

# RANGE ROVER



1970 to Oct 1992 (up to **K** registration) Petrol

## Haynes **Service and Repair Manual**



Includes **Fault Finding** and **MOT Test Check** Sections

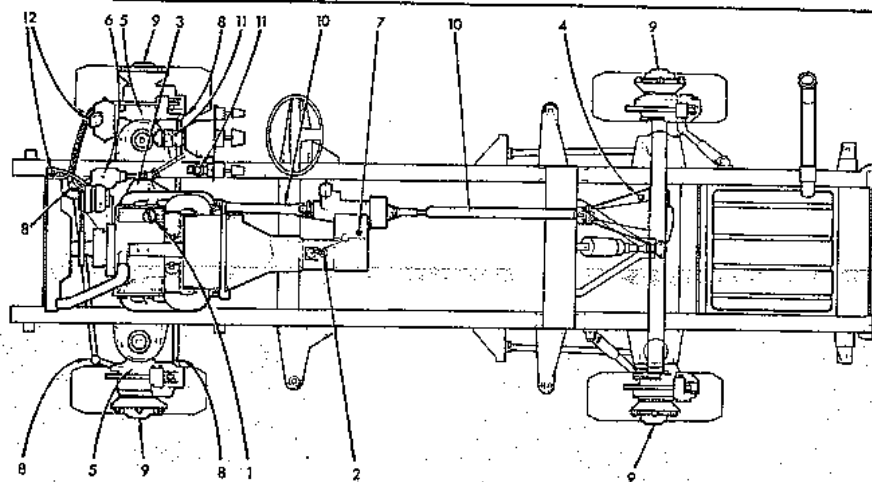
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Component or system	Lubricant type/specification	Duckhams recommendation
1 Engine	Multigrade engine oil, viscosity SAE 20W/50 to API SF or SG	Duckhams QXR, QS, Hypergrade Plus or Hypergrade
2 Main manual gearbox Early 4-speed with limited slip differential Later 4-speed	Hypoid gear oil, viscosity SAE 80EP to API GL4 Multigrade engine oil, viscosity SAE 20W/50 to API SF or SG	Duckhams Hypoid 80W/90 Duckhams QXR, QS, Hypergrade Plus or Hypergrade
3 Front differential	Dexron II D type ATF Hypoid gear oil, viscosity SAE 90EP to API GL4	Duckhams Uni-Matic Duckhams Hypoid 80W/90
4 Rear differential	Hypoid gear oil, viscosity SAE 90EP to API GL4	Duckhams Hypoid 80W/90
5 Swivel housings	Hypoid gear oil, viscosity SAE 90EP to API GL4	Duckhams Hypoid 80W/90
6 Steering box (manual)	Hypoid gear oil, viscosity SAE 90EP to API GL4	Duckhams Hypoid 80W/90
6. Power steering (if fitted)	Dexron IID type ATF	Duckhams Uni-Matic
7 Transfer box Early 4-speed manual transmission with limited slip differential Later 4-speed manual transmission	Hypoid gear oil, viscosity SAE 90EP to API GL4 Multigrade engine oil, viscosity SAE 20W/50 to API SF or SG	Duckhams Hypoid 80W/90 Duckhams QXR, QS, Hypergrade Plus or Hypergrade
8 Balljoints	Multi-purpose lithium based grease to NLGI 2	Duckhams LB 10
9 Front and rear hubs	Multi-purpose lithium based grease to NLGI 2	Duckhams LB 10
10 Propeller shafts	Multi-purpose lithium based grease to NLGI 2	Duckhams LB 10
11 Brake and clutch hydraulic reservoirs	Hydraulic fluid to SAE J1703	Duckhams Universal Brake and Clutch Fluid
12 Cooling system	Ethylene glycol based antifreeze to BS 3150, 3151, or 6580 Dexron II D type ATF	Duckhams Antifreeze and Summer Coolant Duckhams Uni-Matic
Automatic transmission		

# Chapter 1 Engine

For modifications, and information applicable to later models, see Supplement at end of manual

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## Degrees of difficulty

<b>Easy, suitable for novice with little experience</b> 	<b>Fairly easy, suitable for beginner with some experience</b> 	<b>Fairly difficult, suitable for competent DIY mechanic</b> 	<b>Difficult, suitable for experienced DIY mechanic</b> 	<b>Very difficult, suitable for expert DIY or professional</b> 
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## Specifications

### General

Engine type	V8, 4-stroke, water-cooled, ohv
Cubic capacity	3528 cc (215 cu in)
Bore	88.90 mm (3.50 in)
Stroke	71.12 mm (2.80 in)
Compression ratio:	
Pre-1974 models	8.5 : 1
1974 to 1979	8.25 : 1
1979 onwards	8.13 : 1
Certain export models	7.1 : 1
Power output (DIN):	
Up to 1979	130 BHP (98 kW) at 5000 rpm
1979 onwards	156 BHP (116 kW) at 5000 rpm
Maximum torque (DIN):	
Up to 1979	25.6 kgf m (185 lbf ft) at 2500 rpm
1979 onwards	28.3 kgf m (205 lbf ft) at 3000 rpm
Firing order	1 - 8 - 4 - 3 - 6 - 5 - 7 - 2
Cylinder numbering (front to rear):	
Left-hand bank	1 - 3 - 5 - 7
Right-hand bank	2 - 4 - 6 - 8
Compression pressure at cranking speed	9.5 kgf/cm <sup>2</sup> (135 lbf/in <sup>2</sup> ) minimum

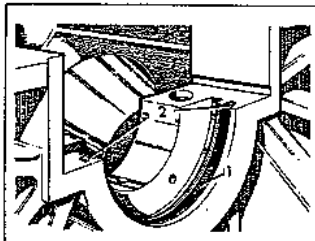


Fig. 1.17 A new half oil seal (early type) fitted to the crankcase (Sec 39)

1 Oil seal 2 Seal ends trimmed off

**48 Engine reassembly - general**

To ensure maximum life with minimum trouble from a rebuilt engine, not only must everything be correctly assembled, but everything must be spotlessly clean, all the oilways must be clear, locking washers and spring washers must always be fitted where indicated and all bearing and other working surfaces must be thoroughly lubricated during assembly.

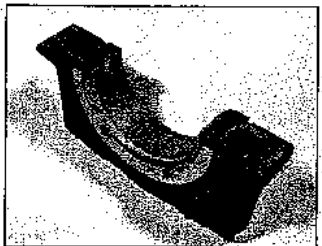
Before assembly begins renew any bolts or studs, the threads of which are in any way damaged, and whenever possible use new spring washers.

Gather together a torque wrench, oil can and clean rag, also a set of engine gaskets, crankshaft front and rear oil seals and a new oil filter element.



1 Fit the upper main bearing shells to the crankcase. The inner shells have oil holes and grooves. Make sure that the tongue locates in the slot in the crankcase (photo).

2 The centre main bearing (No 3) has a



39.10 The tags must locate in the grooves. This is the flanged shell for No 3 bearing



39.1 Refitting a main bearing upper shell

special flanged bearing shell as it takes the crankshaft endthrust.

3 There are two different types of rear oil seal fitted to the Range Rover engine. The earlier type consists of a rubber strip in two halves; one half is embedded into a groove in the crankcase (behind the rear main bearing location) and the other half is embedded into a groove in the combined oil seal carrier and rear main bearing cap. Later models have a standard round lip type oil seal which is clamped in place by the rear main bearing cap. Both types also incorporate rubber strip seals in the side faces of the rear main bearing cap, although they are of different design. The early type have a single straight strip whereas the later ones are of a cruciform pattern.

4 In the earlier type engines the oil seal has by its design to be fitted in two operations, one before the crankshaft is refitted and one after. The later type is fitted after the crankshaft has been refitted.

**Early models**

5 Fit a new half oil seal to the crankcase groove. The ends should project above the mating face. Force the seal into the groove using a hammer handle to rub it down. The seal should not project more than 0.031 in (1.5 mm) above the groove.

6 When the seal has been forced right into the groove, cut off the ends level with the packing face.

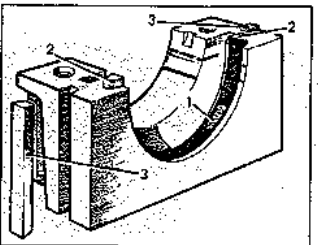


Fig. 1.18 Early type rear main bearing cap and oil seal carrier (Sec 39)

1 Seal 2 Seal ends 3 Side strip seals



39.8 Lubricate the main bearing shells generously

7 Apply heavy engine oil to the oil seal.

**All models**

8 Lubricate the upper shell bearings and main bearing journals with engine oil. Inject some into the oilways too (photo).

9 Lift the crankshaft and lower it evenly into position in the inner bearing shells.

10 Fit the lower bearing shells, which are plain, to the main bearing caps, ensuring that the tags locate correctly in the grooves in the caps (photo).

11 Lubricate the shells in the caps for numbers 1 to 4 main bearings and refit them in the correct order. The caps are marked 1 to 4 from front to rear and the arrows on them should all point the same way to the front of the engine.

12 Refit the retaining bolts but only do them up finger tight at this stage.

13 The next task is to refit the rear main bearing cap and oil seal carrier. As already described the rear oil seals differ, so here again the procedure varies.

**Early models**

14 Fit the other half seal to the groove in the rear main bearing cap as described in paragraphs 5 and 6.

15 Fit new seals to the side of the bearing cap. Do not cut them as they must protrude 1/16 in (1.5 mm) above the packing face of the cap.

16 Lubricate the rear oil seal strip with heavy engine oil and the side seals with light engine oil.

17 Fit and lubricate the lower bearing shell in the bearing cap and then fit the assembly to the crankcase. Refit the bolts finger tight.

18 Use a blunt instrument to drive the side seals into the bearing cap channels as far as they will go.

19 Use a mallet to tap the crankshaft first as far to the rear and then as far forward as it will travel. This is to align the centre main bearing thrust faces.

20 Tighten the main bearing caps numbers 1 to 4 to the specified torque.

21 Tighten the rear main bearing cap to its specified torque, and trim any of the side seals protruding from the cap.



39.22 Checking the crankshaft endfloat at the centre bearing

22 Check that the crankshaft endfloat does not exceed that specified (photo). If it is not correct, check the assembly procedure or the components for faults.

**Later models**

23 In order to align the thrust faces of the centre main bearing tap the end of the crankshaft with a mallet, forward and rearward.

24 The securing bolts of the main bearing caps can now be tightened down evenly to the recommended torque setting (see Specifications) (photo).

