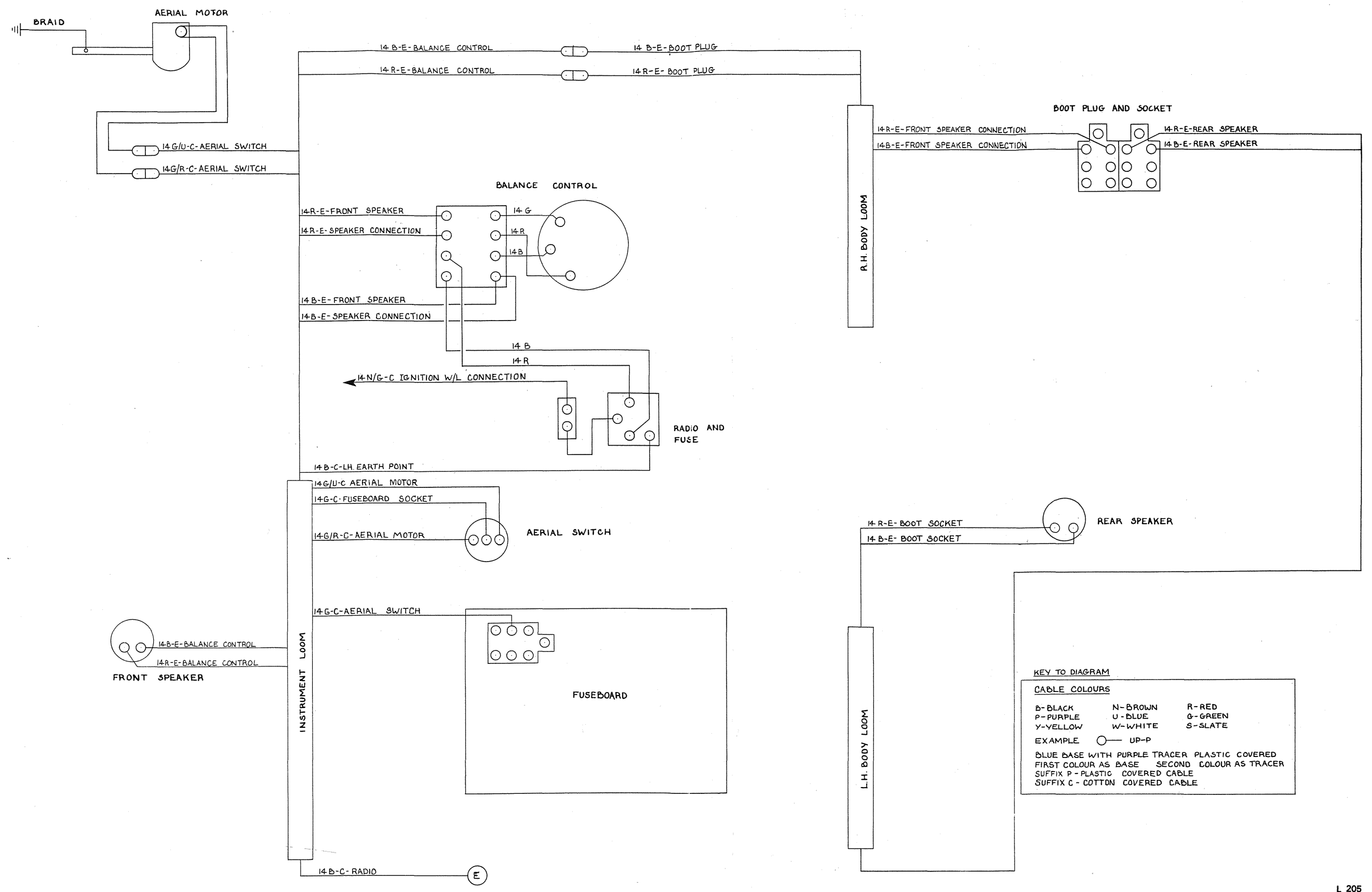
RADIO RECIEVER & SPEAKERS

ROLLS-ROYCE SILVER SHADOW
AND
BENTLEY T SERIES
RIGHT-HAND DRIVE CARS
PRIOR TO CAR SERIAL NUMBER SRH 5001

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PRACTICAL WIRING DIAGRAM

SHEET 10

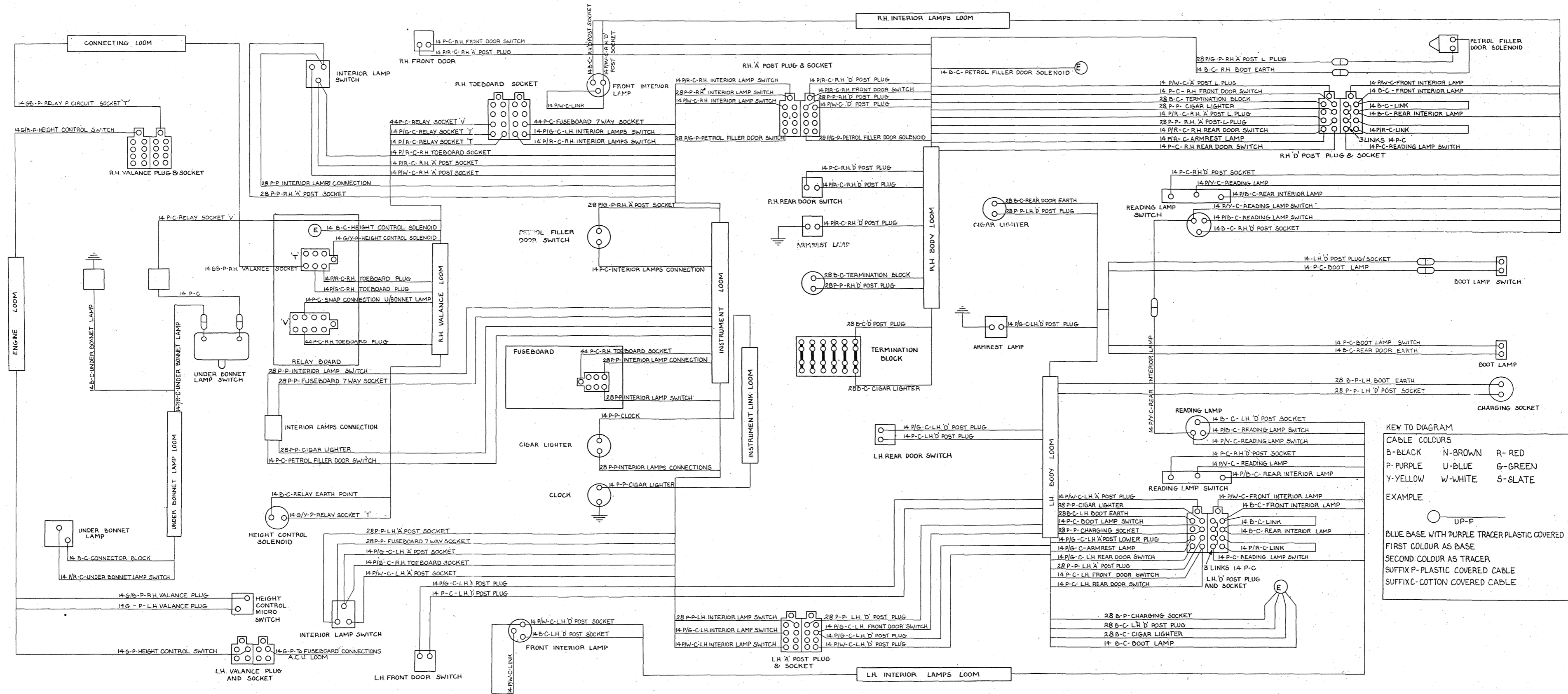
INTERIOR LIGHTING

ROLLS-ROYCE SILVER SHADOW AND BENTLEY T SERIES RIGHT-HAND DRIVE CARS PRIOR TO CAR SERIAL NUMBER SRH 5001

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Section 3

**RIGHT-HAND DRIVE CARS FROM
SERIAL NUMBER 5001 TO 6000**

APPLICATION

Theoretical

SHEET No

1

Printed in England

September 1970

T.S.D 2476

SECTION 3

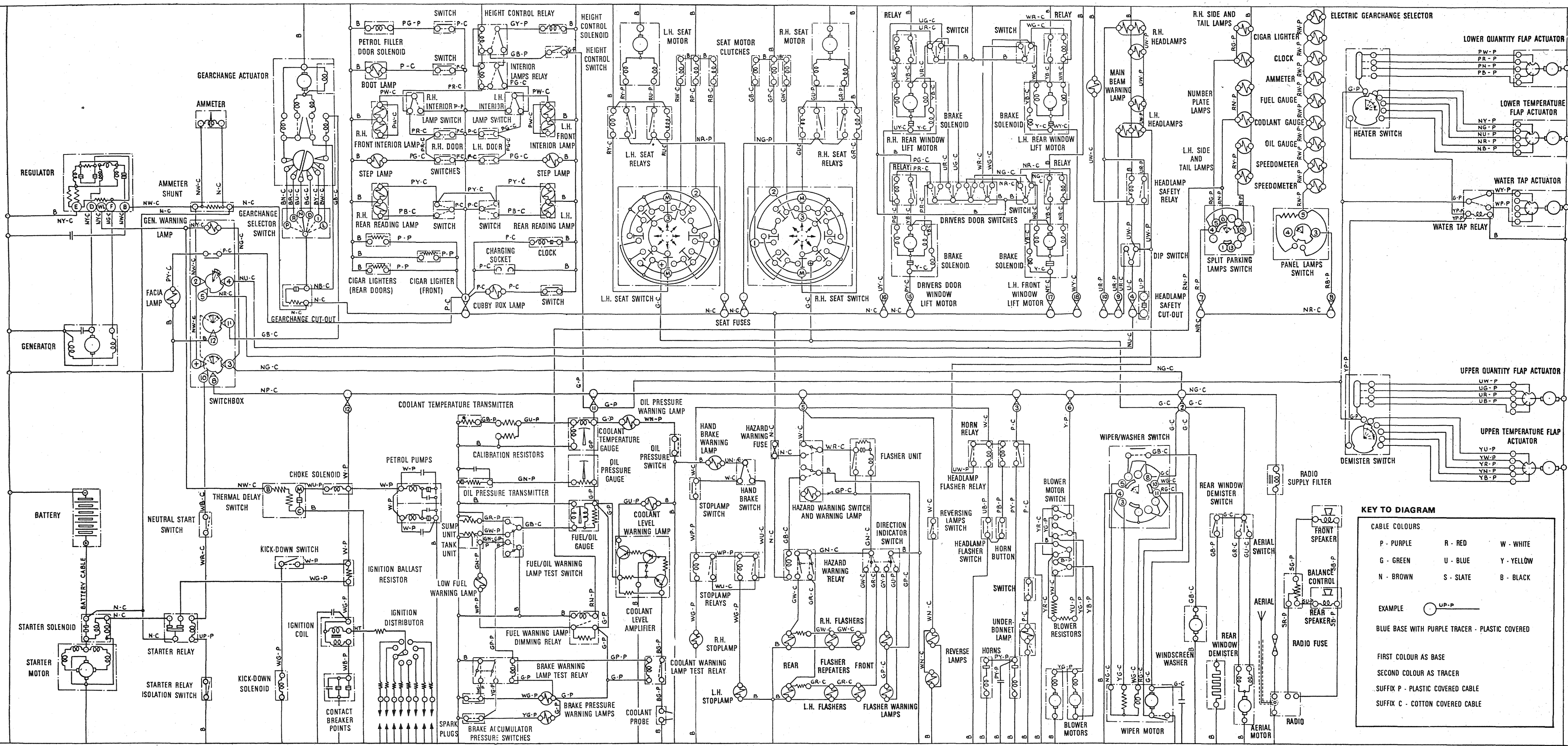
THEORETICAL WIRING DIAGRAM

**ROLLS-ROYCE SILVER SHADOW
AND
BENTLEY T SERIES
RIGHT-HAND DRIVE STANDARD CARS
(Car Serial Numbers 5001-6000)**

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Section 4

**LEFT-HAND DRIVE CARS FROM
SERIAL NUMBER 6000 TO 9000**

APPLICATION

Theoretical

SHEET No

1

Printed in England

September 1970

T.S.D 2476

SECTION 4

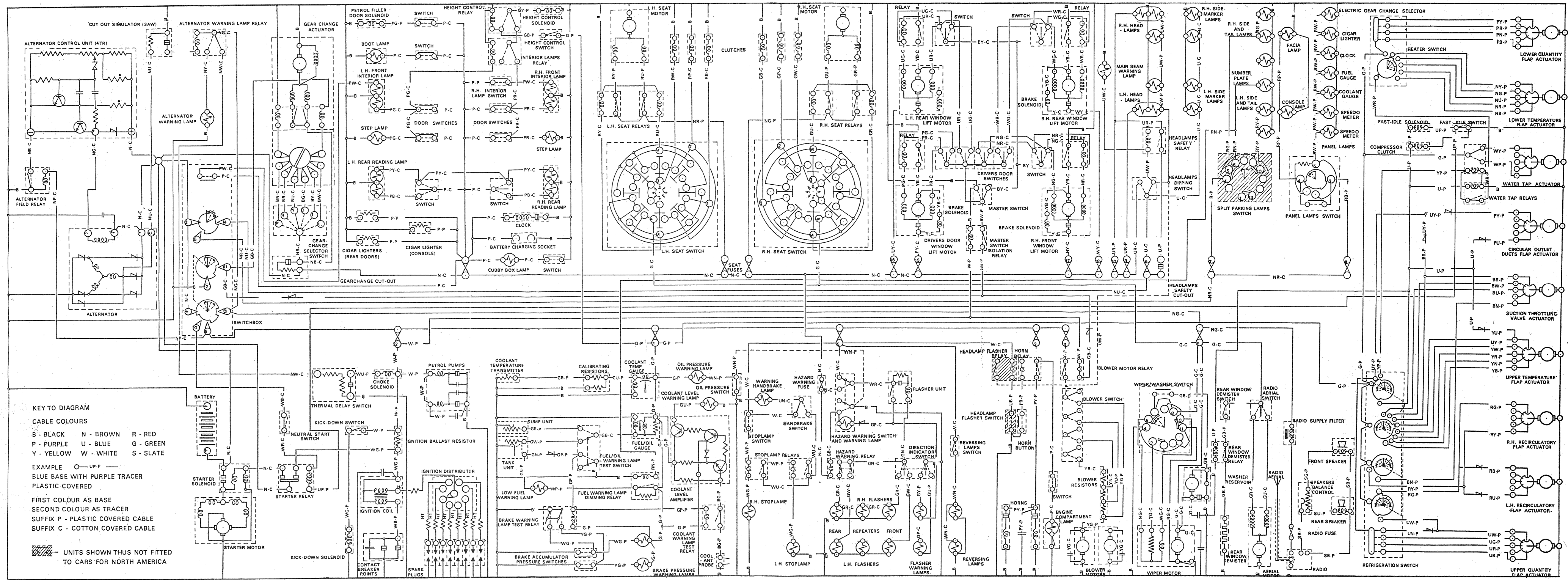
THEORETICAL WIRING DIAGRAM

ROLLS-ROYCE SILVER SHADOW AND BENTLEY T SERIES LEFT-HAND DRIVE CARS (A.F.S.S.)

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Section 5

LEFT-HAND DRIVE CARS FROM SERIAL NUMBER 6000 TO 9000

APPLICATION	SHEET No
Engine Compartment Looms and Exterior Lighting Looms	1
Bulkhead Toe-board and Instrument Panel Looms	2
Centre Console and Electrically Operated Seat Looms	3
Electrically Operated Windows, Luggage Compartment, and Side and Rear Exterior Lighting Looms	4

Printed in England

September 1970

T.S.D 2476

PRACTICAL WIRING DIAGRAM

**SHEET I
ENGINE COMPARTMENT LOOMS AND
EXTERIOR LIGHTING LOOMS**

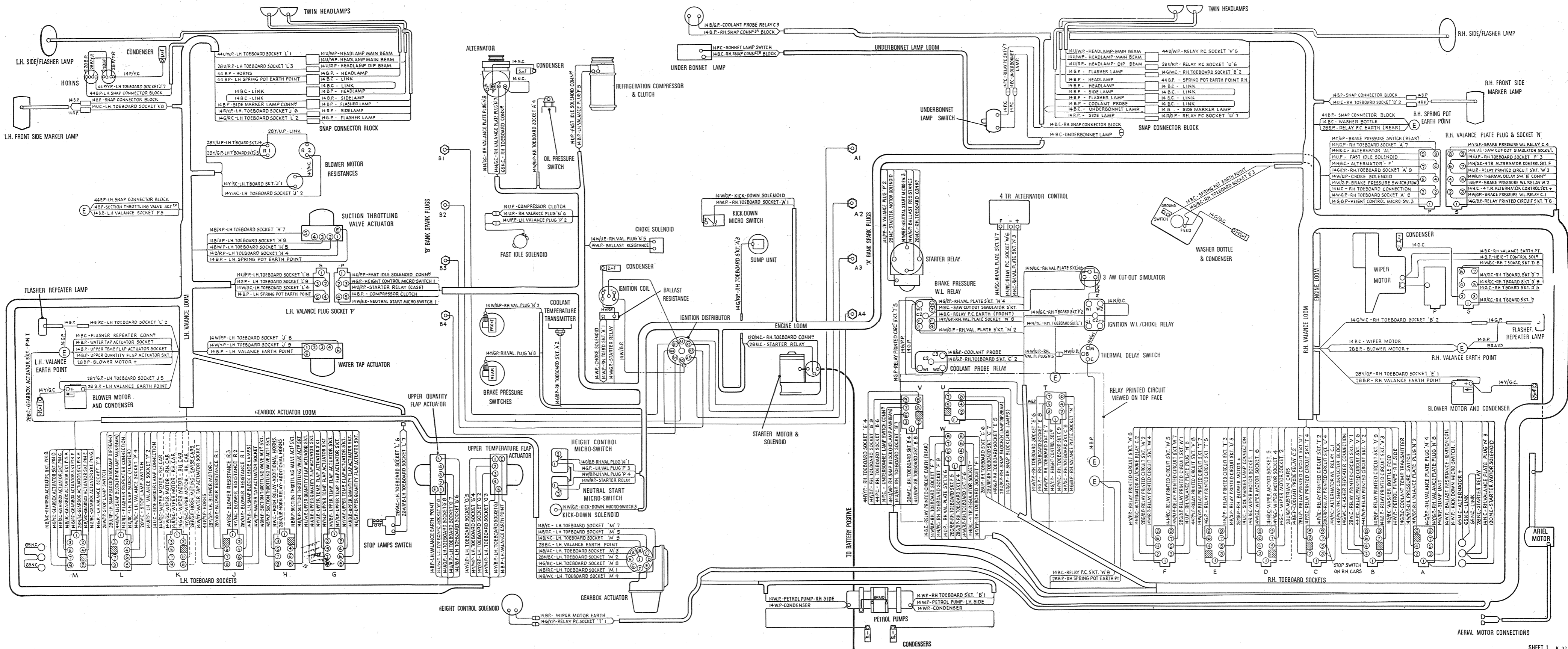
**ROLLS-ROYCE SILVER SHADOW
AND
BENTLEY T SERIES
LEFT-HAND DRIVE CARS**

(Car Serial Numbers 6000-9000)

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PRACTICAL WIRING DIAGRAM

**SHEET 2
BULKHEAD TOE-BOARD AND INSTRUMENT
PANEL LOOMS**

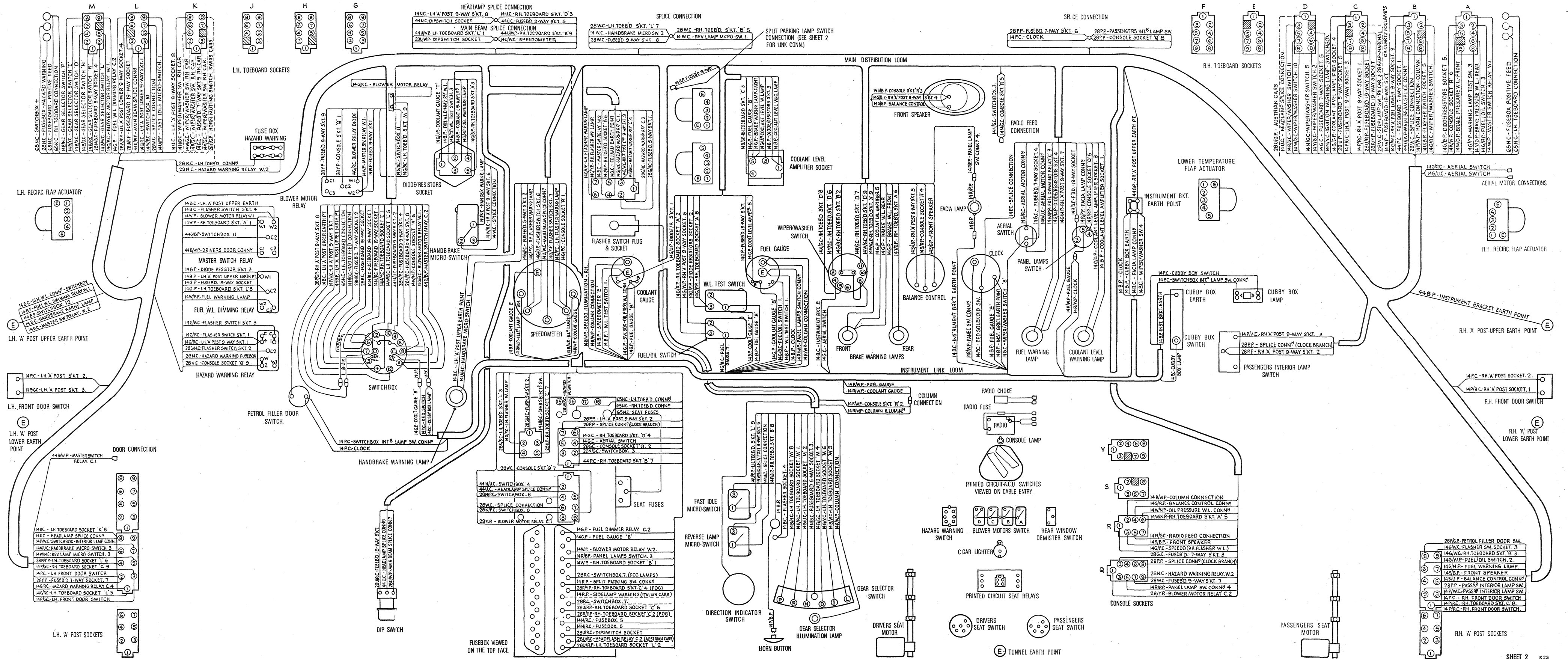
**ROLLS-ROYCE SILVER SHADOW
AND
BENTLEY T SERIES
LEFT-HAND DRIVE CARS**

(Car Serial Numbers 6000-9000)

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PRACTICAL WIRING DIAGRAM

SHEET 3

**CENTRE CONSOLE AND ELECTRICALLY
OPERATED SEAT LOOMS**

**ROLLS-ROYCE SILVER SHADOW
AND**

**BENTLEY T SERIES
LEFT-HAND DRIVE CARS**

(Car Serial Numbers 6000-9000)

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PRACTICAL WIRING DIAGRAM

SHEET 4

**ELECTRICALLY OPERATED WINDOWS,
LUGGAGE COMPARTMENT AND
SIDE AND REAR EXTERIOR LIGHTING LOOMS**

**ROLLS-ROYCE SILVER SHADOW
AND**

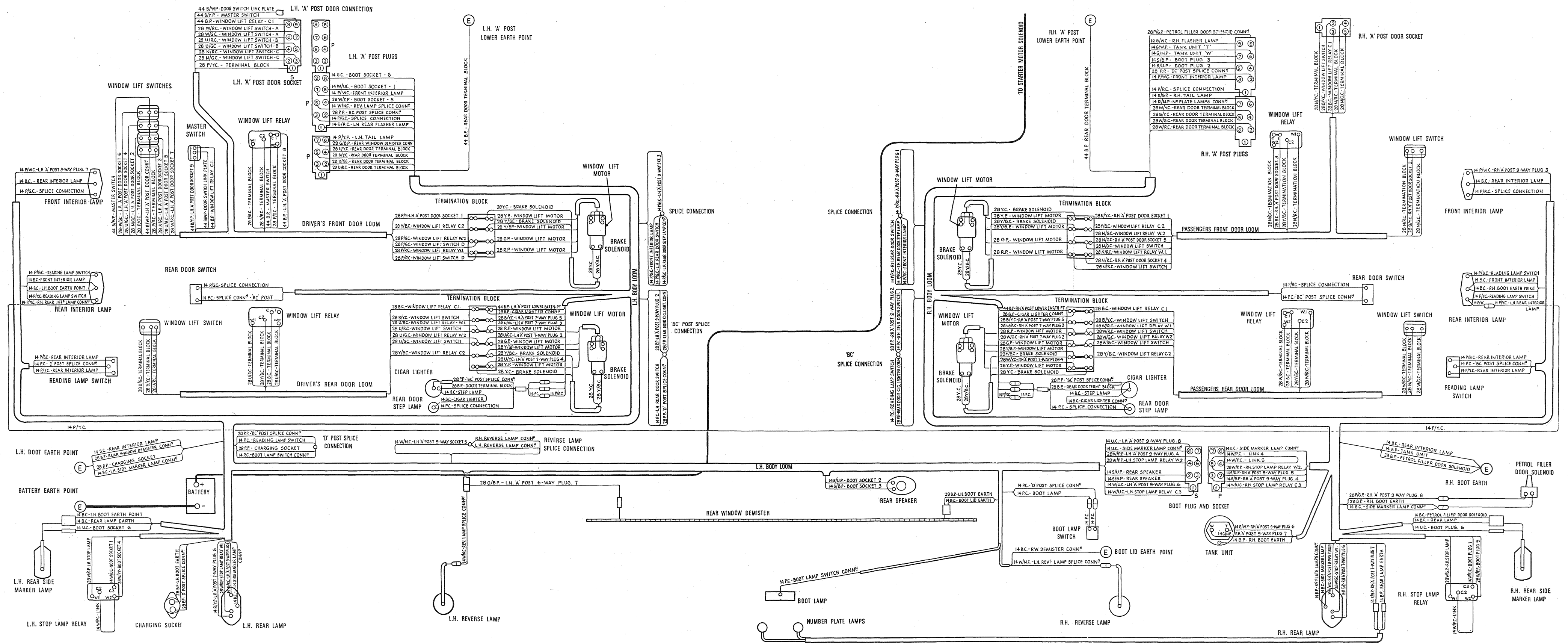
**BENTLEY T SERIES
LEFT-HAND DRIVE CARS**

(Car Serial Numbers 6000-9000)

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Section 6

LEFT-HAND DRIVE LONG WHEELBASE CARS WITH DIVISION, FROM SERIAL NUMBER 6598

APPLICATION	SHEET No
Theoretical	1
L.H. and R.H. Body Looms	2
Engine Looms	3
Main Distribution Looms	4

SECTION 6

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September 1970

T.S.D. 2476

THEORETICAL WIRING DIAGRAM

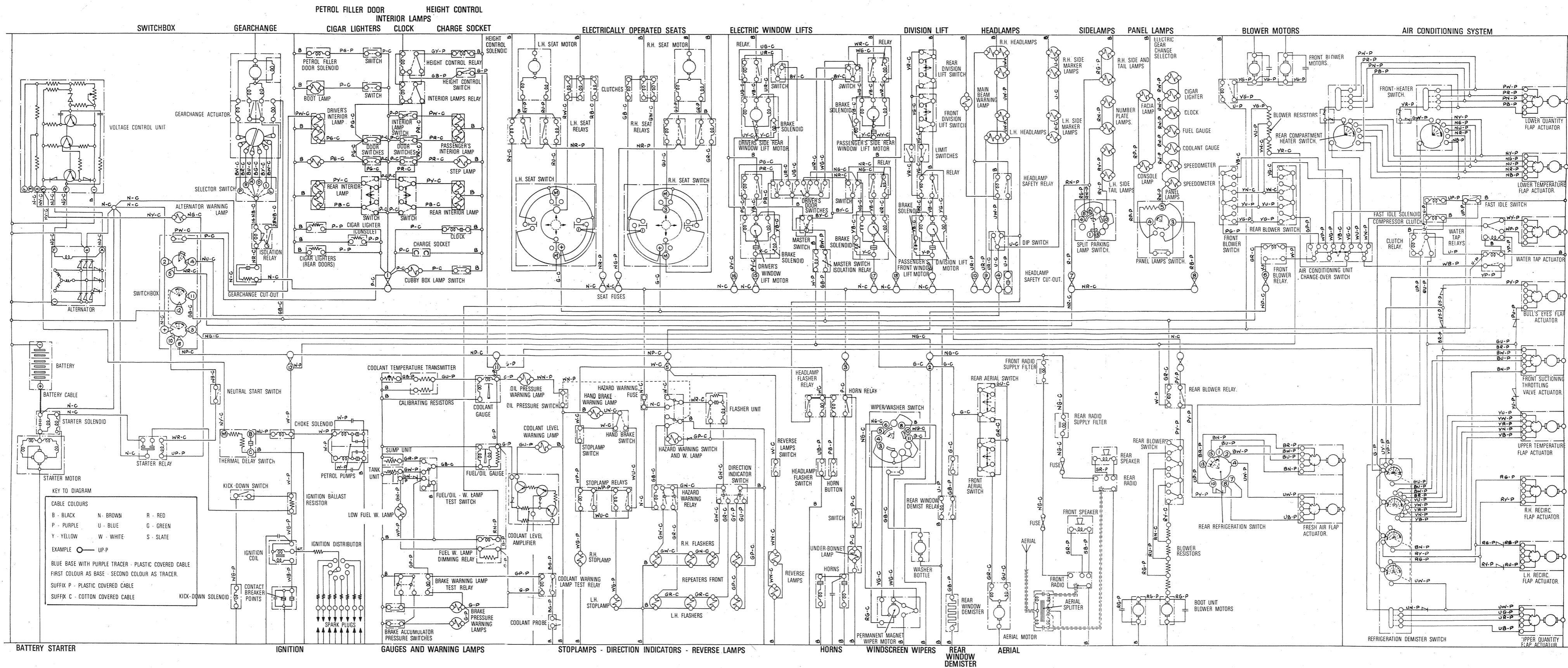
SHEET 1

ROLLS-ROYCE SILVER SHADOW
AND
BENTLEY T SERIES
LEFT-HAND DRIVE LONG WHEELBASE CARS
WITH DIVISION
AFTER CAR SERIAL NUMBER LRX 6598

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PRACTICAL WIRING DIAGRAM

SHEET 2

L.H. & R.H. BODY LOOMS

ROLLS-ROYCE SILVER SHADOW

AND

BENTLEY T SERIES

LEFT-HAND DRIVE LONG WHEELBASE CARS

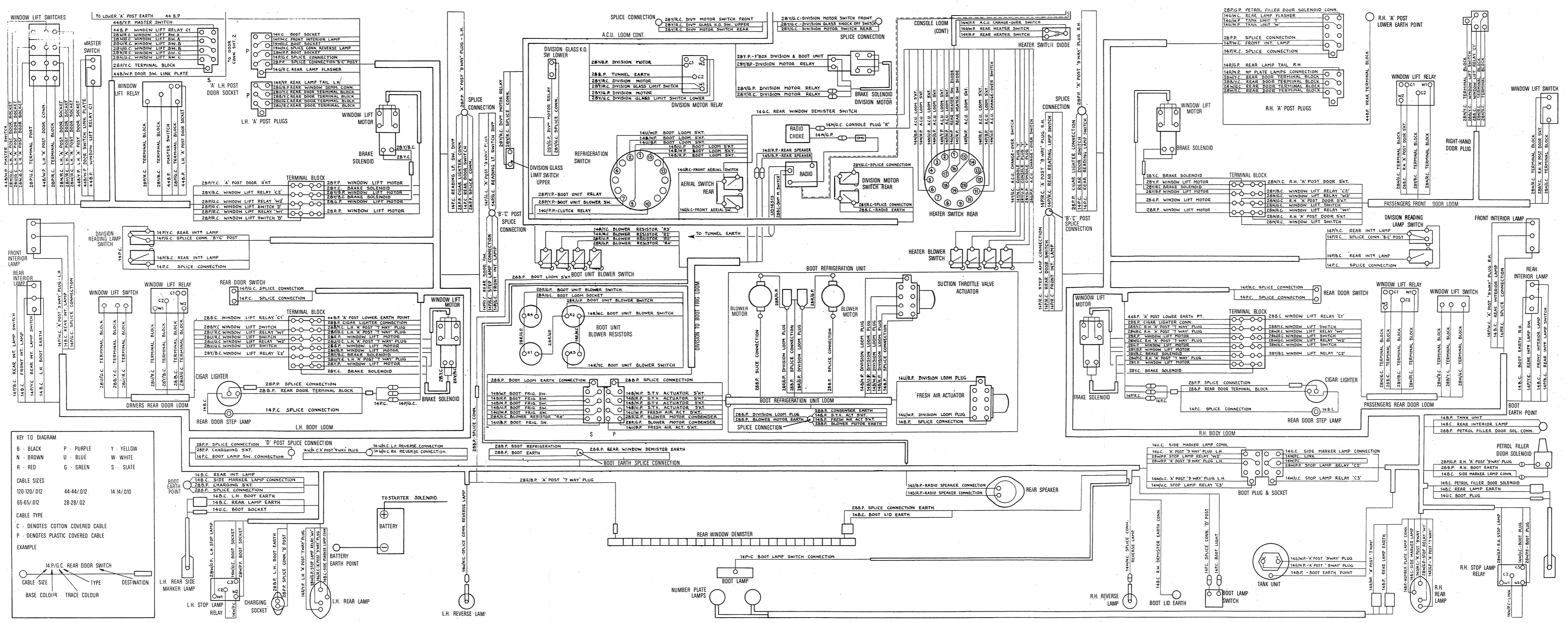
WITH DIVISION

AFTER CAR SERIAL NUMBER LRX 6598

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PRACTICAL WIRING DIAGRAM

SHEET 3

ENGINE LOOMS

ROLLS-ROYCE SILVER SHADOW

AND

BENTLEY T SERIES

LEFT-HAND DRIVE LONG WHEELBASE CARS

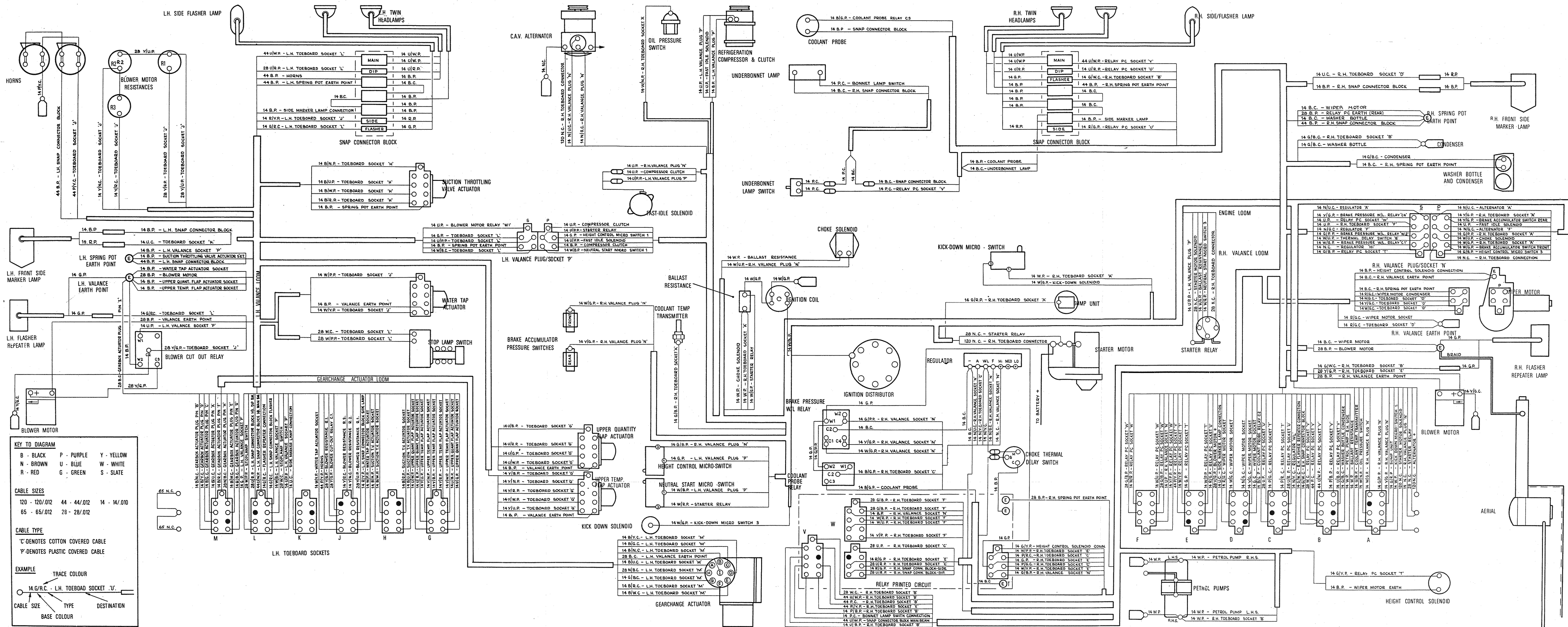
WITH DIVISION

AFTER CAR SERIAL NUMBER LRX 6598

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PRACTICAL WIRING DIAGRAM

SHEET 4

MAIN DISTRIBUTION LOOMS

ROLLS-ROYCE SILVER SHADOW

AND

BENTLEY T SERIES

LEFT-HAND DRIVE LONG WHEELBASE CARS

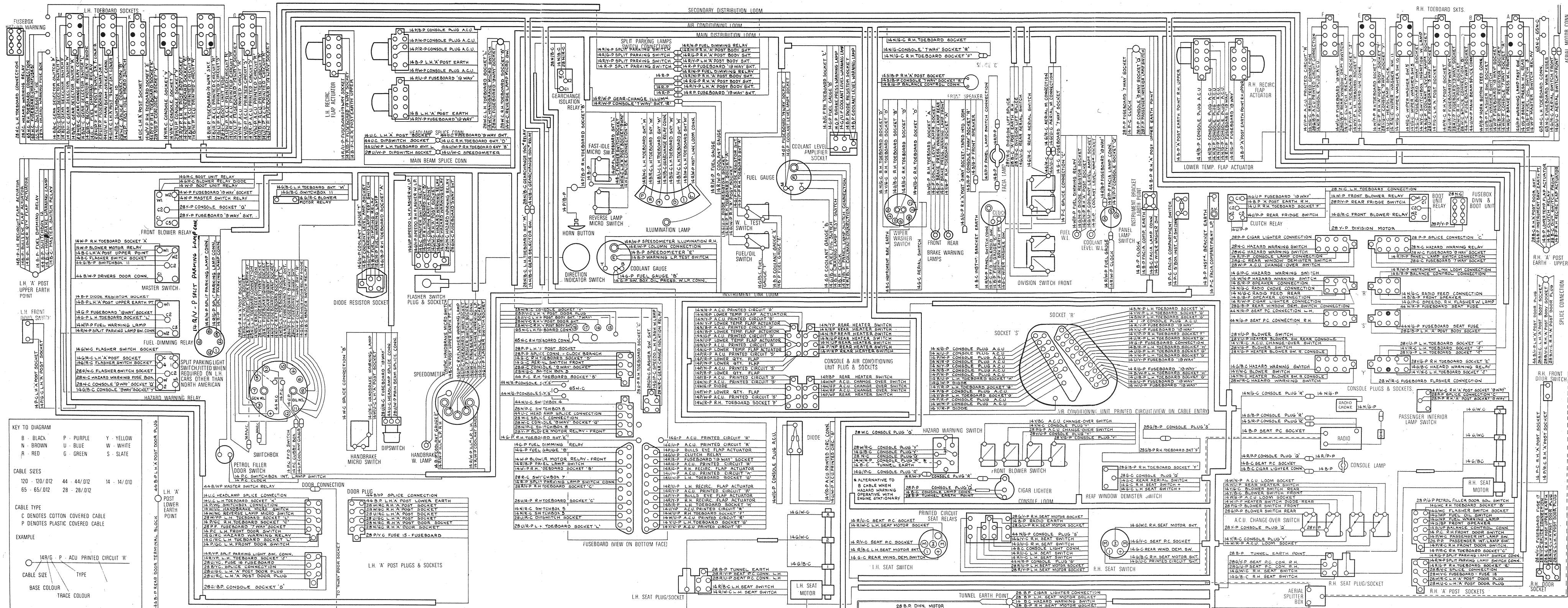
WITH DIVISION

AFTER CAR SERIAL NUMBER LRX 6598

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Section 7

LEFT-HAND DRIVE CARS PRIOR TO SERIAL NUMBER 6000

APPLICATION	SHEET No
Engine and Instruments	1
Electrically Operated Seats	2
Lighting	3
Electrically Operated Windows	4
Starter and Ignition	5
Air Conditioning Unit (A.C.U.)	6
Interior Lighting	7
Gear Range Selector	8
Radio Receiver and Speakers	9
Direction Indicators and Handbrake Warning Lamp	10

PRACTICAL WIRING DIAGRAM

SHEET 1

ENGINE AND INSTRUMENTS

ROLLS-ROYCE SILVER SHADOW AND BENTLEY T SERIES LEFT-HAND DRIVE CARS PRIOR TO CAR SERIAL NUMBER SRX 6000

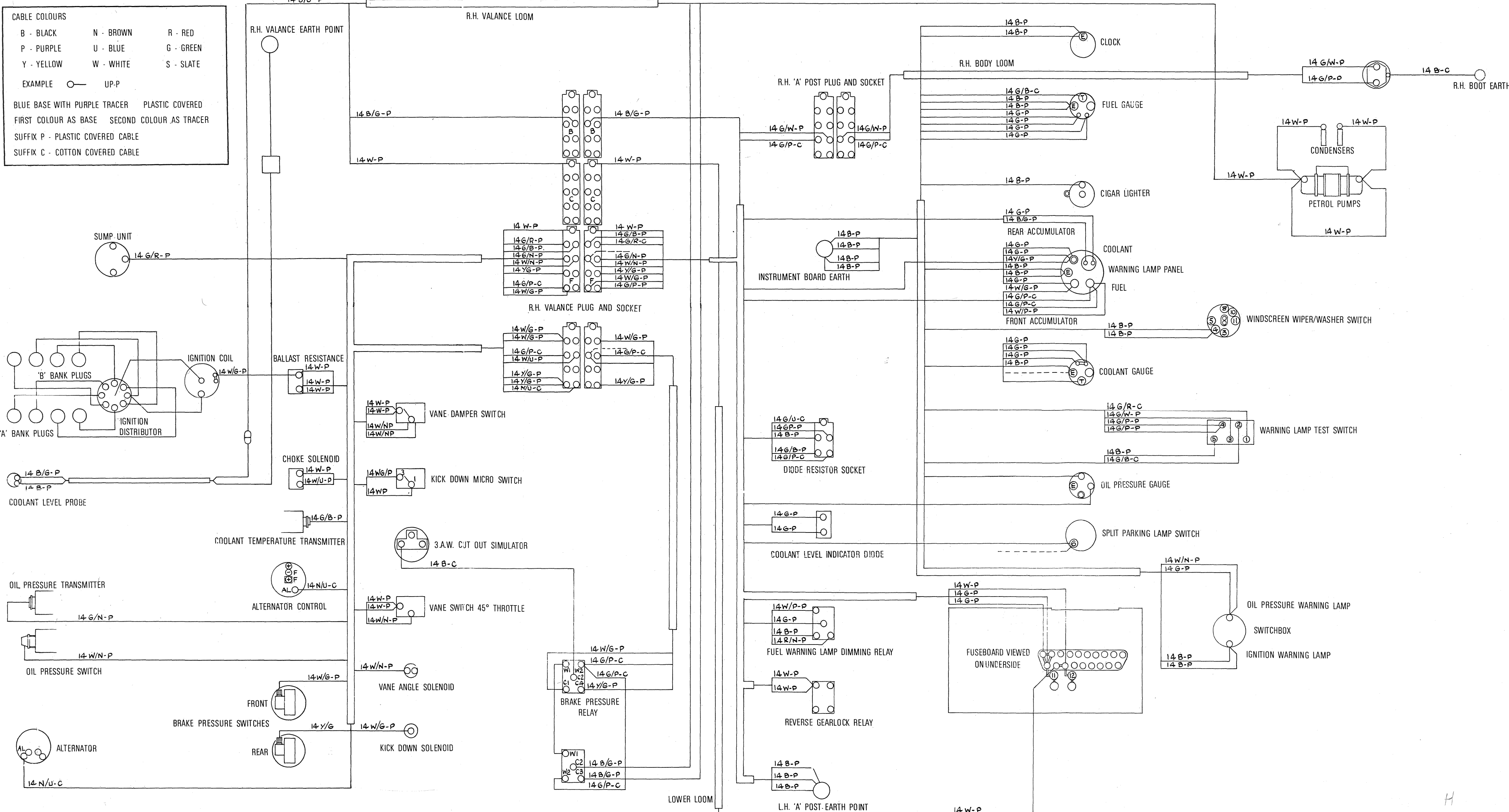
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KEY TO DIAGRAM