25 Fit the new cruciform side seals to the grooves at the sides of the rear main bearing cap (photo).

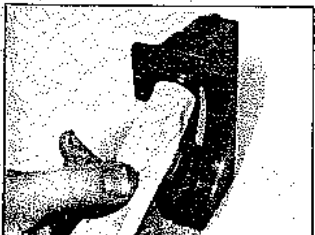
26 Do not cut the cruciform seals at this stage as they must project above the bearing cap mating faces approximately 0.062 in (1.5 mm).

27 Apply a coating of jointing compound to the rear half of the rear main bearing cap mating face, or alternatively apply the jointing compound to the equivalent area on the cylinder block (photo).

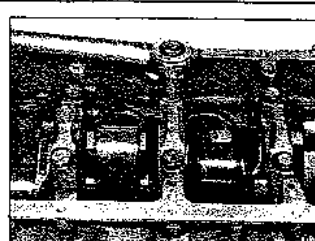
28 Lubricate the bearing shell and the cruciform side seals with clean engine oil and refit the bearing cap.

29 Do not fully tighten the two retaining bolts at this stage, but make sure that the cap is both fully home and squarely seated on the cylinder block.

30 Tighten the retaining bolts equally by one



39.27 Applying jointing compound to the rear half of the cap mating face



39.24 Tightening the main bearing cap bolts

quarter of a turn from finger tight to settle the cap. Now back off the bolts by one complete turn.

31 The crankshaft rear oil seal can now be fitted, but it is strongly recommended that the Rover service tool (RO.1014), which is a seal guide, be used when fitting the oil seal (Fig. 1.19).

32 If however the tool is unobtainable, it is possible to fit the seal provided that the greatest possible care is taken. Lightly oil the outer edge of the flange, ensuring that no oil is deposited on the seal housing surfaces, or the seal will not stay in position when clamped down. Lubricate the inner circumference of the seal, making sure that the outer edge remains absolutely dry and clean, or again it will not stay in position (photo).

33 Offer the seal to the flange, locating the lower edge in position and feeding the lip round under the flange. Then press the upper edge into position very gently. Push the seal home (photo).

34 If the tool can be obtained proceed as follows.

35 First make sure that the oil seal guide and the crankshaft journal are scrupulously clean and then coat the seal guide and crankshaft journal with clean engine oil. **Note:** The lubricant must totally coat the outer surface of the oil seal guide to prevent the possibility of turning back the lip of the oil seal when fitting it.

36 In respect of handling the oil seal, avoid



39.32 Carefully lubricate the flange outer diameter



39.25 Fitting new side seals to the rear main bearing cap (later model)

touching the seal lip at any time. Visually inspect the seal for damage and make sure that the outer diameter of the seal remains clean and dry at all times.

37 Position the oil seal, onto the seal guide tool, with the lip of the oil seal facing towards the engine.

38 Position the seal guide tool on the end of the crankshaft and push the seal, by hand, into the recess formed in the main bearing cap and cylinder block. The seal must fit squarely and abut the machined step in the recess.

39 With the seal so held in position, carefully withdraw the guide tool.

40 Once the seal is home in the recess, the

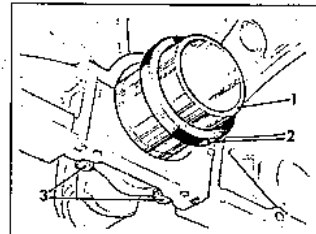
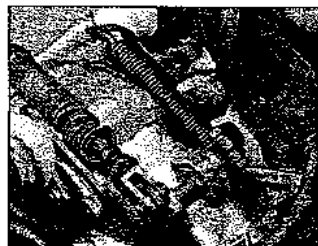


Fig. 1.19 Rover service tool RO.1014 - seal guide (Sec 39)

1 Seal guide 3 Main bearing cap bolts 2 Seal



39.33 Feed the seal very carefully over the flange edge



11.2 The throttle cable is connected to the linkage by a clevis pin



11.3 Undo the adjuster nut to free the cable from the bracket



11.5 The cable is attached to the top of the pedal by a clevis pin (arrowed)

3 Place the flame trap and pipes in a petrol bath and clean them. Allow the flame trap to dry. Pull dry rag through the pipes.  
4 Refitting is the reverse procedure to removal.

**11 Throttle cable—removal, refitting and adjusting**

- 1 Remove the air cleaner as described in Section 3.
- 2 Remove the split pin and clevis pin and disconnect the cable end from the carburettor linkage (photo).
- 3 Slide back the rubber cover and undo the adjuster nut so that the adjuster can be removed from the bracket (photo).
- 4 Inside the vehicle, remove the right-hand lower dash panel to reach the top of the accelerator pedal.
- 5 Remove the split pin and clevis pin so that the cable is freed from the pedal (photo).

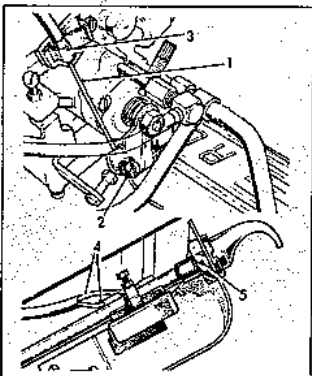


Fig. 3.9 Choke cable connections (Sec 12)

- 1 Choke inner cable
- 2 Trunnion retaining screw
- 3 Cable retaining clip
- 4 Warning light wires
- 5 Retaining nut

6 Undo the outer cable retaining nut and withdraw the cable and grommet into the engine compartment. The complete cable can now be removed.

7 Adjust the cable with the throttle pedal fully released. The adjustment should be such that the linkage moves with slight pressure on the pedal and not before. At the pedal end connection check that the cable yoke and clevis pin are not too tight a fit, and that the yoke can pivot freely.

**12 Choke cable—removal and refitting**

- 1 The choke cable is fitted to all vehicles which do not have an automatic choke.
- 2 The choke cable is attached to the trunnion at the front of the left-hand carburettor. Undo the screw to release it.
- 3 Disconnect the outer cable from the cable clip by the carburettor and the clip on the air cleaner housing.
- 4 Disconnect the choke warning light switch cables from the choke control assembly below the dashboard on the right-hand side of the steering column.
- 5 Undo the outer cable retaining nut and then withdraw the choke control knob and cable complete.
- 6 Refitting is the reverse procedure to removal. Ensure that the spring washer and nut are fitted over the cable before feeding it through the dashboard panel.
- 7 There should be approximately 1.5 mm (0.05 in) free play when the cable has been reconnected to the trunnion.
- 8 Run the engine and check the choke for correct operation.

**13 Carburettors—general description**

The carburettors are of the variable choke type. The fuel, which is drawn into the air passage through a jet orifice, is metered by a tapered needle which moves in and out of the

jet, thus varying the effective size of the orifice. This needle is attached to, and moves with, the air valve piston which controls the variable choke opening.

At rest, the air valve piston is right down, choking off the air supply, and the tapered needle is fully home with the jet virtually cutting off the fuel outlet from the jet.

For starting, the choke control is used except for the SET model which has an automatic starting device. The standard carburettor incorporates a disc valve for cold starting which allows additional fuel to flow into the mixture stream. The disc valve itself incorporates several orifices which are progressively uncovered as the disc is moved when the choke control is pulled. The throttle butterfly is also opened a small amount. Also included is a temperature controlled valve which weakens the mixture under light load and idling conditions when the engine is hot. The choke on SET models is operated automatically by a bi-metallic spring arrangement which is heated by water from the engine cooling system.

As soon as the engine fires, the suction from the engine (or manifold depression) is partially diverted to the upper side of the chamber in which the diaphragm attached to the air valve piston is positioned. This causes the valve to rise and provides sufficient airflow to enable the engine to run. As the throttle is opened further, manifold depression is reduced and now it is the speed of air through the venturi which causes the depression in the upper chamber, thus causing the piston to rise further. If the throttle is opened suddenly, the natural tendency of the air valve piston to rise - causing a weak mixture when it is least required (ie during acceleration) - is prevented by a hydraulic damper which delays the piston in its upward travel. The air intake is thus restricted and a proportionately larger quantity of fuel to air is drawn through.

The later types of carburettors with automatic choke (SET models) are fitted to enable the vehicle to conform to the prevailing emission control regulations, which vary from country to country. Tamperproof seals are also fitted to many carburettors so that adjustment, and therefore CO emissions, can

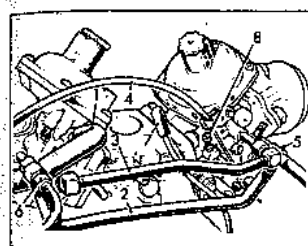


Fig. 3.10 Carburettor attachments (Sec 14)

- 1 Rocker breather pipe
- 2 Main fuel supply pipe
- 3 Choke fuel pipe
- 4 Choke cable
- 5 Main fuel supply union
- 6 Fuel spill return union
- 7 Vacuum pipe to distributor
- 8 Idle speed (throttle stop) screw

be controlled. The object is to prevent adjustment by unqualified mechanics. Satisfy yourself before removing a tamperproof seal that you are not breaking any local or national regulations by so doing.

**14 Carburettors—removal and refitting**

- 1 Remove the air cleaner(s) as described in Section 3.
- 2 Remove the air intake pipe(s), disconnecting the vacuum hoses (if applicable) first. Slacken the hose clip and separate the hose from the hot air box as the assembly is lifted away.
- 3 Disconnect the rocker, breather pipes from the carburettors.
- 4 Disconnect the main fuel supply pipe which runs between the carburettors.
- 5 Disconnect the choke fuel supply pipe which runs between the carburettors.

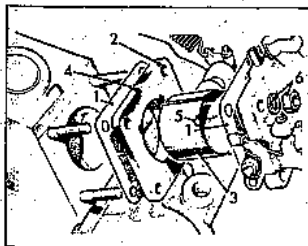


Fig. 3.12 Gaskets, insulator and liner assembly (Sec 14)

- 1 Gaskets
- 2 Insulator
- 3 Liner
- 4 Arrow
- 5 Lug
- 6 Carburettor retaining nuts and washers

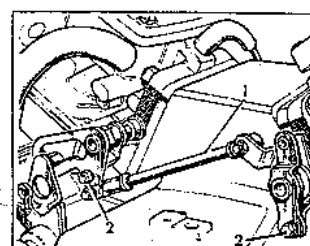


Fig. 3.11 Carburettor linkage connection (Sec 14)

- 1 Adjustable link
- 2 Throttle lever securing nuts
- 3 To remove the left-hand carburettor, disconnect the following:
  - (a) Throttle cable (Section 11)
  - (b) Choke cable (Section 12) or auto choke coolant pipes (as applicable)
  - (c) Fuel supply pipe at the front of the carburettor
  - (d) Throttle linkage between the carburettors
  - (e) Vacuum pipe to the distributor
- 7 To remove the right-hand carburettor, disconnect the following:
  - (a) Fuel return pipe from the union in front of the carburettor
  - (b) Throttle linkage between the carburettors
  - (c) Coolant pipes to automatic choke housing (where fitted)
  - (d) Brake vacuum servo hose from inlet manifold (for convenience)

- 8 Undo the four retaining nuts and washers for each carburettor and lift it away.
- 9 The gaskets and insulator can then be removed if necessary. Note that there is a liner fitted inside the insulator on some models.
- 10 Refitting of the carburettors is the reverse of the removal procedure, but the following points should be noted.
- 11 Clean the mating faces of the carburettor and the inlet manifold.
- 12 Fit the inner gasket, followed by the insulator, making sure that the arrow points towards the centre of the manifold.