CABLE COLOURS		
B - BLACK	N - BROWN	R - RED
P - PURPLE	U - BLUE	G - GREEN
Y - YELLOW	W - WHITE	S - SLATE
EXAMPLE	UP-P	
BLUE BASE WITH PURPLE TRACER	PLASTIC COVERED	
FIRST COLOUR AS BASE	SECOND COLOUR AS TRACER	
SUFFIX P - PLASTIC COVERED CABLE		
SUFFIX C - COTTON COVERED CABLE		



H

PRACTICAL WIRING DIAGRAM

SHEET 2

ELECTRICALLY OPERATED FRONT SEATS

ROLLS-ROYCE SILVER SHADOW

AND

BENTLEY T SERIES

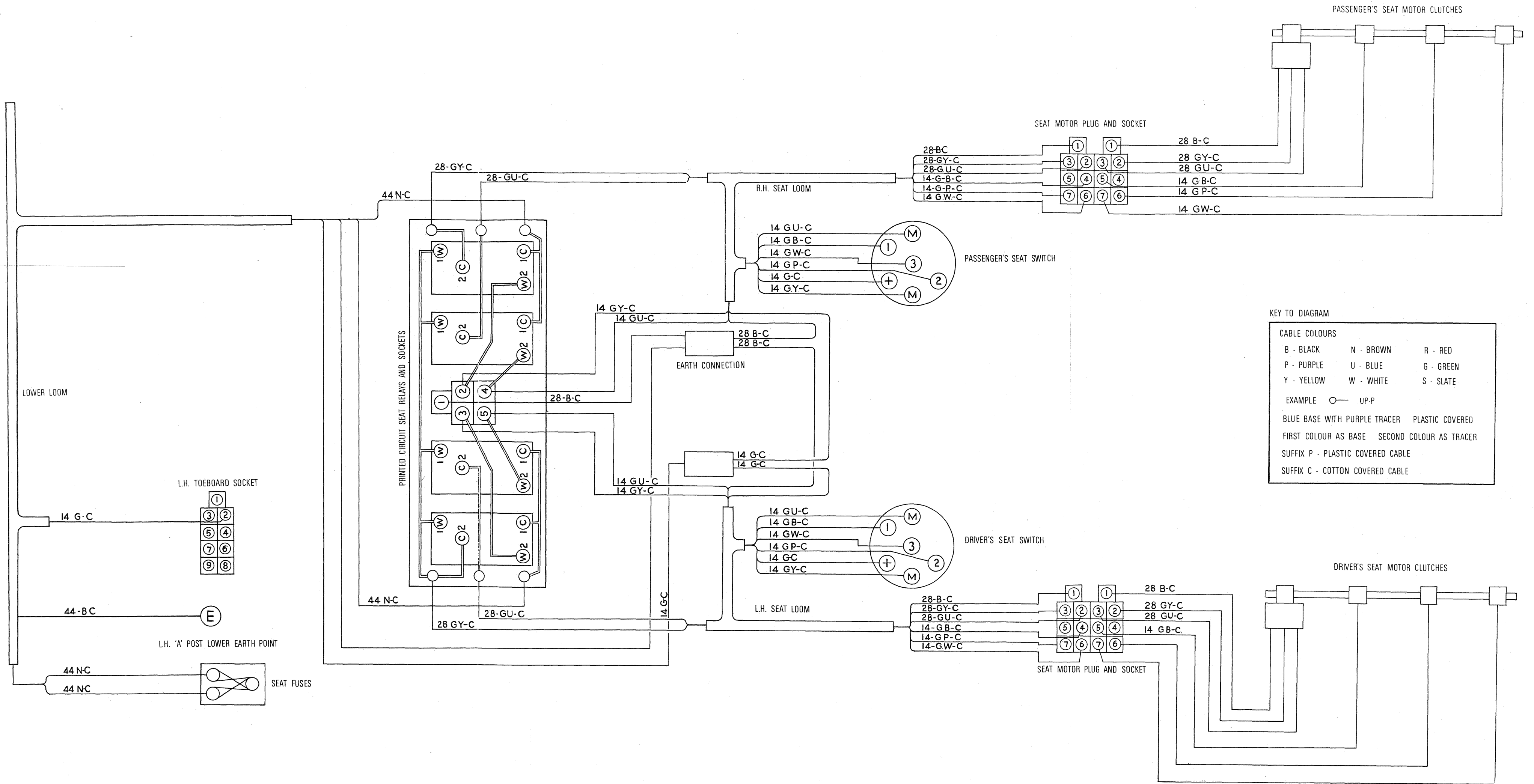
LEFT-HAND DRIVE CARS

PRIOR TO CAR SERIAL NUMBER SRX 6000

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KEY TO DIAGRAM

CABLE COLOURS		
B - BLACK	N - BROWN	R - RED
P - PURPLE	U - BLUE	G - GREEN
Y - YELLOW	W - WHITE	S - SLATE

EXAMPLE UP-P

BLUE BASE WITH PURPLE TRACER PLASTIC COVERED
 FIRST COLOUR AS BASE SECOND COLOUR AS TRACER
 SUFFIX P - PLASTIC COVERED CABLE
 SUFFIX C - COTTON COVERED CABLE

PRACTICAL WIRING DIAGRAM

SHEET 3

LIGHTING

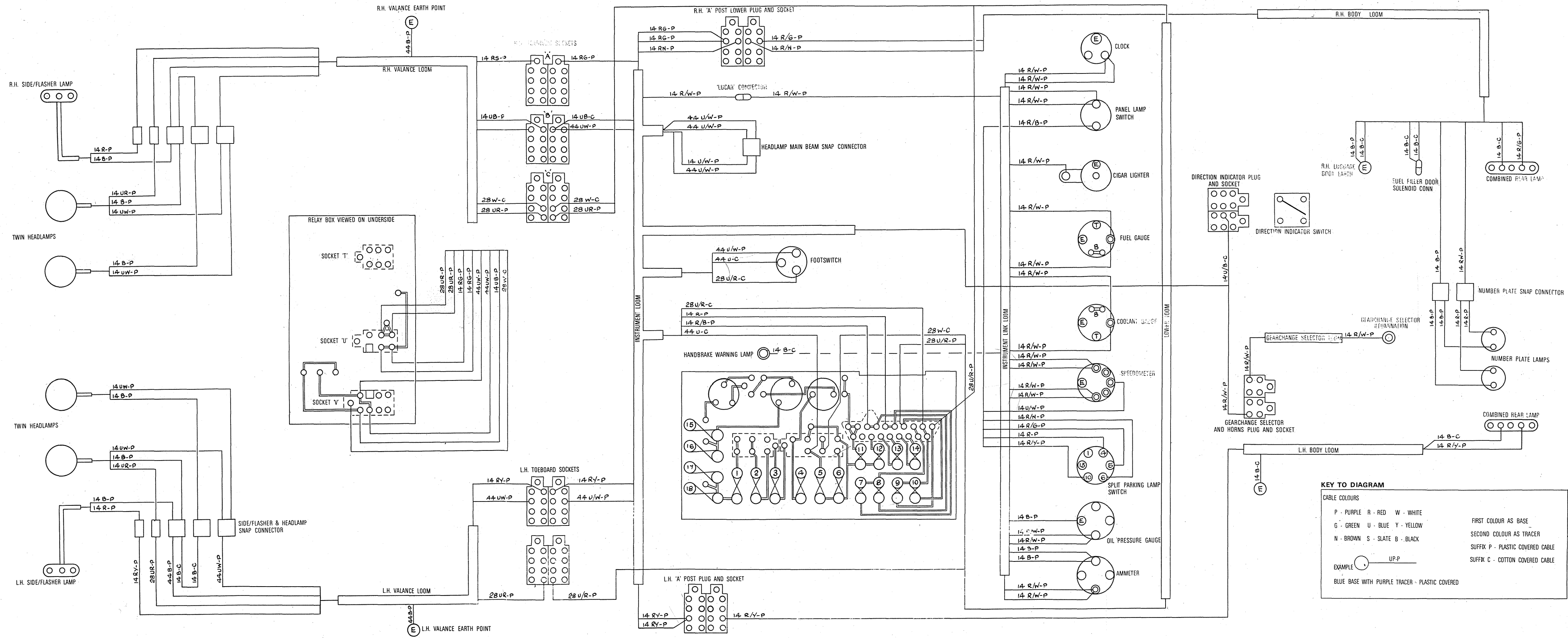
ROLLS-ROYCE SILVER SHADOW AND BENTLEY T SERIES LEFT-HAND DRIVE CARS PRIOR TO CAR SERIAL NUMBER SRX 6000

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KEY TO DIAGRAM

CABLE COLOURS			FIRST COLOUR AS BASE SECOND COLOUR AS TRACER
P - PURPLE	R - RED	W - WHITE	
G - GREEN	U - BLUE	Y - YELLOW	SUFFIX P - PLASTIC COVERED CABLE
N - BROWN	S - SLATE	B - BLACK	SUFFIX C - COTTON COVERED CABLE

EXAMPLE: UP-P
 BLUE BASE WITH PURPLE TRACER - PLASTIC COVERED

PRACTICAL WIRING DIAGRAM

SHEET 4

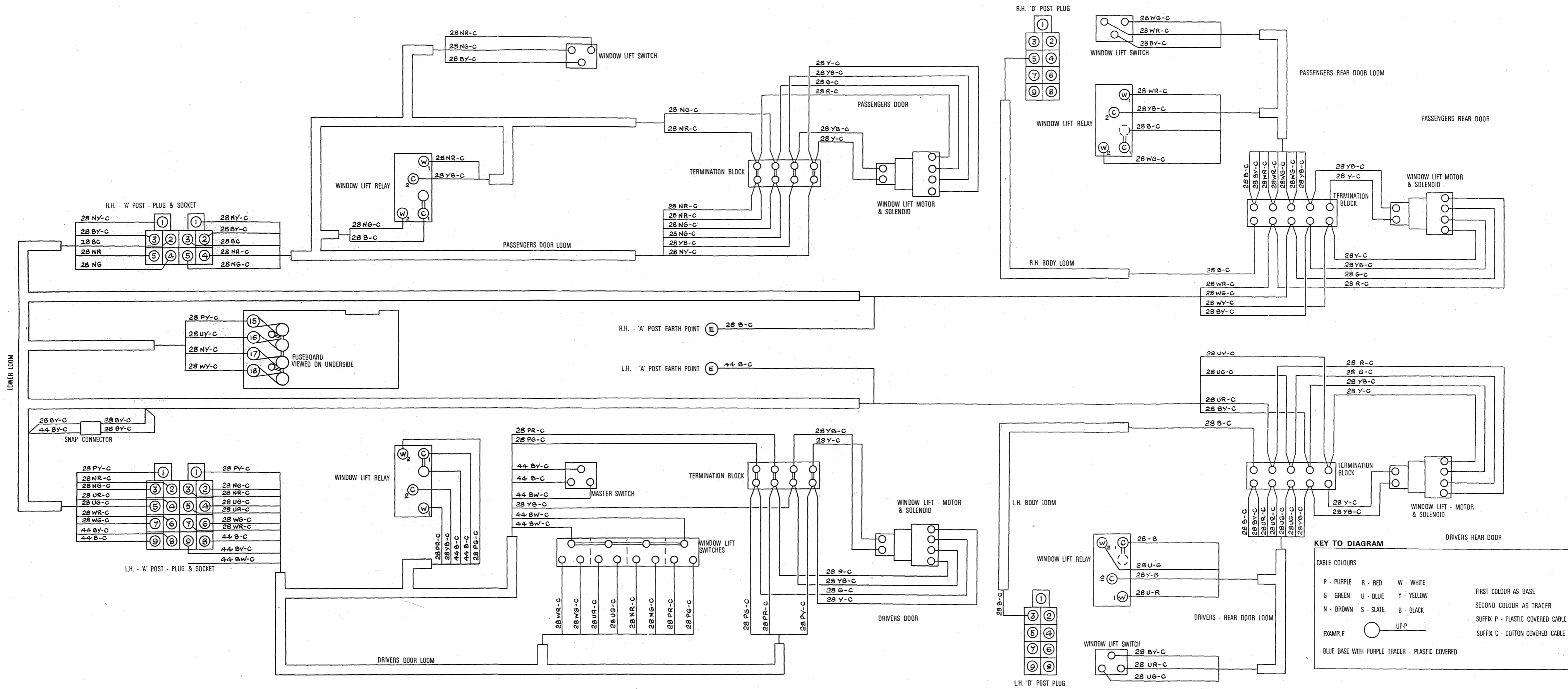
ELECTRICALLY OPERATED WINDOWS

ROLLS-ROYCE SILVER SHADOW
AND
BENTLEY T SERIES
LEFT-HAND DRIVE CARS
PRIOR TO CAR SERIAL NUMBER SRX 6000

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KEY TO DIAGRAM

CABLE COLOURS			FIRST COLOUR AS BASE SECOND COLOUR AS TRACER SUFFIX P - PLASTIC COVERED CABLE SUFFIX C - COTTON COVERED CABLE
P - PURPLE	R - RED	W - WHITE	
G - GREEN	U - BLUE	Y - YELLOW	
N - BROWN	S - SLATE	B - BLACK	

EXAMPLE UP-P
BLUE BASE WITH PURPLE TRACER - PLASTIC COVERED

PRACTICAL WIRING DIAGRAM

SHEET 5

STARTER & IGNITION

ROLLS-ROYCE SILVER SHADOW
AND
BENTLEY T SERIES
LEFT-HAND DRIVE CARS
PRIOR TO CAR SERIAL NUMBER SRX 6000

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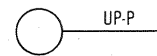
(E) 28 B-C
R.H. VALANCE EARTH POINT

(E) 14 B-P
L.H. VALANCE EARTH POINT

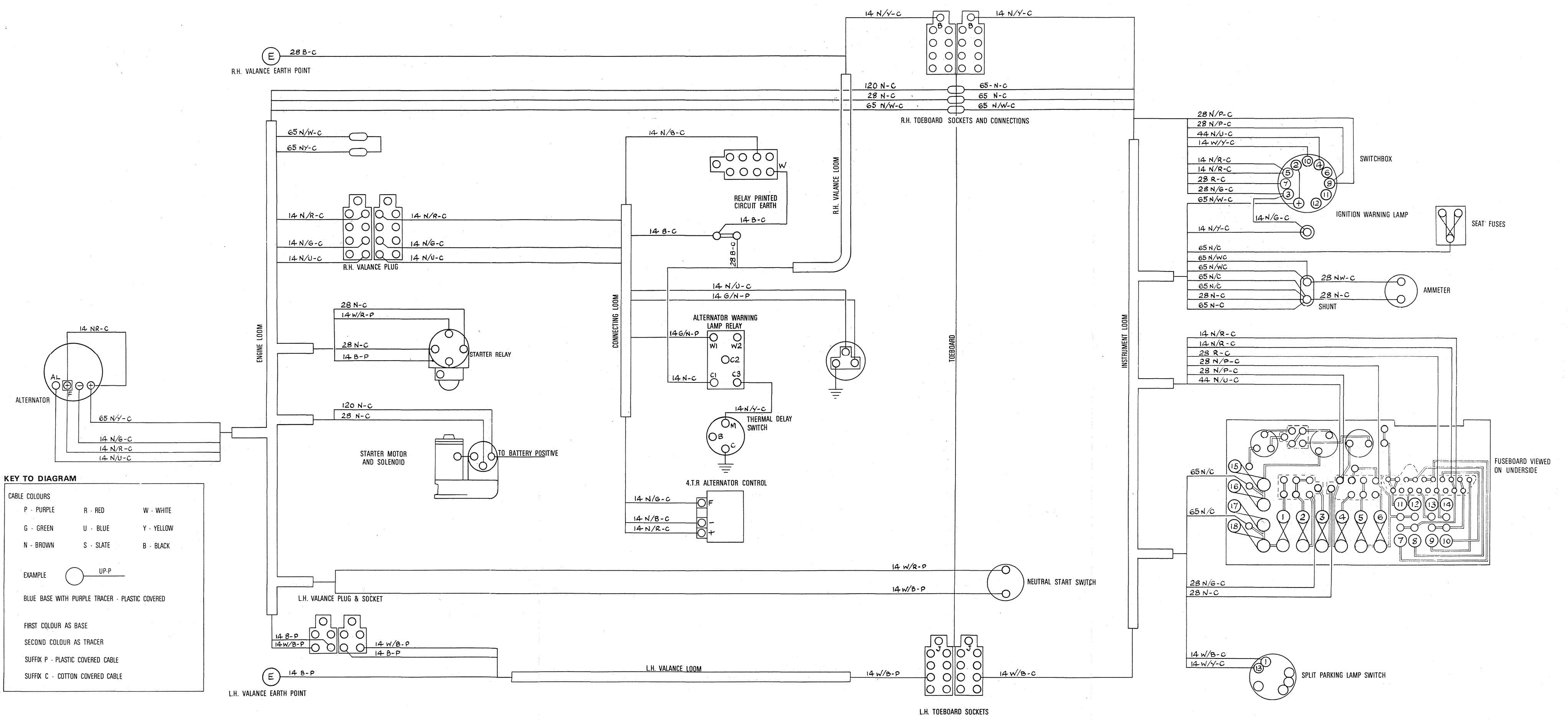
KEY TO DIAGRAM

CABLE COLOURS

P - PURPLE	R - RED	W - WHITE
G - GREEN	U - BLUE	Y - YELLOW
N - BROWN	S - SLATE	B - BLACK

EXAMPLE  UP-P
BLUE BASE WITH PURPLE TRACER - PLASTIC COVERED

FIRST COLOUR AS BASE
SECOND COLOUR AS TRACER
SUFFIX P - PLASTIC COVERED CABLE
SUFFIX C - COTTON COVERED CABLE



L.H. TOEBOARD SOCKETS

FUSEBOARD VIEWED ON UNDERSIDE

PRACTICAL WIRING DIAGRAM

SHEET 6

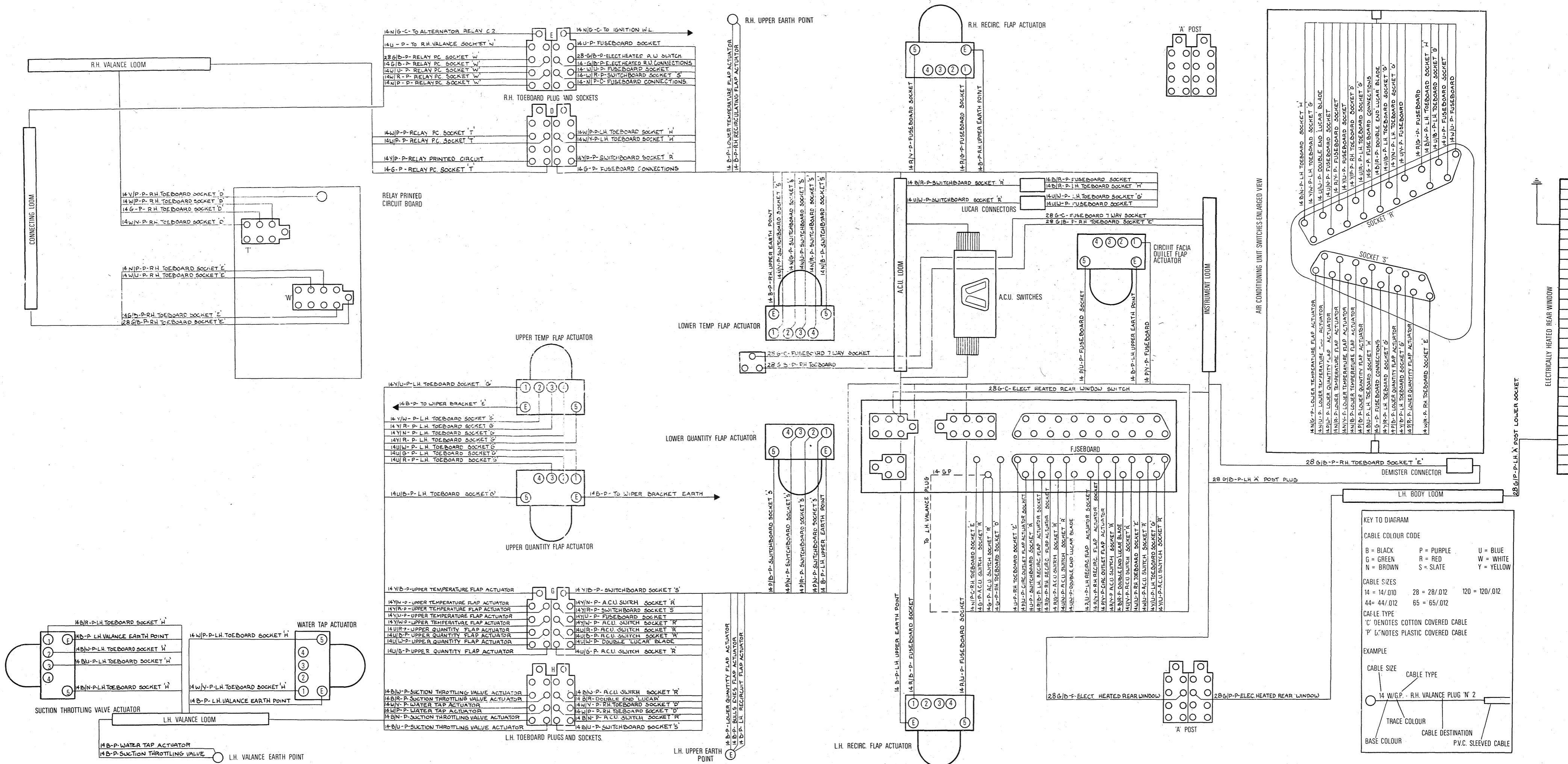
AIR CONDITIONING UNIT

ROLLS-ROYCE SILVER SHADOW
AND
BENTLEY T SERIES
LEFT-HAND DRIVE CARS
PRIOR TO CAR SERIAL NUMBER SRX 6000

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KEY TO DIAGRAM

CABLE COLOUR CODE

B = BLACK	P = PURPLE	U = BLUE
G = GREEN	R = RED	W = WHITE
N = BROWN	S = SLATE	Y = YELLOW

CABLE SIZES

14 = 14/010	28 = 28/012	120 = 120/012
44 = 44/012	65 = 65/012	

CABLE TYPE

'C' DENOTES COTTON COVERED CABLE
'P' G' NOTES PLASTIC COVERED CABLE

EXAMPLE

CABLE SIZE: 14 W/G.P. - R.H. VALANCE PLUG 'N' 2
 CABLE TYPE: [Symbol]
 TRACE COLOUR: [Symbol]
 CABLE DESTINATION: [Symbol]
 BASE COLOUR: [Symbol]
 CABLE DESTINATION: [Symbol]
 P.V.C. SLEEVED CABLE: [Symbol]

PRACTICAL WIRING DIAGRAM

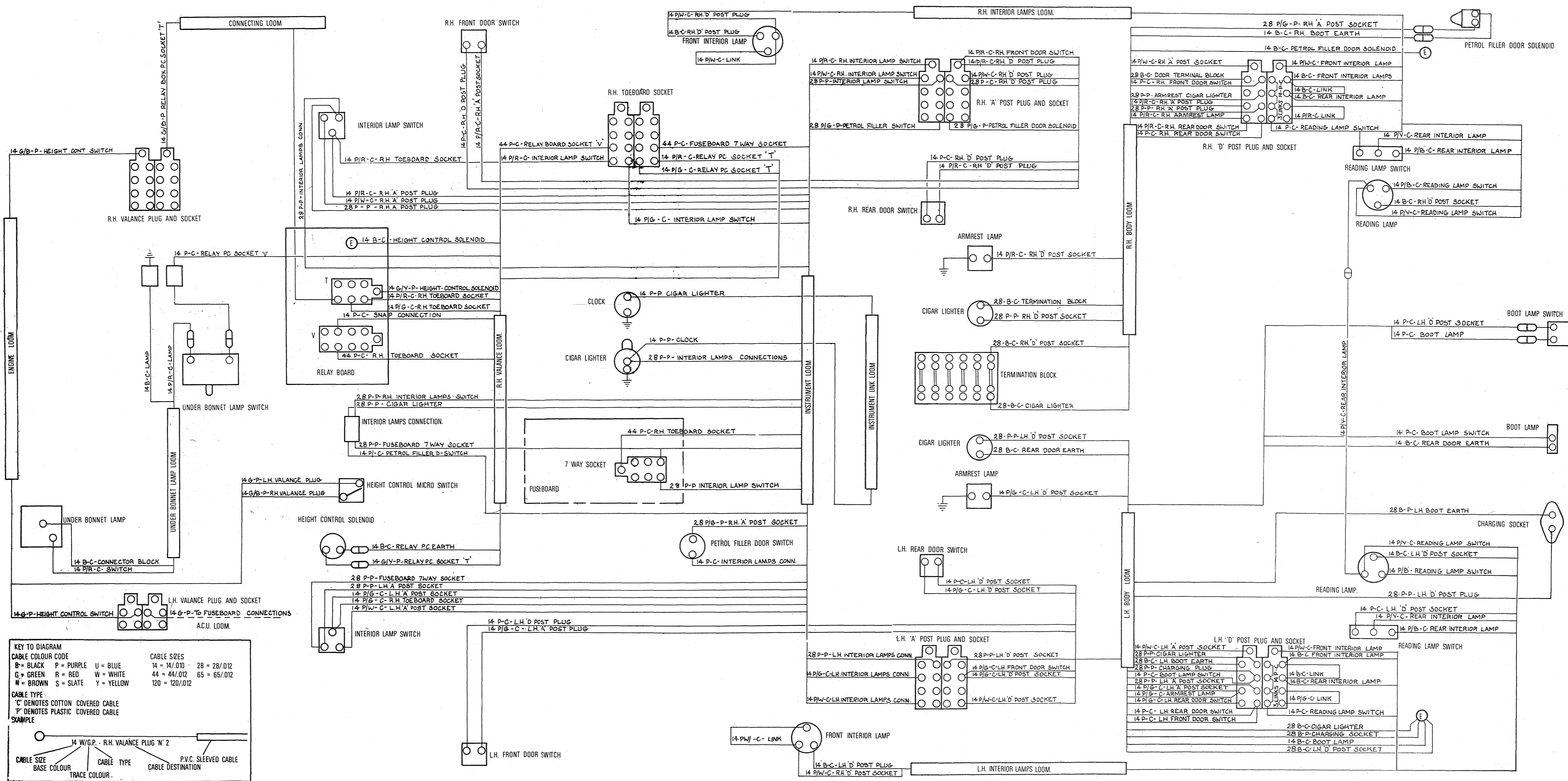
SHEET 7
INTERIOR LIGHTING

ROLLS-ROYCE SILVER SHADOW
AND
BENTLEY T SERIES
LEFT-HAND DRIVE CARS
PRIOR TO CAR SERIAL NUMBER SRX 6000

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KEY TO DIAGRAM

CABLE COLOUR CODE			CABLE SIZES		
B = BLACK	P = PURPLE	U = BLUE	14 = 14/010	28 = 28/012	
G = GREEN	R = RED	W = WHITE	44 = 44/012	65 = 65/012	
N = BROWN	S = SLATE	Y = YELLOW	120 = 120/012		

CABLE TYPE
 'C' DENOTES COTTON COVERED CABLE
 'P' DENOTES PLASTIC COVERED CABLE

EXAMPLE

CABLE SIZE: 14 W/G.P.
 BASE COLOUR: W
 TRACE COLOUR: G
 CABLE TYPE: P
 CABLE DESTINATION: R.H. VALANCE PLUG 'N' 2
 P.V.C. SLEEVED CABLE

PRACTICAL WIRING DIAGRAM

SHEET 8

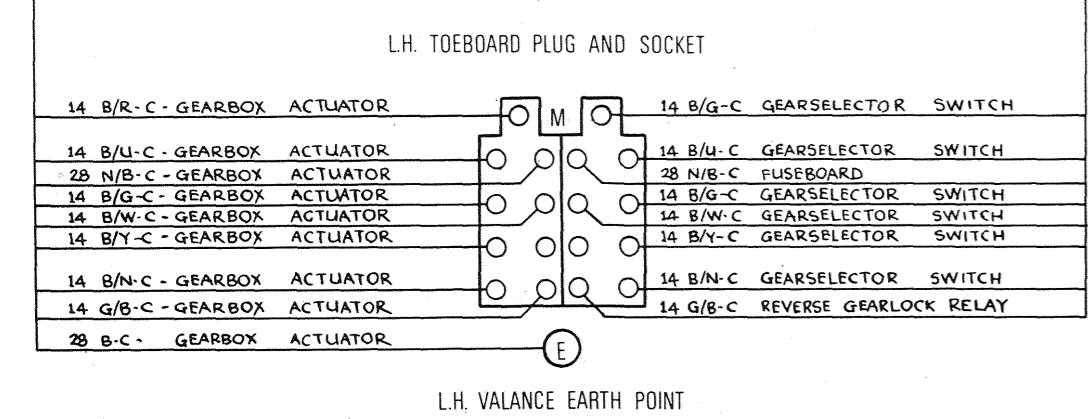
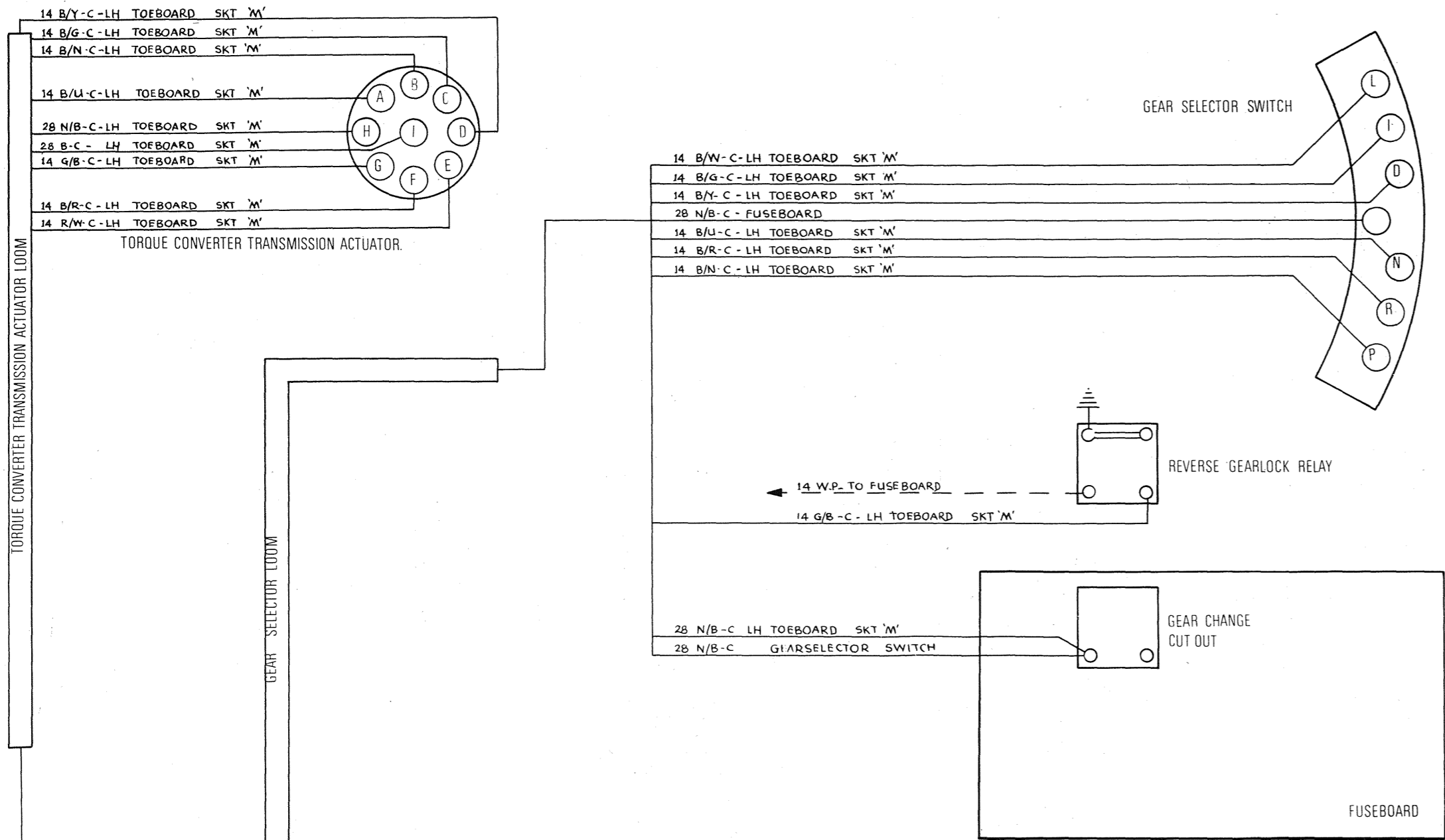
GEAR RANGE SELECTOR

ROLLS-ROYCE SILVER SHADOW
AND
BENTLEY T SERIES
LEFT-HAND DRIVE CARS
PRIOR TO CAR SERIAL NUMBER SRX 6000

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KEY TO DIAGRAM

CABLE COLOUR CODE

B = BLACK	P = PURPLE	U = BLUE
G = GREEN	R = RED	W = WHITE
N = BROWN	S = SLATE	Y = YELLOW

CABLE SIZE

14 = 14/.010	28 = 28/.012	120 = 120/.012
44 = 44/.012	65 = 65/.012	

CABLE TYPE

'C' DENOTES COTTON COVERED CABLE
'P' DENOTES PLASTIC COVERED CABLE

EXAMPLE

PRACTICAL WIRING DIAGRAM

SHEET 9

RADIO RECEIVER AND SPEAKERS

ROLLS-ROYCE SILVER SHADOW AND BENTLEY T SERIES LEFT-HAND DRIVE CARS PRIOR TO CAR SERIAL NUMBER SRX 6000

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PRACTICAL WIRING DIAGRAM

SHEET 10

DIRECTION INDICATORS & HAND BRAKE WARNING LAMP

ROLLS-ROYCE SILVER SHADOW

AND

BENTLEY T SERIES

LEFT-HAND DRIVE CARS

PRIOR TO CAR SERIAL NUMBER SRX 6000

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KEY TO DIAGRAM

CABLE COLOUR CODE

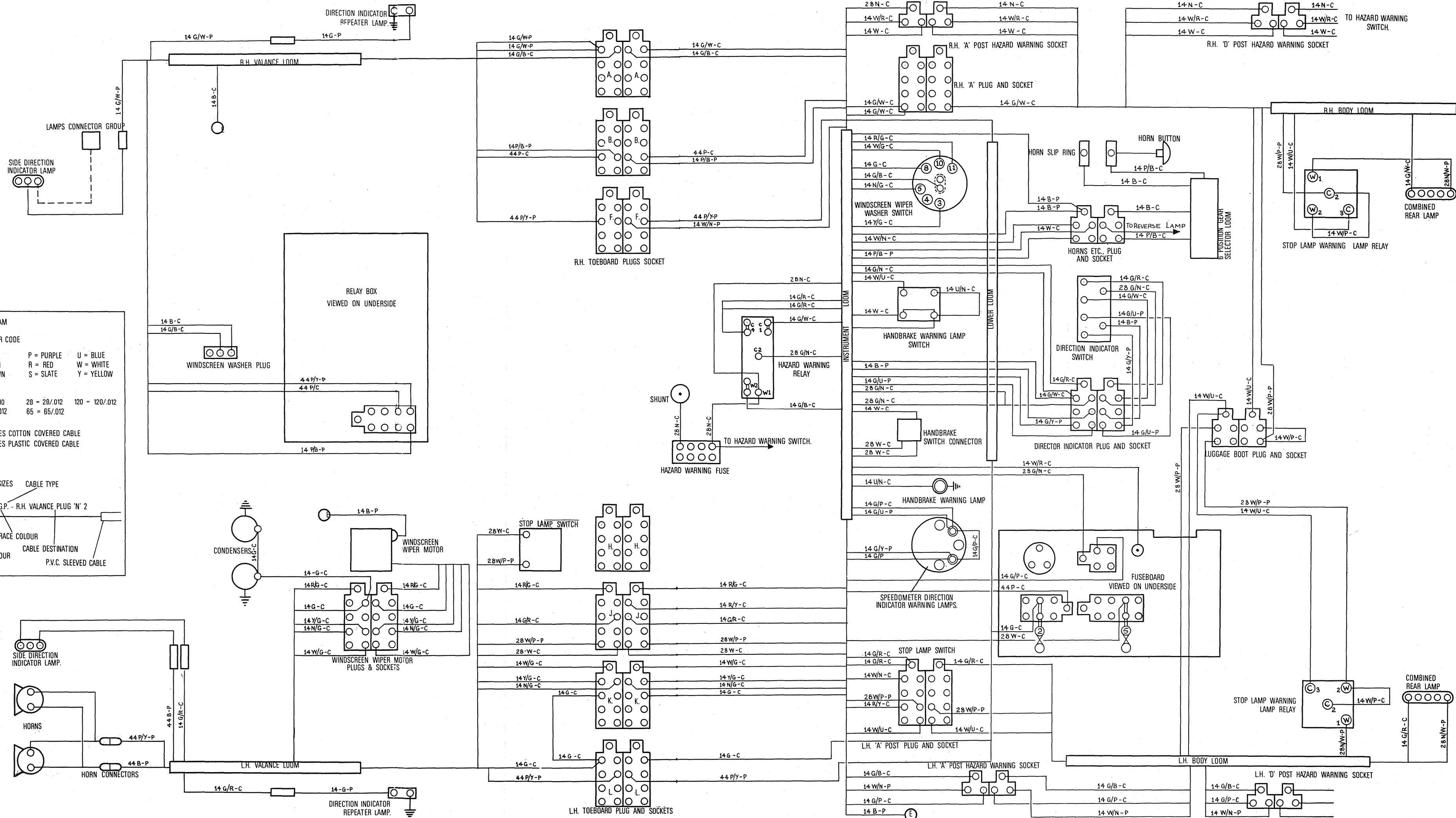
B = BLACK	P = PURPLE	U = BLUE
G = GREEN	R = RED	W = WHITE
N = BROWN	S = SLATE	Y = YELLOW

CABLE SIZE

14 = 14/010	28 = 28/012	120 = 120/012
44 = 44/012	65 = 65/012	

'C' DENOTES COTTON COVERED CABLE
'P' DENOTES PLASTIC COVERED CABLE

EXAMPLE



Section 8

RIGHT-HAND DRIVE LONG WHEELBASE CARS WITH DIVISION, FROM SERIAL NUMBER 6598

APPLICATION	SHEET No
Engines Looms, L.H. and R.H. Valance Looms and Gearchange Actuator Loom	1
L.H. and R.H. Body Looms, Door Looms and Refrigeration Looms	2
Main Distribution Loom, Air Conditioning Loom, Secondary Distribution Loom, Console Loom and Instrument Loom	3