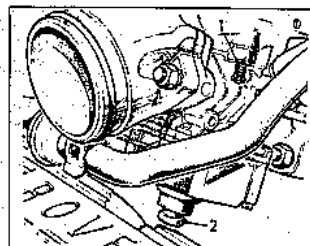


Fig. 3.13 Carburettor mixture adjustment (early models) (Sec 15)

- 1 Piston lifting pin
- 2 Jet adjusting screw

13 Refit the liner taking care to ensure that the lugs locate properly in the insulator recesses and do not stand proud. Note: The liner can only be fitted one way round, that is with the tabs engaged in the slots.

14 The remainder of the fitting procedure is a direct reversal of the removal sequence.

15 After installation it will be found necessary to tune and adjust the carburettors as described in Section 15.

**15 Carburettors—tuning and adjusting**

Before attempting to tune and adjust the carburettors, it is important to realise that certain items of equipment will be required. If these are not available, the job should not be attempted, but should be carried out by a suitably equipped Rover dealer. For those motorists intending to do the job themselves, it is essential that service tool number 'S.353' or a similar item is purchased beforehand to enable the later type of jet needle to be repositioned. An airflow balancing meter is also a very useful device for tuning and balancing, although listening carefully at the end of a rubber or plastic tube of about 1/4 in (6mm) diameter may be sufficient. It is also highly desirable that an exhaust gas analyser is used to check the CO content of the exhaust gas.

Before any attempt is made to adjust the carburettors, the ignition timing, spark plugs and distributor dwell angle should be checked and adjusted as necessary.

**Manual choke carburettors**

- 1 Check the throttle cable adjustment as described in Section 11. Also check that the linkage and cable move freely without any tendency to stick.
- 2 Start the engine and run it until warm.
- 3 The thermostat must be open (indicated by the radiator becoming warm) before switching off.
- 4 Slacken off the throttle adjusting lever securing nuts on both carburettors.
- 5 Start the engine and check that the idling speed is as specified. If necessary, adjust the throttle stop screws. On some models a tamperproof sleeve is fitted and this setting can only be adjusted by an authorized dealer with special tools.
- 6 Check the mixture in each carburettor in turn. Raise the piston very slightly (0.8 mm/0.03 in) using a long thin screwdriver, or by means of the piston lifting pin on early models. If the engine speed immediately increases, the mixture is too rich. If the engine speed immediately decreases, the mixture is too weak. No change, or a very slight fall in engine speed, indicates a correct mixture.
- 7 To correct the mixture strength, screw the jet adjusting screw (below the carburettor) into the carburettor to weaken or out of the carburettor to enrich the mixture.

15 If there is still no spark, examine the distributor cap carefully for tracking. This can be recognised by a very thin black line running between two or more electrodes or between an electrode and some other part of the distributor. These lines are paths which conduct electricity across the cap thus letting it run to earth. The only remedy is a new distributor cap.

16 Apart from the ignition timing being incorrect, other causes of misfiring have already been dealt with under the section dealing with the failure of the engine to start. To recap - these are that:

- (a) the coil may be faulty giving an intermittent misfire
- (b) there may be a damaged wire or loose connection in the low tension circuit
- (c) there may be a mechanical fault in the distributor

17 If the ignition timing is too far retarded, it should be noted that the engine will tend to overheat and there will be a quite noticeable drop in power. If the engine is overheating and the power is down and the ignition timing is correct, then the carburetors should be checked, as it is likely that this is where the fault lies.

### Engine fires but will not run

18 If the engine fires when the starter motor is cranking but cuts out as soon as the starter switch is released, the ballast resistor or resistance wire must be suspect, since this is bypassed only when the starter motor is operating (See Section 1).

19 Do not be tempted by bypass a failed ballast resistor or resistance wire with ordinary wire, or coil overheating and possible failure may result.






## Chapter 5 Clutch

For modifications, and information applicable to later models, see Supplement at end of manual

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General description	1		

### Degrees of difficulty

Easy, suitable for novice with little experience		Fairly easy, suitable for beginner with some experience		Fairly difficult, suitable for competent DIY mechanic		Difficult, suitable for experienced DIY mechanic		Very difficult, suitable for expert DIY or professional	
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### Specifications

#### General

Make	Borg and Beck
Type	Diaphragm
Clutch plate diameter	10.5 in (268.5 mm)
Actuation	Hydraulic
Clutch fluid type/specification	Hydraulic fluid to SAE J1703

#### Torque wrench setting

Clutch cover bolts	lbf ft 35 to 38	kgf m 4.9 to 5.2
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#### General description

The clutch which is fitted to the Range Rover is a single dry plate diaphragm spring type and is hydraulically operated.

The unit comprises a steel cover which is dowelled and bolted to the rear face of the flywheel and contains the pressure plate, diaphragm spring and fulcrum rings.

The clutch disc is free to slide along the splined input (primary) shaft and is held in position between the flywheel and the pressure plate by the pressure of the pressure plate spring. Friction lining material is riveted to the clutch disc and it has a spring cushioned hub to absorb transmission shocks and to help ensure a smooth take-off.

The circular diaphragm spring is mounted on shoulder pins and held in place in the cover by two fulcrum rings. The spring is also held to the pressure plate by

three spring steel clips which are riveted in position.

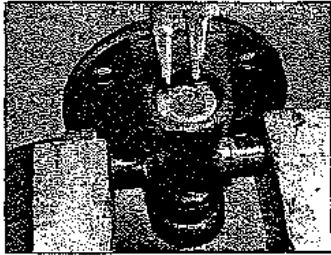
The clutch release mechanism consists of a hydraulic master cylinder and slave cylinder and the interconnecting pipework, a release arm and sealed ball type release bearing - the latter being in permanent contact with the fingers of the pressure plate assembly.

As the friction linings on the clutch driven plate wear, the pressure plate automatically moves closer to the driven plate to compensate. This makes the centre of the diaphragm spring move nearer to the release bearing, so decreasing the release bearing clearance. Depressing the clutch pedal actuates the clutch release arm by means of hydraulic pressure. The release arm pushes the release bearing forwards to bear against the release fingers, so moving the centre of the diaphragm spring inwards. The spring is sandwiched between two annular rings which act as fulcrum points. As the centre of the spring is pushed in, the outside of the spring is pushed out, so moving the pressure plate

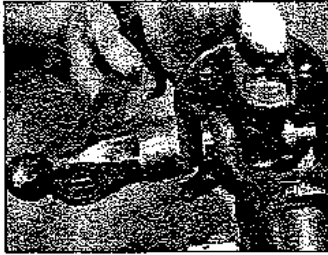
backwards and disengaging the pressure plate from the clutch disc.

When the clutch pedal is released, the diaphragm spring forces the pressure plate into contact with the friction linings on the clutch disc and at the same time pushes the clutch disc a fraction of an inch forwards on its splines so engaging the clutch disc with the flywheel. The clutch disc is now firmly sandwiched between the pressure plate and the flywheel so the drive is taken up.

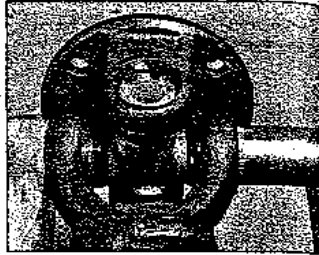
**Warning:** Dust created by clutch wear and deposited on the clutch components may contain asbestos which is a health hazard. DO NOT blow it out with compressed air or inhale any of it. DO NOT use petrol or petroleum based solvents to clean off the dust. Brake system cleaner or methylated spirit should be used to flush the dust into a suitable receptacle. After the clutch components are wiped clean with rags, dispose of the contaminated rags and cleaner in a sealed, marked container.



5.5 Refitting a circlip



5.6 Inserting the bearing cups with the spider in position in the shaft yoke



5.7 Using a vice and socket to press the bearing cups into place

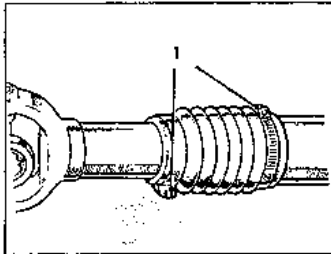


Fig. 7.6 Refit the rubber boot to the shaft with worm drives (1) 180° apart (Sec 5)



6.1 The rear shaft grease nipple for the splined section

Inside the yoke press one of the bearing cups in just far enough to allow the circlip to be fitted (photo). Repeat this operation with the other bearing cup.

6 Insert the spider into the yokes of the propeller shaft. Partially insert both bearing cups, being careful to ensure that the spider trunnions do not dislodge any of the needle rollers (photo).

7 Using a vice carefully press both bearing cups into place but ensure that none of the bearing rollers are dislodged. Repeat the operation given in paragraph 5 (photo).

8 Fit the grease nipple to the spider.

9 Smear the splines on the end of the shaft with grease. Carefully match up the alignment

mark and slide the shaft into the sleeve. Tighten the dust cap. **Note:** Do not pack grease into the sleeve prior to fitting the shaft as it may prevent the shaft being pushed fully home.

10 If the front propeller shaft is being serviced, pull the rubber boot over the sleeve and tighten the clips. Ensure that the worm drives on the clips are 180° apart from each other to retain the balance of the shaft.

11 Refit the shaft to the vehicle as described in Section 2 and lubricate the bearings using a grease gun applied to the universal joint and sleeve nipples. **Note:** If the sleeve is fitted with a plug instead of a grease nipple, replace it with a nipple to enable lubrication of the

sleeve splines. Do not overfill the sleeve splines with grease. These should be sufficient to lubricate the splines only.

**6 Propeller shaft sliding sleeves - lubrication**

1 The rear propeller shaft splined sleeve is fitted with a grease nipple and this should be greased every 8000 miles (10 000 km) with the specified lubricant (photo).

2 The front propeller shaft does not have a grease nipple fitted to its splined sleeve because of its exposed location. A plug is fitted instead. Every 24 000 miles (40 000 km) or 2 years, the splined sleeve should be lubricated as follows.

3 Undo the front end of the propeller shaft as directed in Section 2.

4 Remove the plug from the splined sleeve greasing point and fit a grease nipple.

5 Compress the sliding joint as far as possible and then lubricate it with the specified grease. Compressing the joint first will ensure that too much grease is not injected.

6 Remove the grease nipple and refit the plug.

7 Refit the propeller shaft as directed in Section 2.

**Fault finding - propeller shafts**

**Vibration**

- Wear in sliding sleeve splines
- Worn universal joint bearings
- Propeller shaft out of balance
- Distorted propeller shaft

**Knock or clunk when taking up drive**

- Worn universal joint bearings
- Worn axle drive pinion splines
- Loose drive flange bolts
- Excessive backlash in axle gears

**Chapter 8 Front and rear axles**

For modifications, and information applicable to later models, see Supplement at end of manual

**Contents**

Differential pinion oil seal - renewal	7	Front axle - removal and refitting	12
Fault finding - front and rear axles	See end of Chapter	Front steering swivel and housing assembly - removal, overhaul adjusting and refitting	10
Front and rear axle oil - changing and level checking	14	General description	1
Front and rear stub axes - removal, overhaul and refitting	6	Rear axle differential assembly - removal and refitting	3
Front and rear wheel hubs and bearings - renewal	5	Rear axle halfshaft - removal and refitting	2
Front axle casing oil seals - removal and refitting	9	Rear axle - removal and refitting	4
Front axle differential assembly - removal and refitting	11	Steering swivel pin housing - oil changing and level checking	13
Front axle halfshafts and constant velocity joints - removal and refitting	8		

**Degrees of difficulty**

<b>Easy</b> , suitable for novice with little experience	<b>Fairly easy</b> , suitable for beginner with some experience	<b>Fairly difficult</b> , suitable for competent DIY mechanic	<b>Difficult</b> , suitable for experienced DIY mechanic	<b>Very difficult</b> , suitable for expert DIY or professional
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**Specifications**

**Axle type**

Front	Spiral bevel with enclosed CV joint
Rear	Spiral bevel with fully floating halfshafts
Final drive ratio	3.54 : 1

**Adjustment data**

Hub-to-stub axle endfloat (front and rear)	0.002 to 0.004 in (0.05 to 0.10 mm)
Endfloat on CV joint	0.025 in (0.64 mm) maximum
Swivel pin adjustment shims available	0.003, 0.005, 0.010 and 0.030 in (0.076, 0.127, 0.254 and 0.762 mm)
Differential pinion pre-load	7 to 12 lb (3.2 to 4.5 kg) measured at flange
Crownwheel-to-bevel gear backlash	0.008 to 0.010 in (0.20 to 0.25 mm)

**Lubricant**

Type/specification:	
Differentials and swivel pin housings	Hypoid gear oil, viscosity SAE 90EP to API GL4
Front and rear hubs	Multi-purpose lithium based grease to NLGI 2
Capacities:	
Differentials	3 Imp pints (1.7 litres)
Swivel pin housings	0.5 Imp pint (0.25 litre)

**Torque wrench settings**

	lbf ft	kgf m
Differential carrier-to-axle casing	28	3.8
Propeller shaft flanges	25	3.5
Halfshaft and hub cap	38	5.2
Drive flange - differential pinion	85	11.7
Crownwheel retaining bolts:		
Early models - cross-shaft with pin fixing	35	4.8
Later models - cross-shaft retained by circlips	45	6.2
Crownwheel bearing cap bolts	60	8.3
Self-levelling load adjuster - pivot bracket	30	4.0
Track rod end balljoint retaining nut	30	4.0
Brake calliper-to-front swivel	60	8.5
Front axle swivel housing-to-axle casing bolts	44	6.0
Stub axle-to-swivel housing (front)	44	6.0
Stub axle-to-axle casing (rear)	44	6.0
Front axle swivel pin retaining bolts	60	8.5
Front swivel-to-housing oil seal retainer plate bolts	10	1.4

**Starter motor**

Make .....	Lucas M45 or 3M100PE	
Type .....	Pre-engaged	
Repair data:	M46	3M100PE
Minimum brush length .....	0.375 in (9.5 mm)	0.375 in (9.5 mm)
Armature endfloat .....	0.005 to 0.015 in (0.12 to 0.40 mm)	0.010 in (0.25 mm)
Minimum copper thickness on commutator after refinishing .....	-	0.14 in (3.5 mm)

**Horns**

Number .....	2
Make and type .....	Lucas 6H or Miko TR89

**Wiper motors**

Make and type:	Lucas 17W 2-speed
Windscreen .....	Lucas 14W single speed
Tailgate and headlamps (as applicable) .....	0.002 to 0.008 in (0.05 to 0.20 mm)
Armature endfloat .....	0.187 in (4.8 mm)
Minimum brush length .....	

**Wipers**

Blade type .....	Champion X4503
Arm type .....	Champion CCA6

**Bulbs**

Headlamps:	Wattage	Type
Tungsten .....	75/50	Bulvers 1867/4 DE
Quartz halogen .....	60/55	
Sidelamps .....	4	Lucas 233
Stop/tail lamps .....	21/6	Lucas 380
Reversing lamps .....	21	Lucas 382
Direction indicator lamps .....	21	Lucas 382
Number plate lamps .....	4	Lucas 233
Instrument illumination and warning lamps .....	2.2	Smiths capless
Hazard warning switch illumination .....	2	Lucas 281
Clock illumination .....	2	Lucas 281
Interior lamp .....	10	Lucas 585 (festoon)

**Fuses**

Location:	
Main fuse box .....	Under bonnet, on left-hand bulkhead
In-line fuses .....	Heated rear window, heater blower motor

**Rating:**

Main fuse box .....	35 amp
Heater rear window .....	50 amp
Heater blower motor .....	10 amp

**Torque wrench settings**

	lbf ft	kgf m
Starter motor securing bolts .....	30 to 35	4.0 to 4.4
Alternator pulley nut .....	25 to 30	3.5 to 4.2
Wiper motor yoke bolt .....	12 to 16	1.5 to 2.2

**1 General description**

The electrical system is of the 12 volt type and the major components comprise a 12 volt battery, of which the negative terminal is earthed. A Lucas alternator is fitted to the front right-hand side of the engine and is driven from the engine crankshaft pulley. A pre-engaged Lucas starter motor is mounted on the rear right-hand side of the engine.

The battery supplies current for the ignition, lighting and other electrical circuits, and provides a reserve of electricity when the current consumed by the electrical equipment

exceeds that being produced by the alternator. Normally, the alternator is able to meet any demand placed upon it. In later models there is an option available to provide a split charging facility. With this option, two batteries can be fitted instead of the normal single unit. When equipment such as an electric winch is being used the power will be provided by the second battery leaving the main one untouched for normal usage.

When fitting electrical accessories to cars with a negative earth system, it is important, if they contain silicon diodes or transistors, that they are connected correctly, otherwise damage may result to the components concerned. Before purchasing any electrical accessory check that it has or can be

adjusted to the correct polarity to suit the car.

It is important that the battery leads are always disconnected if the battery is to be boost charged, or if any body or mechanical repairs are to be carried out using electric arc welding equipment, otherwise serious damage can be caused to the more delicate instruments, especially those containing semi-conductors.

Apart from carrying spare fuses in the vehicle as a normal precaution, it is wise to carry spare bulbs as well. In many countries this is required by law. One of the most important bulbs is the ignition (charge) warning light bulb. This is connected into the charging circuit and if it fails, no charge will be made by the alternator. If this bulb fails it must therefore be renewed immediately.

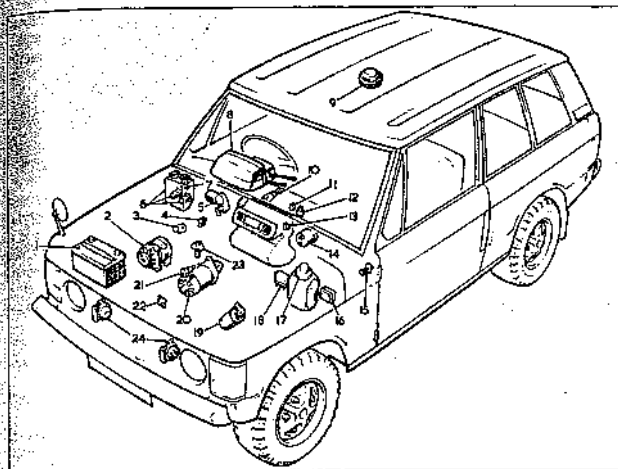
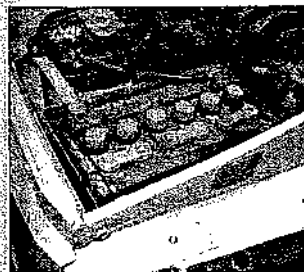


Fig. 10.1 Location of electrical equipment (Sec 1)

- |  |                             |   |
|--|-----------------------------|---|
| 1 Battery  | 8 Instrument housing        | 17 Windscreen washer reservoir and motor (earlier models) |
| 2 Alternator   | 9 Roof lamp                 | 18 Starter relay  |
| 3 Brake warning switch (circuit failure)                         | 10 Hazard warning switch    | 19 Ignition coil  |
| 4 Stop-light switch  | 11 Reversing light switch   | 20 Starter motor  |
| 5 Windscreen wiper motor   | 12 Differential lock switch | 21 Thermostat   |
| 6 Windscreen/tailgate washer reservoir and motors (later models) | 13 Handbrake switch         | 22 Oil pressure switch                                    |
| 7 Starter relay  | 14 Clock                    | 23 Thermostat switch                                      |
|  | 15 Door pillar switch       | 24 Horns  |
|  | 16 Fuse box                 |   |

**2 Battery removal and refitting**

- 1 Detach the negative battery lead followed by the positive battery lead from the battery terminal lugs. Disconnecting the leads in this order reduces the possibility of 'shorting' the battery (photo).
- 2 Remove the wing nuts and lift off the frame.
- 3 Lift out the battery.



2.1 The battery in position. Negative (earth) lead is the one connected to the strap

- 4 Before refitting the battery, clean the battery tray thoroughly.
- 5 Fit the battery, then connect the terminal leads, positive first. Do not hammer them on. They may jam or at worst the battery will crack.

- 6 Finally, smear the battery terminals and lead ends with a little petroleum jelly or a proprietary brand of battery corrosion inhibitor. Do not use regular lubricating grease as a substitute.
- 7 Never disconnect the battery while the engine is running or the alternator semi-conductors will be damaged.

**3 Battery maintenance and inspection**

- 1 Normal battery maintenance consists of checking the electrolyte level of each cell to ensure that the separators are covered by 1/4 in (5 mm) of electrolyte. If the level has fallen, top up the battery using distilled water only. Do not overfill. If a battery is overfilled or any electrolyte spilled, immediately wipe away the excess as electrolyte attacks and corrodes any metal it comes into contact with very rapidly.