PRACTICAL WIRING DIAGRAM

SHEET 1

ENGINE LOOM , L.H. & R.H. VALANCE LOOMS AND GEARCHANGE

ACTUATOR LOOM

ROLLS-ROYCE SILVER SHADOW

AND

BENTLEY T SERIES

RIGHT-HAND DRIVE LONG WHEELBASE CARS

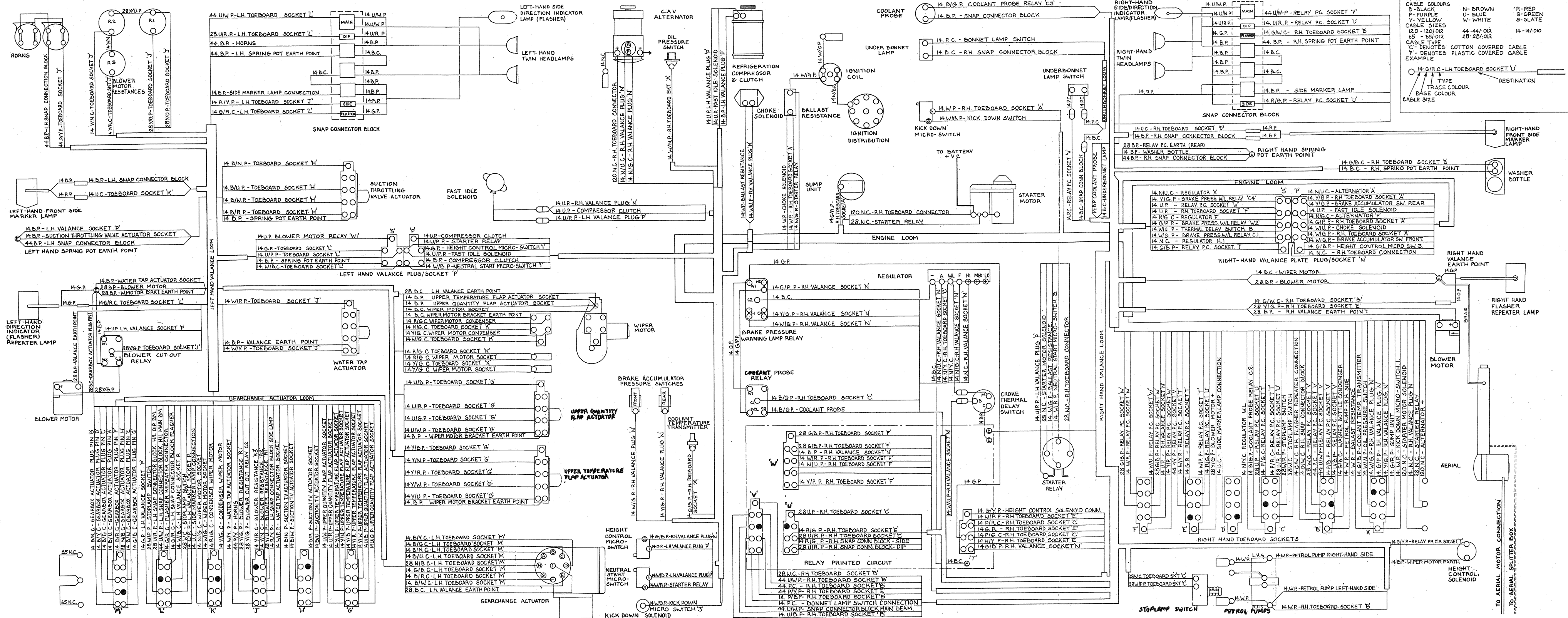
WITH DIVISION

AFTER CAR SERIAL NUMBER 6598

T.S.D. Publications 2664

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KEY TO DIAGRAM

CABLE COLOURS

B - BLACK	N - BROWN	R - RED
P - PURPLE	U - BLUE	S - GREEN
Y - YELLOW	W - WHITE	S - SLATE

CABLE SIZES

2.0 - 12.0/0.2	44 - 44/0.2	14 - 14/0.10
4.5 - 15.0/0.2	28 - 28/0.2	

CABLE TYPE

C - DENOTES COTTON COVERED CABLE
 V - DENOTES PLASTIC COVERED CABLE

EXAMPLE

14 G/P - LH TOEBOARD SOCKET 'U'
 TYPE: ————
 TRACE COLOUR: ————
 BASE COLOUR: ————
 CABLE SIZE: ————
 DESTINATION: ————

PRACTICAL WIRING DIAGRAM

SHEET 2

L.H. & R.H. BODY LOOMS, DOOR LOOMS, DIVISION TO BOOT
REFRIGERATION UNIT AND BOOT REFRIGERATION UNIT

ROLLS-ROYCE SILVER SHADOW

AND

BENTLEY T SERIES

RIGHT-HAND DRIVE LONG WHEELBASE CARS

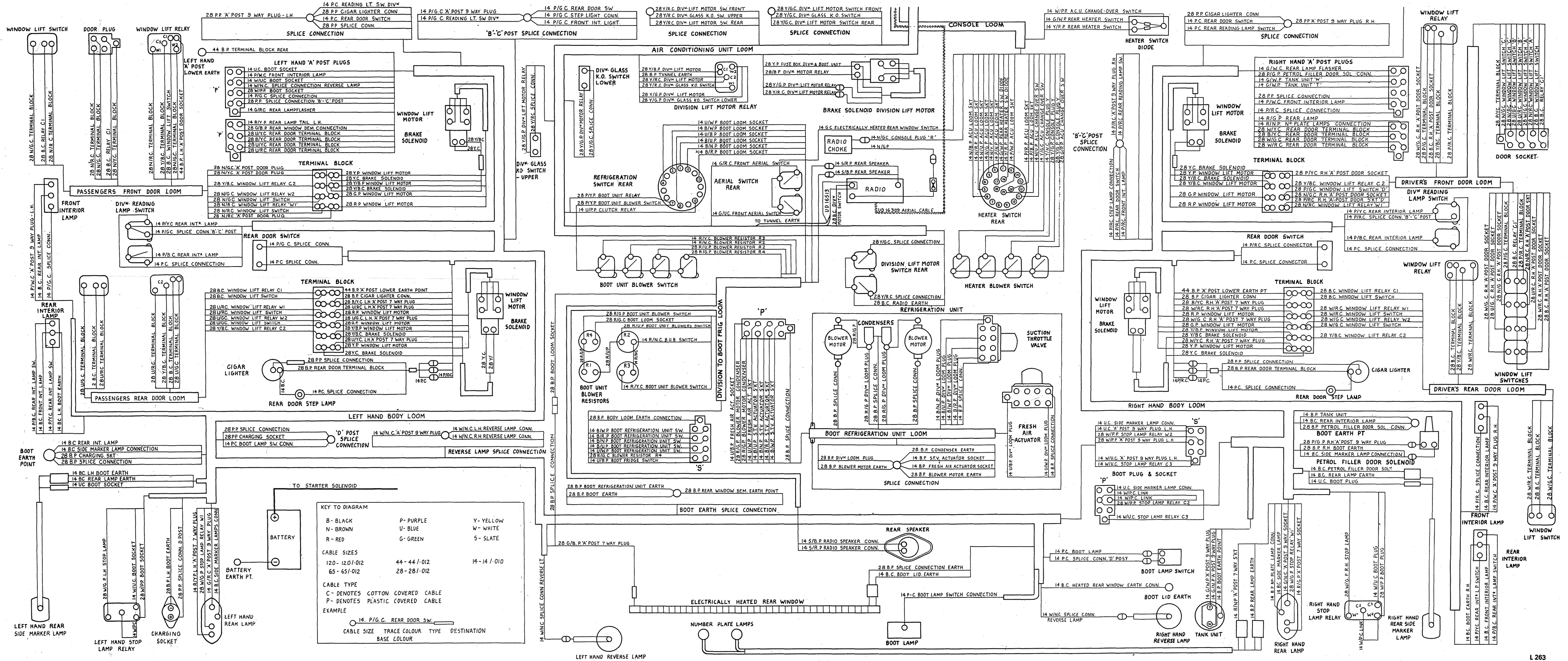
WITH DIVISION

AFTER CAR SERIAL NUMBER 6598

T.S.D. Publications 2664

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PRACTICAL WIRING DIAGRAM

SHEET 3

MAIN DISTRIBUTION LOOM, AIR CONDITIONING LOOM, SECONDARY
DISTRIBUTION LOOM, CONSOLE LOOM AND INSTRUMENT LOOM

ROLLS-ROYCE SILVER SHADOW

AND

BENTLEY T SERIES

RIGHT-HAND DRIVE LONG WHEELBASE CARS

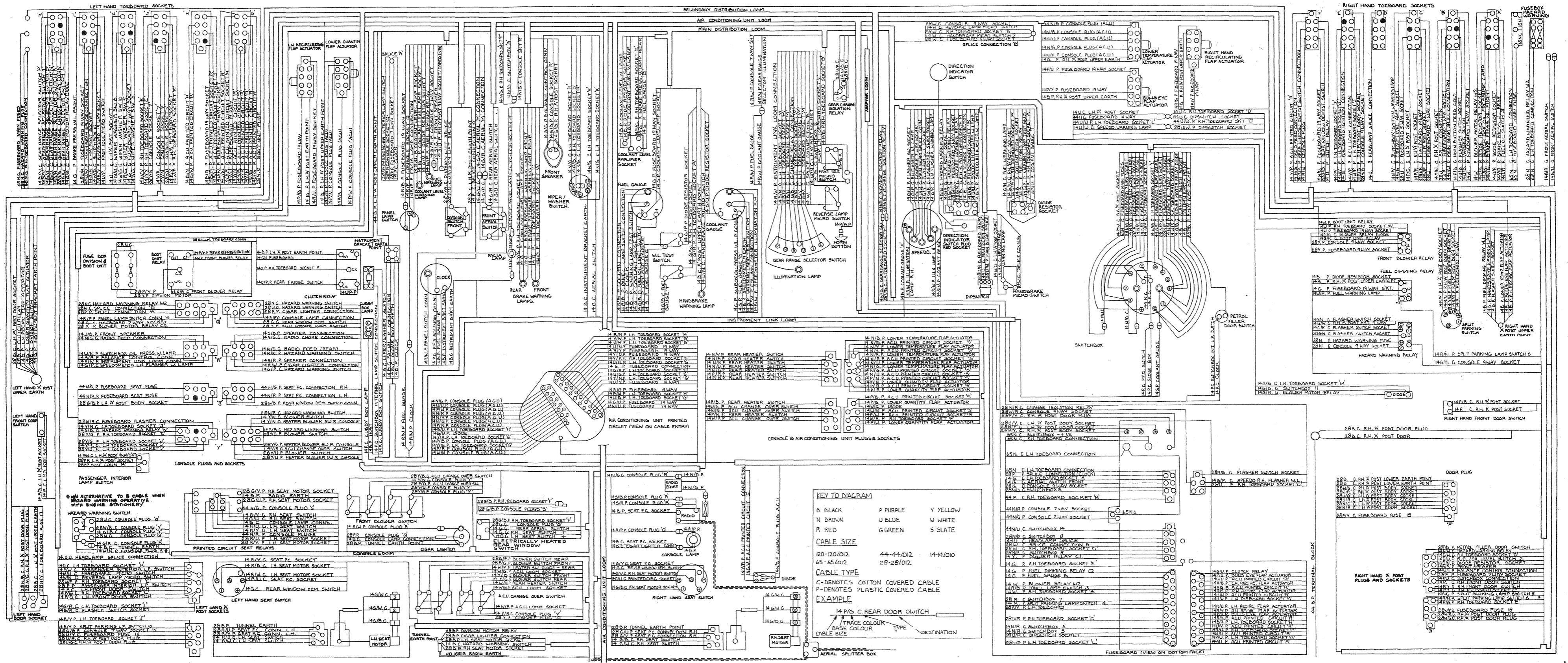
WITH DIVISION

AFTER CAR SERIAL NUMBER 6598

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contents of this publication without prior notice.



KEY TO DIAGRAM

B BLACK	P PURPLE	Y YELLOW
N BROWN	U BLUE	W WHITE
R RED	G GREEN	S SLATE

CABLE SIZE

120-120/012	44-44/012	14-14/010
65-65/012	28-28/012	

CABLE TYPE

C-DENOTES COTTON COVERED CABLE
P-DENOTES PLASTIC COVERED CABLE

EXAMPLE

14/P/G.C. REAR DOOR SWITCH
TRACE COLOUR TYPE DESTINATION
CABLE SIZE

Section 9

RIGHT-HAND DRIVE CARS FROM SERIAL NUMBER 9000

APPLICATION	SHEET No.
Engine Compartment Looms	1
Interior Looms	2
Left-hand and Right-hand Body Looms, Console and Door Looms	3
Fuseboard and Sockets	4

Printed in England

April 1971

T.S.D. 2476

PRACTICAL WIRING DIAGRAMS

Sheet 1
Engine Compartment Looms

for
Rolls-Royce Silver Shadow
and
Bentley T Series

**RIGHT-HAND DRIVE CARS FROM
SERIAL NUMBER 9000**

T. S. D. Publications 2723

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KEY TO DIAGRAM

CABLE COLOURS

B - BLACK	R - RED	P - PURPLE
S - SLATE	Y - YELLOW	M - BROWN
G - GREEN	U - BLUE	W - WHITE

CABLE SIZES

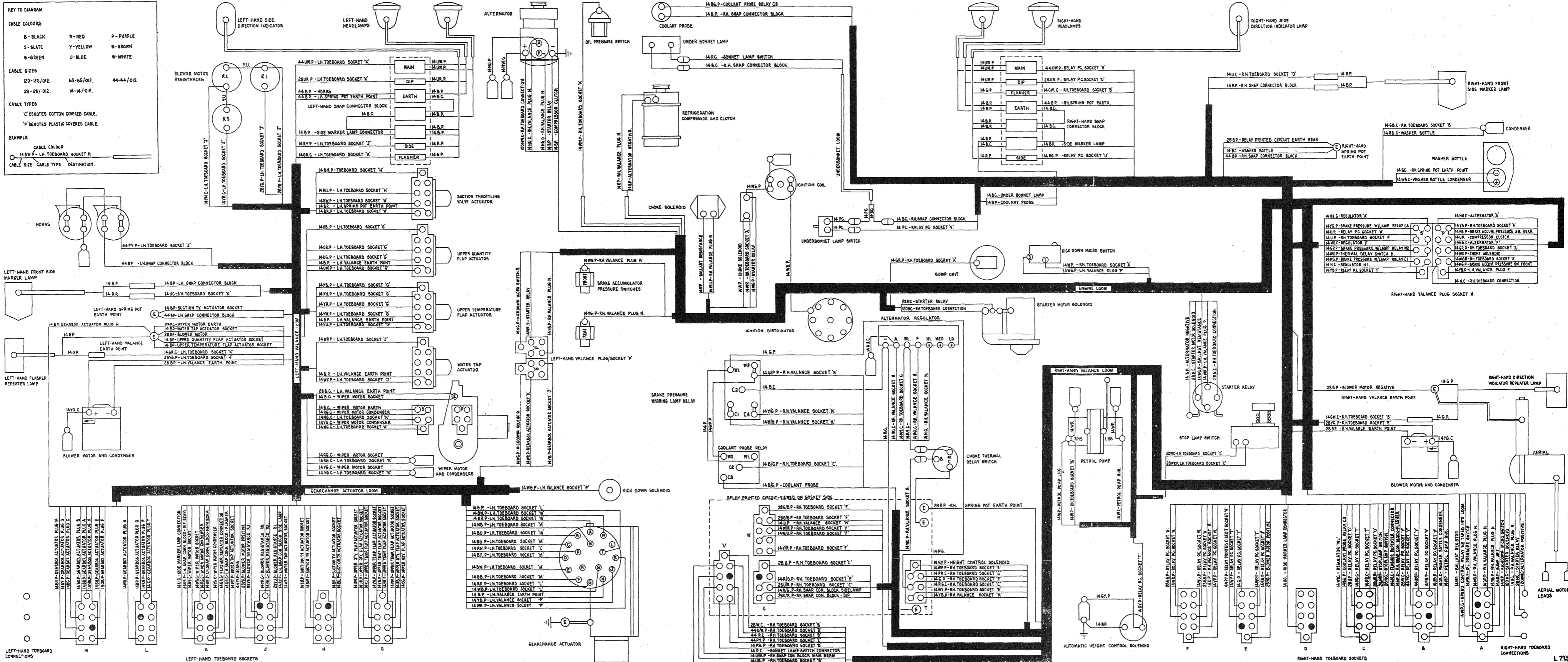
120-120/OI2.	65-65/OI2.	44-44/OI2
28-28/OI2.	14-14/OI2.	

CABLE TYPES

'C' DENOTES COTTON COVERED CABLE.
'P' DENOTES PLASTIC COVERED CABLE.

EXAMPLE

CABLE COLOUR: 14BP
CABLE SIZE: 14BP
CABLE TYPE: LH TOEBOARD SOCKET M
DESTINATION: LH TOEBOARD SOCKET M



PRACTICAL WIRING DIAGRAMS

Sheet 2
Interior Looms

for
Rolls-Royce Silver Shadow
and
Bentley T Series

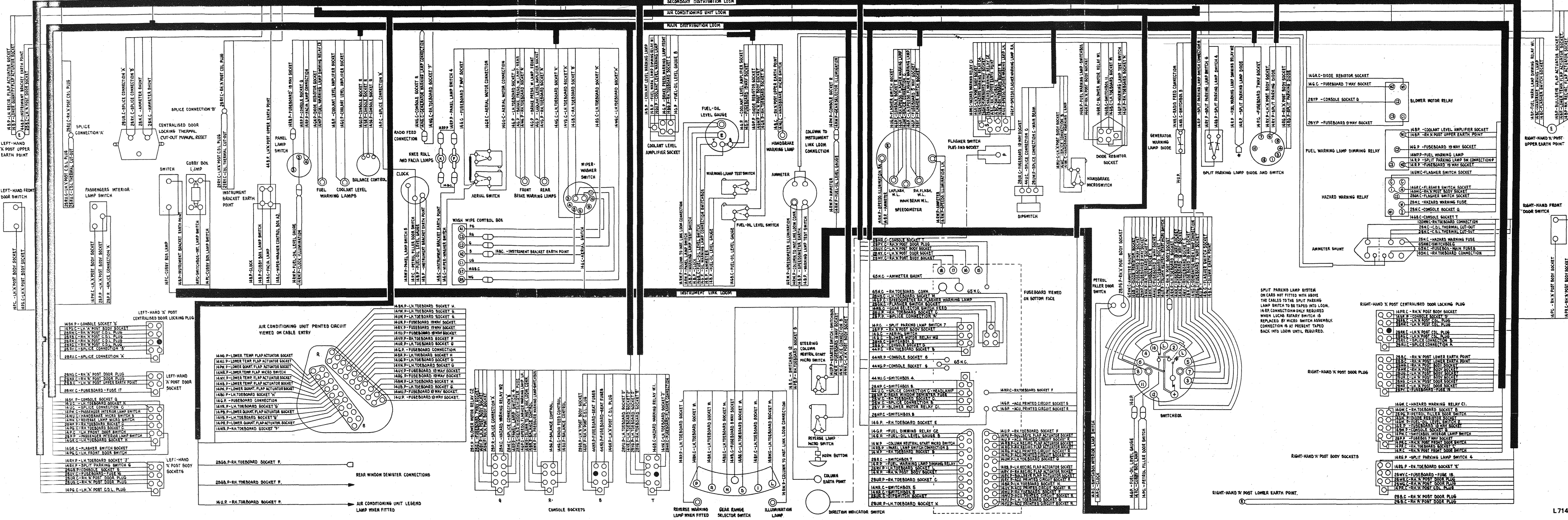
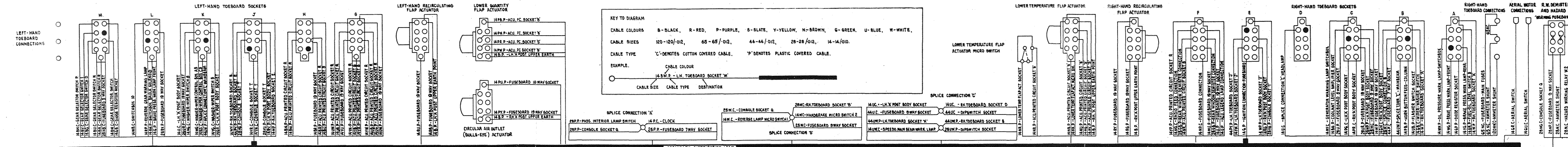
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PRACTICAL WIRING DIAGRAMS

Sheet 3
Left-hand and Right-hand Body Looms
Console and Door Looms

for
Rolls-Royce Silver Shadow
and
Bentley T Series

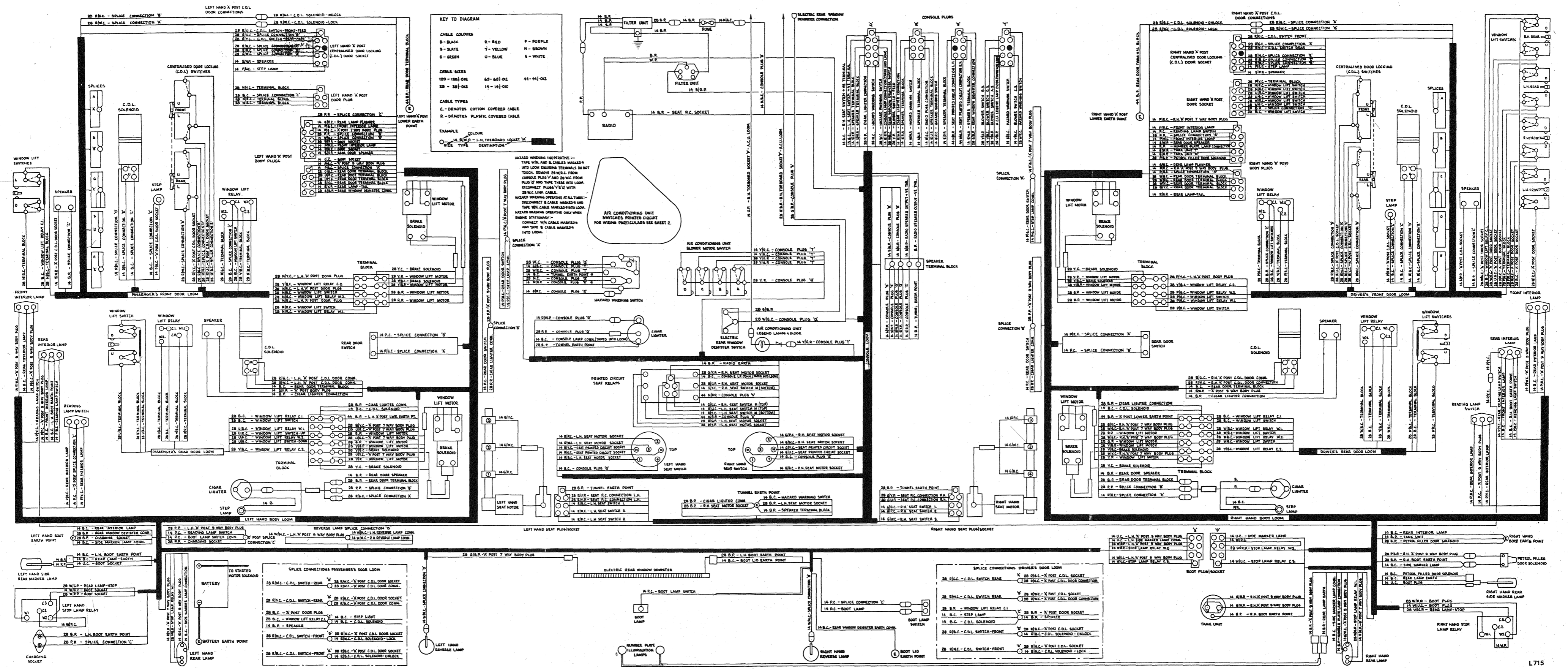
RIGHT-HAND DRIVE CARS FROM
SERIAL NUMBER 9000

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PRACTICAL WIRING DIAGRAMS

Sheet 4
Fuseboard and Sockets

for
Rolls-Royce Silver Shadow
and
Bentley T Series

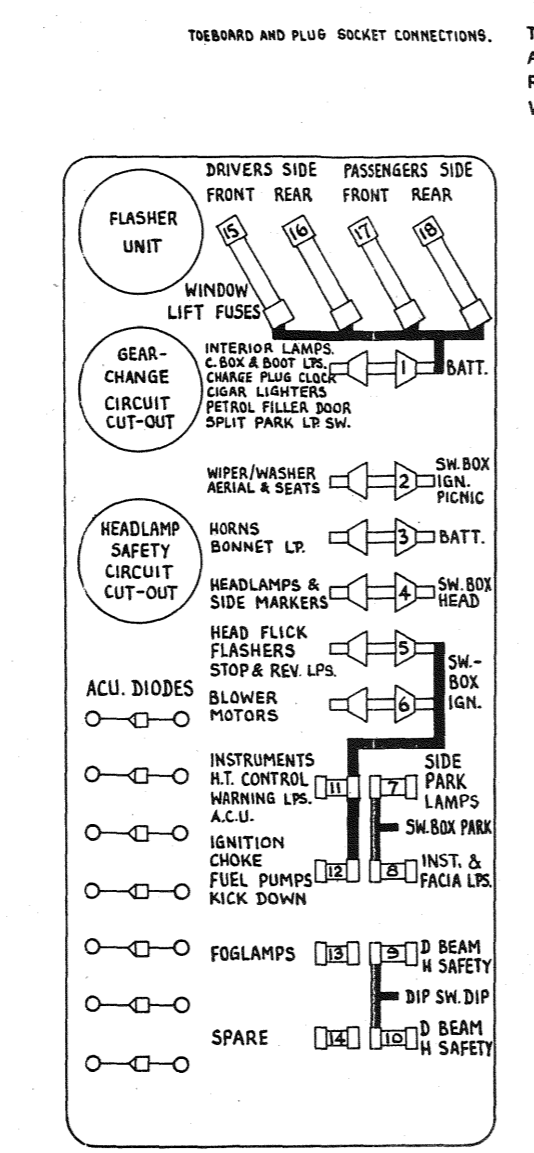
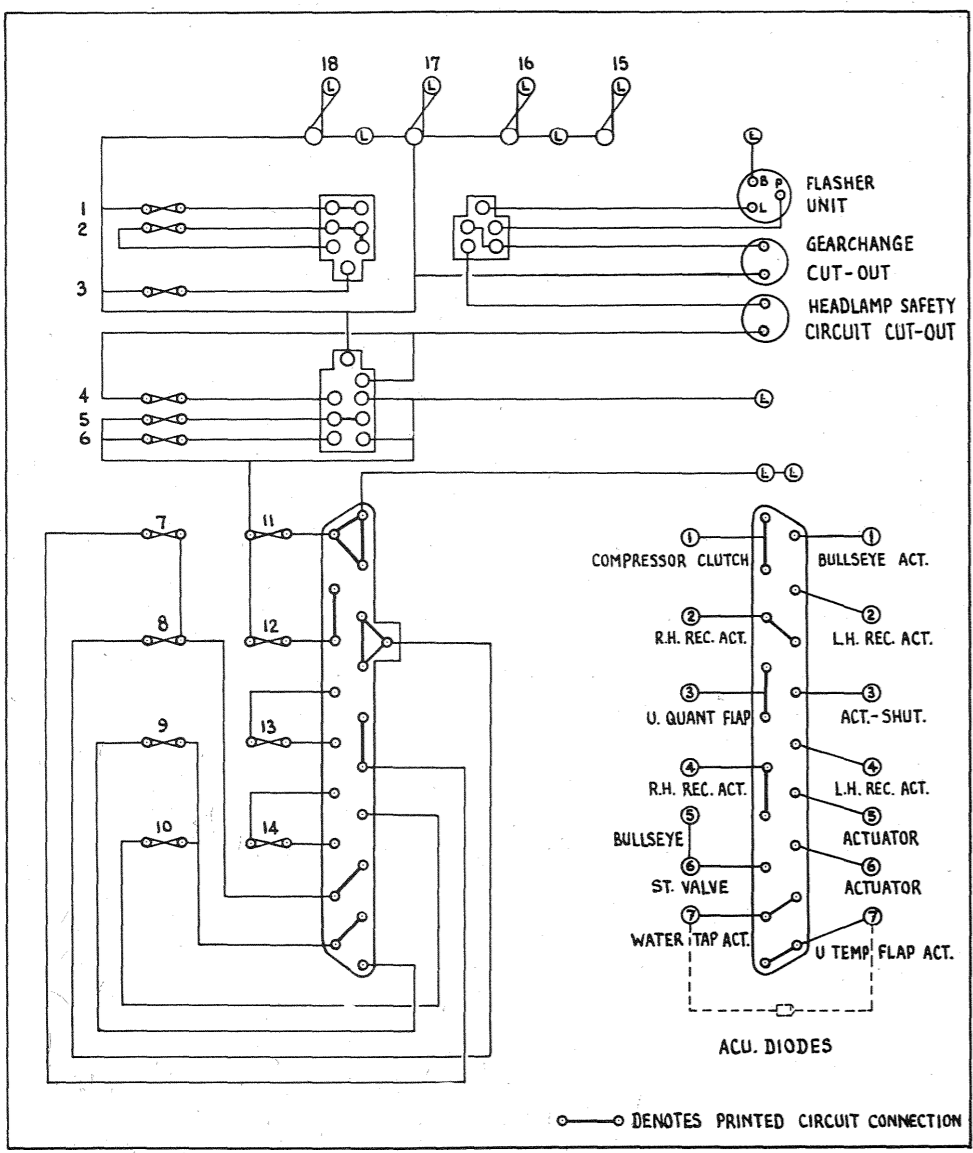
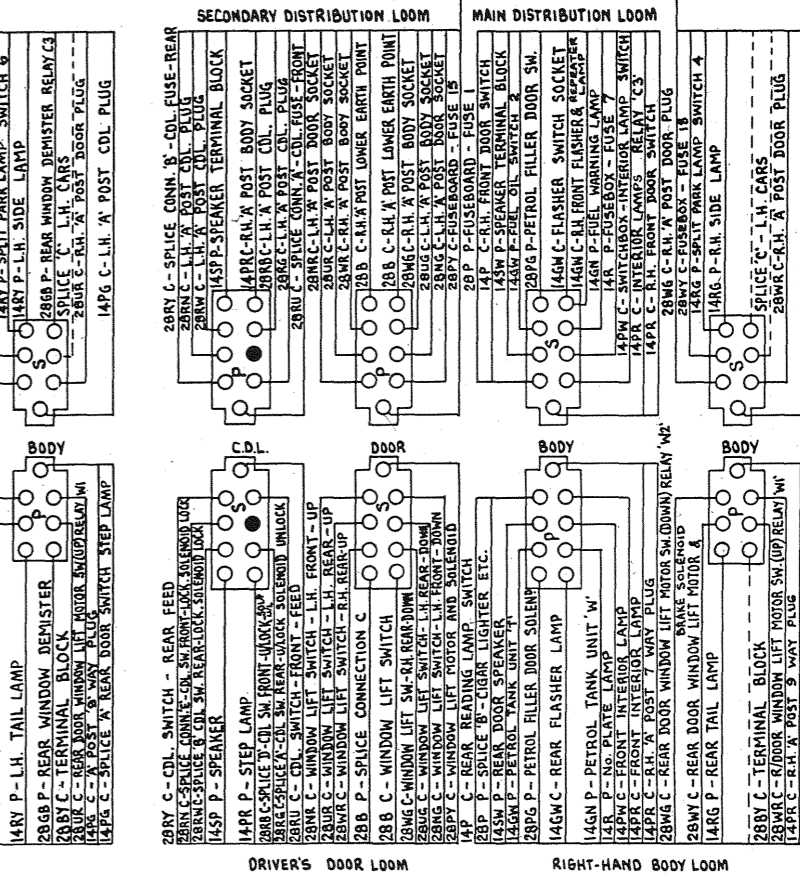
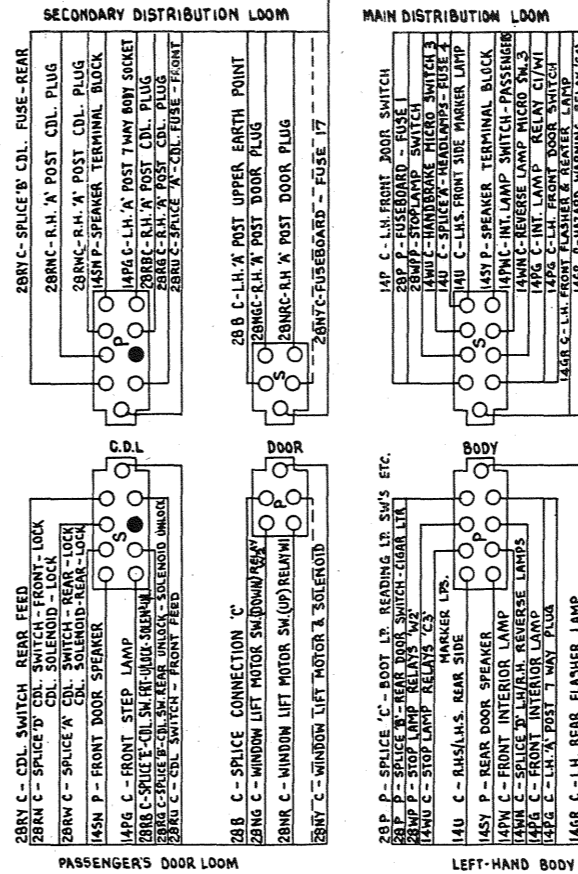
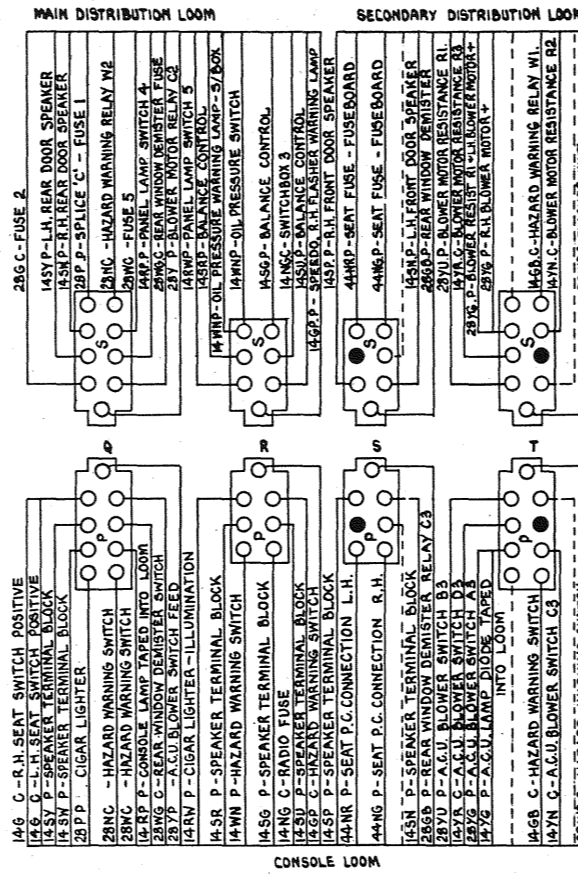
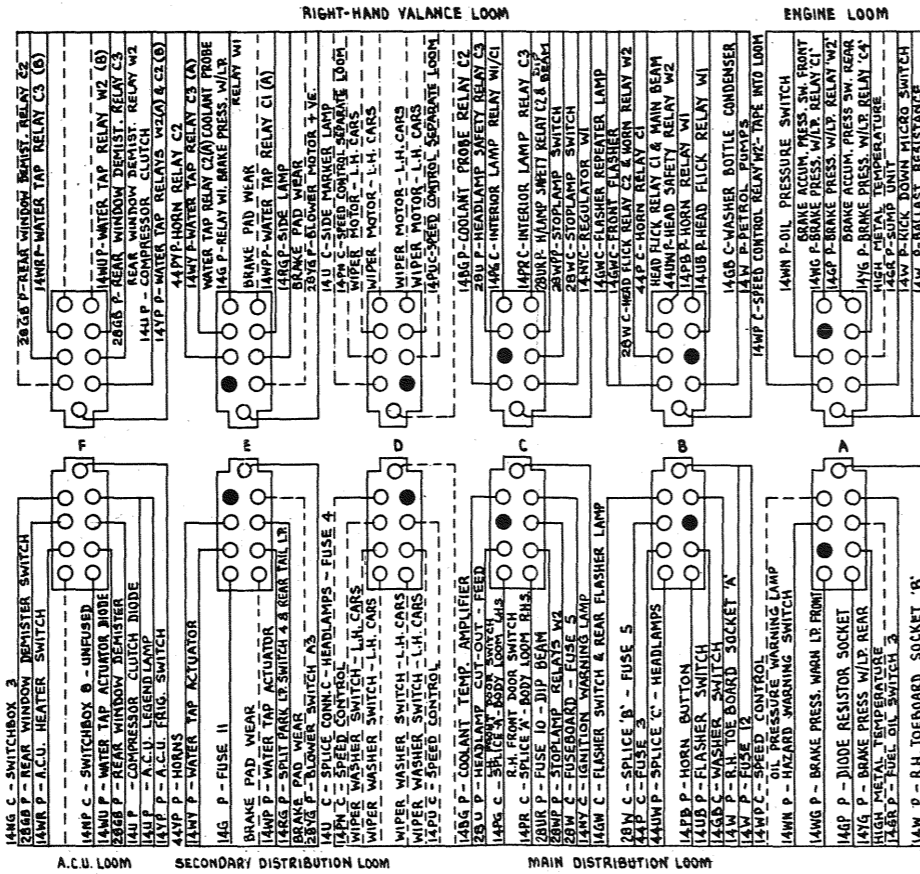
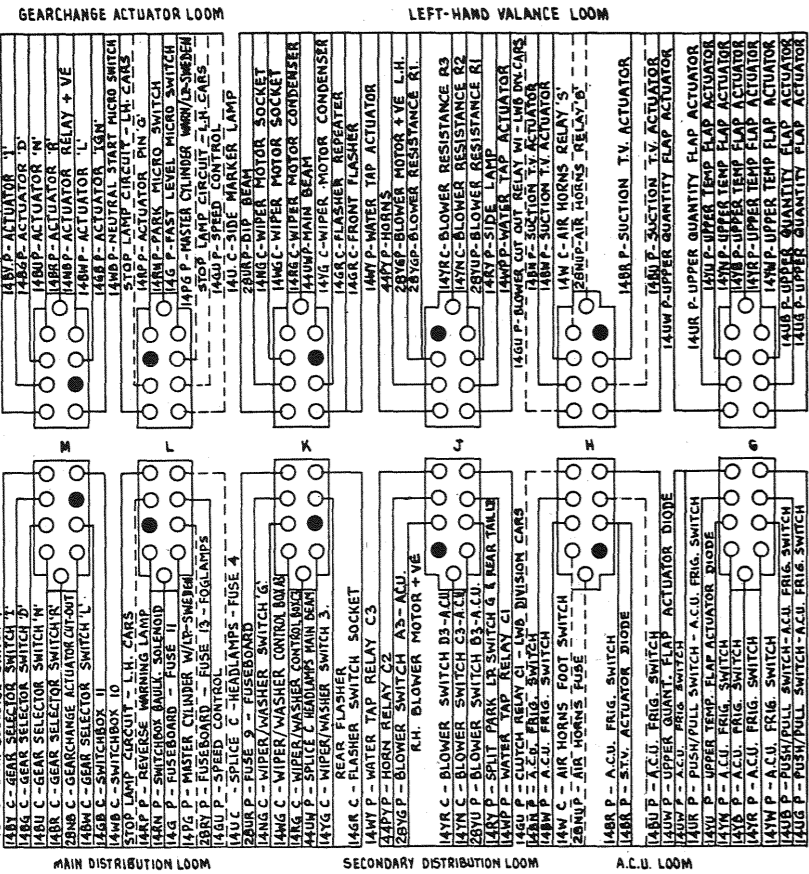
**RIGHT-HAND DRIVE CARS FROM
SERIAL NUMBER 9000**

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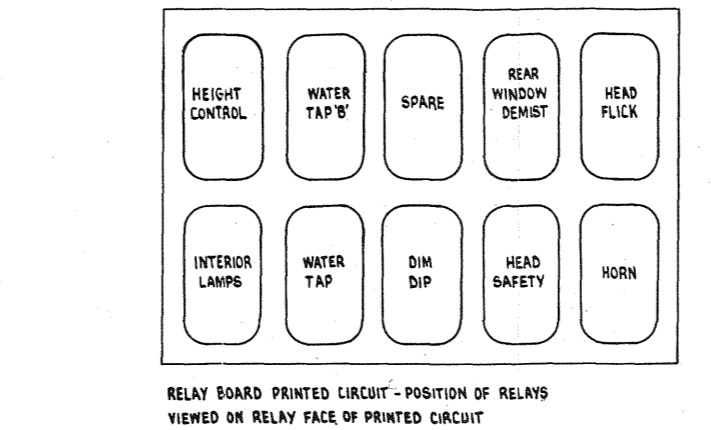
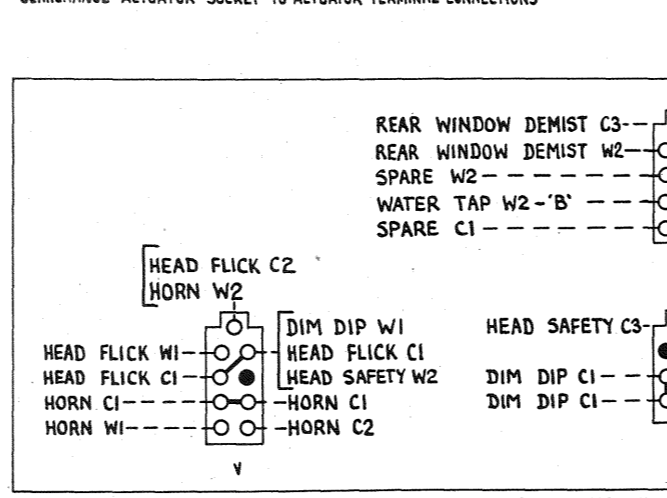
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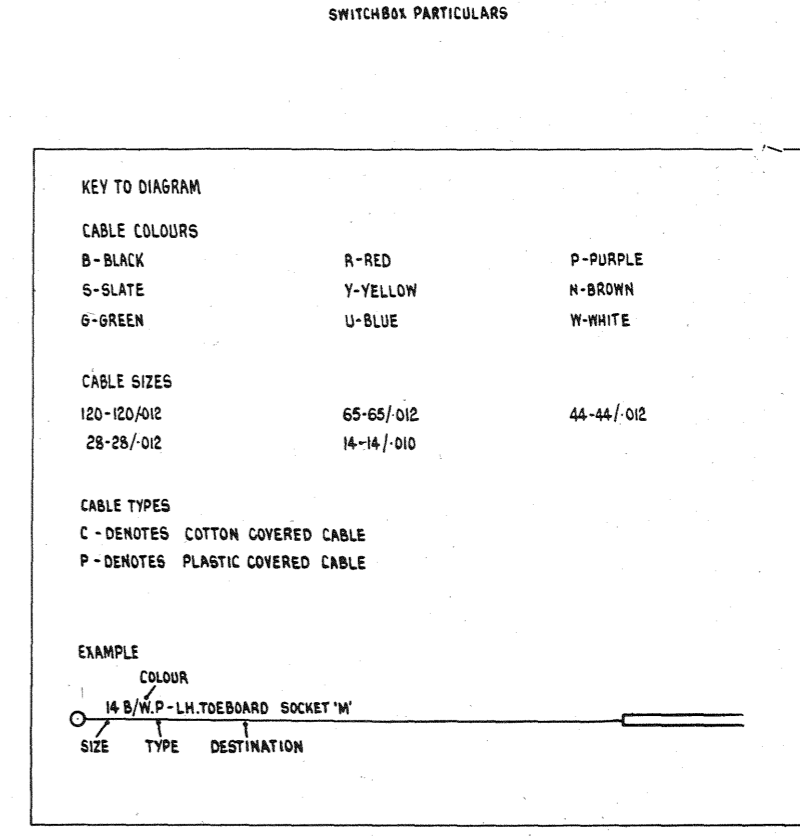
TO ENABLE THE ABOVE CABLE CONNECTIONS TO BE EASILY FOLLOWED THE CHARTS SHOW THE ACTUAL ORIGIN AND DESTINATION OF EACH CABLE BUT DO NOT TAKE INTO ACCOUNT THE RUN OF THE CABLE WITHIN THE LOOMS. TO OBTAIN THIS INFORMATION SEE THE PRACTICAL WIRING DIAGRAM ON SHEETS 1, 2, 3.

CABLE	FROM	TO
14 BRP	PIN 'A' RECEPTACLE-SOCKET	TERMINAL 'R' ACTUATOR
14 BUP	PIN 'B' RECEPTACLE-SOCKET	TERMINAL 'N' ACTUATOR
14 BGP	PIN 'C' RECEPTACLE-SOCKET	TERMINAL 'D' ACTUATOR
14 BVP	PIN 'D' RECEPTACLE-SOCKET	TERMINAL 'I' ACTUATOR
14 BWP	PIN 'E' RECEPTACLE-SOCKET	TERMINAL 'L' ACTUATOR
14 GBP	PIN 'F' RECEPTACLE-SOCKET	TERMINAL 'IGN' ACTUATOR
14 BP	PIN 'H' RECEPTACLE-SOCKET	EARTH
14 YBP	PIN 'J' RECEPTACLE-SOCKET	N FAST LEVEL MICRO SWITCH 2
14 WRP	PIN 'K' RECEPTACLE-SOCKET	N START MICRO SWITCH 1
14 BNP	PIN 'M' RECEPTACLE-SOCKET	TERMINAL 'P' ACTUATOR
14 NBP	PIN 'N' RECEPTACLE-SOCKET	RELAY POSITIVE
14 RNP	PIN 'P' RECEPTACLE-SOCKET	PARK MICRO SWITCH 3
14 WBP	PIN 'S' RECEPTACLE-SOCKET	N START MICRO SWITCH 1
14 GP	PIN 'T' RECEPTACLE-SOCKET	N FAST LEVEL MICRO SWITCH 2



TERMINAL	FEED FOR	POSITION SERVICES	TERMINAL CONNECTIONS
2	LIGHTING SWITCH - FROM 6	LOCKED	NONE
3	GEN. WARN L & FUSE 2	UNLOCKED	ELECTRIC G/CHANGE ON 11 TO 12
4	FUSE 4 - HEADLAMPS	IGNITION ON	ALL EXCEPT STARTER 3 & 8 TO +VE: 11 TO 12
5	FUSES 7 & 8	START	ALL 3 & 8 TO +VE: 11 TO 12
6	FEED TO S/BOX FROM AMMETER/SUM	PICNIC	RADIO WIPERS ETC. 3 TO +VE
7	FUSE 13		
8	FUSES 5 & 6 REAR WINDOW DEMIST. FUSE		
9	STARTER CIRCUIT		
11	GEARBOX ACTUATOR 'IGN' TERMINAL		
12	FROM L.H. X POST UPPER EARTH POINT		
+	IGNITION SWITCH - FROM 6		

BULK SOLENOID OPERATES WHEN KEY IS MOVED FROM UNLOCKED TO LOCKED POSITION PROVIDED GEARBOX IS IN THE PARK POSITION. IGNITION KEY CAN ONLY BE REMOVED WHEN THE SWITCHBOX IS IN THE LOCKED POSITION.



FUSEBOARD PRINTED CIRCUIT - SOCKET AND FUSE CONNECTIONS - VIEWED ON SOCKET FACE OF PRINTED CIRCUIT

FUSEBOARD IDENTIFICATION

'M' TERMINAL ON HEAD SAFETY, BOTH WATER TAP, HT. CONTROL, SPARE AND REAR WINDOW DEMIST. RELAYS EARTHED AS 'W2' ON INTERIOR LAMPS RELAY

RELAY BOARD PRINTED CIRCUIT - RELAYS TO SOCKET CONNECTIONS - VIEWED ON SOCKET FACE OF PRINTED CIRCUIT

Section 10

LEFT-HAND DRIVE CARS FROM SERIAL NUMBER 9000

APPLICATION	SHEET No.
Engine Compartment Looms	1
Main and Secondary Distribution Looms, and Air Conditioning Looms	2
Left-hand and Right-hand Body Looms	3
Fuseboard and Sockets	4

Printed in England

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SECTION 10

PRACTICAL WIRING DIAGRAMS

Sheet 1
Engine Compartment Looms

for
Rolls-Royce Silver Shadow
and
Bentley T Series

**LEFT-HAND DRIVE CARS FROM
SERIAL NUMBER 9000**

T.S.D. Publications 2724

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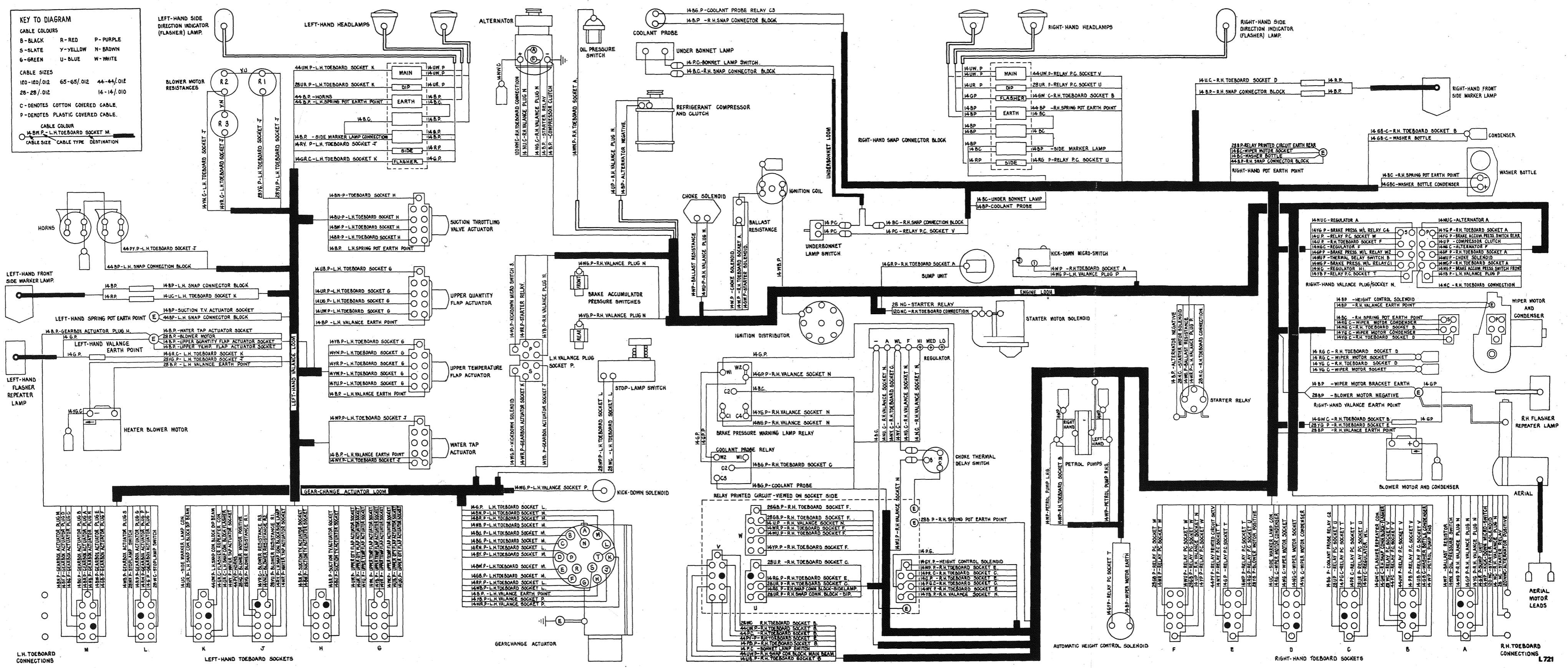
KEY TO DIAGRAM

CABLE COLOURS
 B - BLACK R - RED P - PURPLE
 S - SLATE Y - YELLOW N - BROWN
 G - GREEN U - BLUE W - WHITE

CABLE SIZES
 1E0-1E0/012 6S-6S/012 44-44/012
 2B-2B/012 14-14/010

C - DENOTES COTTON COVERED CABLE.
 P - DENOTES PLASTIC COVERED CABLE.

CABLE COLOUR
 14 SW P - L.H. TOEBOARD SOCKET M
 CABLE SIZE CABLE TYPE DESTINATION



L.H. TOEBOARD CONNECTIONS

LEFT-HAND TOEBOARD SOCKETS

GEARCHANGE ACTUATOR

RIGHT-HAND TOEBOARD SOCKETS

R.H. TOEBOARD CONNECTIONS

PRACTICAL WIRING DIAGRAMS

Sheet 2
Main and Secondary Distribution Looms
Air Conditioning Unit Looms

for
Rolls-Royce Silver Shadow
and
Bentley T Series

LEFT-HAND DRIVE CARS FROM
SERIAL NUMBER 9000

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PRACTICAL WIRING DIAGRAMS

Sheet 3
Left-hand and Right-hand Body Looms

for
Rolls-Royce Silver Shadow
and
Bentley T Series

**LEFT-HAND DRIVE CARS FROM
SERIAL NUMBER 9000**

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PRACTICAL WIRING DIAGRAMS

Sheet 4
Fuseboards and Sockets

for
Rolls-Royce Silver Shadow
and
Bentley T Series

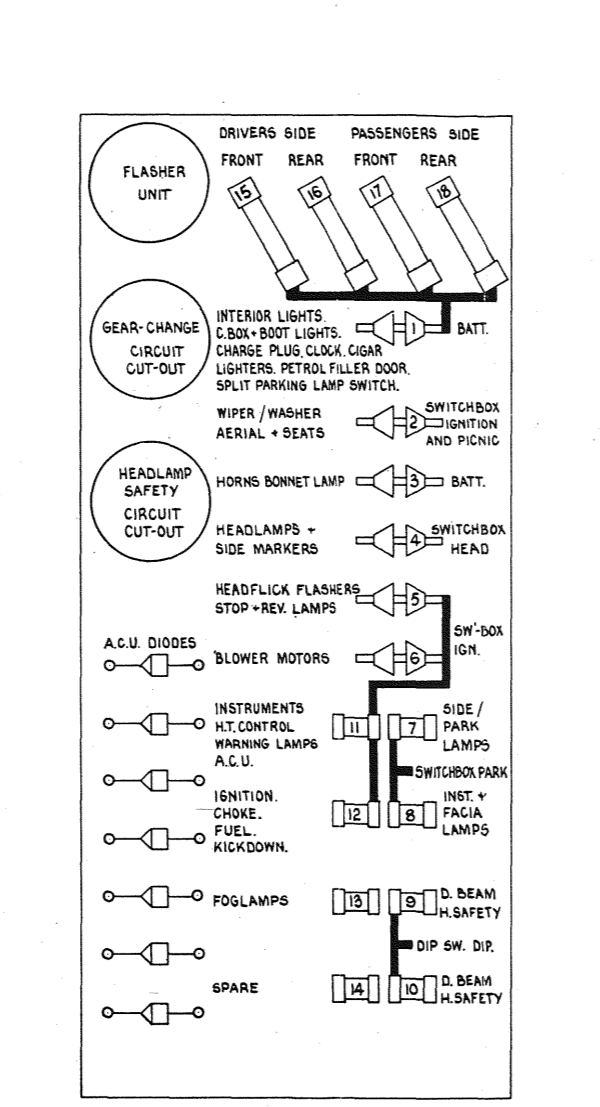
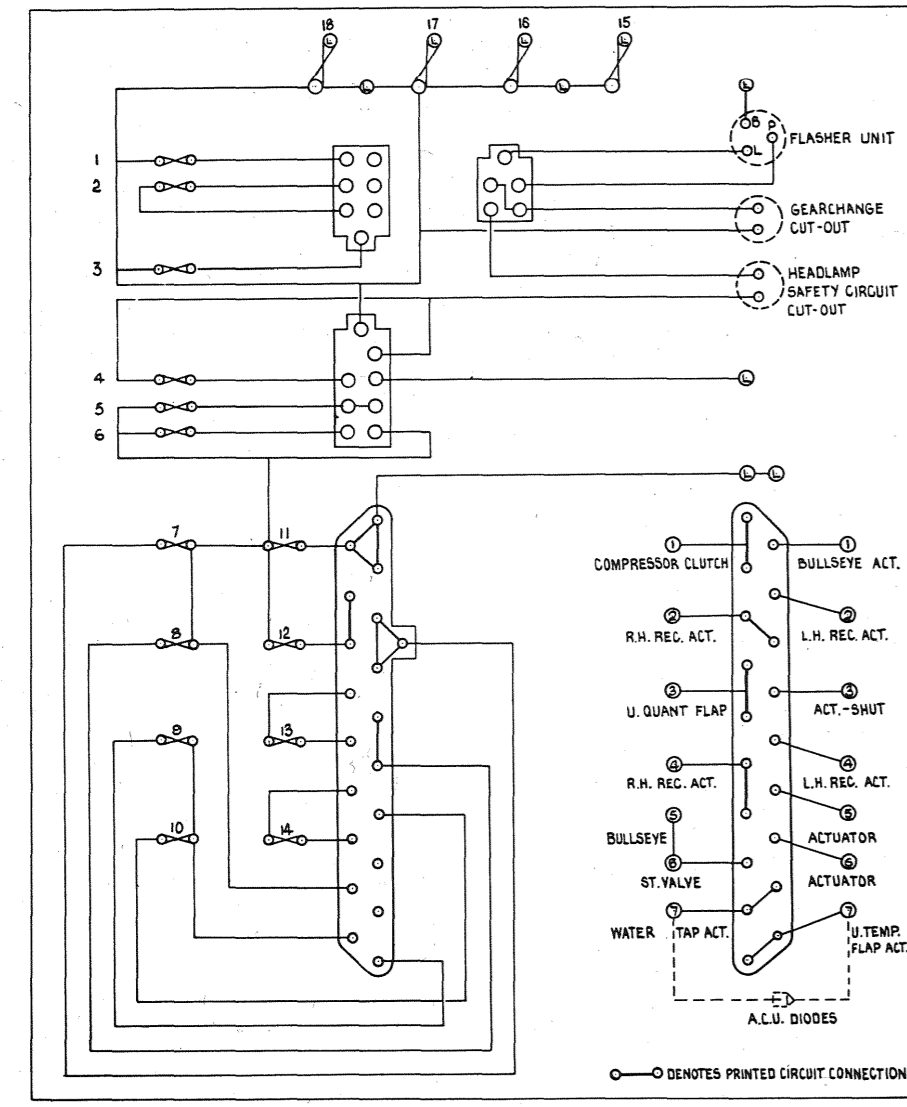
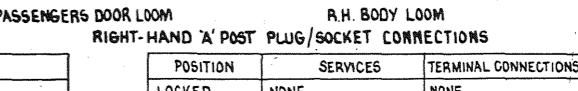
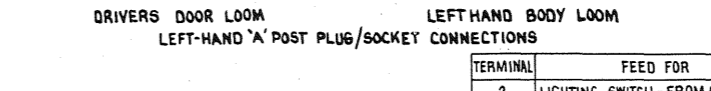
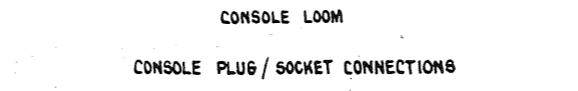
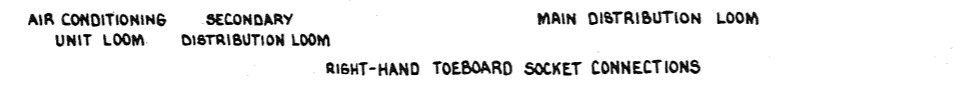
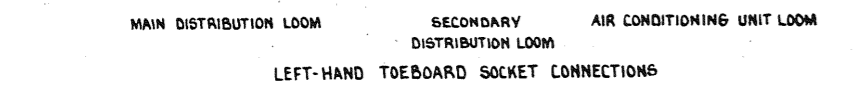
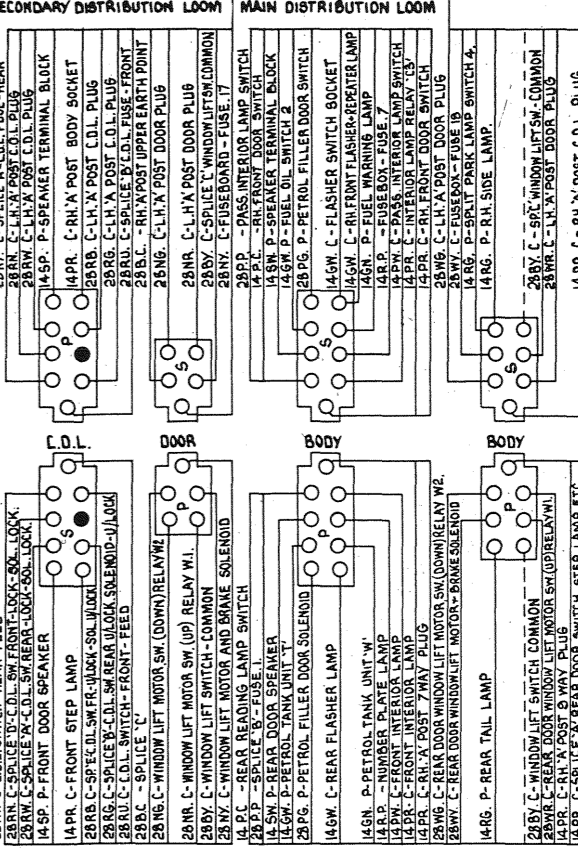
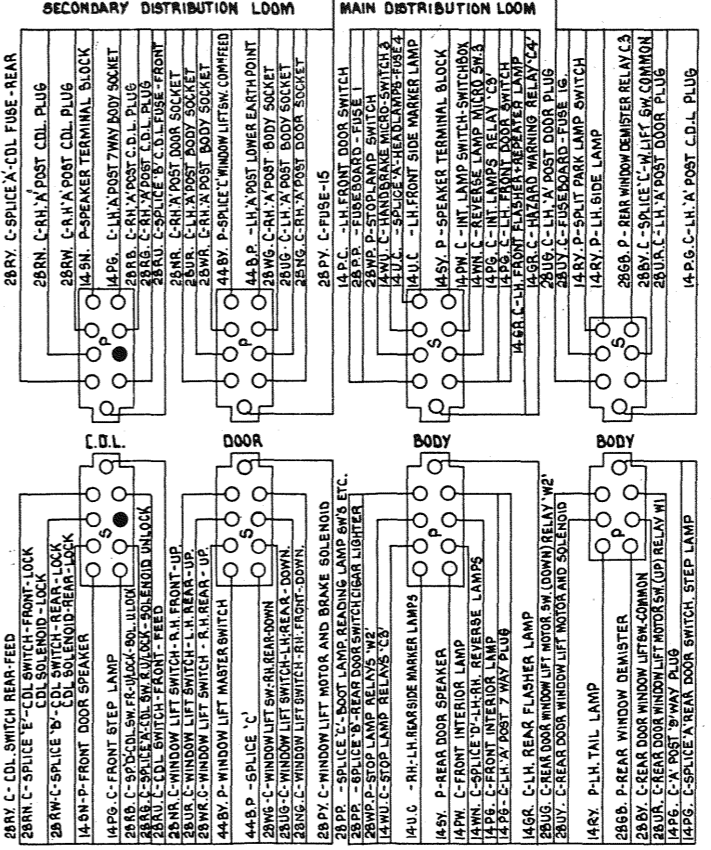
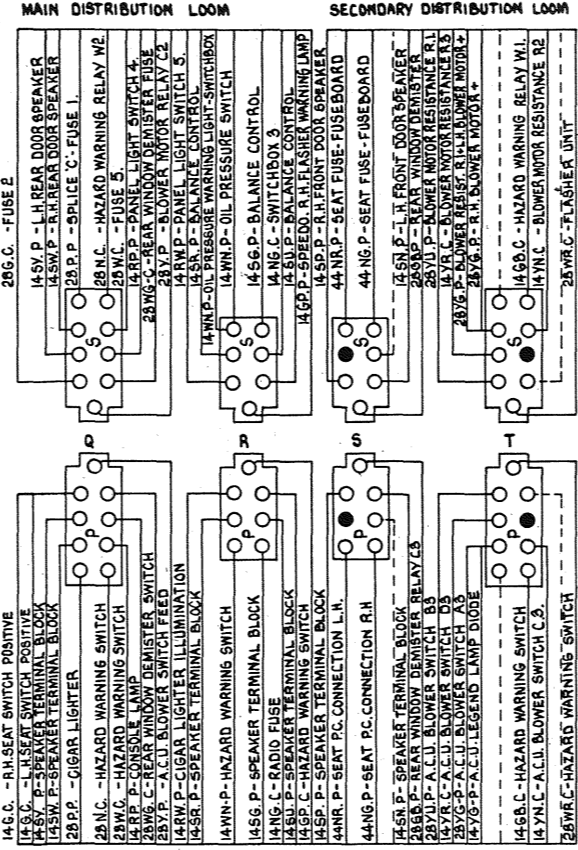
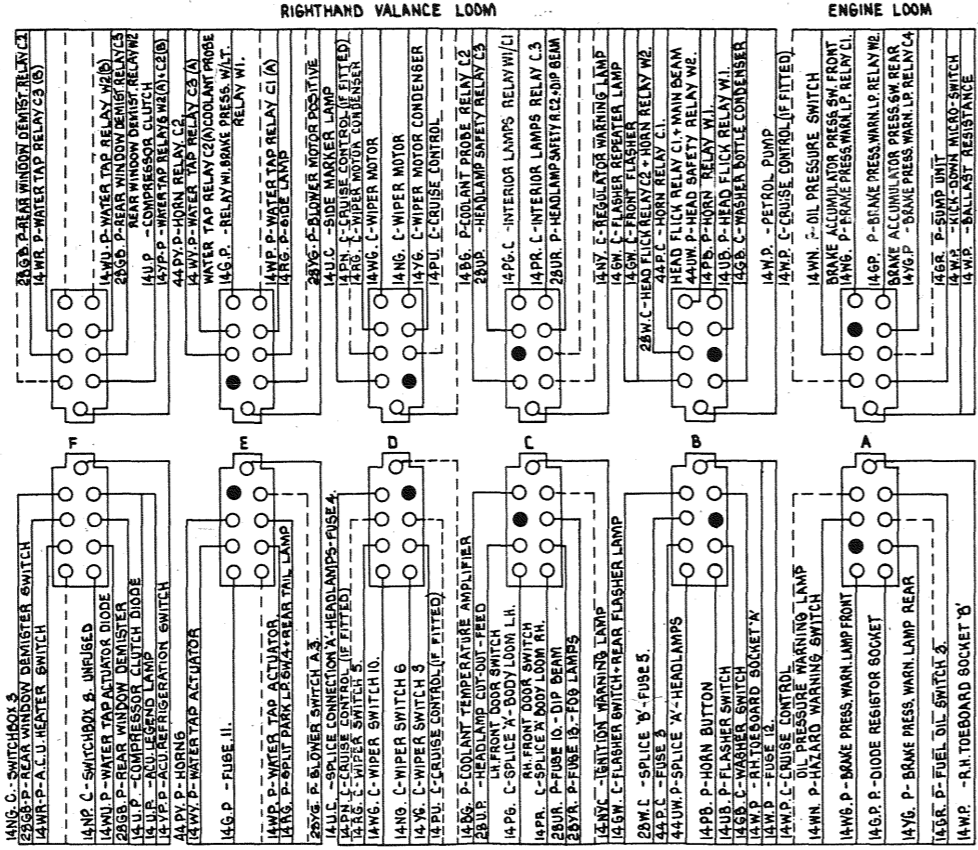
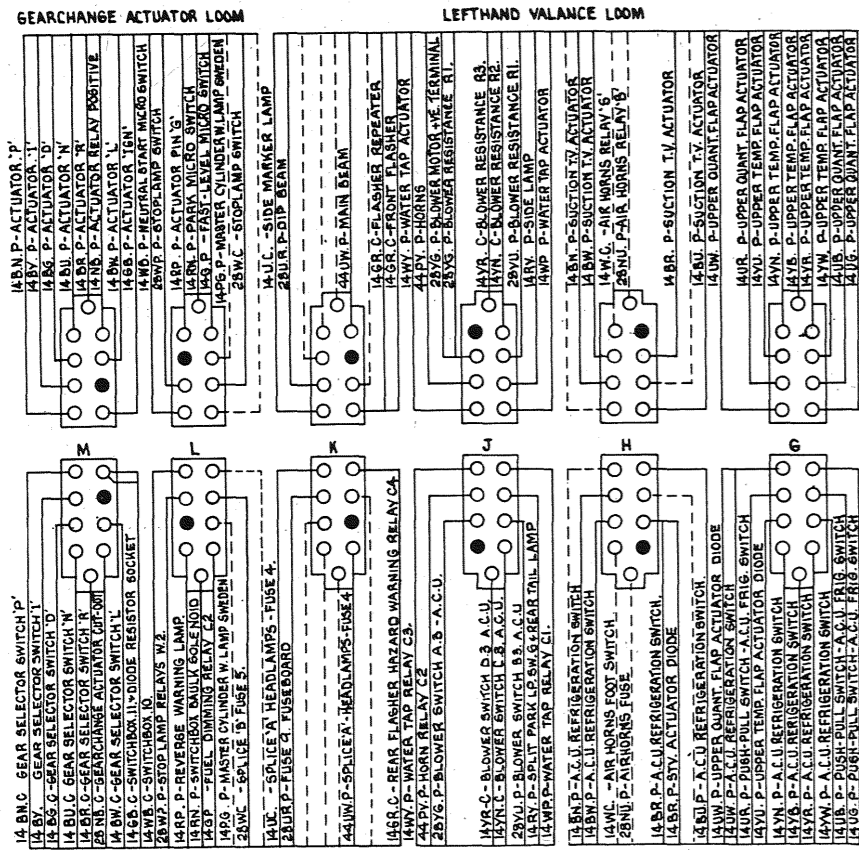
LEFT-HAND DRIVE CARS FROM
SERIAL NUMBER 9000

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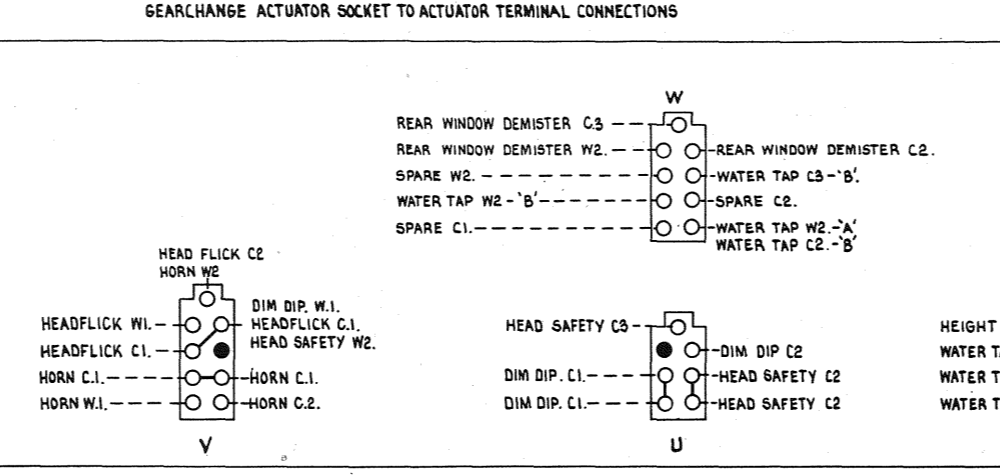
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TOEBOARD AND PLUG / SOCKET CONNECTIONS
TO ENABLE THE ABOVE CABLE CONNECTIONS TO BE EASILY FOLLOWED THE CHARTS SHOW THE ACTUAL ORIGIN AND DESTINATION OF EACH CABLE BUT DO NOT TAKE INTO ACCOUNT THE RUN OF THE CABLE WITHIN THE LOOMS.

CABLE	FROM	TO
14 BR. P.	PIN 'A' RECEPTACLE - SOCKET	TERMINAL 'R' ACTUATOR
14 BU. P.	PIN 'B' RECEPTACLE - SOCKET	TERMINAL 'N' ACTUATOR
14 BG. P.	PIN 'C' RECEPTACLE - SOCKET	TERMINAL 'D' ACTUATOR
14 BY. P.	PIN 'D' RECEPTACLE - SOCKET	TERMINAL 'I' ACTUATOR
14 BW. P.	PIN 'E' RECEPTACLE - SOCKET	TERMINAL 'Y' ACTUATOR
14 GB. P.	PIN 'G' RECEPTACLE - SOCKET	TERMINAL IGN ACTUATOR
14 B.P.	PIN 'H' RECEPTACLE - SOCKET	EARTH
14 YB. P.	PIN 'V' RECEPTACLE - SOCKET	N. FAST LEVEL MICRO SWITCH 2.
14 WR. P.	PIN 'W' RECEPTACLE - SOCKET	N. START MICRO SWITCH 1.
14 BN. P.	PIN 'N' RECEPTACLE - SOCKET	TERMINAL 'P' ACTUATOR
14 NB. P.	PIN 'N' RECEPTACLE - SOCKET	RELAY POSITIVE
14 RN. P.	PIN 'R' RECEPTACLE - SOCKET	PARK MICRO SWITCH 3.
14 WB. P.	PIN 'S' RECEPTACLE - SOCKET	N. START MICRO SWITCH 1.
14 GP. P.	PIN 'T' RECEPTACLE - SOCKET	N. FAST LEVEL MICRO SWITCH 2.

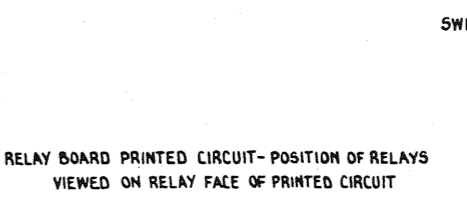


'W1' TERMINAL ON HEAD LAMP SAFETY, BOTH WATER TAP, HT. CONTROL, SPARE AND REAR WINDOW DEMIST RELAYS EARTHED AS IS 'W2' ON INTERIOR LAMPS RELAY.

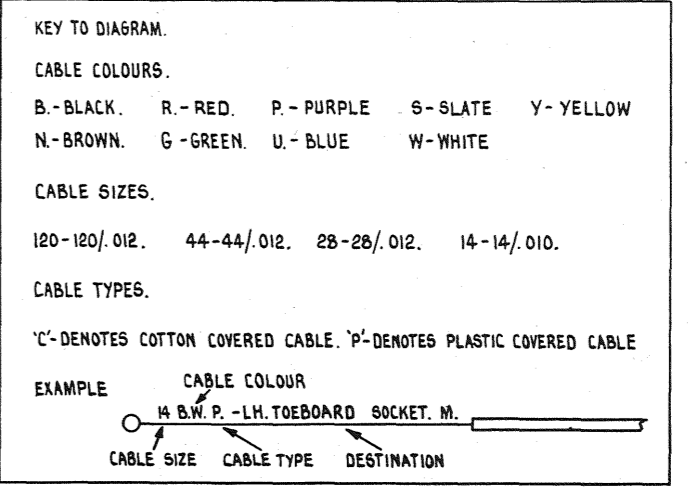
TERMINAL	FEED FOR
2	LIGHTING SWITCH - FROM 6
3	GEN. WARNING LIGHT + FUSE 2
4	FUSE 4 - HEADLAMPS
5	FUSES 7 + 8
6	FEED TO SWITCHBOX FROM AMMETER SHUNT
7	FUSE 13
8	FUSES 5-6 REAR WINDOW DEMISTER FUSE
10	STARTER CIRCUIT
11	GEARBOX ACTUATOR 'IGN' TERMINAL
12	FROM L.H.'A' POST UPPER EARTH POINT
+	IGNITION SWITCH - FROM 6

POSITION	SERVICES	TERMINAL CONNECTIONS
LOCKED	NONE	NONE
UNLOCKED	ELECTRIC G/CHANGE ONLY	11 TO 12
IGNITION ON	ALL EXCEPT STARTER	5+8 T + VE : 11 TO 12
START	ALL	5, 8, 10 TO +VE 11 TO 12
PICNIC	RADIO WIPERS ETC.	5 TO +VE

BULK SOLENOID OPERATES WHEN KEY IS MOVED FROM UNLOCKED TO LOCKED POSITION PROVIDED GEARBOX IS IN THE PARK POSITION.
IGNITION KEY CAN ONLY BE REMOVED WHEN THE SWITCHBOX IS IN THE LOCKED POSITION.



SWITCHBOX PARTICULARS



FUSEBOARD PRINTED CIRCUIT - SOCKET AND FUSE CONNECTIONS. VIEWED ON SOCKET FACE OF PRINTED CIRCUIT.

FUSE IDENTIFICATION

RELAY BOARD PRINTED CIRCUIT - RELAYS TO SOCKET CONNECTIONS. VIEWED ON SOCKET FACE OF PRINTED CIRCUIT

Section 11

LEFT-HAND DRIVE LONG WHEELBASE CARS WITH DIVISION FROM SERIAL NUMBER 9000

APPLICATION	SHEET No.
Engine Compartment Looms	1
Instrument and Facia Looms	2
Body Looms, Door and Console Looms	3
Division and Air Conditioning Boot Unit Looms	4

Printed in England

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SECTION 11

PRACTICAL WIRING DIAGRAMS

Sheet 1
Engine Compartment Looms

for
Rolls-Royce Silver Shadow
and
Bentley T Series

**LEFT-HAND DRIVE LONG-WHEELBASE
CARS WITH DIVISION FROM SERIAL
NUMBER 9000**

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KEY TO DIAGRAM

CABLE COLOURS

B - BLACK	R - RED	P - PURPLE
S - SLATE	Y - YELLOW	N - BROWN
G - GREEN	U - BLUE	W - WHITE

CABLE SIZES

120-120/O12	65-65/O12	44-44/O12
28-28/O12	14-14/O10	

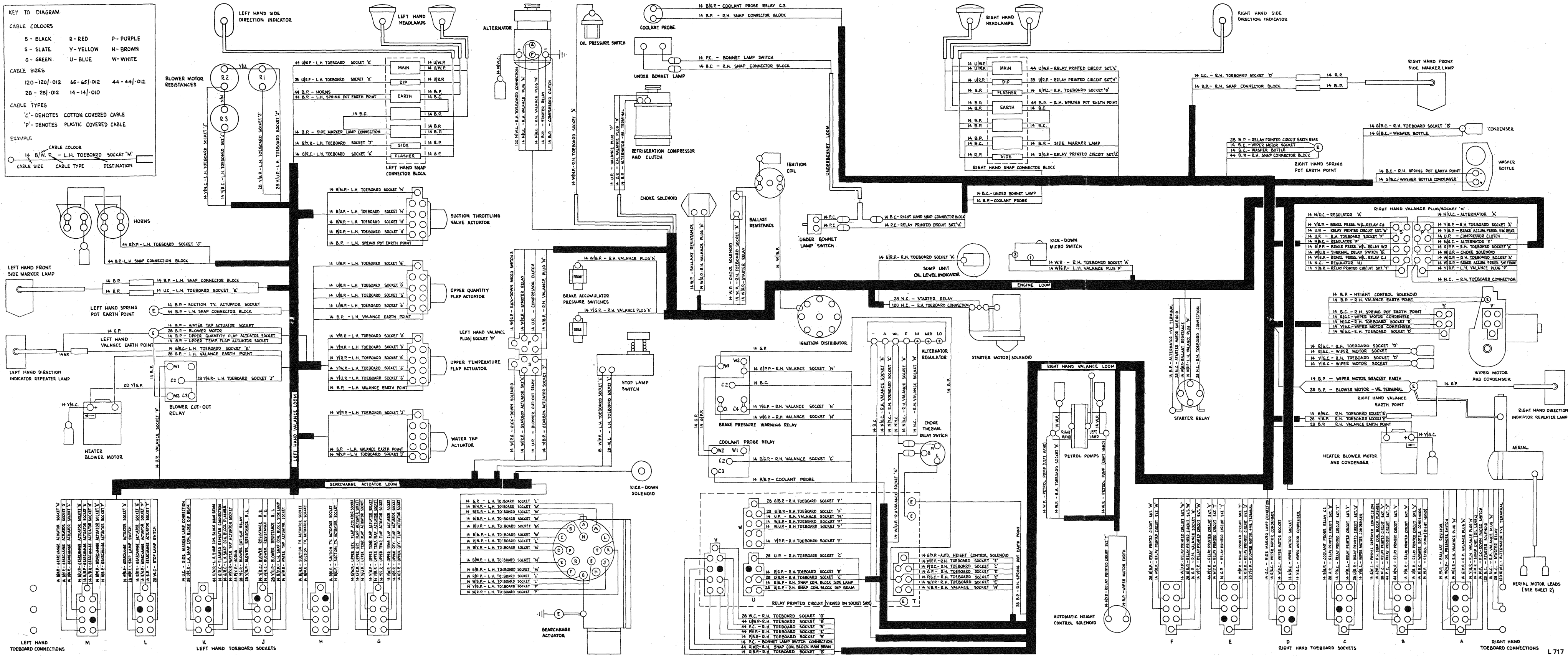
CABLE TYPES

'C' - DENOTES COTTON COVERED CABLE
'P' - DENOTES PLASTIC COVERED CABLE

EXAMPLE

14 B/W.P. - L.H. TOEBOARD SOCKET 'M'

CABLE COLOUR CABLE SIZE CABLE TYPE DESTINATION



PRACTICAL WIRING DIAGRAMS

Sheet 2
Instrument and Facia Looms

for
Rolls-Royce Silver Shadow
and
Bentley T Series

**LEFT-HAND DRIVE LONG-WHEELBASE
CARS WITH DIVISION FROM SERIAL
NUMBER 9000**

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PRACTICAL WIRING DIAGRAMS

Sheet 3
Body Looms Door and Console
Looms

for
Rolls-Royce Silver Shadow
and
Bentley T Series

LEFT-HAND DRIVE LONG-WHEELBASE
CARS WITH DIVISION FROM SERIAL
NUMBER 9000

T. S. D. Publications 2718

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PRACTICAL WIRING DIAGRAMS

Sheet 4
Division and Air Conditioning
Boot Unit Looms

for
Rolls-Royce Silver Shadow
and
Bentley T Series

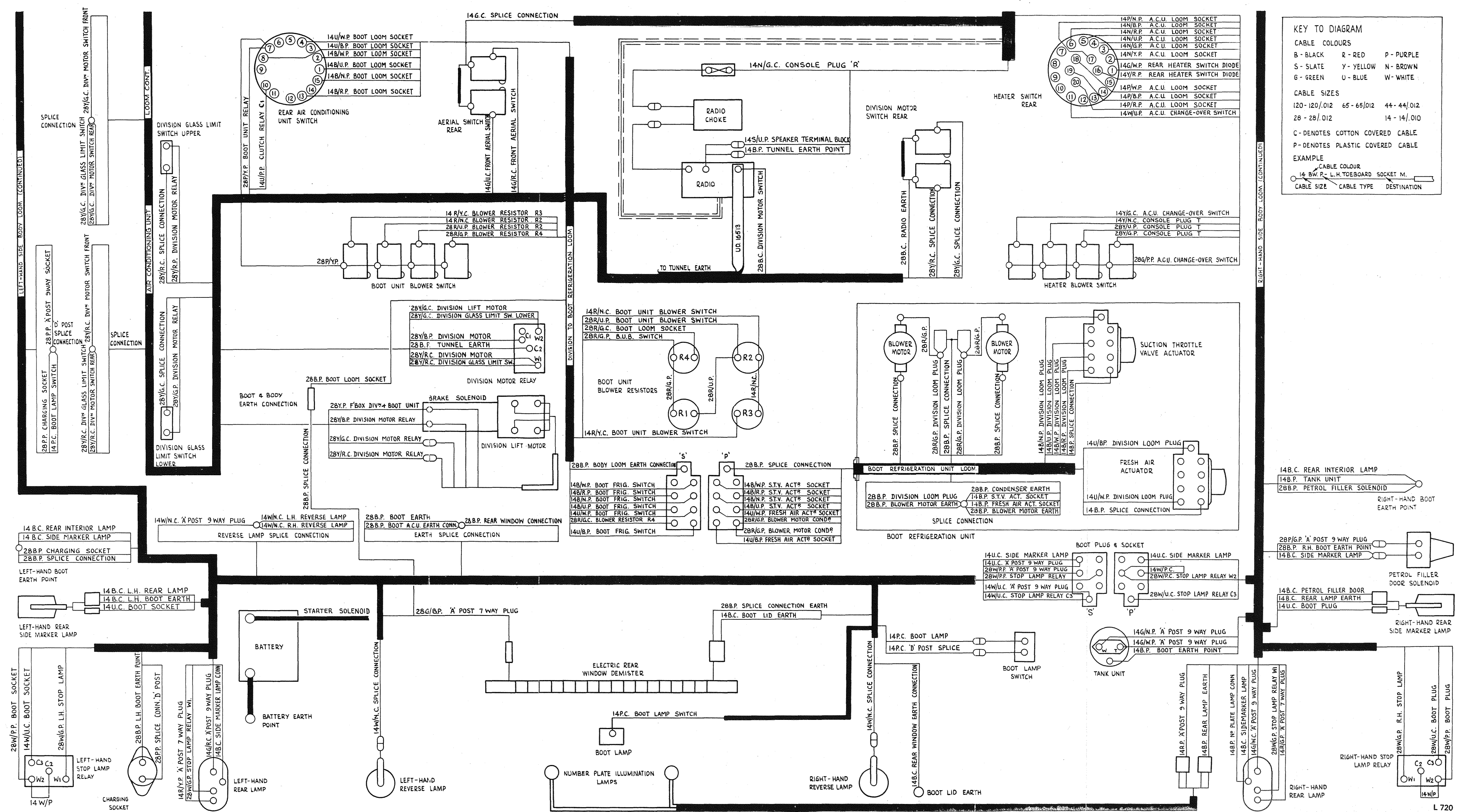
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KEY TO DIAGRAM

CABLE COLOURS

B - BLACK	R - RED	P - PURPLE
S - SLATE	Y - YELLOW	N - BROWN
G - GREEN	U - BLUE	W - WHITE

CABLE SIZES

120 - 120/012	65 - 65/012	44 - 44/012
28 - 28/012		14 - 14/010

EXAMPLE

14 B.W.P. L.H. TOEBOARD SOCKET M.

Section 12

LEFT-HAND AND RIGHT-HAND DRIVE CARS FROM SERIAL NUMBER 9000

APPLICATION	SHEET No.
Radio Receiver and Stereo Tape Playing Equipment	1
Radio Receiver and Stereo Tape Playing Equipment - continued	2

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April 1971

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SECTION 12

PRACTICAL WIRING DIAGRAMS

Sheet 1
Radio Receiver and Stereo Tape
Playing Equipment

for
Rolls-Royce Silver Shadow
and
Bentley T Series

ALL LEFT-HAND AND RIGHT-HAND DRIVE
CARS FROM SERIAL NUMBER 9000

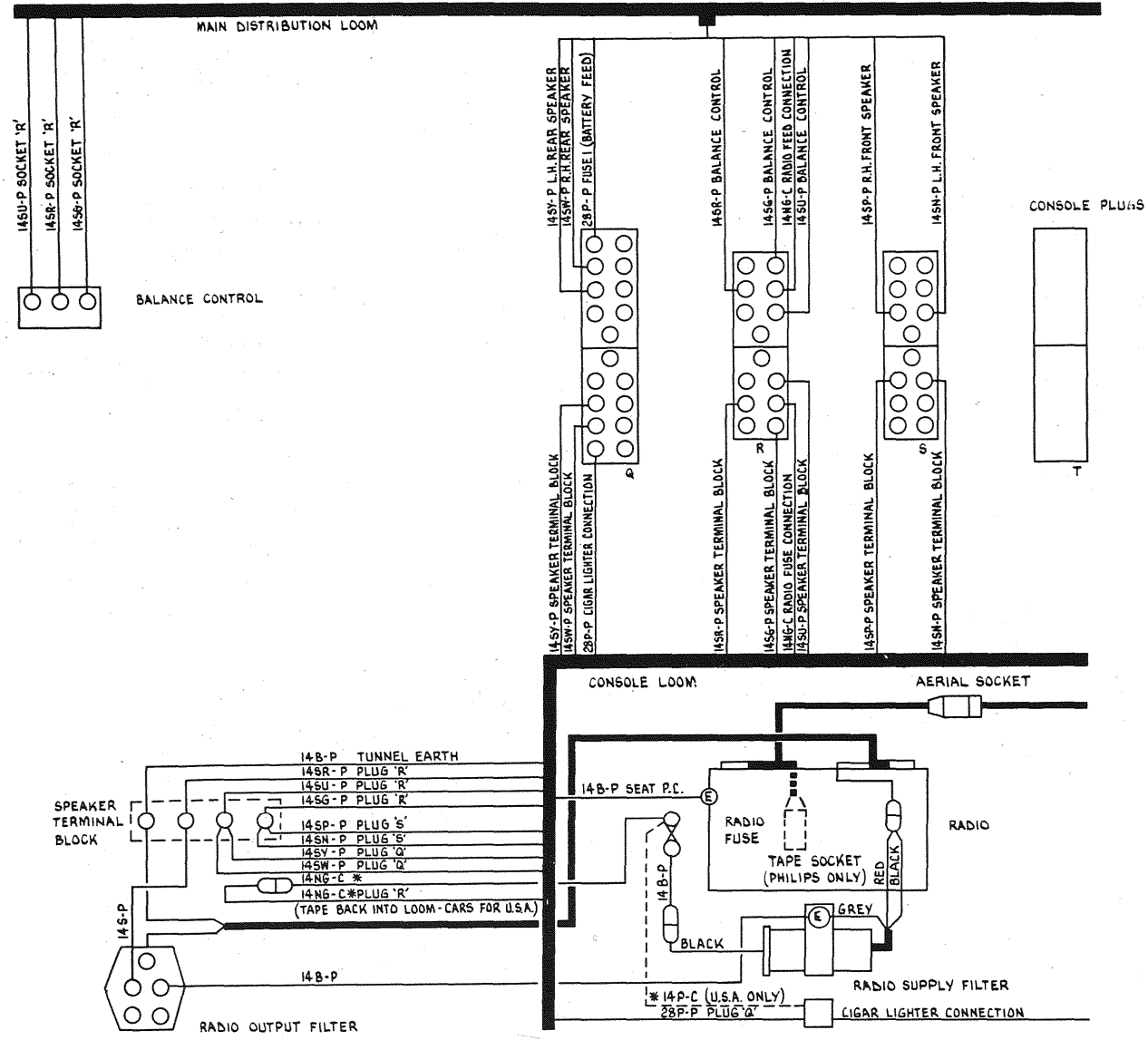
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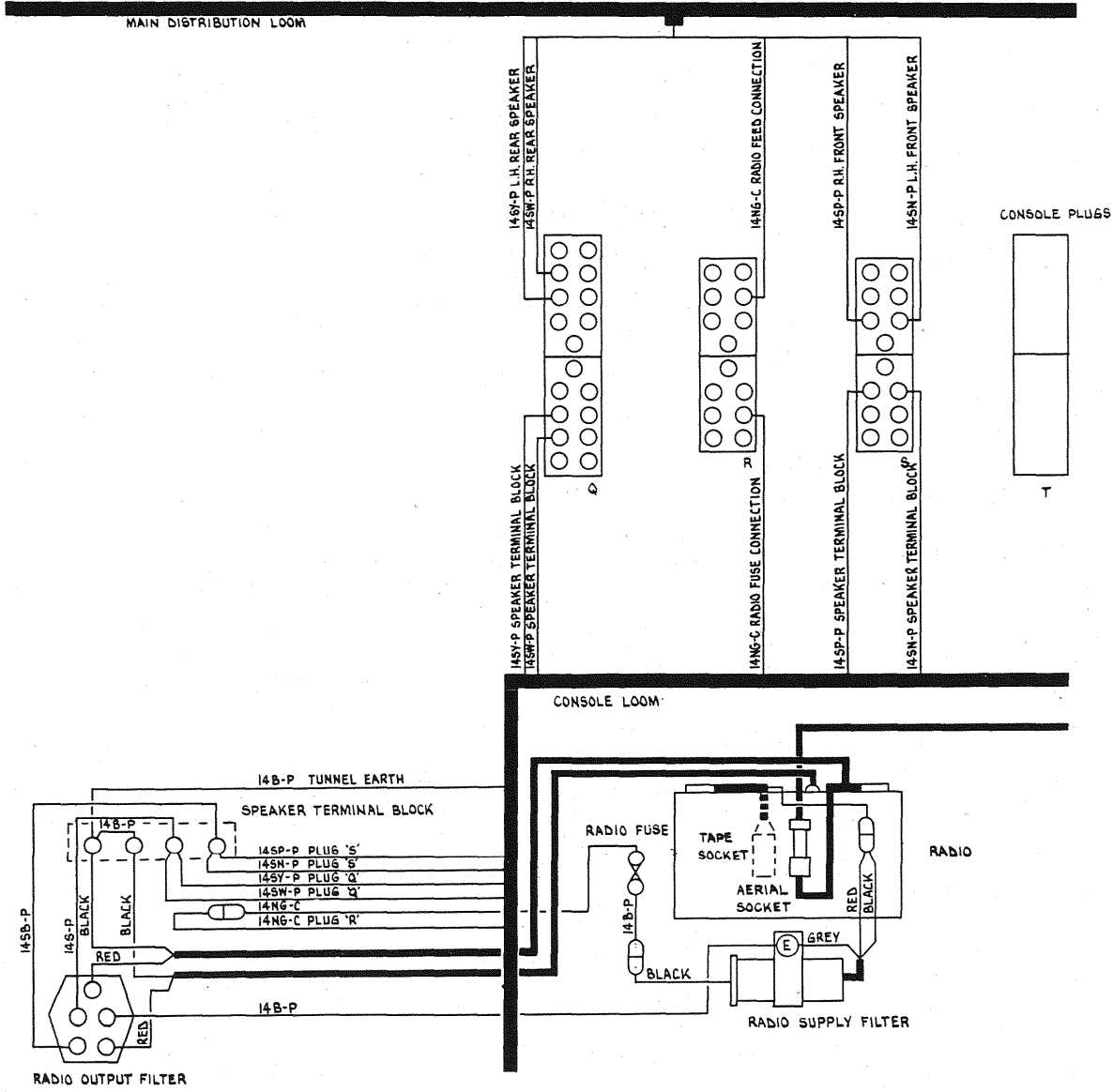
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MONO OUTPUT RADIO