2 If the battery has the 'Auto-fill' device fitted, a special topping-up sequence is required. The white balls in the 'Auto-fill' battery are part of the automatic topping-up device which ensures correct electrolyte level. The vent chamber should remain in position at all times except when topping-up or taking specific gravity readings. If the electrolyte level in any of the cells is below the bottom of the filling tube, top up as follows:

- (a) Lift off the vent chamber cover
- (b) With the battery level, pour distilled water into the trough until all the filling tubes and trough are full
- (c) Immediately refit the cover to allow the water in the trough and tubes to flow into the cells. Each cell will automatically receive the correct amount of water.

3 As well as keeping the terminals clean and covered with petroleum jelly, the top of the battery, and especially the top of the cells, should be kept clean and dry. This helps prevent corrosion and ensures that the battery does not become partially discharged by leakage through dampness and dirt.

4 Once every three months remove the battery and inspect the battery securing bolts, the battery clamp plate, tray and battery leads for corrosion (white fluffy deposits, on the metal, which are brittle to the touch). If any corrosion is found, clean off the deposits with ammonia or a solution of bicarbonate of soda and warm water, and paint over the clean metal with anti-rust and anti-acid paint.

5 At the same time inspect the battery case for cracks. If a crack is found, clean and plug it with one of the proprietary compounds marketed for this purpose. If leakage through the crack has been excessive then it will be necessary to refill the appropriate cell with fresh electrolyte as detailed later. Cracks are frequently caused to the top of the battery case by pouring in distilled water in the middle of winter after instead of before a run. This gives the water no chance to mix with the electrolyte and so the former freezes and splits the battery case.

6 If topping-up the battery becomes too frequent and the case has been inspected for cracks that could cause leakage, but none are found, the battery is being overcharged and the alternator will have to be checked. Generally, this indicates that the regulator (housed within the alternator end cover) is at fault thus allowing the alternator to operate uncontrolled, delivering full output even when the battery is fully charged. A fairly basic check can be carried out (See Section 7), but as a general principle this sort of job is best left to a competent auto-electrician or your Rover dealer.

7 With the battery on the bench at the three-monthly interval check, measure the specific gravity with a hydrometer to determine the state of charge and condition of the electrolyte. There should be very little variation between the different cells, and, if a variation in excess of 0.025 is present, it will be due to either:

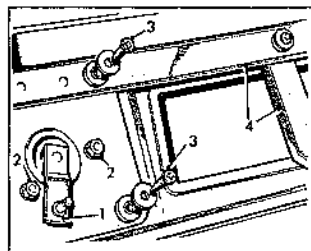
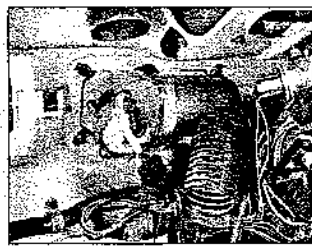


Fig. 10.37 Wiper motor and linkage mounting (Sec 34)

- 1 Wiper motor crank
- 2 Wiper motor mounting bolts
- 3 Linkage mounting screws
- 4 Linkage assembly

- 5 Prise off the spring clips and separate the main link arms from the spindle link arms.
- 6 Prise off the spring clips and separate the main link arms from the wiper motor crank. Note which way the bushes fit.
- 7 Remove the inner wiper spindle grommets.
- 8 Undo the screws which secure the wiper motor and linkage to the bulkhead.
- 9 From underneath the dashboard above the steering column withdraw the wiper motor. Disconnect the electrical plug-in connector (photo).
- 10 Refitting is the reverse of the removal procedure. Remember that the shorter link fits on the driver's side.



34.9 Disconnect the wiper motor plug-in connector

**35 Windscreen wiper motor - overhaul**

- 1 Remove the wiper motor as described in Section 34.
- 2 Remove the three bolts which secure the motor to its mounting plate.
- 3 Withdraw the motor crank through the grommet to separate the motor from the mounting plate.
- 4 Mark the gearbox cover adjacent to the arrowhead on the limit switch cover.
- 5 Undo the screws that retain the gearbox cover and lift it off.
- 6 Make sure that the end of the wiper motor shaft is free from burrs, then withdraw it and extract the dished washer.
- 7 Remove the thrust screw, or thrust screw and locknut, from the side of the wiper body.
- 8 Remove the through-bolts and slowly withdraw the cover and armature. The

brushes will drop clear of the commutator, but do not allow them to become contaminated with grease from the worm gear.

- 9 Pull the armature out of the cover.
- 10 Undo the three screws that retain the brush assembly.
- 11 Lift and slide the limit switch sideways, to release it from the spring clip.
- 12 The brush assembly and limit switch can now be lifted away together.
- 13 Examine the various components for wear and renew as necessary.
- 14 Commence the reassembly procedure by sliding the limit switch in position and securing it with the clip.
- 15 Refit the brush assembly and secure it with the three screws.
- 16 Lubricate the cover bearing and soak the cover bearing felt washer with Shell Turbo 41 oil.
- 17 Refit the armature to the cover, lubricate the self-aligning bearing with Shell Turbo 41 oil, then insert the armature shaft through the bearing whilst restraining the brushes. Take care when inserting the armature shaft to prevent the brushes from becoming contaminated with grease.
- 18 Position the cover against the gearbox casing so that the datum lines are correctly aligned.
- 19 Insert the cover through-bolts and tighten them.
- 20 Refit the thrust screw, or the thrust screw and locknut, and then check the armature endfloat.
- 21 On types with an adjustable thrust screw, loosen the locknut and screw the adjustment screw inwards until resistance is felt. Turn the screw back by a quarter of a turn and tighten the locknut.
- 22 On types with a non-adjustable thrust screw, push the armature towards the cover and place a feeler gauge between the armature shaft and thrust screw. The endfloat at this point should be within the limits given in the Specifications. Where the endfloat is insufficient, the only solution is to place a packing washer under the head of the thrust screw. If the endfloat is excessive, then have metal machined from under the head of the thrust screw.
- 23 Lubricate the final gear bushes with Shell Turbo 41 oil and apply Ragosine Listate grease to the final gear cam.
- 24 Fit the dished washer with its concave surface facing the final drive gear then insert the shaft.
- 25 Pack the area around the worm and final gear with Ragosine Listate grease.
- 26 Reposition the gearbox cover and fit the rubber seal.
- 27 The wiper motor can now be refitted to the mounting plate by reversing the removal procedure.

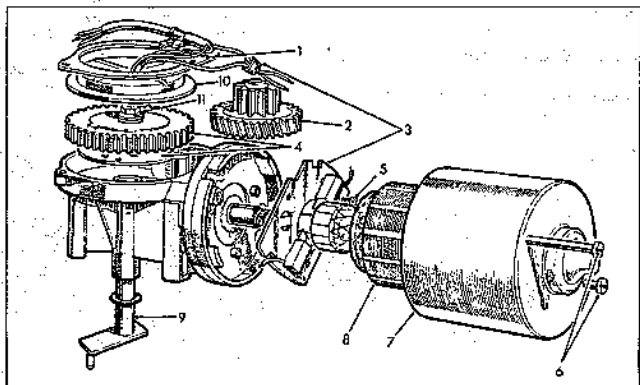


Fig. 10.36 Windscreen wiper motor - exploded view (Sec 35)

- |                              |                                   |                     |
|------------------------------|-----------------------------------|---------------------|
| 1 Gearbox cover              | 4 Gear wheel and driving plate    | 7 Yoke              |
| 2 Intermediate gear wheel    | 5 Brush assembly retaining screws | 8 Armature          |
| 3 Wiring - to brush assembly | 6 Through-bolts                   | 9 Wiper motor crank |
|                              |                                   | 10 Limit switch     |
|                              |                                   | 11 Locknut          |

**36 Tailgate wiper motor and drive assembly - removal and refitting**

Note: Two different wiper systems have been fitted. On early models the wiper motor is located behind the right-hand rear quarter trim panel and is secured to the body by a two-bolt mounting. On later models the wiper motor is located high up behind the left-hand rear quarter panel. This motor is retained to the body by a split bracket with a bolt and captive nut.

- 1 Remove the appropriate quarter panel.
- 2 Pull the rear headlining away in order to reach the wiper wheelbox.
- 3 Remove the wiper arm complete as described in Section 33.
- 4 Remove the nut and spacer from the wiper spindle.
- 5 Disconnect the wiper rack tube clips from the body.
- 6 Disconnect the wiring plug connector at the wiper motor.
- 7 Remove the wiper motor retaining bolt(s) and support the unit.
- 8 Remove the wiper motor, withdrawing the rack tube and wheelbox with it as one assembly.
- 9 The wheelbox and end tube assembly can be removed by slackening the two bolts and nuts which retain it. Then slide it off the end.
- 10 The tube can be slid off the rack by undoing the nut at the wheelbox.
- 11 Refitting is the reverse procedure. Ensure that the wheelbox is correctly aligned on the rack before tightening the nuts.

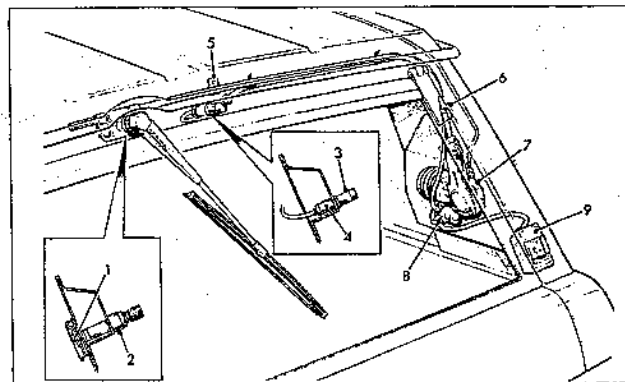


Fig. 10.39 Tailgate wiper/washer layout (early type) (Sec 36)

- |                  |                   |                    |
|------------------|-------------------|--------------------|
| 1 Wiper wheelbox | 4 Sleeve          | 7 Wiper motor      |
| 2 Nut and spacer | 5 Wiper rack clip | 8 Washer motor     |
| 3 Washer jet     | 6 Wiper rack      | 9 Washer reservoir |

**37 Headlamp wiper motor and drive racks - removal and refitting**

- 1 Unplug the wiring connector from the headlamp wiper motor, which is located on the right-hand inner front wing.
- 2 Undo the rack tube collar nuts at the motor.
- 3 Support the wiper motor, undo the two nuts and remove the clamp.
- 4 The wiper motor is now free.
- 5 With the help of an assistant to gently rotate the wiper blades, free the wiper racks from the wheelboxes.
- 6 Withdraw the motor and racks from the flexible rack tubes.
- 7 Do not move the wiper blades on the headlamps, or refitting is made more difficult.

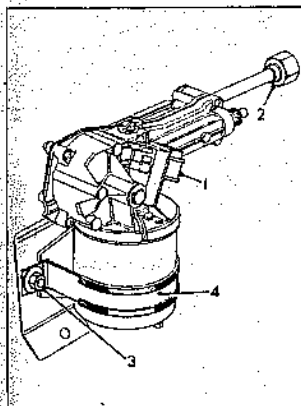


Fig. 10.40 Headlamp wiper motor mounting (Sec 37)

- 1 Electrical connector socket
- 2 Rack tube retaining nut
- 3 Mounting nut
- 4 Clamp

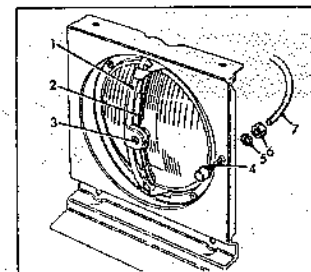


Fig. 10.41 Headlamp wiper/washer jet assembly (Sec 38)

- |                |          |
|----------------|----------|
| 1 Centre frame | 5 Washer |
| 2 Wiper blade  | 6 Nut    |
| 3 Centre screw | 7 Tubing |
| 4 Jet          |          |

8 Refitting is the reverse of the removal procedure. When refitted, the headlamp wiper blades must be aligned with the centre frame when the rack has been fully engaged.

**38 Headlamp wiper arm and blade - removal and refitting**

Note: The headlamp wiper arm and blade are serviced as one unit.

- 1 Using only finger pressure to prevent the wiper arm from rotating, undo the centre screw.
- 2 Ease the centre frame away from the headlamp. The wiper arm and blades can then be withdrawn.
- 3 Refitting is the reverse of the removal procedure. Ensure that the arm is aligned with the centre frame.

**39 Tailgate and headlamp wiper motors - overhaul**

**Brush renewal**

- 1 Unscrew the through-bolts and remove the yoke and armature assembly. Keep the yoke in a clean area, away from any metallic dust or swarf.
- 2 Note the position and colour coding of the wiring and disconnect it at the switch.
- 3 Withdraw the brush and plate assembly.
- 4 Remove the brushes from the insulating plate.
- 5 Renew the brushes if they are worn below the specified minimum.
- 6 Reassembly is the reverse of the dismantling procedure.

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paintwork. Allow the new paint at least two weeks to harden; then, blend it into the surrounding paintwork by rubbing the paintwork in the scratch area with a paintwork renovator or a very fine cutting paste. Finally apply wax polish.

Where the scratch has penetrated right through to the metal of the bodywork, a different repair technique is required. Remove any loose paint, etc., from the bottom of the scratch with a penknife. Using a rubber or nylon applicator, fill the scratch with bodystopper paste. If required, this paste can be mixed with cellulose thinners to provide a very thin paste which is ideal for filling narrow scratches. Before the stopper-paste in the scratch hardens, wrap a piece of smooth cotton rag around the top of a finger. Dip the finger in cellulose thinners and then quickly sweep it across the surface of the stopper-paste in the scratch: this will ensure that the surface of the stopper-paste is lightly hollowed. The scratch can now be painted over as described earlier in this Section.

#### Repair of dents in the vehicle's bodywork

The alloy body panels on the Range Rover are easier to work on than steel, and minor dents or creases can be beaten out fairly easily. However, if the damaged area is quite large, prolonged hammering will cause the metal to harden and to avoid the possibility of cracking, it must be softened or 'annealed'. This can be done easily with a gas blowlamp but great care is required to avoid actually melting the metal. The blowlamp must always be kept moving in a circular pattern whilst being held a respectable distance from the metal.

One method of checking when the alloy is hot enough is to rub down the surface to be annealed and then apply a thin film of oil over it. The blowlamp should be played over the rear side of the oiled surface until the oil evaporates and the surface is dry. Turn off the blowlamp and allow the metal to cool naturally; the treated areas will now be softened and it will be possible to work it with a hammer or mallet. After panel beating, the damaged section should be rubbed down and painted as described later in this Section.

When deep denting of the vehicle's bodywork has taken place, the first task is to pull the dent out until the affected bodywork almost attains its original shape. There is little point in trying to restore the original shape completely, as the metal in the damaged area will have stretched on impact and cannot be reshaped to its original contour. It is better to bring the level of the dent up to a point which is about 1/8 in (3 mm) below the level of the surrounding bodywork. In cases where the dent is very shallow anyway, it is not worth trying to pull it out at all.

If the underside of the dent is accessible, it can be hammered out gently from behind using the method described earlier.

Should the dent be in a section of the bodywork which has a double skin or some other factor making it inaccessible from behind, a different technique is called for. Drill several small holes through the metal inside the dent area, particularly in the deeper sections. Then screw long self-tapping screws into the holes just sufficiently for them to gain a good purchase in the metal. Now the dent can be pulled out by pulling on the protruding heads of the screws with a pair of pliers.

The next stage of the repair is the removal of the paint from the damaged area and from an inch or so of the surrounding 'sound' bodywork.

**Note:** On no account should coarse abrasives be used on aluminium panels in order to remove paint. The use of a wire brush or abrasive on a power drill for example, will cause deep scoring of the metal and in extreme cases, penetrate the thickness of the relatively soft aluminium alloy.

Removal of paint is best achieved by applying paint remover to the area, allowing it to act on the paintwork for the specified time and then removing the softened paint with a wood or nylon scraper. This method may have to be repeated in order to remove all traces of paint. A good method of removing small stubborn traces of paint is to rub the area with a nylon scouring pad soaked in thinners or paint remover.

**Note:** If it is necessary to use this method, always wear rubber gloves to protect the hands from burns from the paint remover. It is also advisable to wear protection over the eyes as any paint remover that gets into the eyes will cause severe inflammation, or worse.

Finally, remove all traces of paint and remover by washing the area with plenty of clean fresh water.

To complete the preparations for filling, score the surface of the bare metal with a screwdriver or the tang of a file, or alternatively, drill small holes in the affected area. This will provide a really good 'key' for the filler paste.

To complete the repair, see the Section on filling and respraying.

#### Repair of holes or gashes in the vehicle's bodywork

Remove all the paint from the affected area and from an inch or so of the surrounding 'sound' bodywork, using the method described in the previous Section. With the paint removed you will be able to gauge the severity of the damage and therefore decide whether to replace the whole panel (if this is possible) or to repair the affected area. It is often quicker and more satisfactory to fit a new panel than to attempt to repair large areas of damage.

Remove all fittings from the affected area except those which will act as a guide to the original shape of the damaged bodywork (eg. headlamp shells, etc). Then, using tin snips or a hacksaw blade remove all loose metal and

other metal badly affected by damage. Hammer the edges of the hole inwards in order to create a slight depression for the filler paste.

Before filling can take place it will be necessary to block the hole in some way. This can be achieved by the use of zinc gauze or aluminium tape.

Zinc gauze is probably the best material to use for a large hole. Cut a piece to the approximate size and shape of the hole to be filled, then position it in the hole so that its edges are below the level of the surrounding bodywork. It can be retained in position by several blobs of filler paste around its periphery.

Aluminium tape should be used for small or very narrow holes. Pull a piece off the roll and trim it to the approximate size and shape required, then pull off the backing paper (if used) and stick the tape over the hole; it can be overlapped if the thickness of one piece is insufficient. Burnish down the edges of the tape with the handle of a screwdriver or similar, to ensure that the tape is securely attached to the metal underneath.

#### Bodywork repairs - filling and respraying

Before using this Section, see the Section on dent, deep scratch, hole and gash repairs.

Many types of bodyfiller are available, but generally speaking those proprietary kits which contain a tin of filler paste and a tube of resin hardener are best for this type of repair. A wide, flexible plastic or nylon applicator will be found invaluable for imparting a smooth and well contoured finish to the surface of the filler.

Mix up a little filler on a clean piece of card or board. Use the hardener sparingly (follow the maker's instructions on the packet) otherwise the filler will set rapidly.

Using the applicator, apply the filler paste to the prepared area; draw the applicator across the surface of the filler to achieve the correct contour and to level the filler surfaces. As soon as a contour that approximates the correct one is achieved, stop working the paste; if you carry on too long the paste will become sticky and begin to 'pick-up' on the applicator. Continue to add thin layers of filler paste at twenty-minute intervals until the level of the filler is just 'proud' of the surrounding bodywork.

Once the filler has hardened, excess can be removed using a metal plane or file. From then on, progressively finer grades of abrasive paper should be used, starting with a 40 grade production paper and finishing with a 400 grade 'wet or dry' paper. Always wrap the abrasive paper around a flat rubber, cork, or wooden block, otherwise the surface of the filler will not be completely flat. During the smoothing of the filler surface, the 'wet-or-dry' paper should be periodically rinsed in water. This will ensure that a very fine smooth finish is imparted to the filler at the final stage.

At this stage, the 'dent' should be surrounded by a ring of bare metal, which in turn should be encircled by the finely feathered edge of the good paintwork. Rinse and repair with clean water, until all the dust produced by the rubbing-down operation is gone.

Spray the whole area with a light coat of grey primer, this will show up any imperfections in the surface of the filler. If at all possible, it is recommended that an, etch-primer is used on untreated alloy surfaces, otherwise the primer may not be keyed sufficiently and may subsequently flake off. Repair imperfections with fresh filler paste or bodystopper and once more, smooth the surface with abrasive paper. If bodystopper is used, it can be mixed with cellulose thinners to form a really thin paste which is ideal for filling small holes. Repeat the spray and repair procedures until you are satisfied that the surface of the filler, and the feathered edge of the paintwork are perfect. Clean the repair area with clean water and allow it to dry fully. The repair area is now ready for spraying. Paint spraying must be carried out in a warm dry, windless and dust free atmosphere. This condition can be created artificially if you have access to a large indoor working area, but if you are forced to work in the open, you will have to pick your day very carefully. If you are working indoors, dusting the floor in the work area with water will 'lay' the dust which would otherwise be in the atmosphere. If the repair is confined to one body panel, mask off the surrounding panels; this will help to minimise the effects of a slight mismatch in paint colours. Bodywork fittings will also need to be masked off. Use genuine masking tape and several thickness of newspaper for the masking operation.

Before commencing to spray, agitate the aerosol can thoroughly, then spray a test area (an old tin, or similar) until the technique is mastered. Cover the repair area with a thick coat of primer; the thickness should be built up using several thin layers of paint rather than one thick one. Using 400 grade 'wet or dry' paper, rub down the surface of the primer until it is really smooth. Whilst doing this the work area should be thoroughly doused with water, and the 'wet-or-dry' paper periodically

rinsed in water. Allow to dry before spraying on more paint.