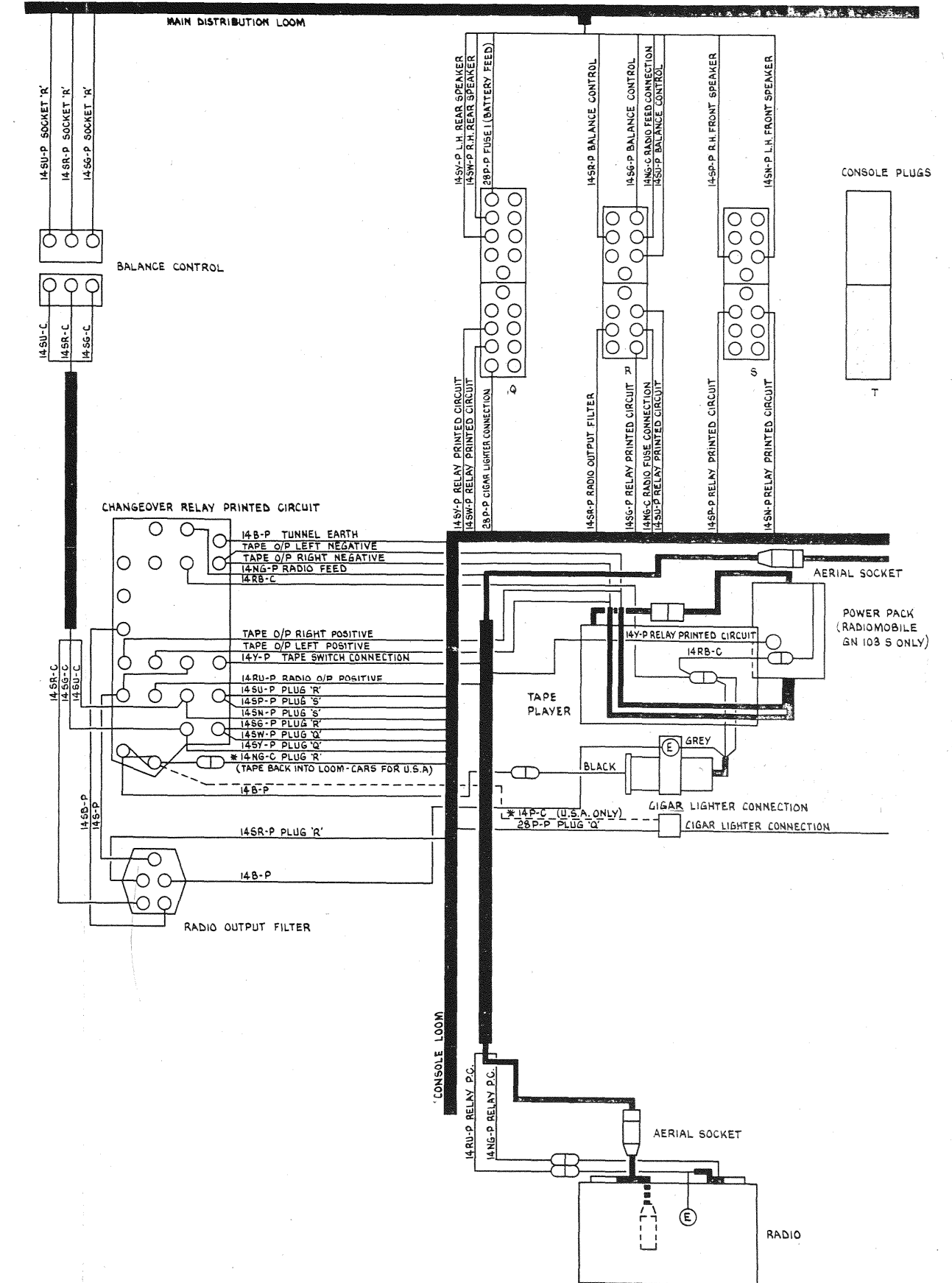
PHILIPS RN 681 RADIOMOBILE 1075
RN 691 RADIOMOBILE 1077

STEREO OUTPUT RADIO

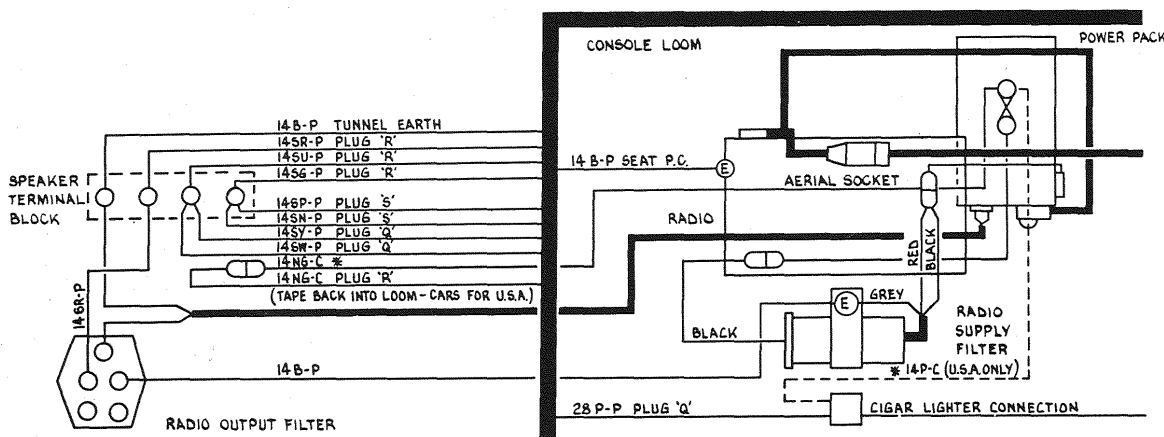


PHILIPS 22 RN 686

MONO OUTPUT RADIO AND STEREO TAPE PLAYER



RADIOMOBILE (VOXSON) GN 103S OR PHILIPS N2602 WITH PHILIPS 22RN681 OR RADIOMOBILE 1075 OR BOSCH KOLN 'K' OR NEW YORKER 'X'
22RN691 OR RADIOMOBILE 1077



BOSCH KOLN 'K' NEW YORKER 'X'

PRACTICAL WIRING DIAGRAMS

Sheet 2
Radio Receiver and Stereo Tape
Playing Equipment

for
Rolls-Royce Silver Shadow
and
Bentley T Series

ALL LEFT-HAND AND RIGHT-HAND DRIVE
CARS FROM SERIAL NUMBER 9000

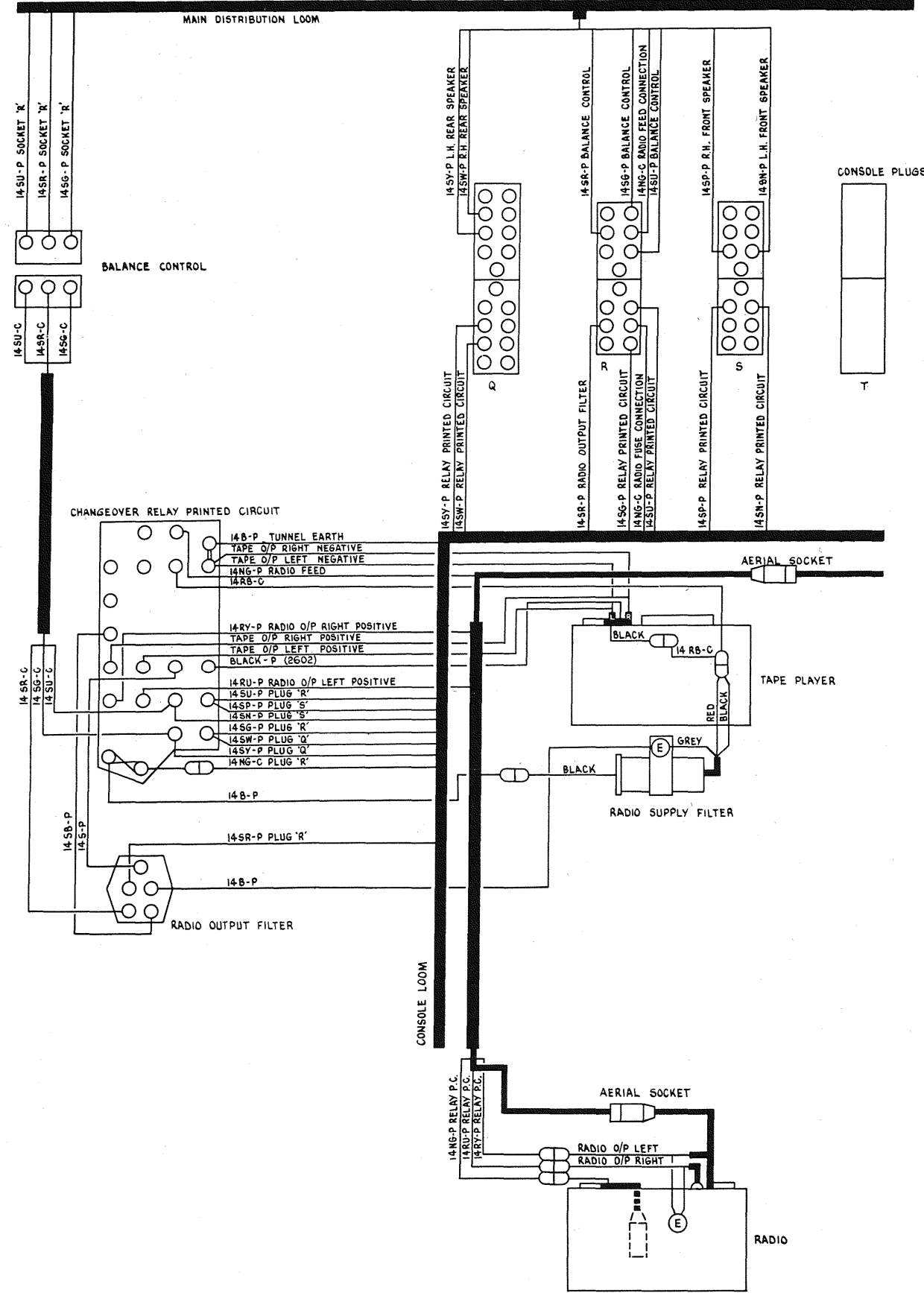
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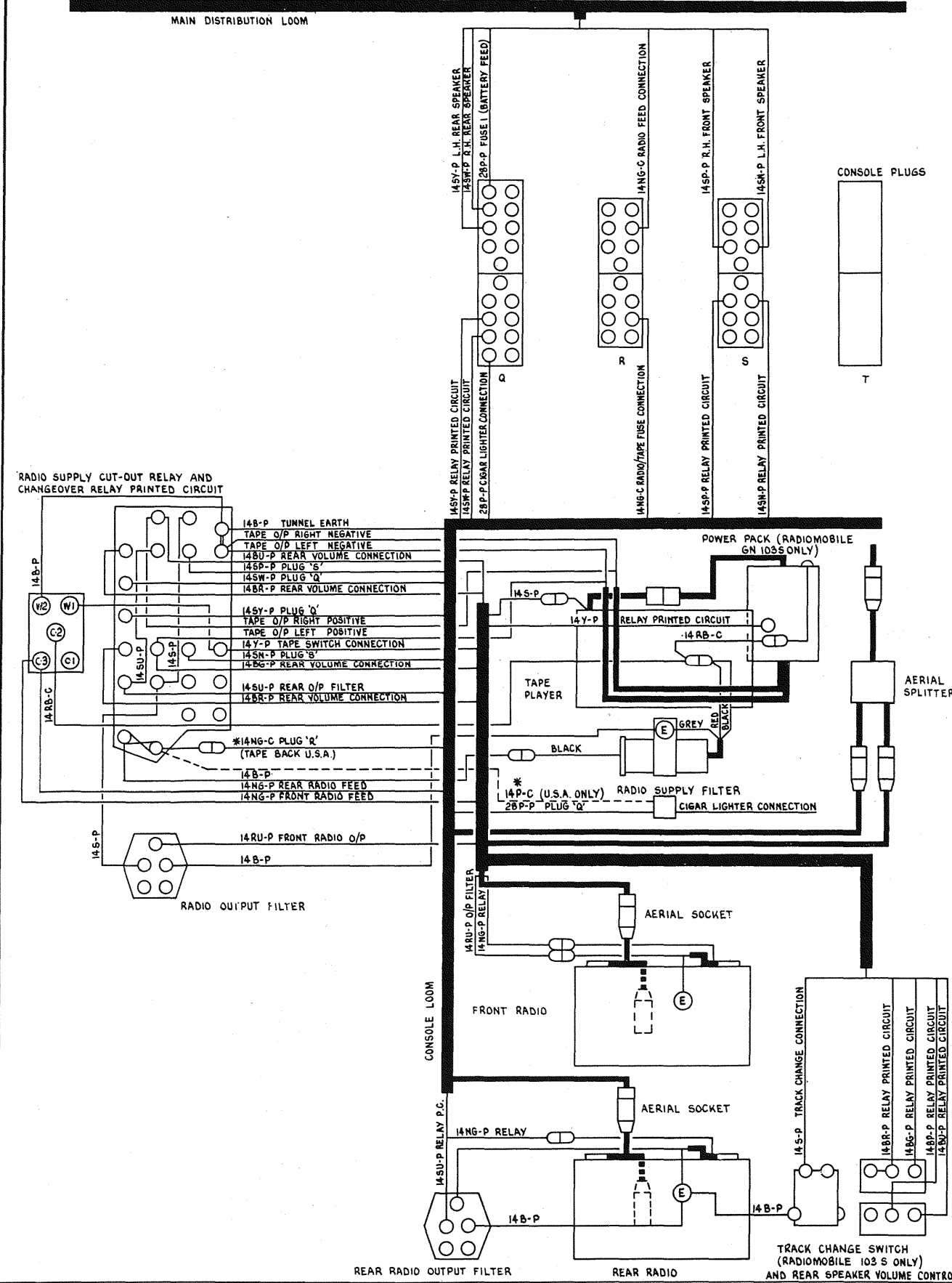
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STEREO OUTPUT RADIO AND STEREO TAPE PLAYER



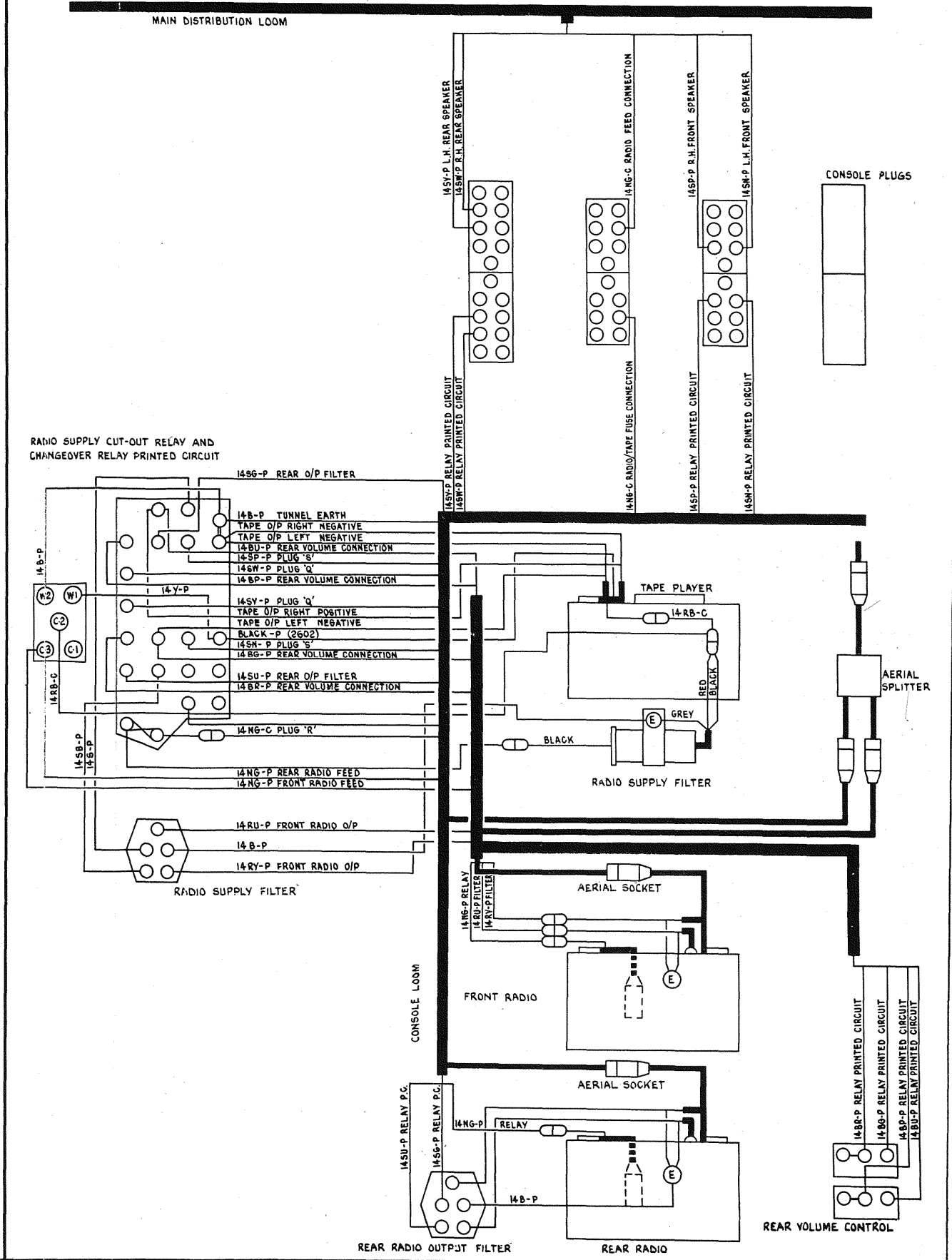
RADIOMOBILE (VOXSON) GN103S OR PHILIPS N2602 WITH PHILIPS 22RN 686

TWO MONO OUTPUT RADIOS AND STEREO TAPE PLAYER - DIVISION CARS



RADIOMOBILE (VOXSON) GN103S OR PHILIPS N2602 WITH TWO PHILIPS 22RN681 OR RADIOMOBILE 1075 OR BOSCH KOLN 'K' OR NEW YORKER 'X' 1077

TWO STEREO OUTPUT RADIOS AND STEREO TAPE PLAYER - DIVISION CARS



RADIOMOBILE (VOXSON) GN103S OR PHILIPS N2602 WITH TWO PHILIPS 22RN 686 RADIOS

Section 13

LEFT-HAND DRIVE CARS FROM SERIAL NUMBER 11882

APPLICATION	SHEET No.
Engine Compartment Looms	1
Facia and Instrument Board Looms	2
Interior and Luggage Compartment Looms	3
Fuseboard and Sockets	4

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PRACTICAL WIRING DIAGRAM

Sheet 1

Engine Compartment Looms

for

Rolls-Royce Silver Shadow

and

Bentley T Series

**LEFT-HAND DRIVE CARS
FROM SERIAL NUMBER 11882**

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KEY TO DIAGRAM

B = BLACK P = PURPLE Y = YELLOW
 W = BROWN U = BLUE W = WHITE
 R = RED G = GREEN S = SLATE

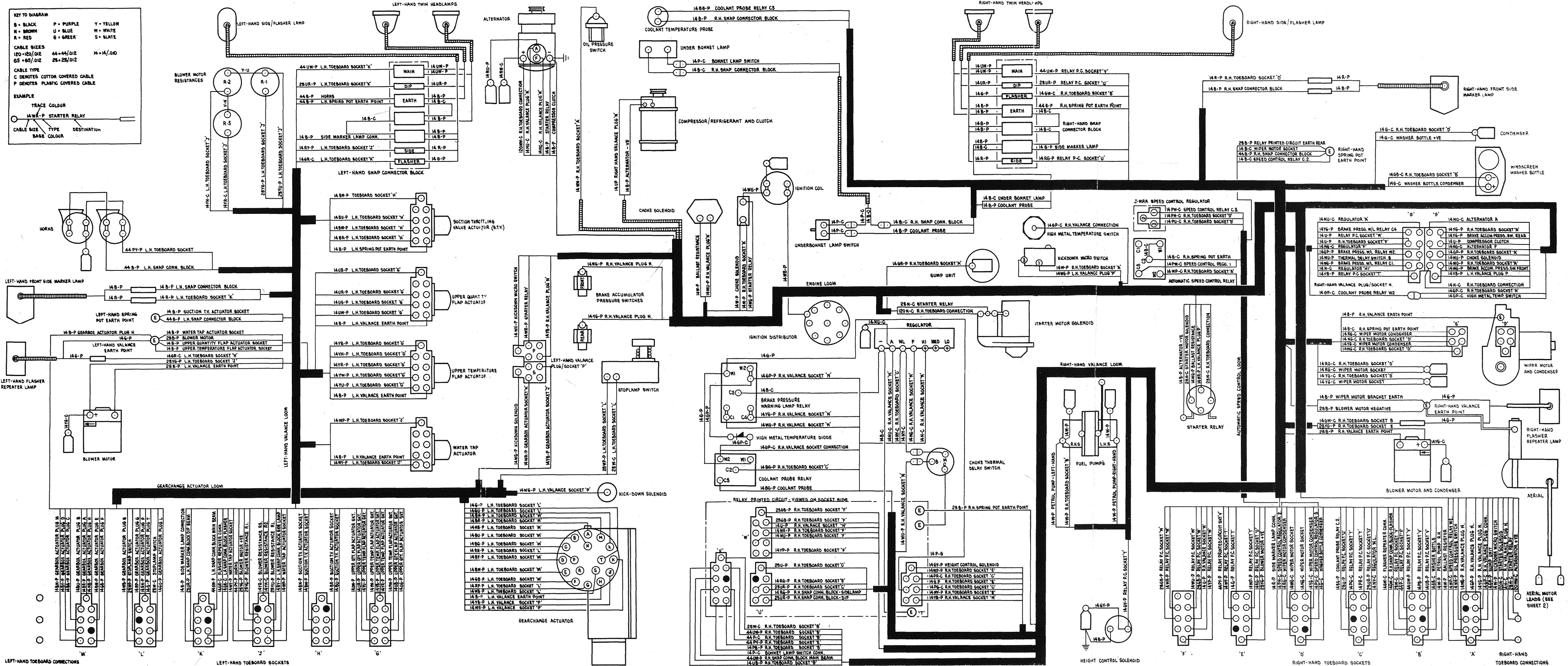
CABLE SIZES
 120+180/012 44+44/012 14+14/012
 65+65/012 28+28/012

CABLE TYPE
 C DEMOTES COTTON COVERED CABLE
 P DEMOTES PLASTIC COVERED CABLE

EXAMPLE

TRACE COLOUR
 14W-P STARTER RELAY

CABLE SIZE TYPE DESTINATION
 BASE COLOUR



LEFT-HAND TOEBOARD CONNECTIONS

LEFT-HAND TOEBOARD SOCKETS

GEARCHANGE ACTUATOR

RELAY PRINTED CIRCUIT - VIEW ON SOCKET SIDE

HEIGHT CONTROL SOLENOID

RIGHT-HAND TOEBOARD SOCKETS

RIGHT-HAND TOEBOARD CONNECTIONS

PRACTICAL WIRING DIAGRAM

Sheet 2

Facia and Instrument Board Looms

for

Rolls-Royce Silver Shadow

and

Bentley T Series

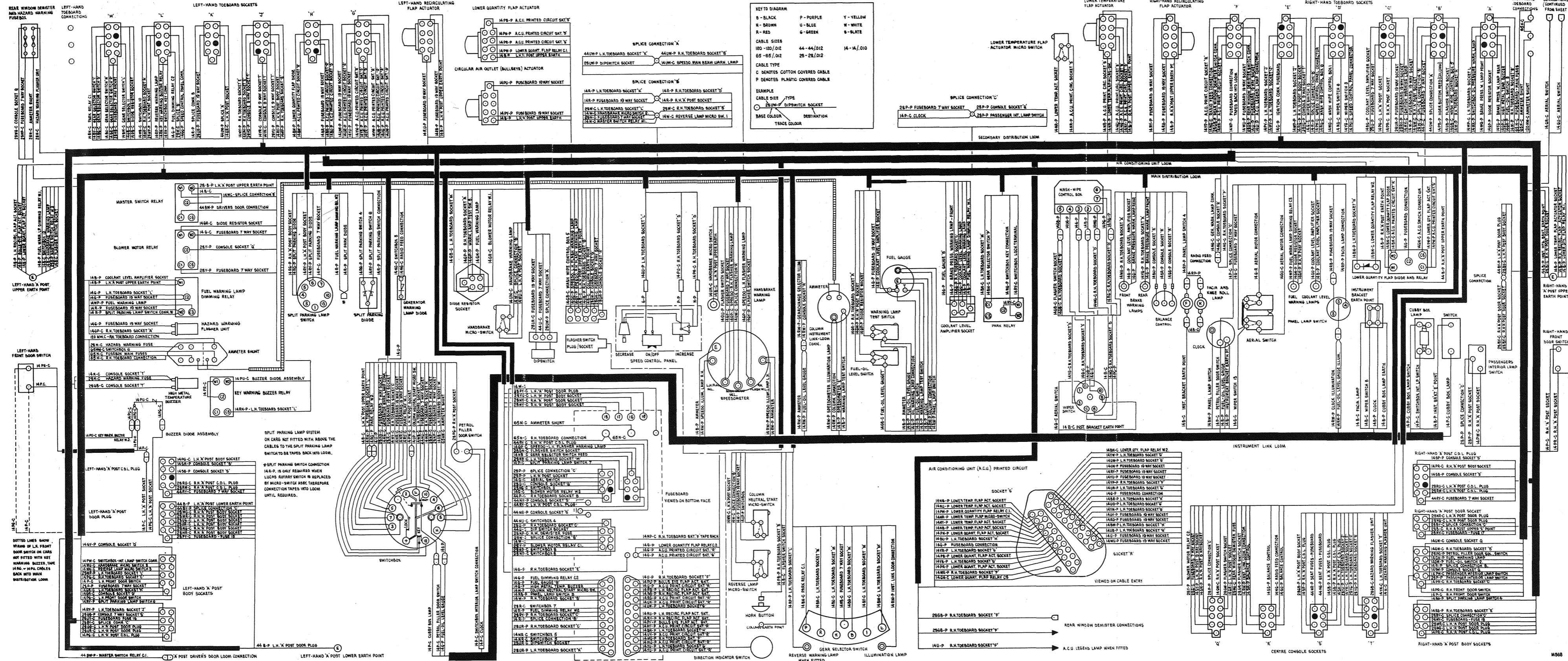
**LEFT-HAND DRIVE CARS
FROM SERIAL NUMBER 11882**

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PRACTICAL WIRING DIAGRAM

Sheet 3
Interior and Luggage Compartment
Looms

for
Rolls-Royce Silver Shadow
and
Bentley T Series

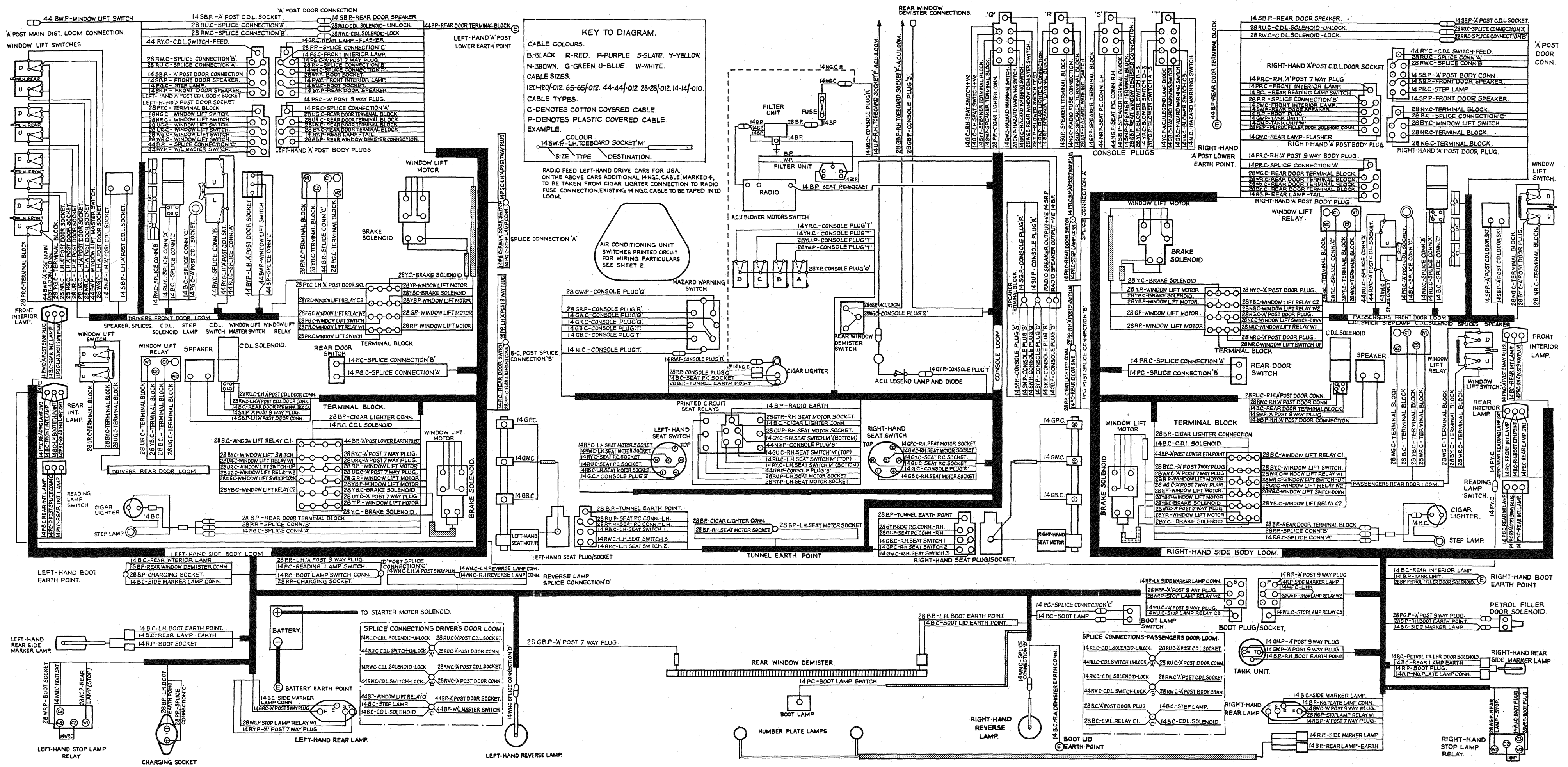
LEFT-HAND DRIVE CARS
FROM SERIAL NUMBER 11882

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 B-BLACK R-RED P-PURPLE S-SLATE Y-YELLOW
 N-BROWN G-GREEN U-BLUE W-WHITE.

CABLE SIZES.
 120-120/012 65-65/012 44-44/012 28-28/012 14-14/010.

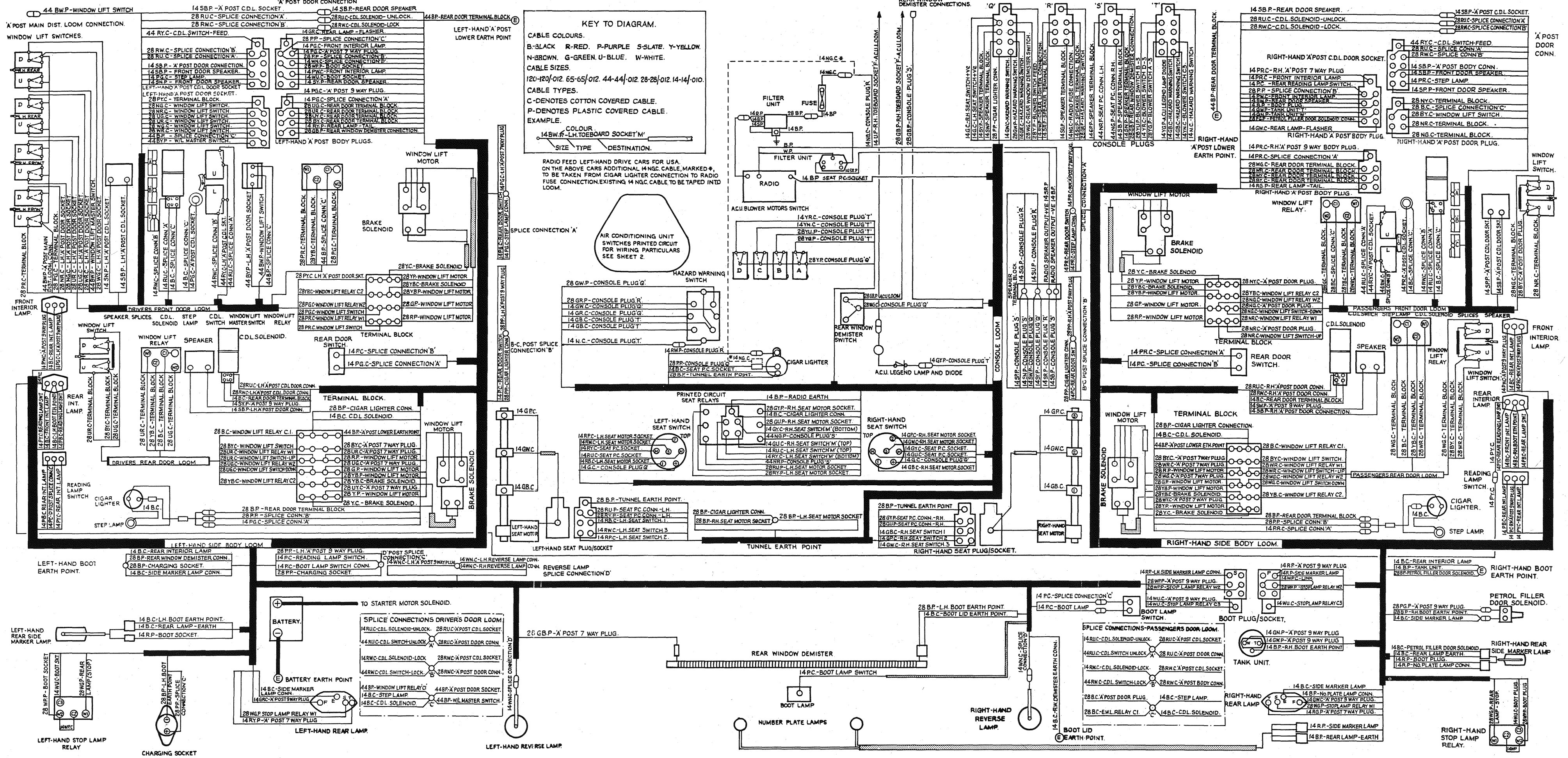
CABLE TYPES.
 C-DENOTES COTTON COVERED CABLE.
 P-DENOTES PLASTIC COVERED CABLE.

EXAMPLE.
 14BW.P-LH.TOEBOARD SOCKET 'M'

COLOUR SIZE TYPE DESTINATION.

RADIO FEED LEFT-HAND DRIVE CARS FOR USA. ON THE ABOVE CARS ADDITIONAL 14NG.C CABLE, MARKED #, TO BE TAKEN FROM CIGAR LIGHTER CONNECTION TO RADIO FUSE CONNECTION EXISTING 14NG.C CABLE TO BE TAPED INTO LOOM.

AIR CONDITIONING UNIT SWITCHES PRINTED CIRCUIT FOR WIRING PARTICULARS SEE SHEET 2.



PRACTICAL WIRING DIAGRAM

Sheet 4

Fuseboard and Sockets

for

Rolls-Royce Silver Shadow

and

Bentley T Series

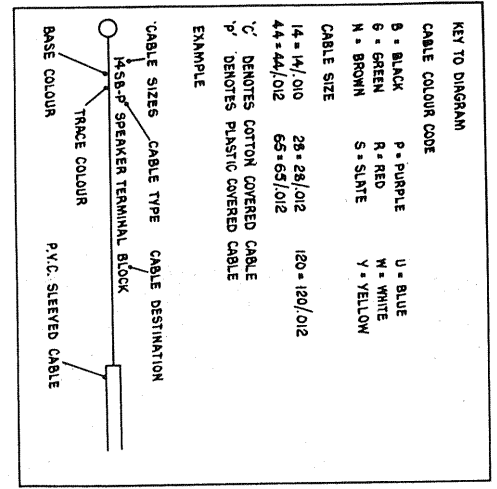
**LEFT-HAND DRIVE CARS
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CABLE	FROM	TO	TERMINAL	FEED FOR	POSITION	SERVICES	TERMINAL CONNECTION
148R-P	PH. X RECEPTACLE SOCKET	TERMINAL 'X' ACTUATOR	2	LIGHTING SWITCH - FROM 6	UNLOCKED	NONE	NONE
148U-P	PH. B	"	3	50N. WARNING LAMP + FUSE 2	UNLOCKED	ELECTRIC CHANGE ONLY	11/0/2
148P-P	PH. C	"	4	FUSE 4 - HEADLAMPS	IGNITION ON ALL EXCEPT STARTER	5-8-TONE 11/0/2	START
148V-P	PH. D	"	5	FUSES 7-8	START	ALL	3S+10V-11/0/2
148W-P	PH. E	"	6	FEED TO 5/0X FROM AMMETER SHUNT	START	RADIO WIPERS, ETC.	3-0-VIE
148X-P	PH. F	"	7	FUSE 13	START		
148Y-P	PH. G	"	8	FUSE 16	START		
148Z-P	PH. H	"	9	FUSE 18	START		
148A-P	PH. I	"	10	STARTER CIRCUIT	START		
148B-P	PH. J	"	11	FEED FROM L.H. POST UPPER EARTH POINT	START		
148C-P	PH. K	"	12	FEED FROM L.H. POST LOWER EARTH POINT	START		
148D-P	PH. L	"	13	IGNITION SWITCH - FROM 6	START		
148E-P	PH. M	"	14	IGNITION SWITCH - FROM 6	START		
148F-P	PH. N	"	15	IGNITION SWITCH - FROM 6	START		
148G-P	PH. O	"	16	IGNITION SWITCH - FROM 6	START		
148H-P	PH. P	"	17	IGNITION SWITCH - FROM 6	START		
148I-P	PH. Q	"	18	IGNITION SWITCH - FROM 6	START		
148J-P	PH. R	"	19	IGNITION SWITCH - FROM 6	START		
148K-P	PH. S	"	20	IGNITION SWITCH - FROM 6	START		
148L-P	PH. T	"	21	IGNITION SWITCH - FROM 6	START		
148M-P	PH. U	"	22	IGNITION SWITCH - FROM 6	START		
148N-P	PH. V	"	23	IGNITION SWITCH - FROM 6	START		
148O-P	PH. W	"	24	IGNITION SWITCH - FROM 6	START		
148P-P	PH. X	"	25	IGNITION SWITCH - FROM 6	START		
148Q-P	PH. Y	"	26	IGNITION SWITCH - FROM 6	START		
148R-P	PH. Z	"	27	IGNITION SWITCH - FROM 6	START		
148S-P	PH. AA	"	28	IGNITION SWITCH - FROM 6	START		
148T-P	PH. AB	"	29	IGNITION SWITCH - FROM 6	START		
148U-P	PH. AC	"	30	IGNITION SWITCH - FROM 6	START		
148V-P	PH. AD	"	31	IGNITION SWITCH - FROM 6	START		
148W-P	PH. AE	"	32	IGNITION SWITCH - FROM 6	START		
148X-P	PH. AF	"	33	IGNITION SWITCH - FROM 6	START		
148Y-P	PH. AG	"	34	IGNITION SWITCH - FROM 6	START		
148Z-P	PH. AH	"	35	IGNITION SWITCH - FROM 6	START		
148A-P	PH. AI	"	36	IGNITION SWITCH - FROM 6	START		
148B-P	PH. AJ	"	37	IGNITION SWITCH - FROM 6	START		
148C-P	PH. AK	"	38	IGNITION SWITCH - FROM 6	START		
148D-P	PH. AL	"	39	IGNITION SWITCH - FROM 6	START		
148E-P	PH. AM	"	40	IGNITION SWITCH - FROM 6	START		
148F-P	PH. AN	"	41	IGNITION SWITCH - FROM 6	START		
148G-P	PH. AO	"	42	IGNITION SWITCH - FROM 6	START		
148H-P	PH. AP	"	43	IGNITION SWITCH - FROM 6	START		
148I-P	PH. AQ	"	44	IGNITION SWITCH - FROM 6	START		
148J-P	PH. AR	"	45	IGNITION SWITCH - FROM 6	START		
148K-P	PH. AS	"	46	IGNITION SWITCH - FROM 6	START		
148L-P	PH. AT	"	47	IGNITION SWITCH - FROM 6	START		
148M-P	PH. AU	"	48	IGNITION SWITCH - FROM 6	START		
148N-P	PH. AV	"	49	IGNITION SWITCH - FROM 6	START		
148O-P	PH. AW	"	50	IGNITION SWITCH - FROM 6	START		
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148Q-P	PH. AY	"	52	IGNITION SWITCH - FROM 6	START		
148R-P	PH. AZ	"	53	IGNITION SWITCH - FROM 6	START		
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148T-P	PH. BB	"	55	IGNITION SWITCH - FROM 6	START		
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148Z-P	PH. BH	"	61	IGNITION SWITCH - FROM 6	START		
148A-P	PH. BI	"	62	IGNITION SWITCH - FROM 6	START		
148B-P	PH. BJ	"	63	IGNITION SWITCH - FROM 6	START		
148C-P	PH. BK	"	64	IGNITION SWITCH - FROM 6	START		
148D-P	PH. BL	"	65	IGNITION SWITCH - FROM 6	START		
148E-P	PH. BM	"	66	IGNITION SWITCH - FROM 6	START		
148F-P	PH. BN	"	67	IGNITION SWITCH - FROM 6	START		
148G-P	PH. BO	"	68	IGNITION SWITCH - FROM 6	START		
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148J-P	PH. BR	"	71	IGNITION SWITCH - FROM 6	START		
148K-P	PH. BS	"	72	IGNITION SWITCH - FROM 6	START		
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148M-P	PH. BU	"	74	IGNITION SWITCH - FROM 6	START		
148N-P	PH. BV	"	75	IGNITION SWITCH - FROM 6	START		
148O-P	PH. BW	"	76	IGNITION SWITCH - FROM 6	START		
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148T-P	PH. CB	"	81	IGNITION SWITCH - FROM 6	START		
148U-P	PH. CC	"	82	IGNITION SWITCH - FROM 6	START		
148V-P	PH. CD	"	83	IGNITION SWITCH - FROM 6	START		
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148T-P	PH. DB	"	107	IGNITION SWITCH - FROM 6	START		
148U-P	PH. DC	"	108	IGNITION SWITCH - FROM 6	START		
148V-P	PH. DD	"	109	IGNITION SWITCH - FROM 6	START		
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148Y-P	PH. DG	"	112	IGNITION SWITCH - FROM 6	START		
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148B-P	PH. DJ	"	115	IGNITION SWITCH - FROM 6	START		
148C-P	PH. DK	"	116	IGNITION SWITCH - FROM 6	START		
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148R-P	PH. DZ	"	131	IGNITION SWITCH - FROM 6	START		
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148B-P	PH. EJ	"	141	IGNITION SWITCH - FROM 6	START		
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148D-P	PH. EL	"	143	IGNITION SWITCH - FROM 6	START		
148E-P	PH. EM	"	144	IGNITION SWITCH - FROM 6	START		
148F-P	PH. EN	"	145	IGNITION SWITCH - FROM 6	START		
148G-P	PH. EO	"	146	IGNITION SWITCH - FROM 6	START		
148H-P	PH. EP	"	147	IGNITION SWITCH - FROM 6	START		
148I-P	PH. EQ	"	148	IGNITION SWITCH - FROM 6	START		
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148K-P	PH. ES	"	150	IGNITION SWITCH - FROM 6	START		
148L-P	PH. ET	"	151	IGNITION SWITCH - FROM 6	START		
148M-P	PH. EU	"	152	IGNITION SWITCH - FROM 6	START		
148N-P	PH. EV	"	153	IGNITION SWITCH - FROM 6	START		
148O-P	PH. EW	"	154	IGNITION SWITCH - FROM 6	START		
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148Q-P	PH. EY	"	156	IGNITION SWITCH - FROM 6	START		
148R-P	PH. EZ	"	157	IGNITION SWITCH - FROM 6	START		
148S-P	PH. FA	"	158	IGNITION SWITCH - FROM 6	START		
148T-P	PH. FB	"	159	IGNITION SWITCH - FROM 6	START		
148U-P	PH. FC	"	160	IGNITION SWITCH - FROM 6	START		
148V-P	PH. FD	"	161	IGNITION SWITCH - FROM 6	START		
148W-P	PH. FE	"	162	IGNITION SWITCH - FROM 6	START		
148X-P	PH. FF	"	163	IGNITION SWITCH - FROM 6	START		
148Y-P	PH. FG	"	164	IGNITION SWITCH - FROM 6	START		
148Z-P	PH. FH	"	165	IGNITION SWITCH - FROM 6	START		
148A-P	PH. FI	"	166	IGNITION SWITCH - FROM 6	START		
148B-P	PH. FJ						

Section 14

All cars built to 1972
Electrical Specification
(Sheets 1-12)

Printed in England

November 1973

T.S.D. 2476

P3

SECTION 14

THEORETICAL WIRING DIAGRAM

Sheet 1

For
Rolls-Royce Silver Shadow
and
Bentley T Series

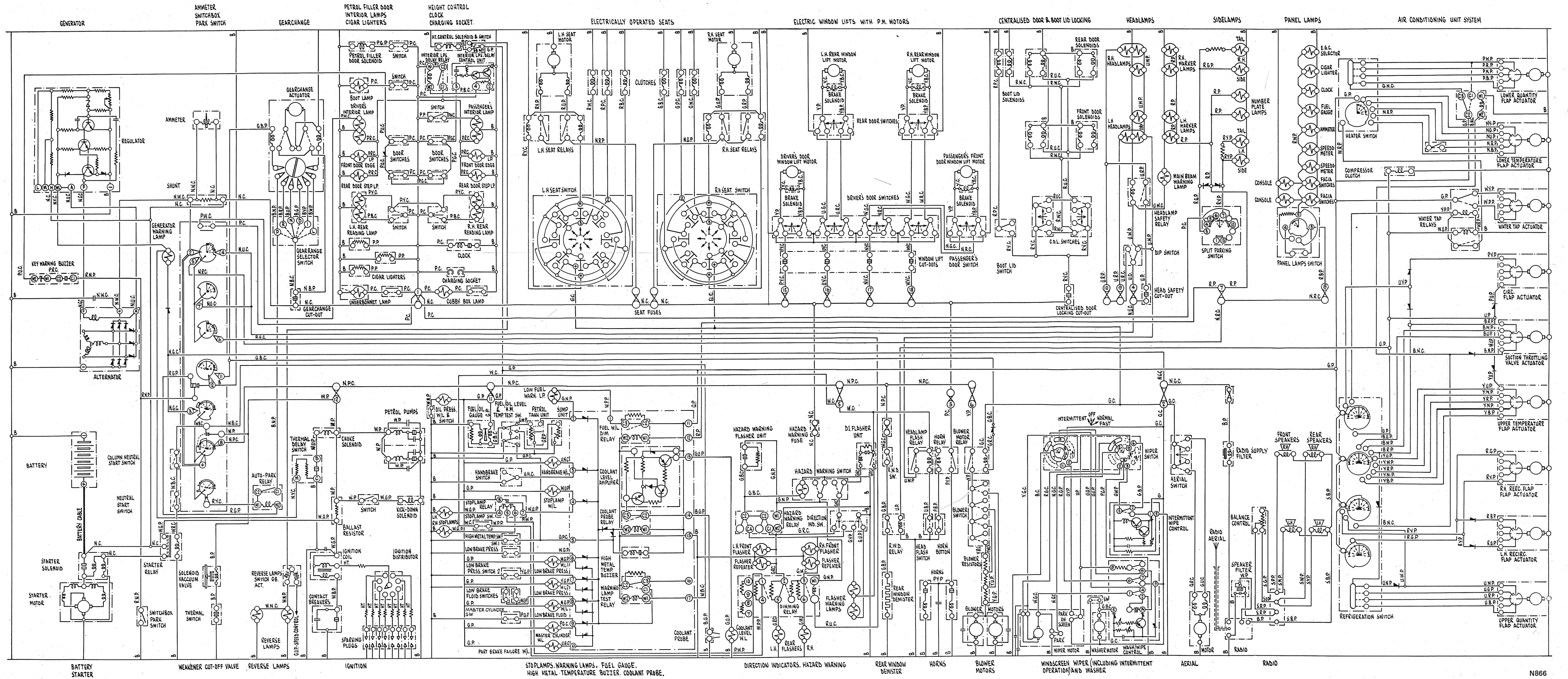
**RIGHT-HAND DRIVE SALOON AND LONG
WHEEL BASE NON-DIVISION CARS FROM
CAR SERIAL NUMBER 13754**

T.S.D. Publication 2962

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THEORETICAL WIRING DIAGRAM

Sheet 2

For
Rolls-Royce Silver Shadow
and
Bentley T Series

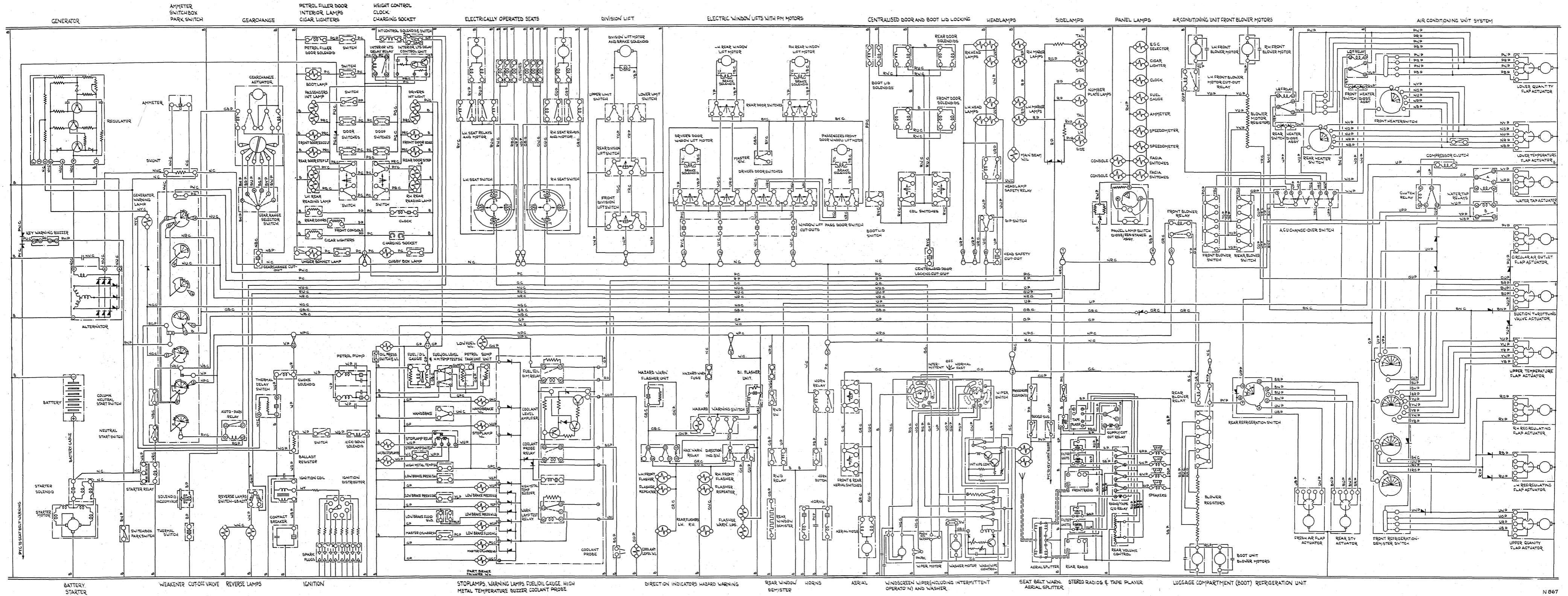
**LONG WHEEL BASE DIVISION CARS FOR
USA AND CANADA FROM CAR SERIAL
NUMBER 13921**

T.S.D. Publication 2973

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THEORETICAL WIRING DIAGRAM

Sheet 3

For
Rolls-Royce Silver Shadow
and
Bentley T Series

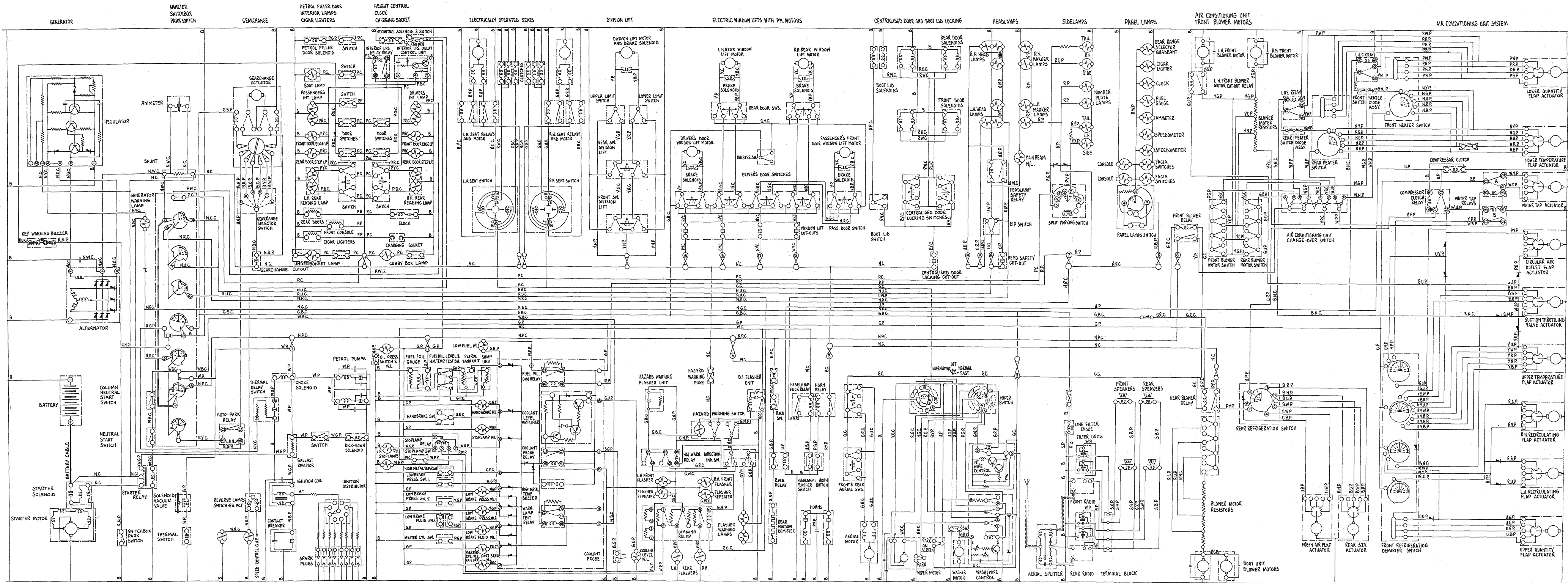
**LEFT-HAND DRIVE LONG WHEEL BASE
DIVISION CARS FOR COUNTRIES OTHER
THAN USA AND CANADA FROM CAR
SERIAL NUMBER 13973**

T.S.D. Publication 2967

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GENERATOR

AMMETER SWITCHBOX PARK SWITCH

GEARCHANGE

PETROL FILLER DOOR INTERIOR LAMPS CIGAR LIGHTERS

HEIGHT CONTROL CLOCK CHARGING SOCKET

ELECTRICALLY OPERATED SEATS

DIVISION LIFT

ELECTRIC WINDOW LIFTS WITH P.M. MOTORS

CENTRALISED DOOR AND BOOT LID LOCKING

HEADLAMPS

SIDELAMPS

PANEL LAMPS

AIR CONDITIONING UNIT FRONT BLOWER MOTORS

AIR CONDITIONING UNIT SYSTEM

BATTERY STARTER

WEAKENER CUT-OFF VALVE

REVERSE LAMPS

IGNITION

STOP LAMPS WARNING LAMPS FUEL OIL GAUGE HIGH METAL TEMPERATURE BUZZER COOLANT PROBE

DIRECTION INDICATOR LAMPS AND HAZARD WARNING

REAR WINDOW DEMISTER

HORNS

AERIAL WINDSCREEN WIPER AND WASHER (INCLUDING INTERMITTENT OPERATION)

STEREO RADIO

LUGGAGE COMP. REFRIGERATION UNIT

THEORETICAL WIRING DIAGRAM

Sheet 4

For
Rolls-Royce Corniche Saloon
and
Bentley Corniche Saloon

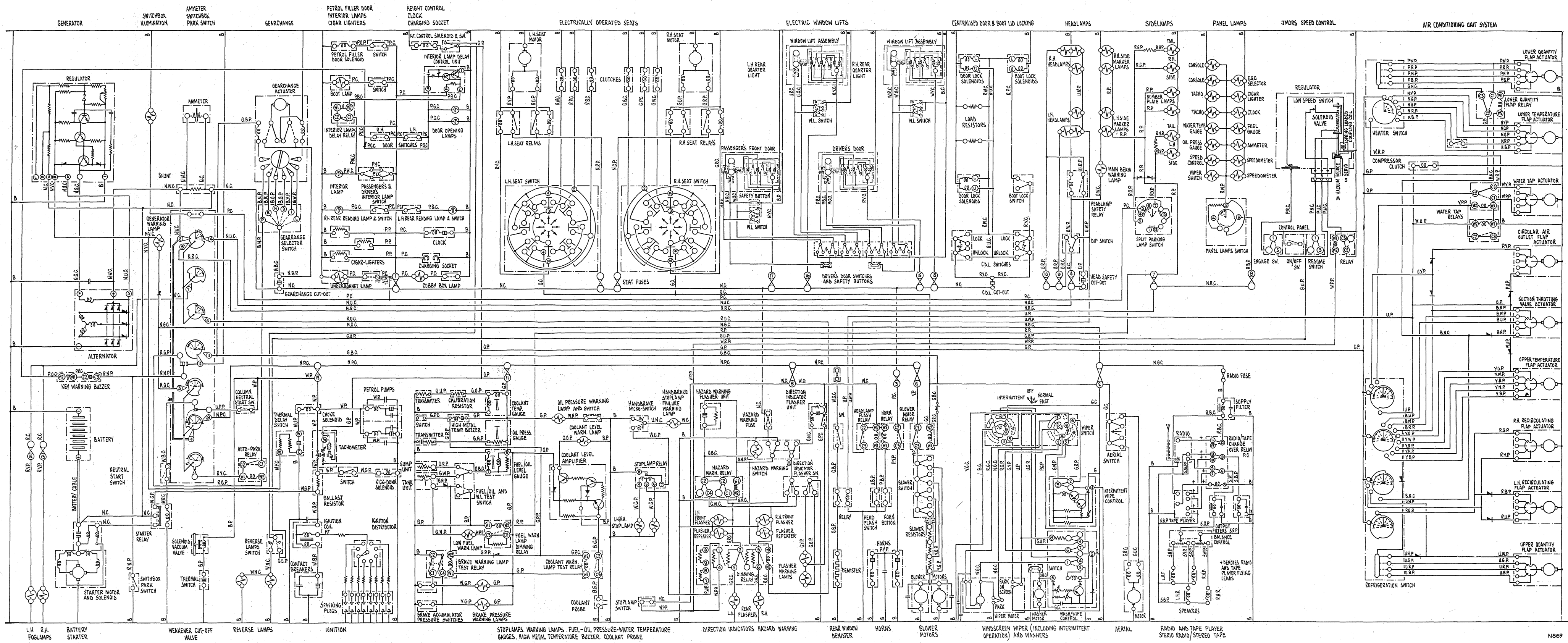
**LEFT-HAND DRIVE CARS FOR COUNTRIES
OTHER THAN USA AND CANADA FROM
CAR SERIAL NUMBER 13984**

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THEORETICAL WIRING DIAGRAM

Sheet 5

For
Rolls-Royce Corniche Saloon
and
Bentley Corniche Saloon

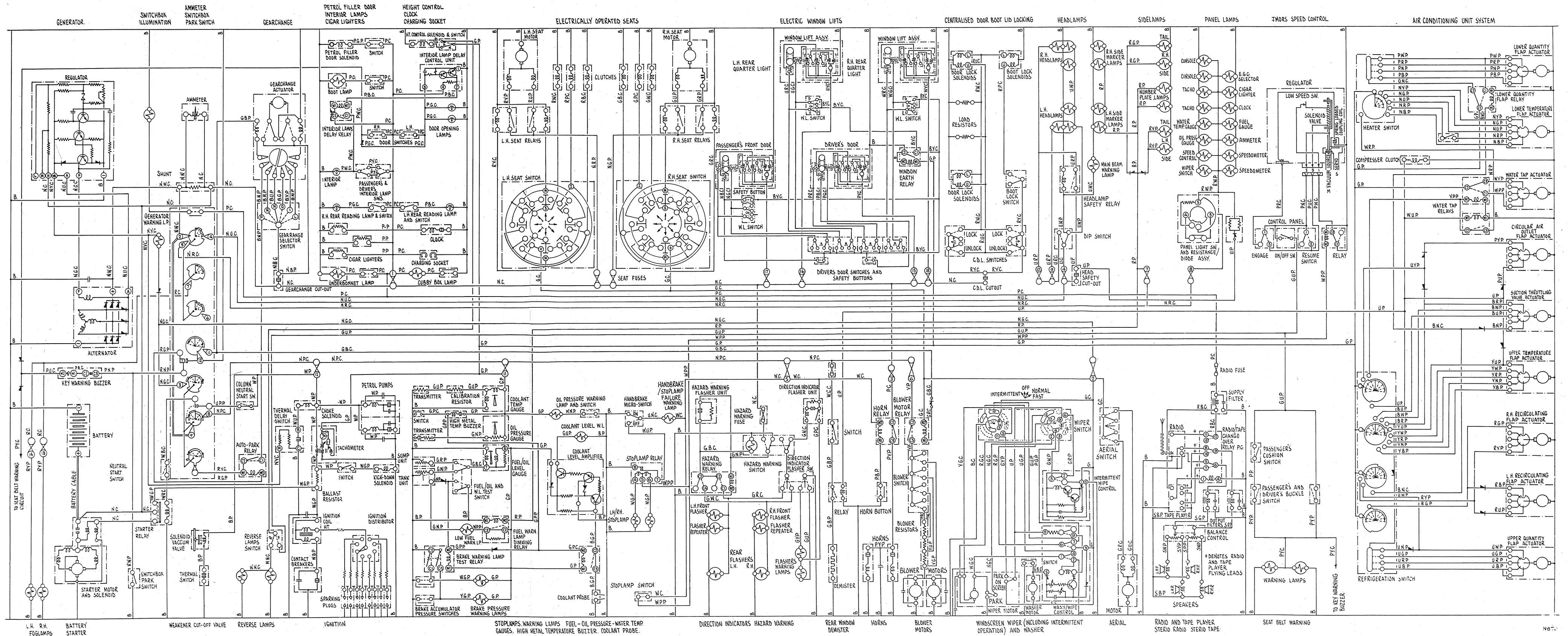
**LEFT-HAND DRIVE CARS FOR USA AND
CANADA FROM CAR SERIAL NUMBER
13459**

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THEORETICAL WIRING DIAGRAM

Sheet 6

For
Rolls-Royce Corniche Saloon
and
Bentley Corniche Saloon

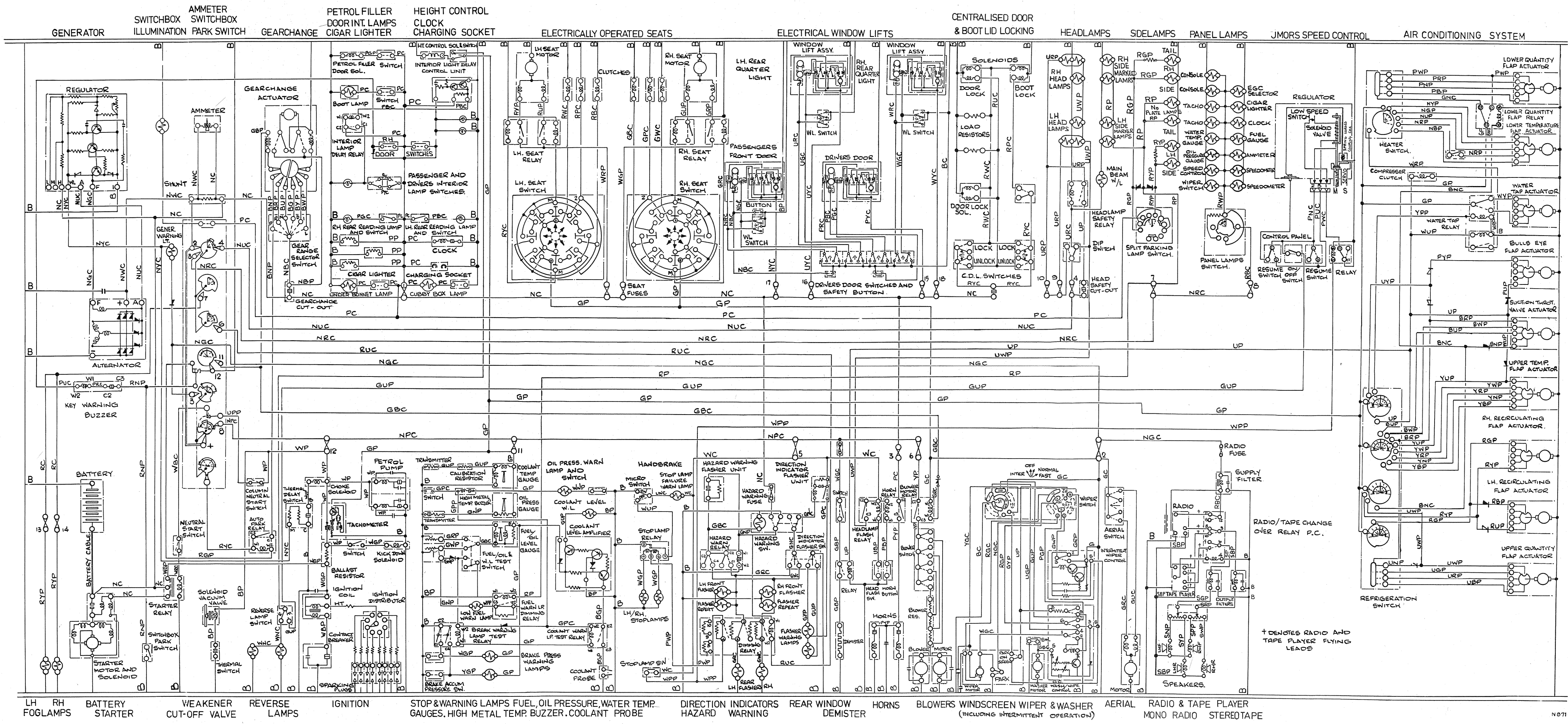
RIGHT-HAND DRIVE CARS FROM CAR NUMBER 13984

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THEORETICAL WIRING DIAGRAM

Sheet 7

For
Rolls-Royce Corniche Convertible
and
Bentley Corniche Convertible

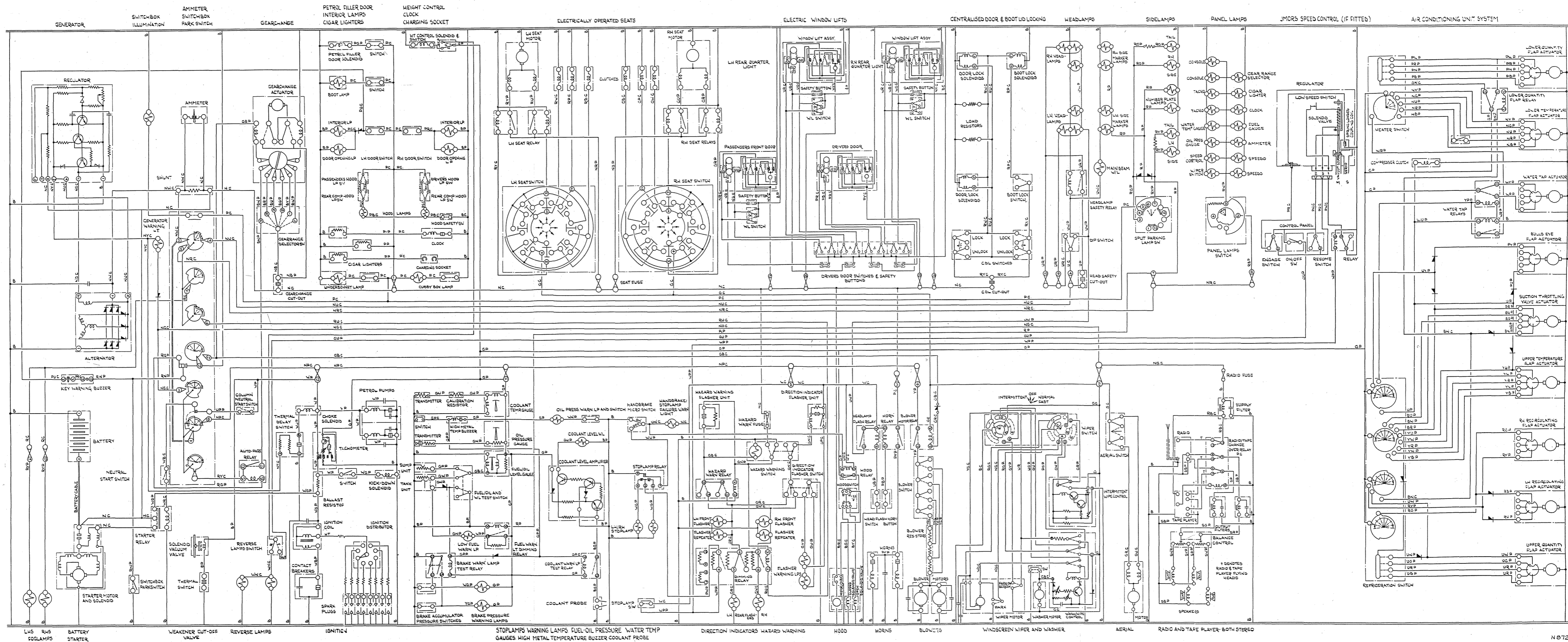
**LEFT-HAND DRIVE CARS FOR COUNTRIES
OTHER THAN USA AND CANADA FROM
CAR SERIAL NUMBER 13861**

T.S.D. Publication 2966

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THEORETICAL WIRING DIAGRAM

Sheet 8

For
Rolls-Royce Corniche Convertible
and
Bentley Corniche Convertible

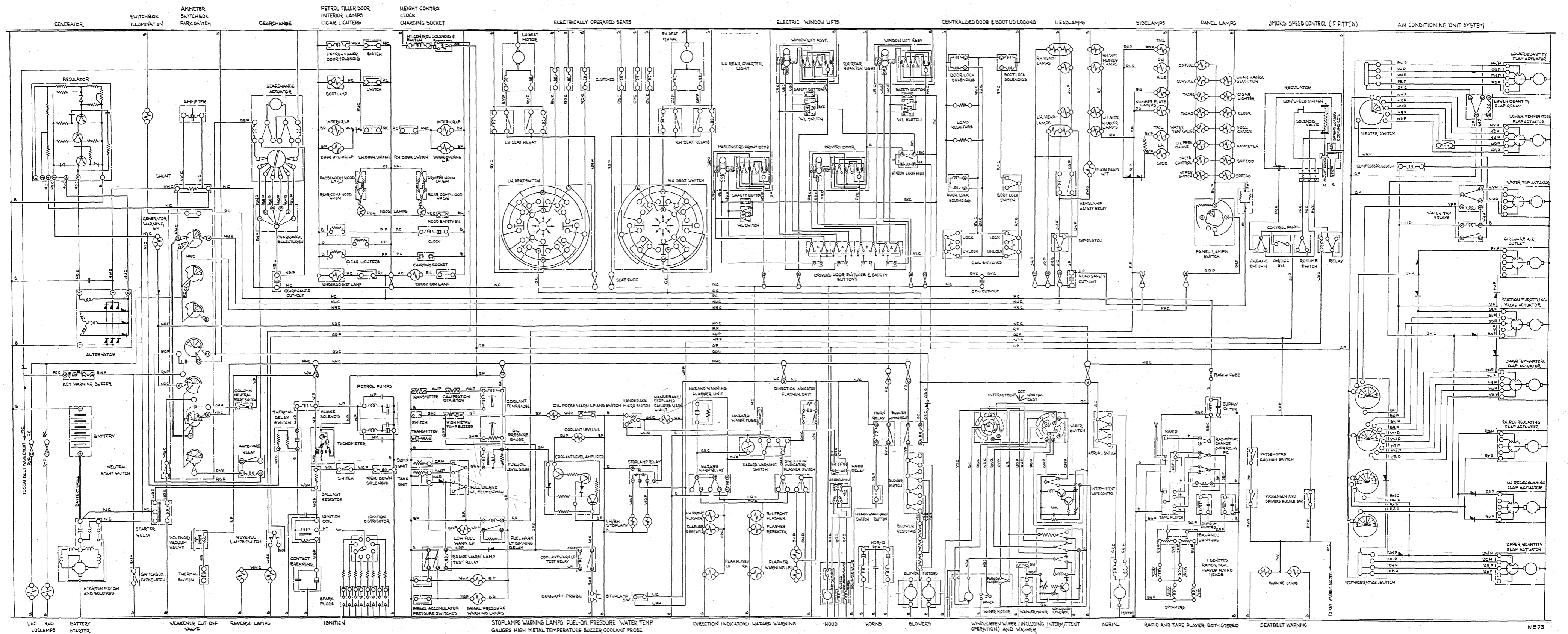
**LEFT-HAND DRIVE CARS FOR USA AND
CANADA FROM CAR SERIAL NUMBER
13413**

T.S.D. Publication 2964

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THEORETICAL WIRING DIAGRAM

Sheet 9

For
Rolls-Royce Corniche Convertible
and
Bentley Corniche Convertible

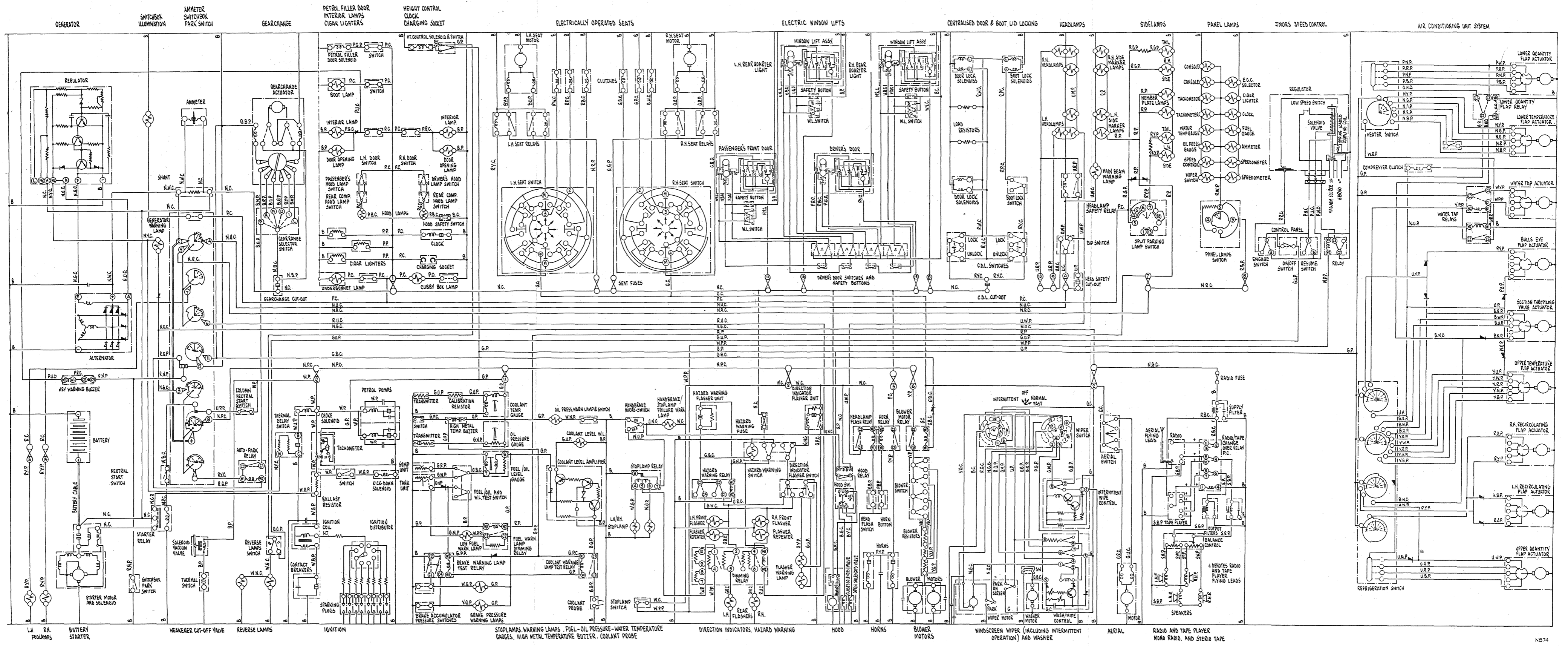
**RIGHT-HAND DRIVE CARS FROM CAR
SERIAL NUMBER 13861**

T.S.D. Publication 2972

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THEORETICAL WIRING DIAGRAM

Sheet 10

For
Rolls-Royce Silver Shadow
and
Bentley T Series

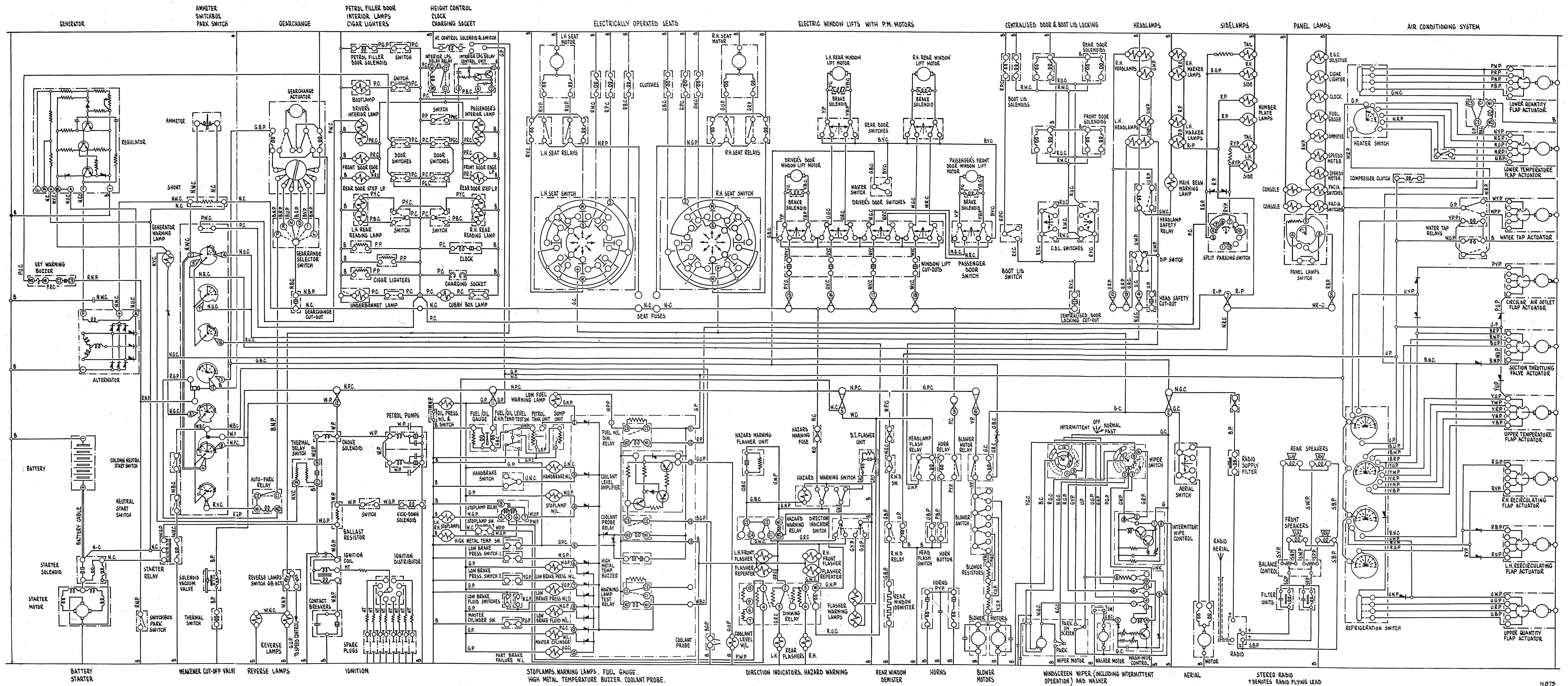
**LEFT-HAND DRIVE SALOON AND LONG
WHEEL BASE NON-DIVISION CARS FOR
COUNTRIES OTHER THAN USA AND
CANADA FROM CAR SERIAL NUMBER
13754**

T.S.D. Publication 2969

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THEORETICAL WIRING DIAGRAM

Sheet 11

For
Rolls-Royce Silver Shadow
and
Bentley T Series

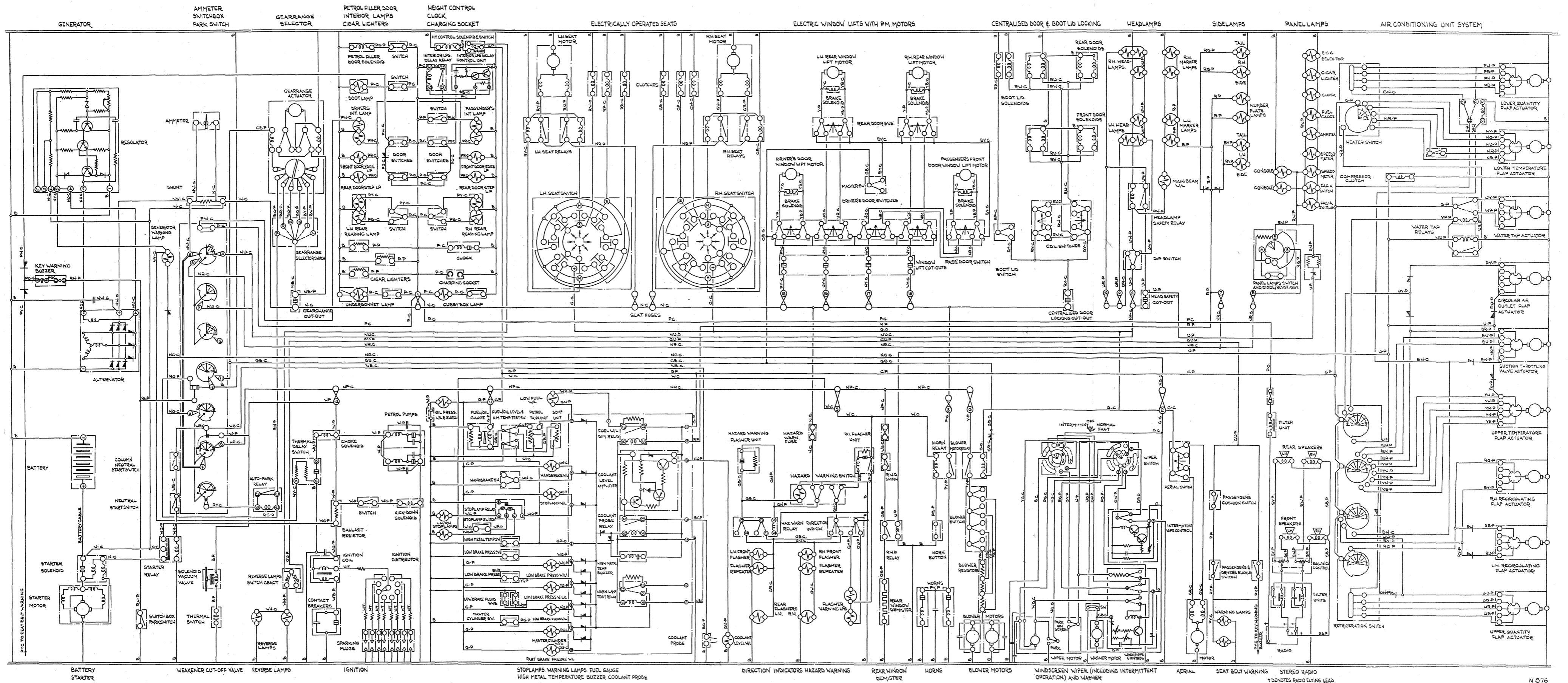
**SALOON AND LONG WHEEL BASE
DIVISION CARS FOR USA AND CANADA
FROM CAR SERIAL NUMBER 13754**