Spray on the top coat, again building up the thickness by using several thin layers of paint. Start spraying in the centre of the repair area and then, using a circular motion, work outwards until the whole repair area and about 2 in of the surrounding original paintwork is covered. Remove all masking material 10 to 15 minutes after spraying on the final coat of paint.

#### 4 Major chassis and body damage - repair

Major chassis and body repair work cannot successfully be undertaken by the average owner. Work of this nature should be entrusted to a competent body repair specialist who should have the necessary jigs, welding and hydraulic straightening equipment as well as skilled panel beaters to ensure that a proper job is done.

If the damage is severe, it is vital that on completion of repair the chassis is in the correct alignment. Less severe damage may also have twisted or distorted the chassis although this may not be visible immediately. It is therefore always best on completion of the repair to check for twist and squareness to ensure that all is correct.

If distortion of the chassis is suspected, the chassis dimensions must be checked. Again, this is something that must be done by a specialist.

#### 5 Maintenance - hinges and locks

1 Periodically oil the hinges of the bonnet, tailgate and doors with a drop or two of light oil. A good time is after the vehicle has been washed.

2 Periodically oil the bonnet release catch pivot pin and the safety catch pivot pin.

3 Do not over-lubricate door latches and strikers. Normally a little oil on the catch alone is sufficient.

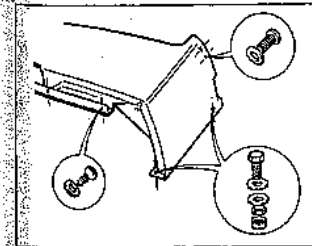


Fig. 12.1 The decker panel and fixings (Sec 8)

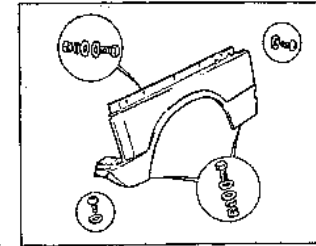


Fig. 12.2 The front wing panel and fixings (Sec 8)

#### 6 Door rattles - tracing and rectification

1 Check first that the door is not loose at the hinges and that the latch is holding the door firmly in position. Check also that the door lines up with the aperture in the body.

2 If the hinges are loose or the door is out of alignment, it will be necessary to reset the hinge positions as described in Section 10.

3 If the latch is holding the door properly, it should hold the door lightly when fully latched and the door should line up with the body. If it is out of alignment it needs adjustment as described in Section 10. If loose, some part of the lock mechanism must be worn out and requiring renewal.

#### 7 Bonnet - removal and refitting

1 Open and support the bonnet.

2 Detach the windscreen washer feed pipe at the reservoir.

3 Mark an outline around the bonnet hinge positions, then unscrew the retaining bolts whilst an assistant helps to support the bonnet in the raised position. With the bolts removed, lift the bonnet clear.

4 Refit in the reverse order of removal, checking bonnet alignment before fully tightening the retaining bolts.

#### 8 Front wing - removal and refitting

1 Remove the bonnet as described in the previous Section.

2 Referring to Chapter 3, remove the air cleaner unit.

3 Refer to Chapter 10 and remove the windscreen wiper arms.

4 Unbolt and remove the decker panel, the retaining bolt and screw positions of which are shown in Fig. 12.1.

5 Refer to Chapter 10 and remove the front side and indicator light unit from the wing to be removed.

6 The wing panel on the side concerned can now be removed after its retaining bolts and screws are removed. Their positions are shown in Fig. 12.2.

7 Refitting the wing is a direct reversal of the removal procedure. Before fully tightening its fastenings, check the panel alignment. When refitting the decker panel, engage it fully under the top of the windscreen rubber surround.

8 On completion ensure that the lights, indicators, windscreen wipers and washers are fully operational.

**Starter motor**

Type ..... Lucas 78R

**Main fusebox - mid-1984 to 1985 models**

Fuse number and circuit	Rating (amps)	Colour
1 RH headlamp - dipped	7.5	Brown
2 LH headlamp - dipped	7.5	Brown
3 RH headlamp - main	7.5	Brown
4 LH headlamp - main	7.5	Brown
5 RH sidelamps and illumination panel lamps	5	Tan
6 LH sidelamps	5	Tan
7 Front and rear wiper motors	15	Light blue
8 Heater motor	20	Yellow
9 Heated rear windows	15	Light blue
10 Electric mirror heater elements	3	Violet
11 Interior lamps, clock, horns, cigar lighter, headlamp flasher, engine compartment lamp	15	Light blue
12 Rear foglamps (from headlamp dip)	10	Red
13 Indicators, stop-lamps, reversing lamps, electric mirror motors	15	Light blue
14 Trailer auxiliary circuit	15	Light blue
15 Air conditioning fan*	20	Yellow
16 Air conditioning fan*	20	Yellow
17 Air conditioning compressor clutch*	5	Tan
18 Air conditioning blower motor*	20	Yellow
19 Central door locking system*	10	Red
20 Electric window lifts*	25	White

\*Optional fittings

Note: In addition to the above fuses, an in-line fuse of 7 amp rating protects the radio/cassette circuit

**Main fusebox - 1985-on models**

The fusebox is the same as for mid-1984 to 1985 models except for the following:

Fuse number and circuit	Rating (amps)	Colour
15 Auxiliary driving lamps	15	Light blue
16 Rear wash/wipe motor	10	Red
17 Cigar lighters	20	Yellow
18 Fuel pump	10	Red
19 Central door locking*	10	Red
20 Electric window lifts*	25	White

\*Optional fittings

**Auxiliary fusebox - models with air conditioning (1985-on)**

Fuse number and circuit	Rating (amps)	Colour
A1 Air conditioning fan	20	Yellow
A2 Air conditioning fan	20	Yellow
A3 Air conditioning compressor clutch	5	Tan
A4 Air conditioning blower motor	20	Yellow
A5 Spare		
A6 Spare		

**Main fusebox - 1989 models**

Fuse number and circuit	Rating (amps)	Colour
1 RH headlamp low beam and power wash	7.5	Brown
2 LH headlamp low beam	7.5	Brown
3 RH headlamp high beam	7.5	Brown
4 LH headlamp high beam, auxiliary lamp switch	7.5	Brown
5 RH parking lamps and instrument illumination	5	Tan
6 LH parking lamps and radio illumination	5	Tan
7 Front wash/wiper motors, seat relay, window lift relay, aerial amplifier	15	Blue
8 Heater/air conditioning motor	30	Green
9 Heated rear screen	25	White
10 Window lifts rear - option	30	Green
11 Interior lamp delay, clock, radio, under-bonnet illumination	15	Blue
12 Rear fog guard (from dipped headlamps)	10	Red

**Main fusebox - 1989 models (continued)**

Fuse number and circuit	Rating (amps)	Colour
13 Direction indicators, stoplamps, reverse lamps, electric mirror pick-up point, low coolant, heated jets, interior lamp delay heater/air conditioning relay	15	Blue
14 Hazard lamp, horn, headlamps flash	20	Yellow
15 Auxiliary driving lamps	15	Blue
16 Rear wash/wiper motor, heated rear screen switch	10	Red
17 Cigar lighters (front and rear)	20	Yellow
18 Fuel pump	10	Red
19 Central door locking option	10	Red
20 Electric window lifts front option	30	Green

**Main fusebox - 1990 models**

Fuse number and circuit	Rating (amps)	Colour
A1 LH dipped beam	10	Red
A2 LH main beam, auxiliary lamp relay	10	Red
A3 LH sidelamps, radio illumination, trailer pick-up	5	Tan
A4 Rear fog guard (headlamp switch controlled)	10	Red
A5 Direction indicators, resistor, heated jets, thermostat, heated front screen timer, air conditioning low coolant, speed transducer, interior lamp delay, reverse lights, stop-lamps	20	Yellow
A6 Auxiliary driving lamps (from main beam)	10	Red
A7 RH sidelamps, rheostat controlled instrument/switch illumination, trailer pick-up	5	Tan
A8 RH main beam	10	Red
A9 RH dipped beam	10	Red
B1 Front wash/wipe, seat relays, window lift relays, aerial amplifier	20	Yellow
B2 Interior lamp, clock, under-bonnet illumination, electric seat relays, radio, door lamps	20	Yellow
B3 Hazard switch, alarm, main beam/dip flash, horns	20	Yellow
B4 Cigar lighters	20	Yellow
B5 Sunroof motor	20	Yellow
B6 Headlamp wash	20	Yellow
B7 Air conditioning compressor clutch	5	Tan
B8 Air conditioning/radiator cooling fan	20	Yellow
B9 Air conditioning/radiator cooling fan	20	Yellow
C1 Heated rear screen (voltage switch controlled)	30	Green
C2 Window lifts rear	30	Green
C3 Rear wash/wipe motor, heated rear screen relay, mirror heaters	10	Red
C4 Fuel pump	10	Red
C5 Mirror motors, cruise control (option)	10	Red
C6 Not used	-	-
C7 Central locking	15	Blue
C8 Window lifts front	30	Green
C9 Heater/air conditioning motor	30	Green

**Bulbs**

Bulbs	Wattage
Rear foglamps	21
Side repeater lamps	6
Differential lock warning lamp	2.2
Engine compartment lamp	5
Auxiliary driving lamps	55
Sidelamps	5
Stop/tail lamps	21/5
Number plate lamp	5
Instrument panel lamps	1.2
Ignition warning lamp	2
Cigar lighter illumination	1.2
Door edge/puddle lamps	5
Auxiliary switch panel illumination	1.2
Automatic graphics illumination	5

**PART D: FUEL INJECTION SYSTEM (LUCAS HOT-WIRE)**



**Warning:** Many of the procedures in this Section require the removal of fuel lines and connections which may result in some fuel spillage. Before carrying out any operation on the fuel system refer to the precautions given in "Safety first" at the beginning of this manual, and follow them implicitly. Petrol is a highly-dangerous and volatile liquid, and the precautions necessary when handling it cannot be overstressed

**Description**

1 A Lucas Hot-wire electronic fuel injection system is fitted to all 1988-on models. The system ensures that the correct air/fuel mixture is supplied to the engine under all engine operating conditions. This is achieved by using various sensors which send signals to the ECU, and this information is then computed and the injectors opened for the correct period. The injectors are operated on each bank separately (ie each set of four injectors is triggered together).  
 2 The ECU is located beneath the front left-hand seat and is connected to the main harness by a 40-pin multi-plug.  
 3 The injectors are located on a common fuel

rail but electrically they are arranged in two banks of four.

4 On 1980-on models a tune select resistor is located next to the ECU.

5 A coolant temperature thermistor is located by the front left hand branch of the inlet manifold.

6 A fuel temperature thermistor is located on the front of the fuel distribution rail.

7 Engine idle speed is controlled by a by-pass air valve located on the rear of the inlet plenum chamber. The by-pass air valve maintains the engine idle speed constant when differing loads are applied to the engine such as when the air conditioning system or headlamps are switched on.