T.S.D. Publication 2968

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BATTERY STARTER

WEAKENER CUT-OFF VALVE REVERSE LAMPS

IGNITION

STOPLAMPS WARNING LAMPS FUEL GAUGE HIGH METAL TEMPERATURE BUZZER COOLANT PROBE

DIRECTION INDICATORS HAZARD WARNINGS

REAR WINDOW DEMISTER

HORN

BLOWER MOTORS

WINDSCREEN WIPER (INCLUDING INTERMITTENT OPERATION) AND WASHER

AERIAL

SEAT BELT WARNING STEREO RADIO

† DENOTES RADIO DYING LEAD

THEORETICAL WIRING DIAGRAM

Sheet 12

For
Rolls-Royce Silver Shadow
and
Bentley T Series

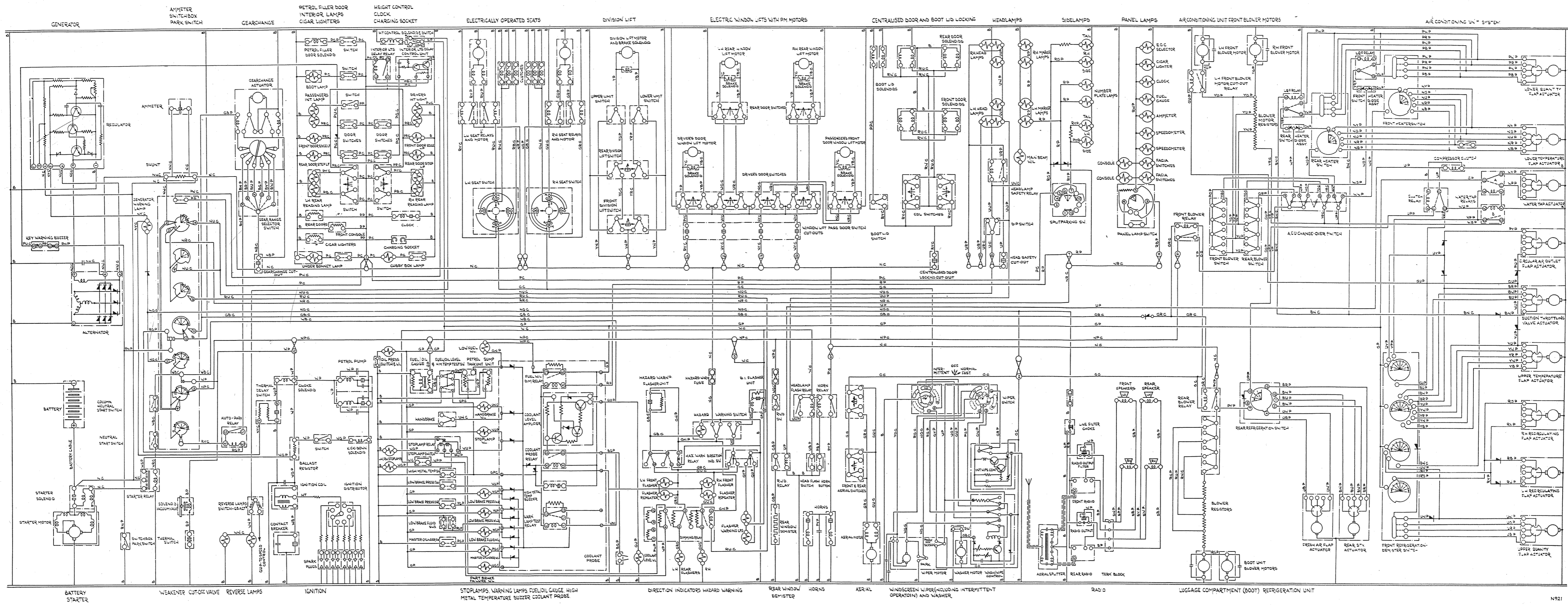
RIGHT-HAND DRIVE LONG WHEEL BASE DIVISION CARS FROM CAR SERIAL NUMBER 13754

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Section 15

All cars built to 1973
Electrical Specification
(Sheets 1-11)

Printed in England

February 1974

T.S.D. 2476

P549

SECTION 15

THEORETICAL WIRING DIAGRAM

Sheet 1

For
Rolls-Royce Silver Shadow
and
Bentley T Series

RIGHT-HAND DRIVE SALOON AND LONG WHEELBASE NON-DIVISION CARS FROM CAR SERIAL NUMBER 16214

T.S.D. Publication 4028

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THEORETICAL WIRING DIAGRAM

Sheet 2

For
Rolls-Royce Silver Shadow
and
Bentley T Series

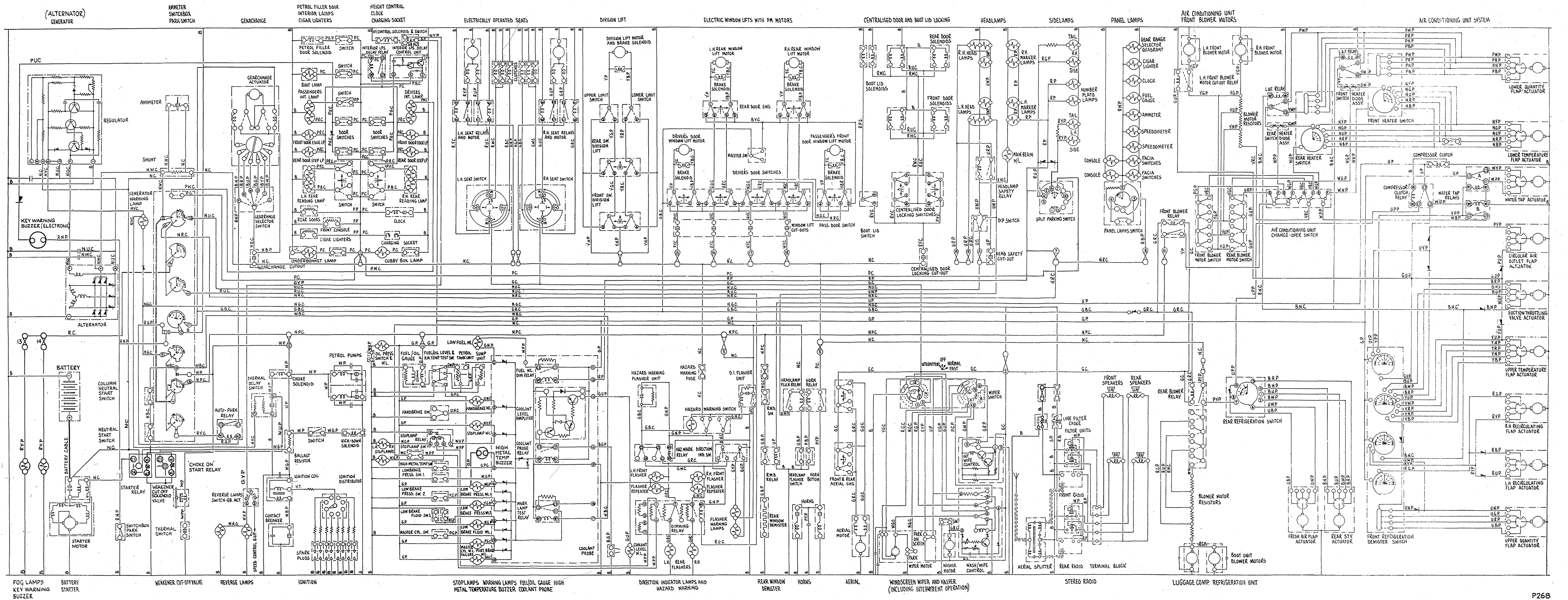
**LONG WHEELBASE DIVISION CARS FOR
USA AND CANADA FROM CAR SERIAL
NUMBER 16214**

T.S.D. Publication 4031

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THEORETICAL WIRING DIAGRAM

Sheet 3

For
Rolls-Royce Corniche Saloon
and
Bentley Corniche Saloon

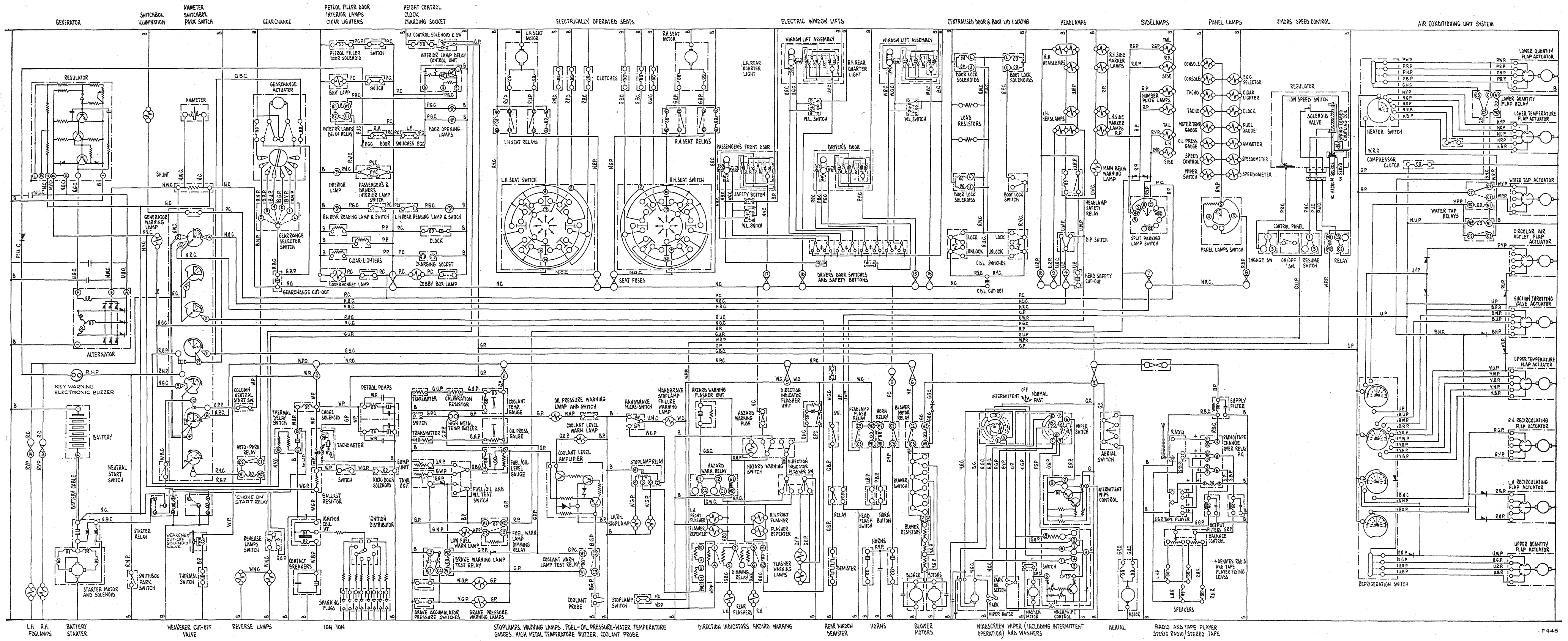
LEFT-HAND DRIVE CARS FOR COUNTRIES OTHER THAN USA AND CANADA FROM CAR SERIAL NUMBER 16214

T.S.D. Publication 4048

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THEORETICAL WIRING DIAGRAM

Sheet 4

For
Rolls-Royce Corniche Saloon
and
Bentley Corniche Saloon

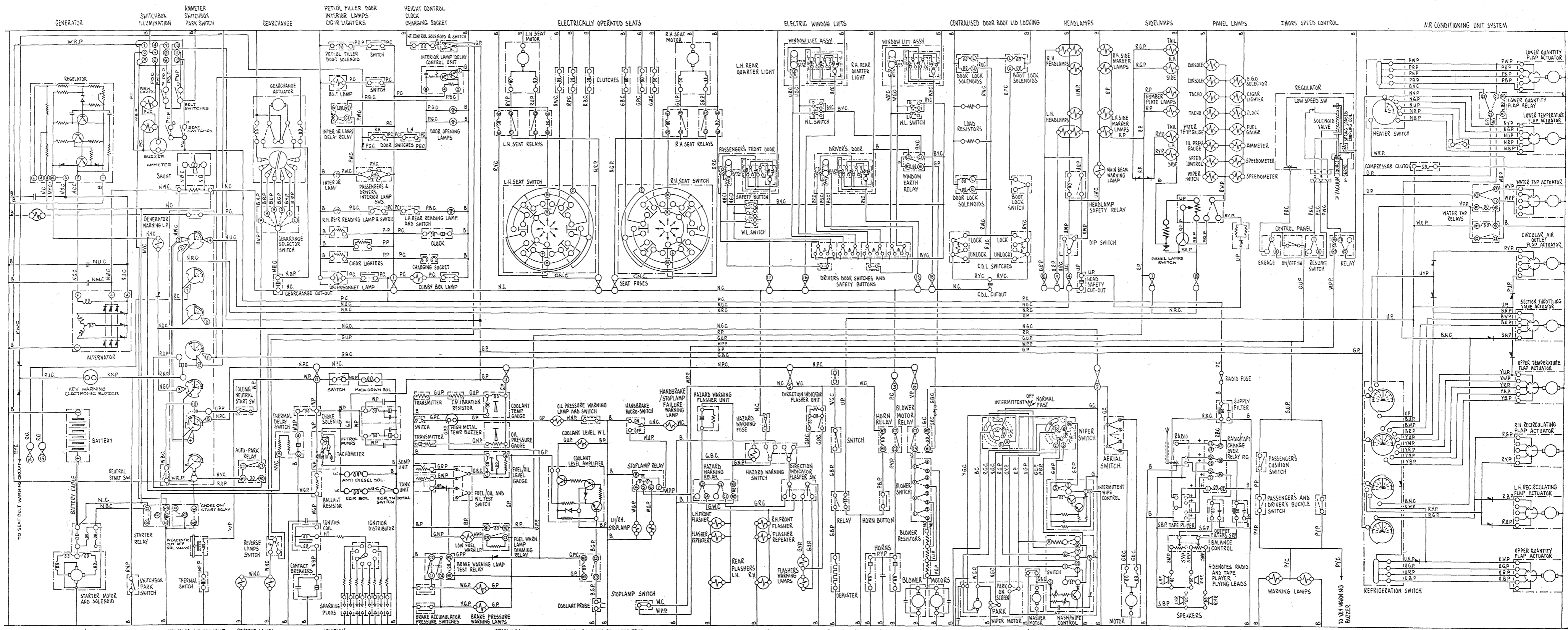
**LEFT-HAND DRIVE CARS FOR USA AND
CANADA FROM CAR SERIAL NUMBER
16214**

T.S.D. Publication 4054

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GENERATOR SWITCHBOX AMMETER SWITCHBOX PETROL FILLER DOOR HEIGHT CONTROL ELECTRICALLY OPERATED SEATS ELECTRIC WINDOW LIFTS CENTRALISED DOOR BOOT LID LOCKING HEADLAMPS SIDELAMPS PANEL LAMPS TWO SPEED CONTROL AIR CONDITIONING UNIT SYSTEM
 BATTERY STARTER WEAKENER CUT-OFF VALVE REVERSE LAMPS IGNITION STOPLAMP WARNING LAMPS FUEL-OIL PRESSURE-WATER TEMP. GAUGES. HIGH METAL TEMPERATURE BUZZER. COOLANT PROBE. DIRECTION INDICATORS HAZARD WARNING REAR WINDOW DEMISTER HORNS BLOWER MOTORS WINDSCREEN WIPER (INCLUDING INTERMITTENT OPERATION) AND WASHER AERIAL RADIO AND TAPE PLAYER STEREO RADIO STEREO TAPE SEAT BELT WARNING WARNING LAMPS REFRIGERATION SWITCH

THEORETICAL WIRING DIAGRAM

Sheet 5

For
Rolls-Royce Corniche Saloon
and
Bentley Corniche Saloon

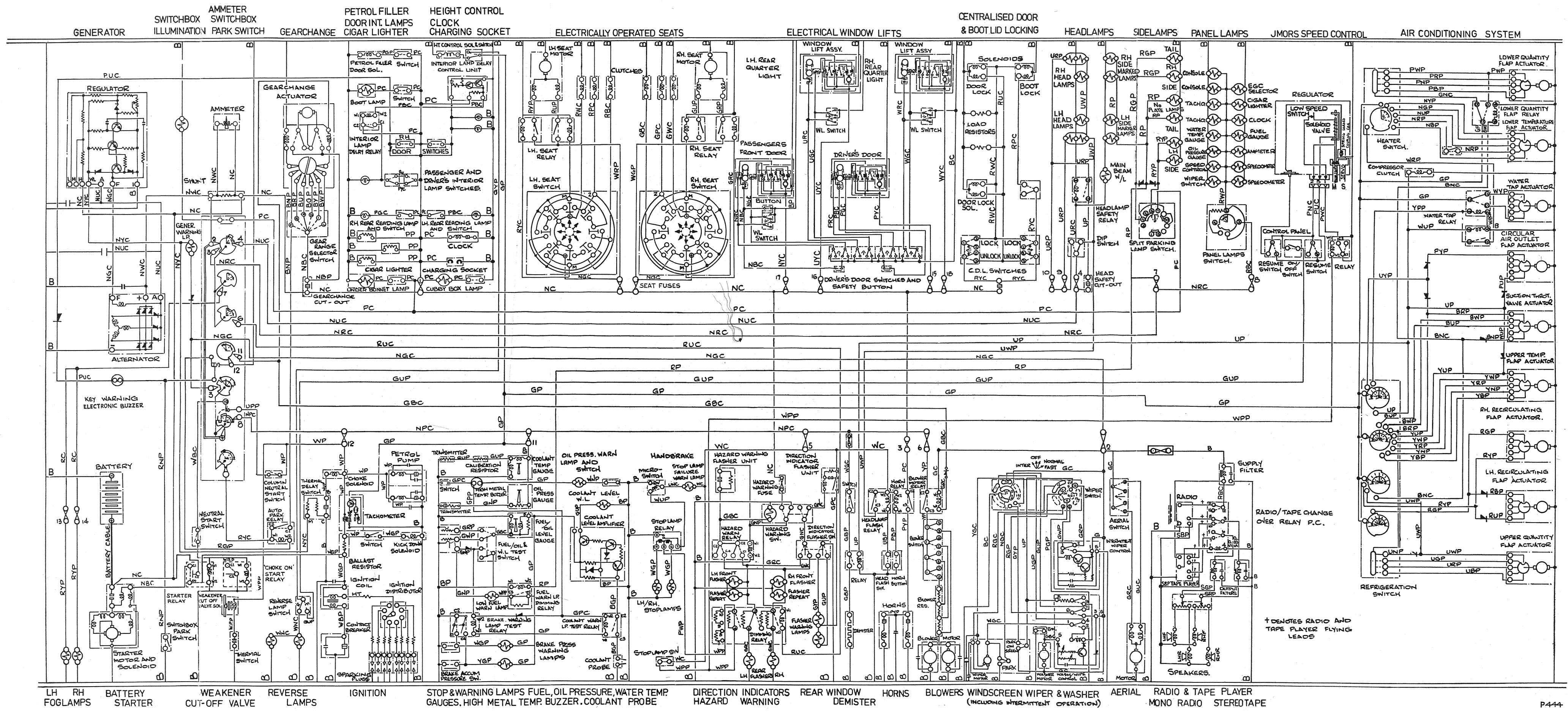
**RIGHT-HAND DRIVE CARS FROM CAR
SERIAL NUMBER 16214**

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THEORETICAL WIRING DIAGRAM

Sheet 6

For
Rolls-Royce Corniche Convertible
and
Bentley Corniche Convertible

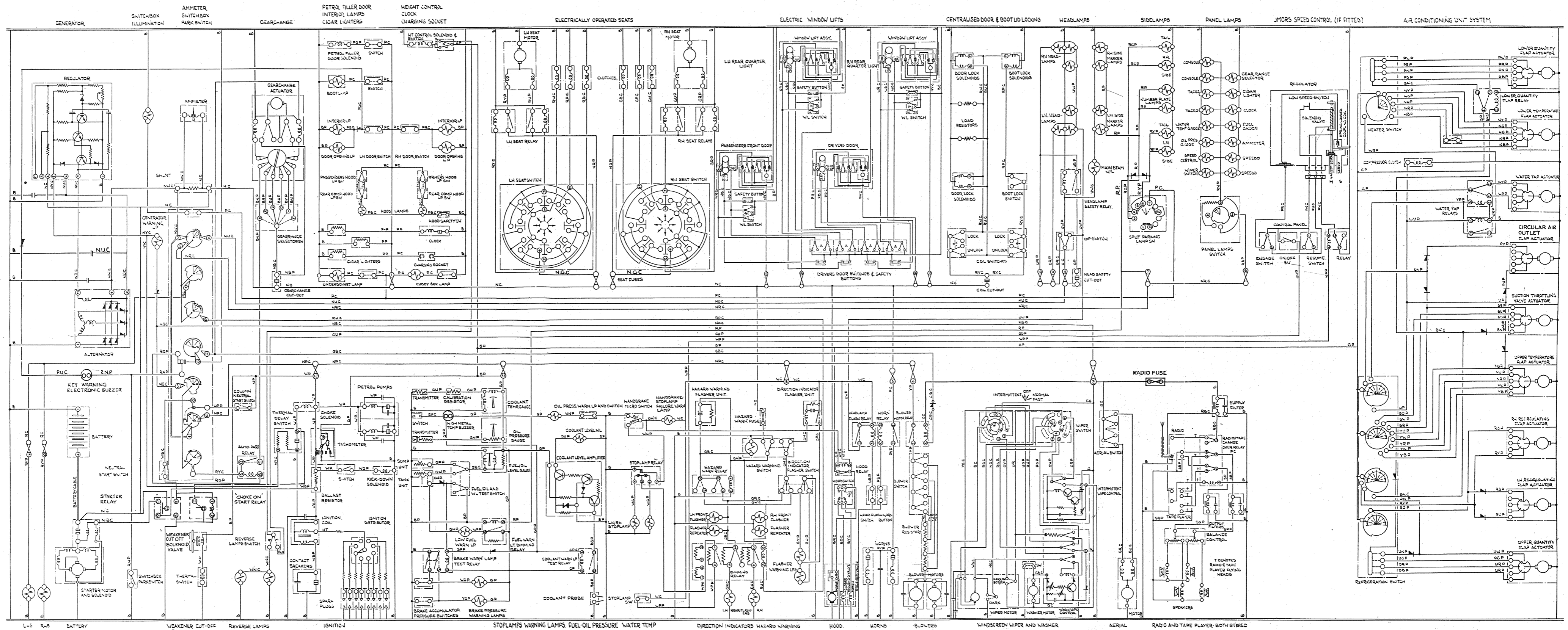
**LEFT-HAND DRIVE CARS FOR COUNTRIES
OTHER THAN USA AND CANADA FROM
CAR SERIAL NUMBER 16214**

T.S.D. Publication 4051

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L-5 R-5 BATTERY WEAKENER CUT-OFF SOL VALVE REVERSE LAMPS IGNITION STOP LAMP WARNING LAMPS FUEL OIL PRESSURE WATER TEMP GAUGES HIGH METAL TEMPERATURE BUZZER COOLANT PROBE
 DIRECTION INDICATORS HAZARD WARNING HORN BLOWERS WINDSCREEN WIPER AND WASHER AERIAL RADIO AND TAPE PLAYER BOTH STEREO
 REFRIGERATION SWITCH

THEORETICAL WIRING DIAGRAM

Sheet 7

For
Rolls-Royce Corniche Convertible
and
Bentley Corniche Convertible

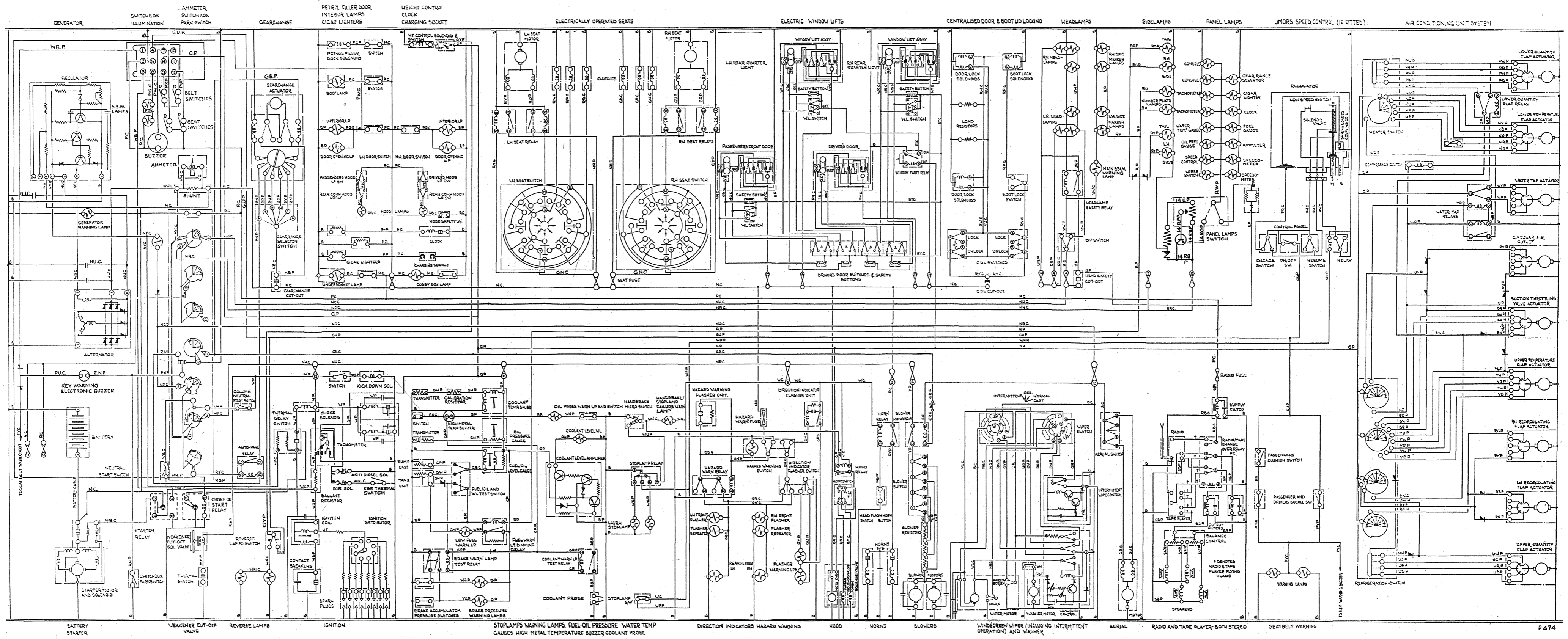
**LEFT-HAND DRIVE CARS FOR USA AND
CANADA FROM CAR SERIAL NUMBER
16214**

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THEORETICAL WIRING DIAGRAM

Sheet 8

For
Rolls-Royce Corniche Convertible
and
Bentley Corniche Convertible

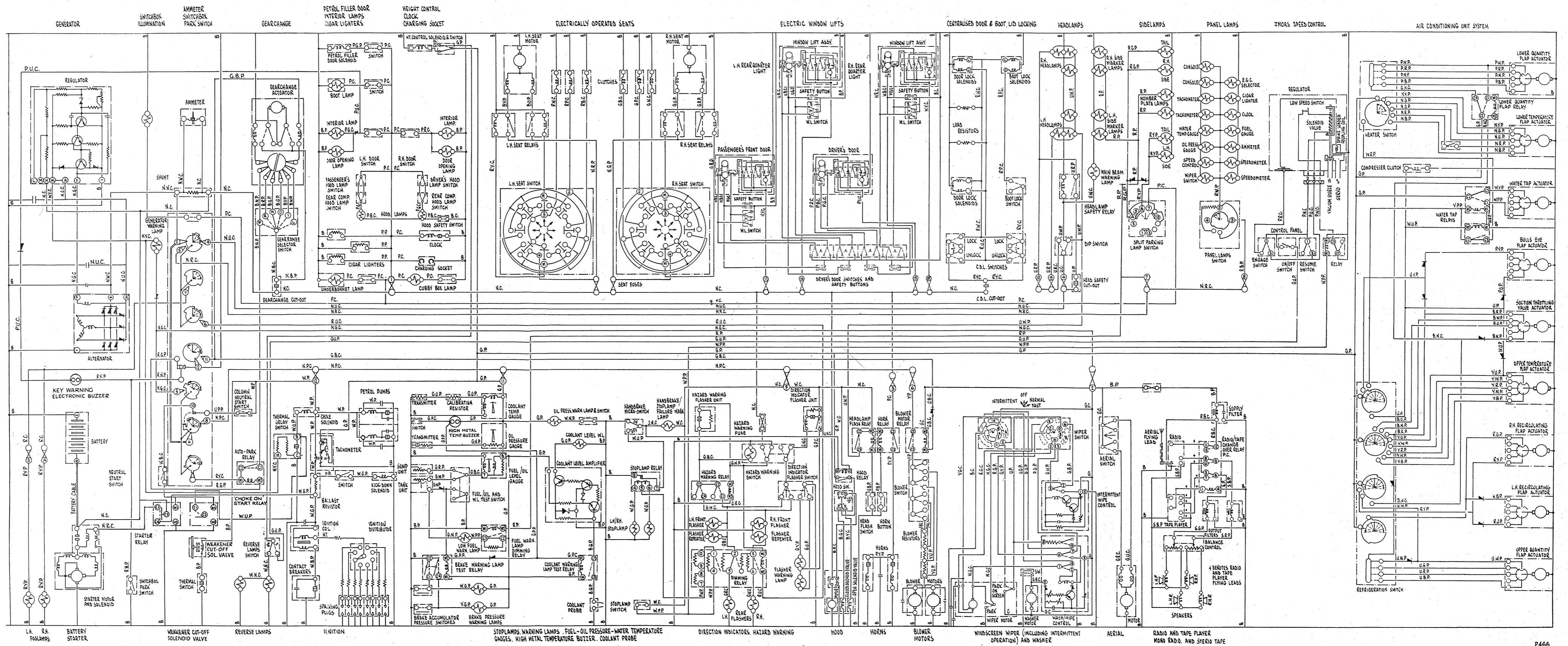
**RIGHT-HAND DRIVE CARS FROM CAR
SERIAL NUMBER 16214**

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THEORETICAL WIRING DIAGRAM

Sheet 9

For
Rolls-Royce Silver Shadow
and
Bentley T Series

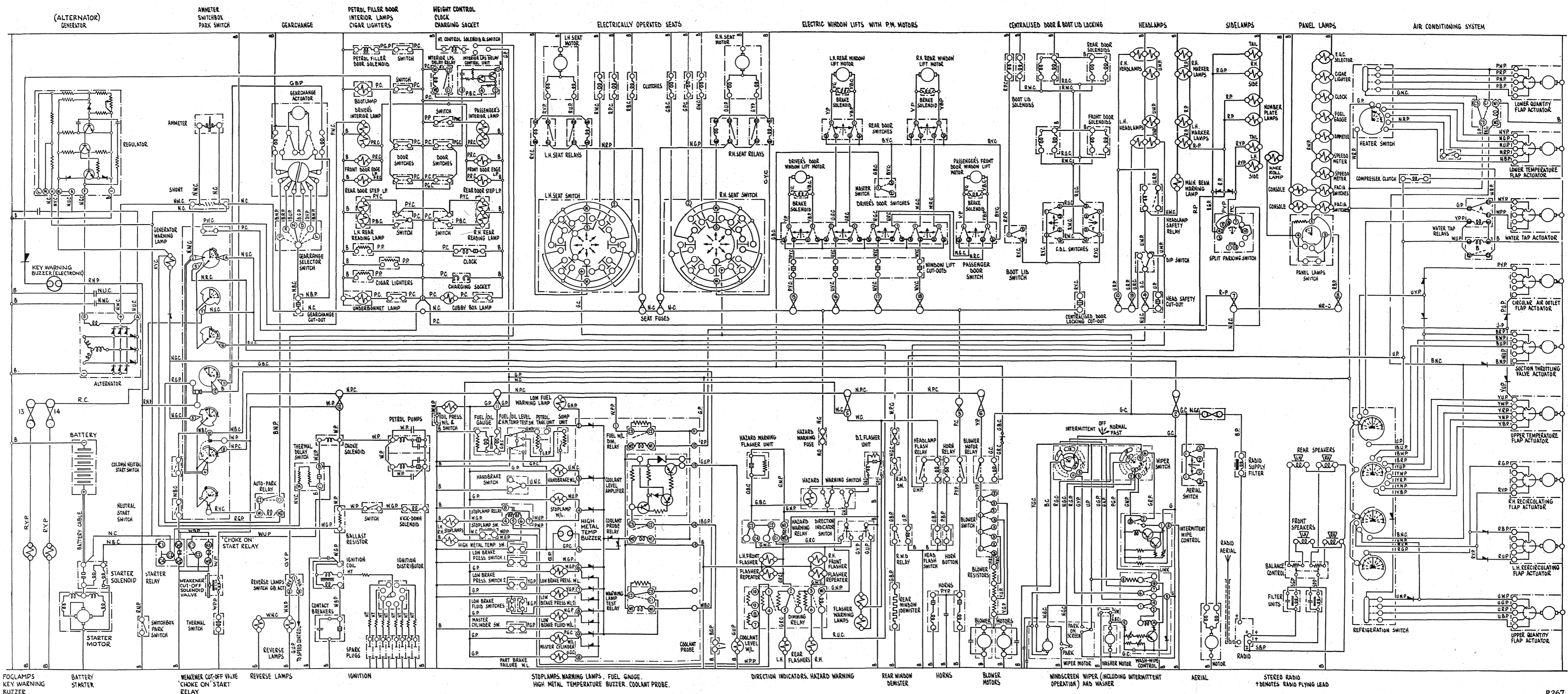
**LEFT-HAND DRIVE SALOON AND LONG
WHEELBASE NON-DIVISION CARS FOR
COUNTRIES OTHER THAN USA AND
CANADA FROM CAR SERIAL NUMBER
16214**

T.S.D. Publication 4030

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THEORETICAL WIRING DIAGRAM

Sheet 10

For
Rolls-Royce Silver Shadow
and
Bentley T Series

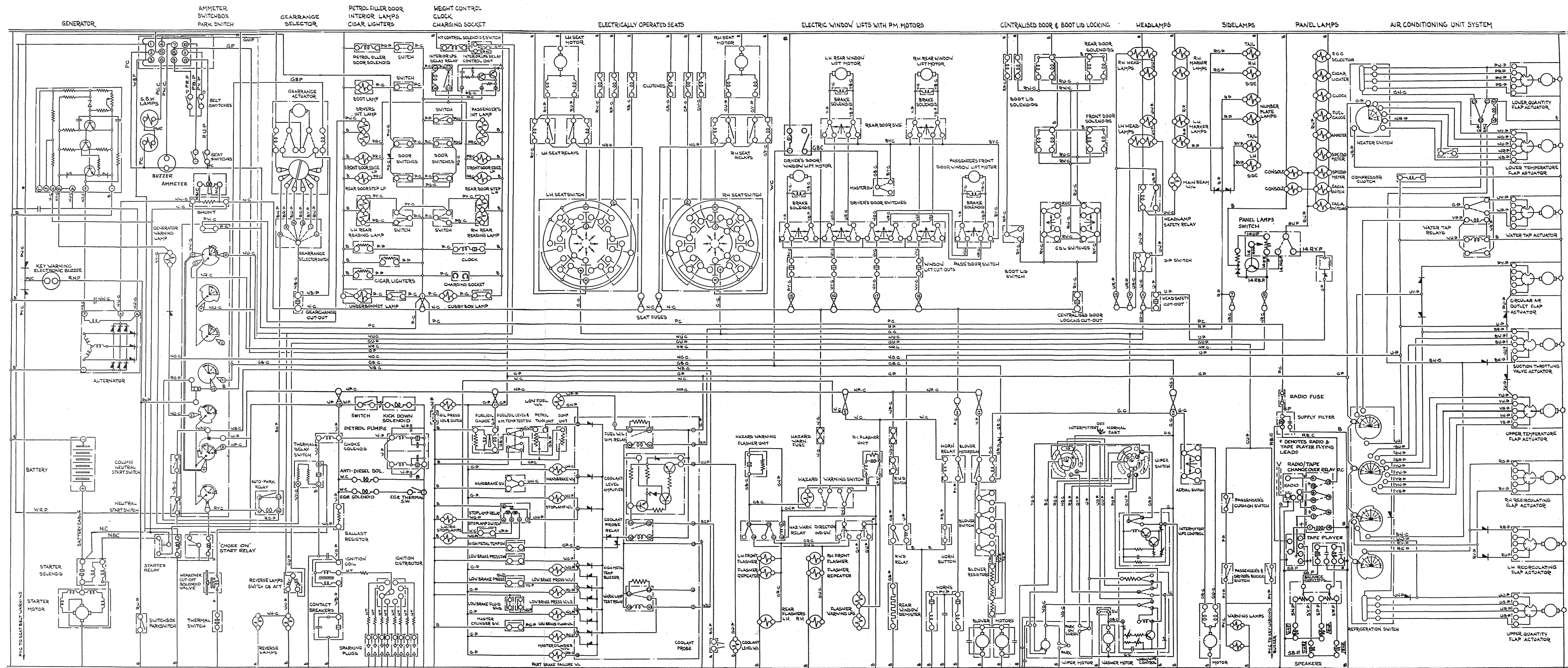
**SALOON AND LONG WHEELBASE NON-
DIVISION CARS FOR USA AND CANADA
FROM CAR SERIAL NUMBER 16214**

T.S.D. Publication 4052

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BATTERY STARTER WEAKENER CUT-OFF VALVE F. REVERSE LAMPS IGNITION STOP LAMPS WARNING LAMPS FUEL GAUGE HIGH METAL TEMPERATURE BUZZER COOLANT PROBE DIRECTION INDICATORS HAZARD WARNING REAR WINDOW DEMISTER HORNS BLOWER MOTORS WINDSCREEN WIPER (INCLUDING INTERMITTENT OPERATION) AND WASHER AERIAL SEAT BELT WARNING STEREO RADIO † DENOTES RADIO FLYING LEAD

THEORETICAL WIRING DIAGRAM

Sheet 11

For
Rolls-Royce Silver Shadow
and
Bentley T Series

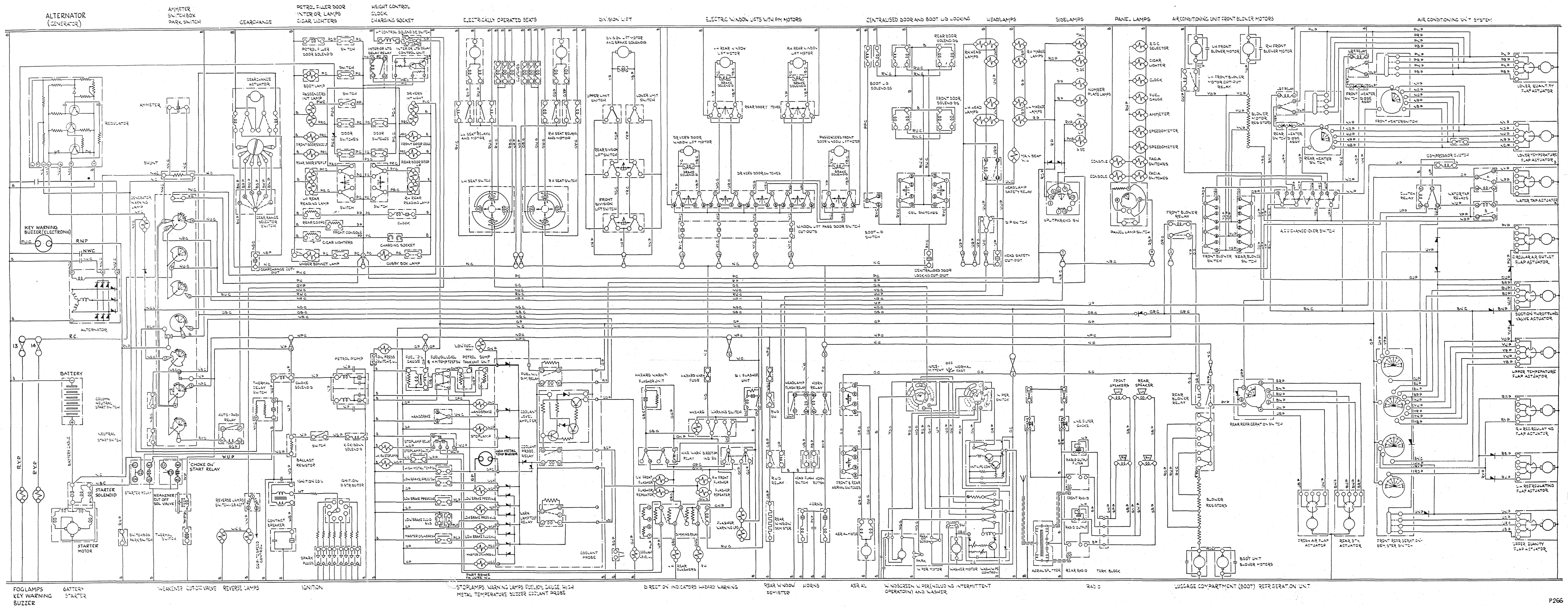
**RIGHT-HAND DRIVE LONG WHEELBASE
DIVISION CARS FROM CAR SERIAL
NUMBER 16214**

T.S.D. Publication 4029

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Section 16

Rolls-Royce Silver Shadow and Bentley 'T' Series Saloons built to August 1975 Electrical Specification (Sheets 1 - 10)

Printed in England

December 1976

T.S.D. 2476

R 108

Section 16

THEORETICAL WIRING DIAGRAM

Sheet 1

For
Rolls-Royce Silver Shadow
and
Bentley T Series

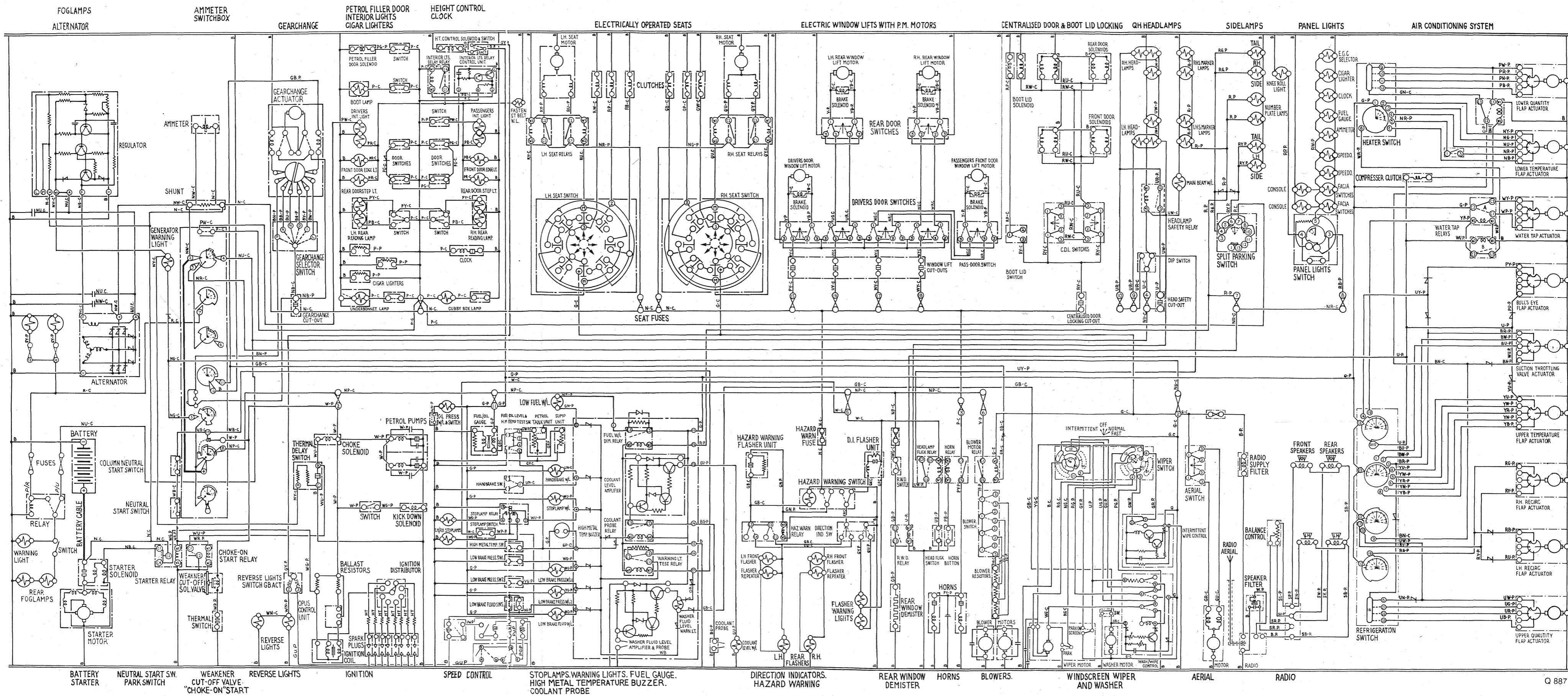
RIGHT-HAND DRIVE SALOON AND LONG WHEELBASE NON-DIVISION CARS FROM CAR SERIAL NUMBERS 22118 AND 22073

T.S.D. Publication 4150

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THEORETICAL WIRING DIAGRAM

Sheet 2

For
Rolls-Royce Silver Shadow
and
Bentley T Series

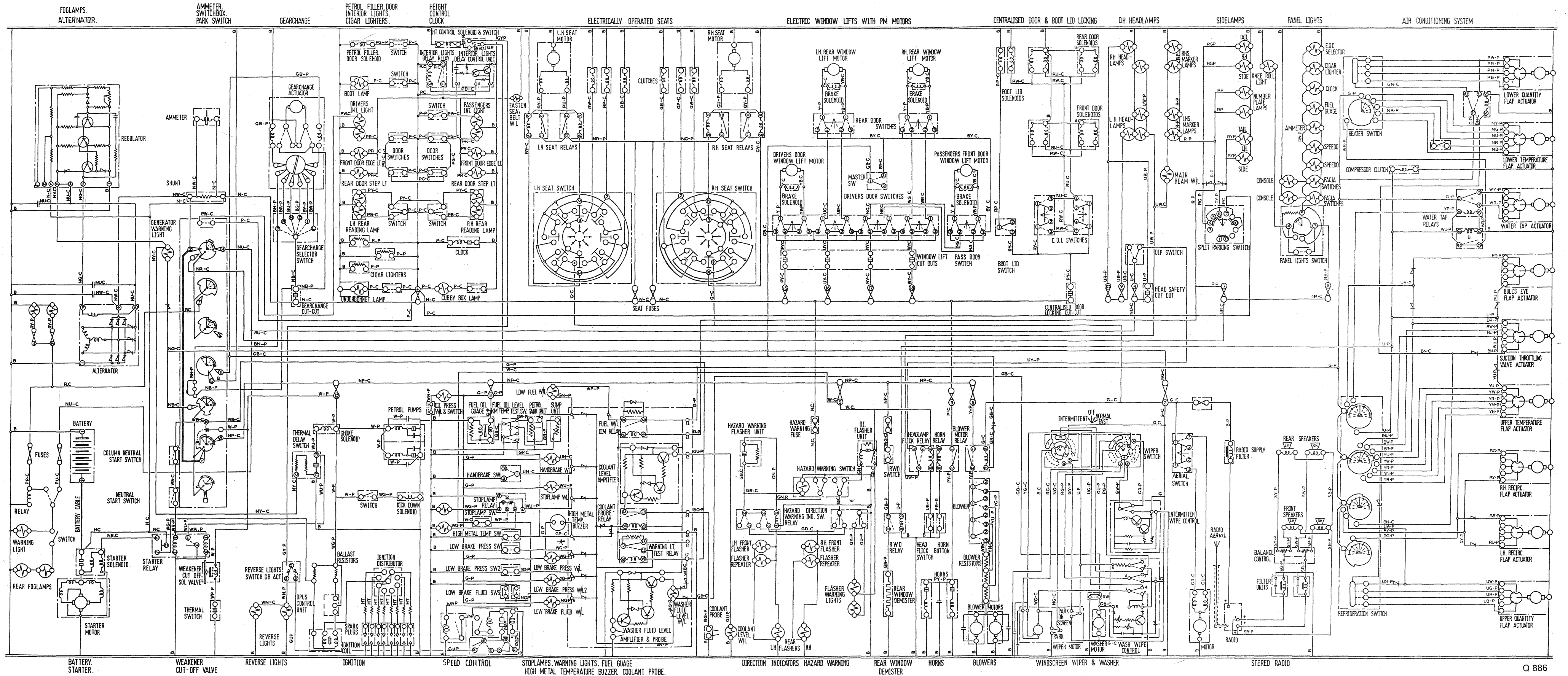
**LEFT-HAND DRIVE SALOON AND LONG
WHEELBASE NON-DIVISION CARS FOR
COUNTRIES OTHER THAN USA AND
CANADA FROM CAR SERIAL NUMBERS
22118 AND 22073**

T.S.D. Publication 4149

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THEORETICAL WIRING DIAGRAM

Sheet 3

For
Rolls-Royce Silver Shadow
and
Bentley T Series

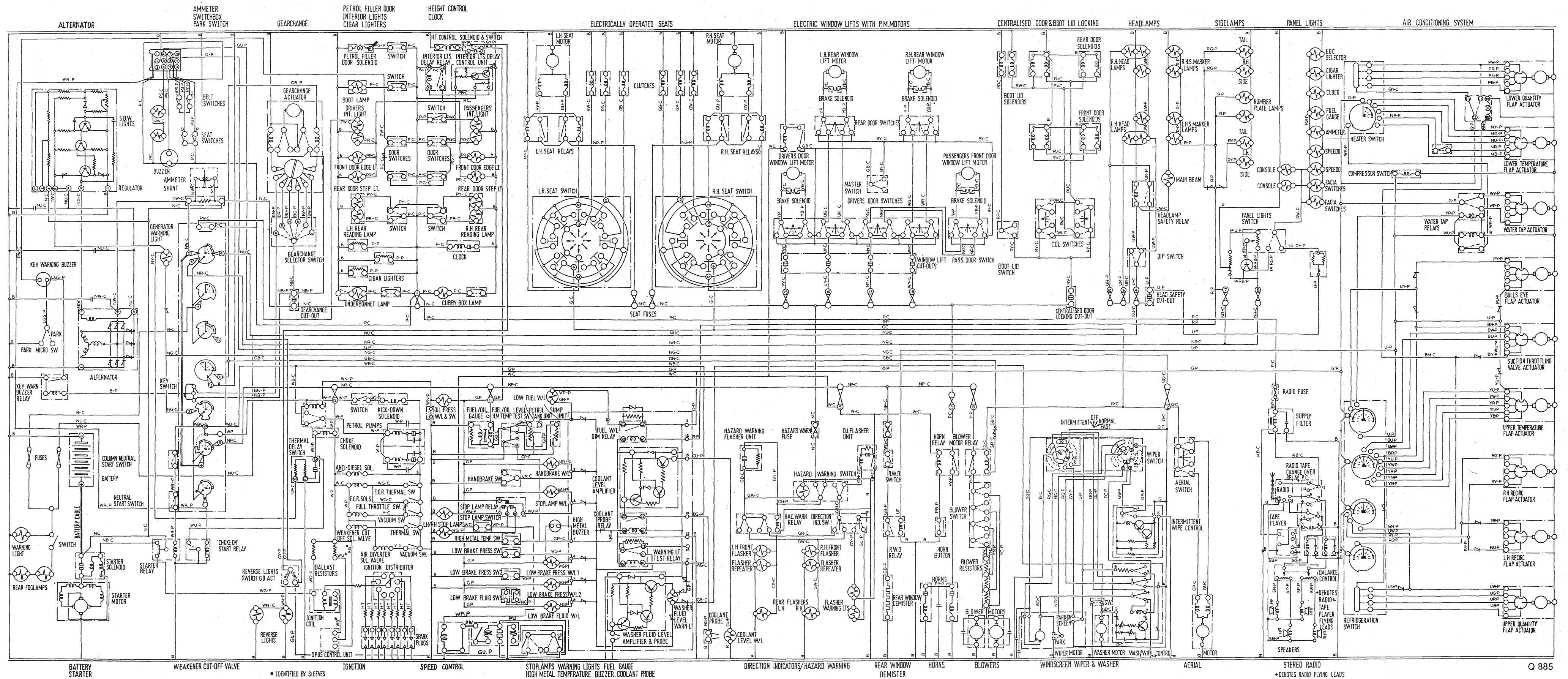
SALOON AND LONG WHEELBASE NON- DIVISION CARS FOR USA AND CANADA FROM CAR SERIAL NUMBERS 22118 AND 22073

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* IDENTIFIED BY SLEEVES

+ DENOTES RADIO FLYING LEADS

THEORETICAL WIRING DIAGRAM

Sheet 4

For
Rolls-Royce Silver Shadow
and
Bentley T Series

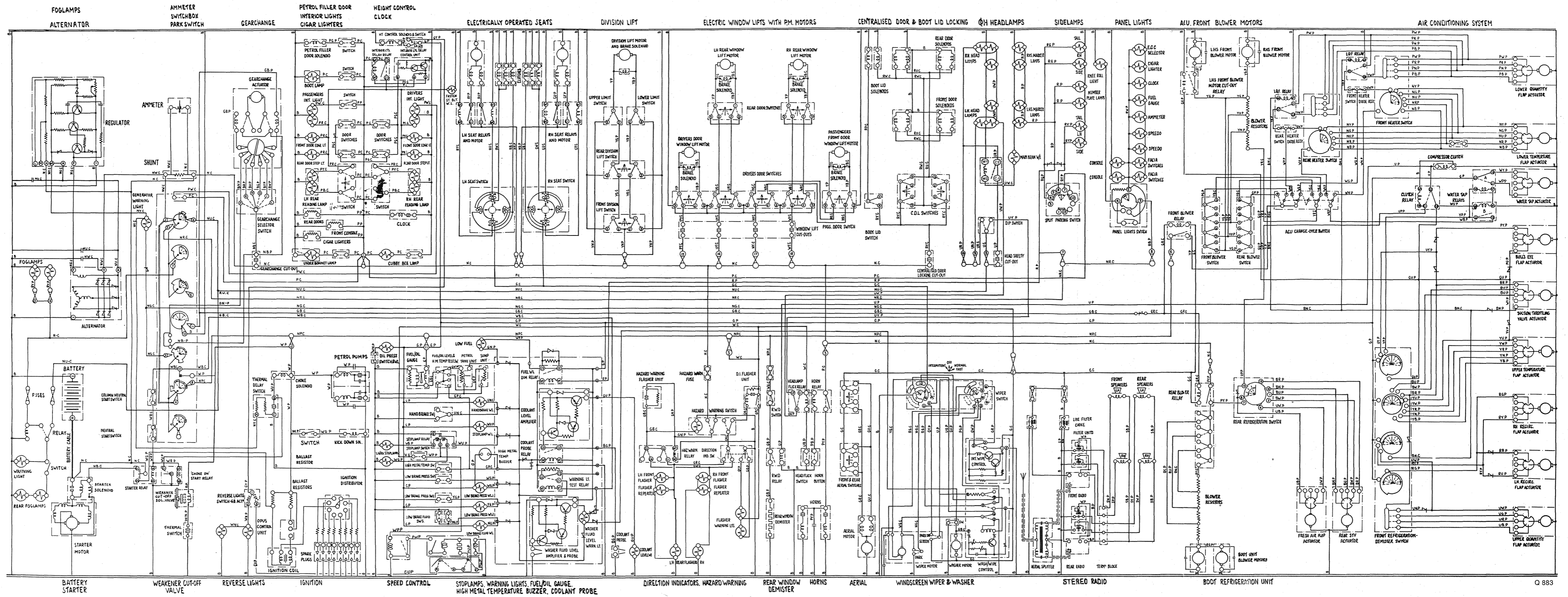
RIGHT-HAND DRIVE LONG WHEELBASE DIVISION CARS FROM CAR SERIAL NUMBER 22073

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THEORETICAL WIRING DIAGRAM

Sheet 5

For
Rolls-Royce Silver Shadow
and
Bentley T Series

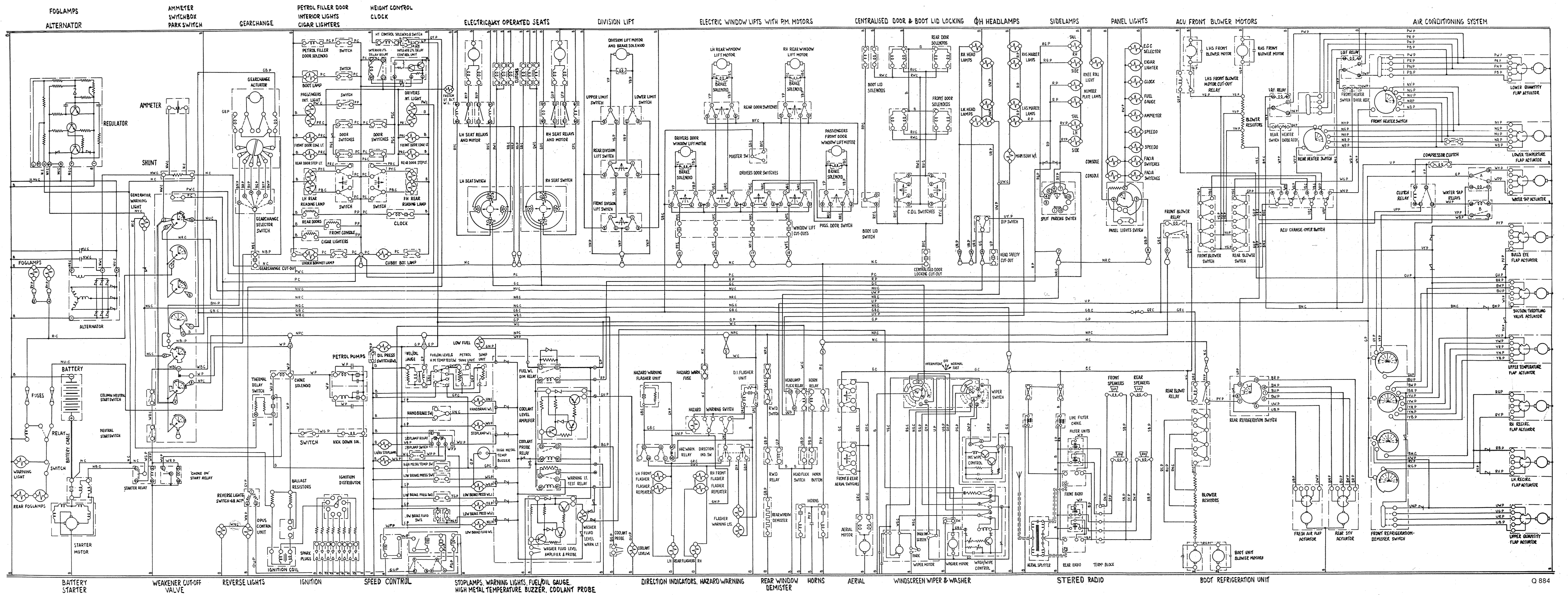
**LEFT-HAND DRIVE LONG
WHEELBASE DIVISION CARS FOR
COUNTRIES OTHER THAN USA AND
CANADA FROM CAR SERIAL NUMBER
22073**

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PRACTICAL WIRING DIAGRAM

Sheet 6

STARTING AND IGNITION CIRCUIT

For
Rolls-Royce Silver Shadow
and
Bentley T Series

**SALOON AND LONG WHEELBASE NON-
DIVISION CARS FOR USA AND CANADA
FROM CAR SERIAL NUMBERS
22118 AND 22073**

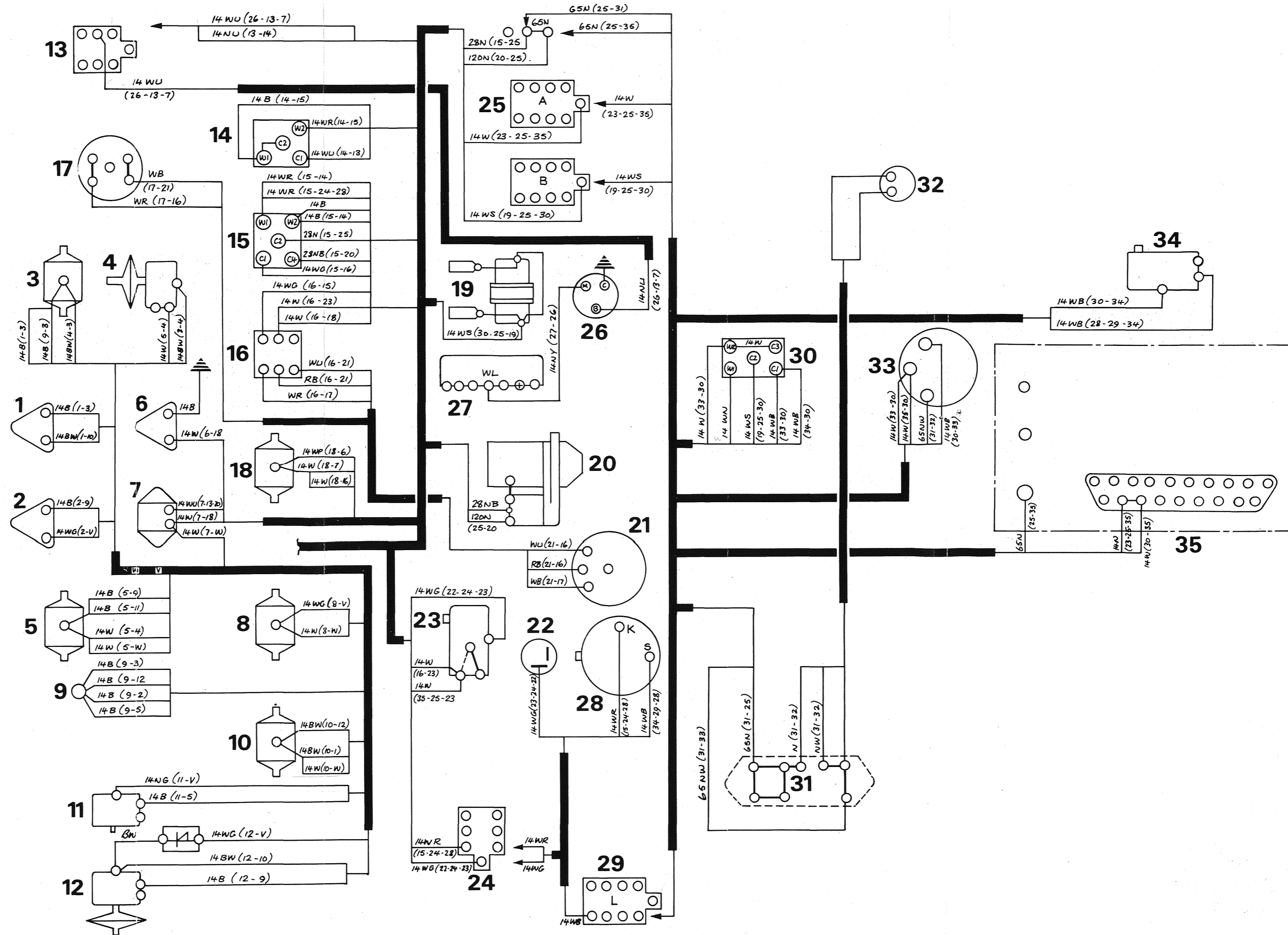
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- 1 Exhaust gas recirculation valve (secondary)
- 2 Exhaust gas recirculation valve (primary)
- 3 Air diverter solenoid valve
- 4 Air diverter vacuum switch
- 5 Anti-diesel solenoid valve
- 6 Weaker cut-off thermal switch
- 7 Choke solenoid
- 8 Exhaust gas recirculation solenoid 1
- 9 Earth point
- 10 Exhaust gas recirculation solenoid 2
- 11 Full throttle switch
- 12 Exhaust gas recirculation valve vacuum switch
- 13 Right-hand valance plug
- 14 Choke-on-start relay
- 15 Starter relay
- 16 Ballast resistor
- 17 Ignition coil
- 18 Weaker cut-off solenoid
- 19 Fuel pumps
- 20 Starter motor & relay
- 21 Ignition distributor
- 22 Kick-down solenoid
- 23 Kick-down switch
- 24 Left-hand valance plug
- 25 Right-hand toeboard sockets
- 26 Choke thermal delay switch
- 27 Voltage regulator
- 28 Gearchange actuator
- 29 Left-hand toeboard socket
- 30 Fuel pumps relay
- 31 Ammeter shunt
- 32 Ammeter
- 33 Switchbox
- 34 Column neutral start switch
- 35 Fuseboard



PRACTICAL WIRING DIAGRAM

Sheet 7

CHARGING CIRCUIT

For
Rolls-Royce Silver Shadow
and
Bentley T Series

**RIGHT-HAND DRIVE SALOON AND LONG
WHEELBASE NON-DIVISION CARS FROM
CAR SERIAL NUMBERS
22118 AND 22073**

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PRACTICAL WIRING DIAGRAM

Sheet 8

EXTERIOR LIGHTING

For
Rolls-Royce Silver Shadow
and
Bentley T Series

RIGHT-HAND DRIVE SALOON AND LONG WHEELBASE NON-DIVISION CARS FROM CAR SERIAL NUMBERS 22118 AND 22073

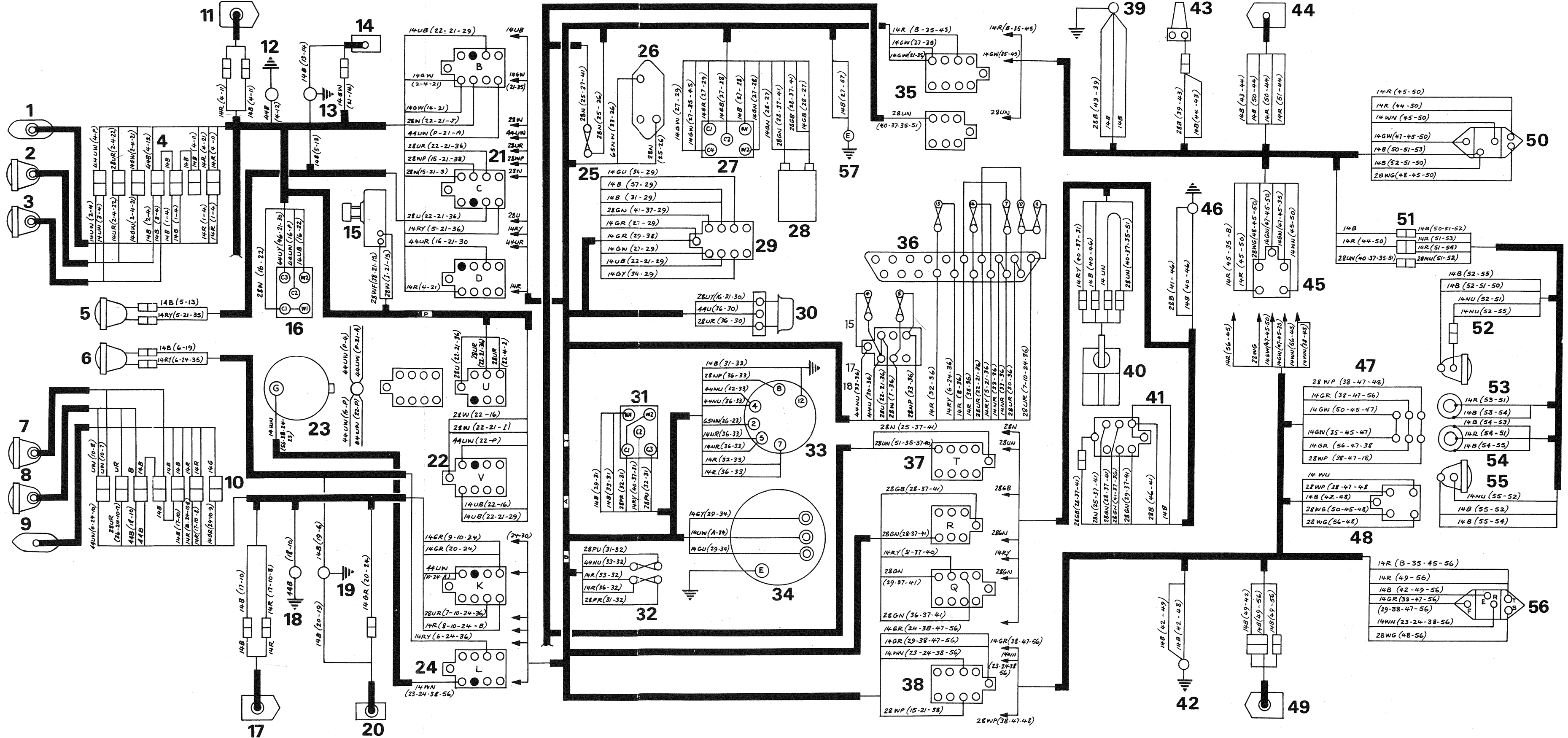
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- 1 Right-hand side/flasher lamp
- 2 Right-hand headlamp (outer)
- 3 Right-hand headlamp (inner)
- 4 Right-hand snap connector block
- 5 Right-hand foglamp
- 6 Left-hand foglamp
- 7 Left-hand headlamp (inner)
- 8 Left-hand headlamp (outer)
- 9 Left-hand side/flasher lamp
- 10 Left-hand snap connector block
- 11 Right-hand front side marker lamp
- 12 Right-hand spring pot earth
- 13 Right-hand valance earth
- 14 Right-hand flasher repeater
- 15 Stoplamp switch
- 16 Head flash relay
- 17 Left-hand front side marker lamp
- 18 Left-hand spring pot earth
- 19 Left-hand valance earth
- 20 Left-hand flasher repeater
- 21 Right-hand toboard sockets
- 22 Relay printed circuit board
- 23 Gearchange actuator
- 24 Left-hand toboard sockets
- 25 Hazard warning fuse
- 26 Ammeter shunt
- 27 Hazard flasher relay
- 28 Hazard flasher unit
- 29 Flasher switch socket
- 30 Dipswitch
- 31 Rear foglamp relay
- 32 Rear foglamp fuses
- 33 Switchbox
- 34 Speedometer
- 35 Right-hand 'A' body socket
- 36 Fuseboard
- 37 Console sockets
- 38 Left-hand 'A' post body sockets
- 39 Right-hand boot earth
- 40 Rear foglamp warning lamp/switch
- 41 Hazard warning switch
- 42 Left-hand boot earth
- 43 Petrol filler door solenoid
- 44 Right-hand side marker lamp
- 45 Boot socket
- 46 Tunnel earth
- 47 Dimming relay connections
- 48 Stoplamp relay socket
- 49 Left-hand rear side marker lamp
- 50 Right-hand rear lamp
- 51 Number plate loom connector
- 52 Right-hand rear foglamp
- 53 Right-hand number plate lamp
- 54 Left-hand number plate lamp
- 55 Left-hand rear foglamp
- 56 Left-hand rear lamp
- 57 Right-hand 'A' post upper earth



PRACTICAL WIRING DIAGRAM

Sheet 9

INTERIOR LIGHTING

For
Rolls-Royce Silver Shadow
and
Bentley T Series

**SALOON AND LONG WHEELBASE NON-
DIVISION CARS FOR USA AND CANADA
FROM CAR SERIAL NUMBERS
22118 AND 22073**

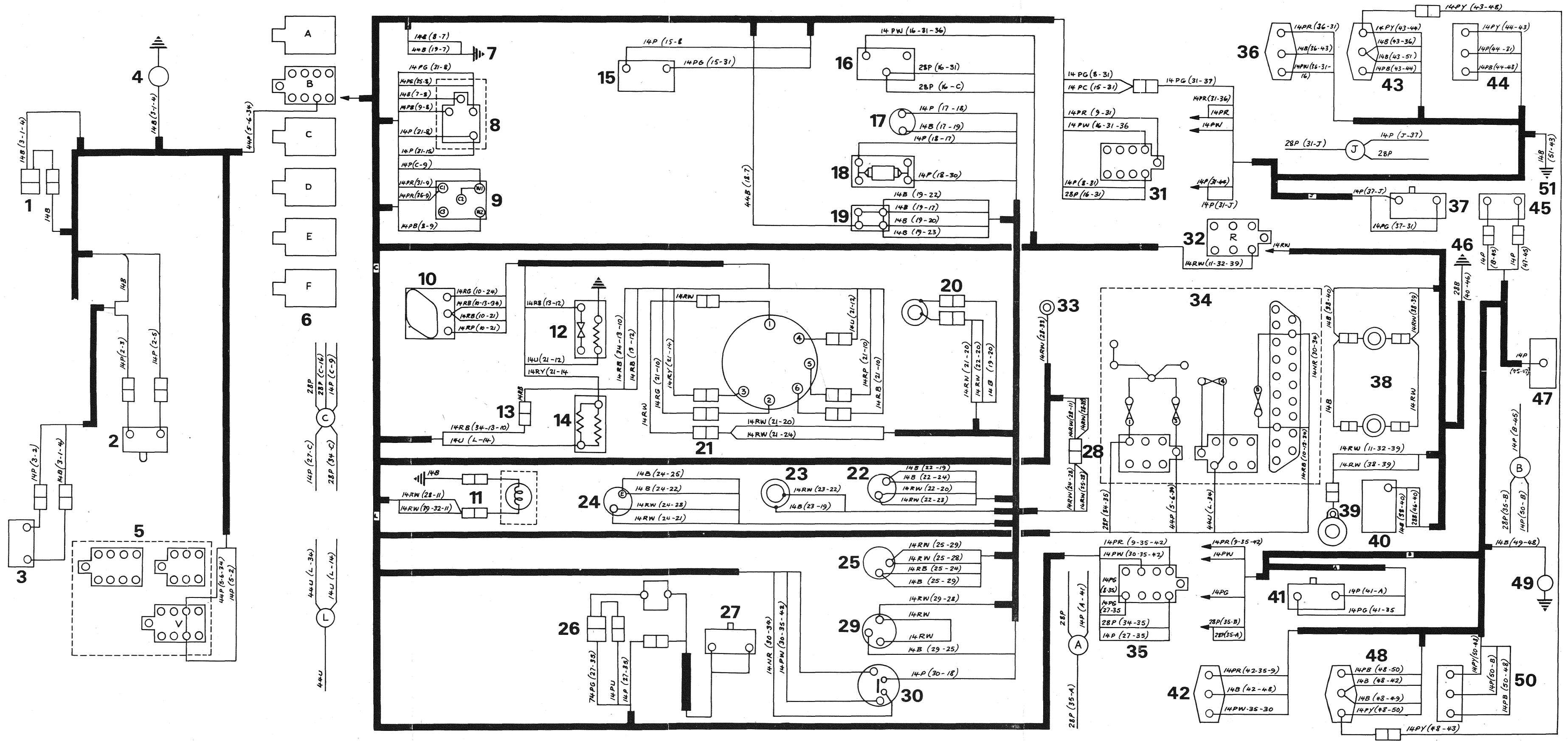
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- 1 Right-hand snap connector block
- 2 Underbonnet lamp switch
- 3 Underbonnet lamp
- 4 Right-hand front earth
- 5 Relay printed circuit board
- 6 Right-hand toeboard sockets
- 7 Right-hand 'A' post earth
- 8 Interior lamps delay unit
- 9 Interior lamps delay relay
- 10 Transistor unit
- 11 Speed control panel
- 12 Zener diode
- 13 Fuse connector
- 14 Resistor unit
- 15 Right-hand front door switch
- 16 Right-hand interior lamp switch (front)
- 17 Cubby box lamp switch
- 18 Cubby box lamp
- 19 Instrument panel earth
- 20 Right-hand facia switch lamp
- 21 Panel lamp switch
- 22 Clock
- 23 Left-hand facia switch lamp
- 24 Fuel/Oil level gauge
- 25 Ammeter
- 26 Seat belt diode
- 27 Left-hand front door switch
- 28 Instrument link loom connection
- 29 Speedometer
- 30 Switchbox
- 31 Right-hand 'A' post sockets
- 32 Console sockets
- 33 Gearchange illumination
- 34 Fuseboard
- 35 Left-hand 'A' post sockets
- 36 Right-hand front interior lamp
- 37 Right-hand rear door switch
- 38 Console illumination
- 39 Cigar lighter
- 40 Hazard warning switch
- 41 Left-hand rear door switch
- 42 Left-hand front interior lamp
- 43 Right-hand rear interior lamp
- 44 Right-hand reading lamp switch
- 45 Boot lamp switch
- 46 Tunnel earth
- 47 Boot lamp
- 48 Left-hand rear interior lamp
- 49 Left-hand boot earth
- 50 Left-hand reading lamp switch
- 51 Right-hand boot earth



PRACTICAL WIRING DIAGRAMS

Sheet 3
Left-hand and Right-hand Body Looms
Console and Door Looms

for
Rolls-Royce Silver Shadow
and
Bentley T Series

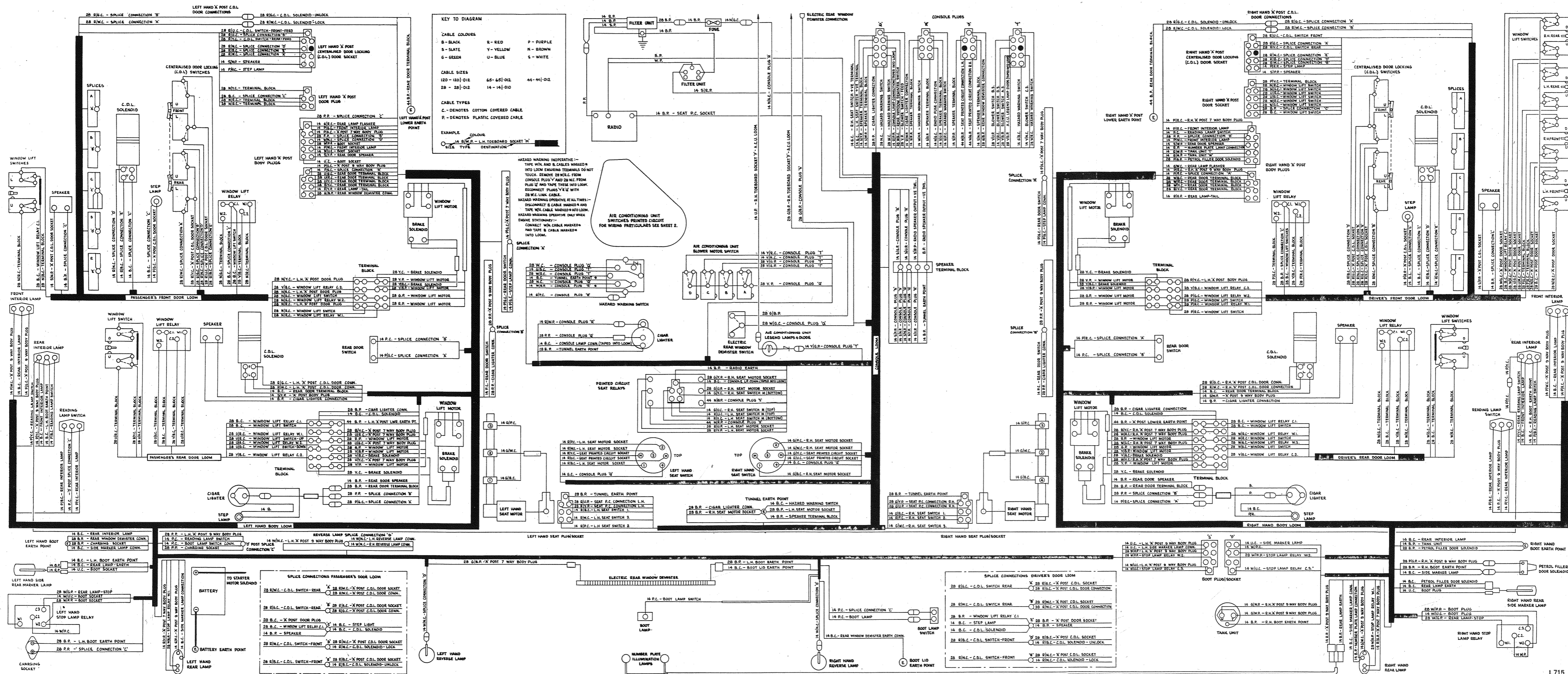
RIGHT-HAND DRIVE CARS FROM
SERIAL NUMBER 9000

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Section 17

Rolls-Royce and Bentley Corniche with Automatic Air Conditioning Unit (Sheets 1 and 2)

THEORETICAL WIRING DIAGRAM

Sheet 1

For
Rolls-Royce Corniche Convertible
and
Bentley Corniche Convertible

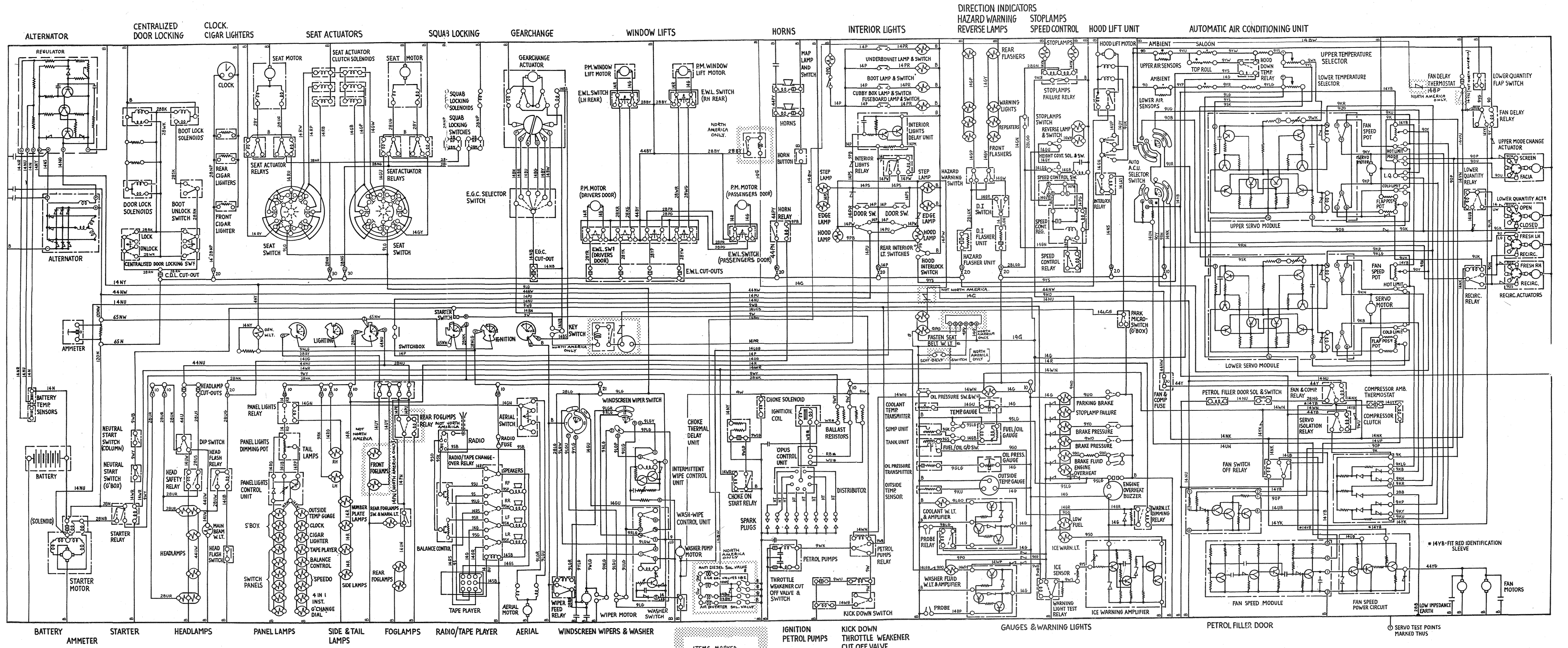
**ALL CARS FROM
SERIAL NUMBER 22583**

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ITEMS MARKED THUS ONLY FITTED AS STATED

SERVO TEST POINTS MARKED THUS

* 14YB-FIT RED IDENTIFICATION SLEEVE

FAN SPEED MODULE

FAN SPEED CIRCUIT

FAN SPEED POT

HOT LIMIT

FAN MOTOR

RECIRC. RELAY

RECIRC. ACTUATORS

RECIRC. FRESH LH

RECIRC. FRESH RH

LOWER QUANTITY OPEN

LOWER QUANTITY CLOSED

LOWER QUANTITY RELAY

LOWER QUANTITY ACTUATOR

UPPER MODE CHANGE ACTUATOR

FAN DELAY RELAY

FAN DELAY THERMOSTAT

FAN DELAY THERMOSTAT

FAN DELAY THERMOSTAT

THEORETICAL WIRING DIAGRAM

Sheet 2

For
Rolls-Royce Corniche Saloon
and
Bentley Corniche Saloon

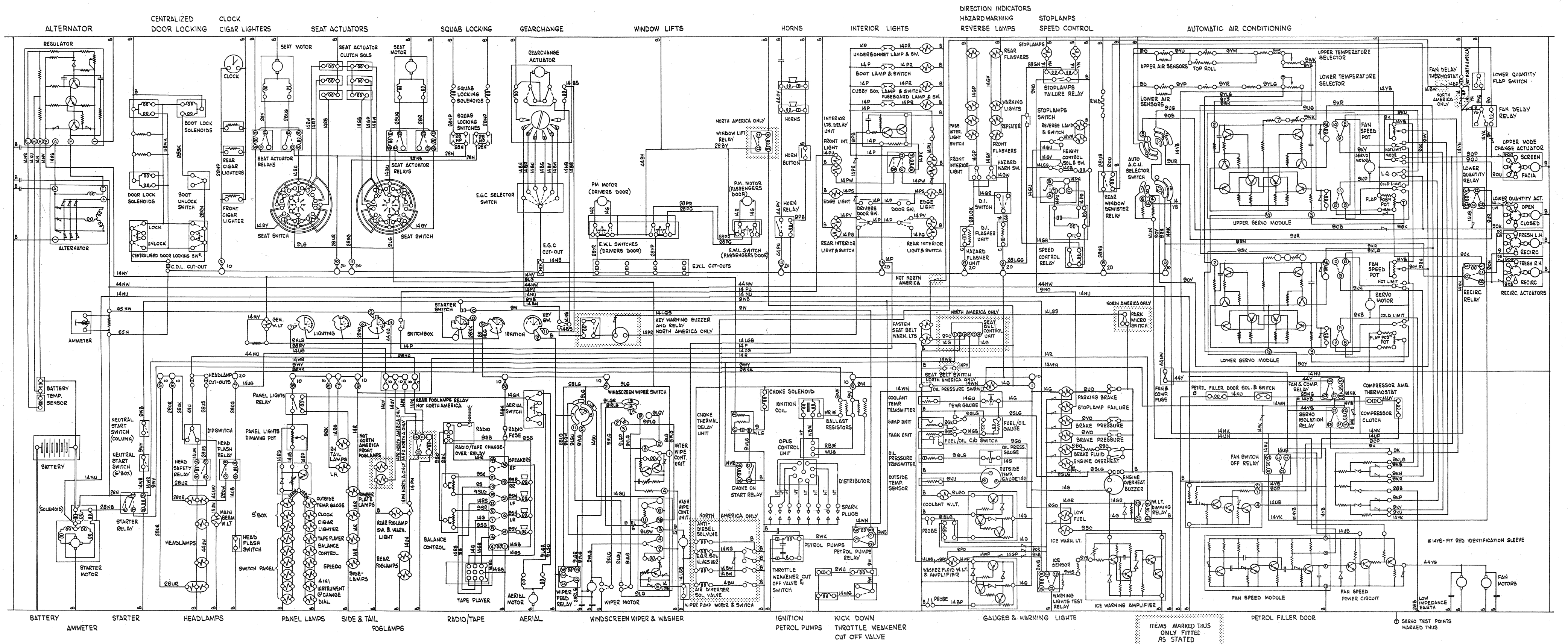
**ALL CARS FROM
SERIAL NUMBER 22583**

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ITEMS MARKED WITH THIS SYMBOL ONLY FITTED AS STATED

SERVO TEST POINTS MARKED WITH THIS SYMBOL

PRACTICAL WIRING DIAGRAM

Sheet 10

WARNING LAMPS AND INSTRUMENTS

For
Rolls-Royce Silver Shadow
and
Bentley T Series

**SALOON AND LONG WHEELBASE NON-
DIVISION CARS FOR USA AND CANADA
FROM CAR SERIAL NUMBERS
22118 AND 22073**

T.S.D. Publication 2476

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- 1 Right-hand front earth
- 2 Right-hand snap connector block
- 3 Coolant probe
- 4 Oil pressure switch
- 5 Brake accumulator pressure switches
- 6 Brake fluid level sensors
- 7 Washer bottle probe
- 8 High metal temperature switch
- 9 Oil sump unit
- 10 Left-hand valance sockets
- 11 Right-hand toeboard sockets
- 12 Left-hand toeboard sockets
- 13 Washer fluid level amplifier
- 14 Seat belt warning loom connector
- 15 Key warning relay
- 16 Key warning buzzer
- 17 Left-hand 'A' post earth
- 18 Right-hand 'A' post earth
- 19 Diode connector
- 20 Warning lamp test board
- 21 Ammeter shunt
- 22 High metal temperature buzzer
- 23 Fuel/Oil gauge
- 24 Ammeter
- 25 Seat belt warning diode assembly
- 26 Left-hand front door switch
- 27 Instrument panel earth
- 28 Right-hand warning lamp cluster
- 29 Seat belt warning lamps
- 30 Clock
- 31 Left-hand warning lamp cluster
- 32 Fuel/Oil level test switch
- 33 High metal temperature test switch
- 34 Speedometer
- 35 Parking brake switch
- 36 Switchbox
- 37 Seat belt warning control unit
- 38 Fuseboard
- 39 Right-hand 'A' post body socket
- 40 Left-hand 'A' post body socket
- 41 Right-hand boot earth
- 42 Fuel tank unit
- 43 Seat belt clasp
- 44 Stoplamp relay socket
- 45 Radio