8 On engines fitted with catalytic converters, Lambda sensors are located just forward of the front converters to monitor the oxygen content of the exhaust gases. The sensors are heated by an internal element to improve their response time.

9 The fuel pressure regulator located on the rear of the fuel rail maintains the fuel pressure at 2.5 bars above the inlet manifold pressure.  
 10 The fuel pump is located in the top of the fuel tank.

11 The airflow sensor is of the hot wire type. A proportion of air flowing through the sensor is passed through a by-pass in which two wires are located. One wire is a sensing wire and the other is a compensating wire. An electronic module mounted on the side of the airflow sensor passes a small current through the sensing wire to produce a heating effect. The compensating wire is not heated but reacts to the temperature of the air passing through the meter. The electronic module monitors the reaction of the wires in proportion to the airflow and sends output signals to the ECU.

12 A throttle potentiometer is mounted on the side of the plenum chamber inlet neck and is attached to the throttle valve shaft.

13 A road speed transducer is located on a bracket beneath the left hand chassis side member. The transducer is operated by cable from the transfer box output shaft, and it sends signals to the ECU. It is also used to operate the electronic speedometer.

14. On 1980-on models an inertia switch is located beneath the front right-hand seat. In the event of an accident the switch opens and disconnects the fuel pump. The switch may be reset by pressing the button.

15 Two fuel injection relays are located beneath the front left-hand seat, and they are energized by the ECU. The main relay supplies current to the fuel injection system; the fuel pump relay energizes the fuel pump.

16 Should the fuel injection system develop a fault, a warning light on the instrument panel will illuminate and the fuel injection system should then be investigated to find the fault. However the system incorporates a limp home feature enabling the vehicle to be driven carefully to a garage.

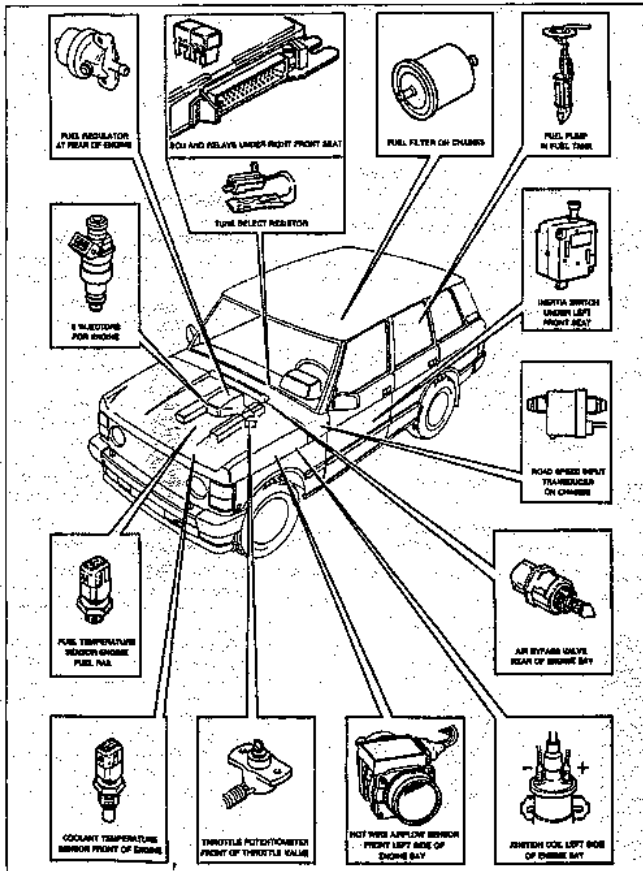
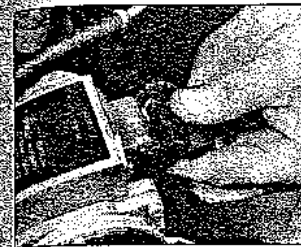


Fig. 13.34 Lucas Hot-wire electronic fuel injection system components (Sec 6D)

Tune select resistor and inertia switch not fitted to pre-1990 models  
 Left-hand drive model shown



6D.19 Disconnecting the multi-plug from the air flow sensor

**Airflow sensor - removal and refitting**

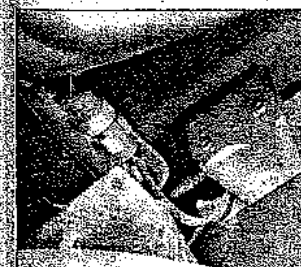
- 17 Disconnect the battery negative lead.
- 18 Loosen the clip and disconnect the hose from the rear of the airflow sensor.
- 19 Disconnect the multi-plug from the unit (photo).
- 20 Release the two clips securing the airflow sensor to the air cleaner then withdraw it from the engine compartment (photo).
- 21 Refitting is a reversal of the removal procedure but make sure that the multi-plug is secure, and that the hoses and clips are fitted correctly.

**Throttle potentiometer - removal, refitting and adjustment**

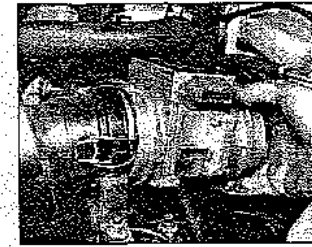
- 22 The procedure is the same as described earlier in Part C, but the adjustment setting is  $3.25 \pm 0.05$  millivolts.

**By-pass air valve (stepper motor) - removal and refitting**

- 23 Disconnect the battery negative lead.
- 24 Disconnect the wiring multi-plug (photo).
- 25 Unscrew the valve from the rear of the plenum chamber and remove the washer.
- 26 Refitting is a reversal of the removal procedure, but clean the threads and apply locking fluid such as Loctite 241 before tightening the valve to the specified torque.



6D.29 Speed transducer located on the left-hand chassis side member



6D.20 Removing the airflow sensor from the air cleaner

**Speed transducer - removal and refitting**

- 27 Disconnect the battery negative lead.
- 28 Jack up the front of the vehicle and support on axle stands.
- 29 The speed transducer is located on a bracket adjacent to the rear engine mounting (photo). The two sections of the speedometer cable are connected to the transducer, one at each end. A faulty speed transducer would affect the idle speed of the engine.

30 Disconnect the speed transducer wiring plug.

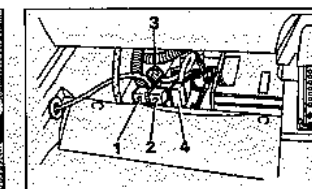
31 Unscrew the collars and disconnect the cables from each side of the transducer.

32 Unbolt and remove the transducer from its mounting.

33 Refitting is a reversal of the removal procedure.

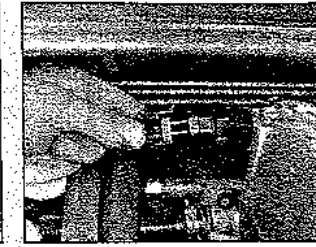
**Fuel injection relays - removal and refitting**

- 34 The two relays are located beneath the front right-hand seat next to the main ECU. The fuel pump relay is mounted on a blue terminal block and the main relay is mounted on a black terminal block.
- 35 Disconnect the battery negative lead.
- 36 Pull the relevant relay directly from its socket.
- 37 Refitting is a reversal of the removal procedure.



13.35 Fuel Injection relay locations beneath the front right-hand seat (Sec 6D)

- 1 Fuel pump relay
- 2 Main relay
- 3 Diagnostic plug
- 4 Condenser fan timer unit



6D.24 Disconnecting the wiring multi-plug from the by-pass air valve on the rear of the plenum chamber

**Electronic control unit (ECU) - removal and refitting**

- 38 Disconnect the battery negative lead.
- 39 Move the front right-hand seat fully forwards, then remove the rear opening cover for access to the ECU.
- 40 Pull out and unhook the multi-plug from the ECU. An arrow on the plug indicates which way to remove it.
- 41 Unscrew the screws and release the ECU from the spring clip.
- 42 Refitting is a reversal of the removal procedure.

**Fuel temperature thermistor - removal and refitting**

- 43 Disconnect the battery negative lead.
- 44 Disconnect the multi-plug from the thermistor.
- 45 Unscrew the thermistor from the fuel rail. Note that it is not necessary to depressurise the fuel system as the thermistor is not in direct contact with the fuel.
- 46 Refitting is a reversal of the removal procedure.

**Coolant temperature thermistor - removal and refitting**

- 47 Partially drain the cooling system with reference to Section 5 of this Chapter.

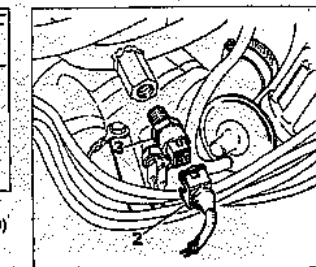


Fig. 13.36 Fuel injection thermistor (3) and plug (2) (Sec 6D)

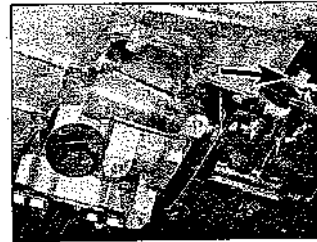


Fig. 13.93 Main gearbox filler/level plug (arrowed) (Sec 9B)

to the filler/level plugs before securing them in position (Figs. 13.93 and 13.94).  
50 Before refitting the aluminium top cover, refit the gear lever housing and check the bias spring adjustment.

**1986 to 1988 models**

- 51 Disconnect the battery earth lead.
- 52 Refer to Section 17 and remove the centre console.
- 53 Remove the noise insulation pad to gain access to the gear lever gaiter.
- 54 Undo the four screws and drill out all the pop rivets securing the gaiter to the gearbox.
- 55 Disconnect the reversing light leads and pull the leads through the tunnel aperture.
- 56 Refer to Fig. 13.95 and undo the lower locknut from the high/low operating rod.

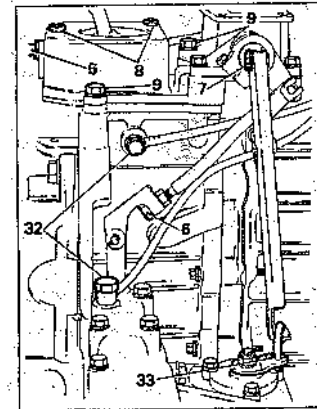


Fig. 13.95 Transmission linkage and component attachments - 1986-on models (Sec 9B)

- 5 Reversing lamp leads
- 6 High/low operating rod lower locknut
- 7 Differential lock lever clevis pin spring clip
- 8 Gearchange housing top cover screws
- 9 Gearchange housing retaining bolts
- 32 Breather pipe attachments
- 33 Differential lock lever connecting link

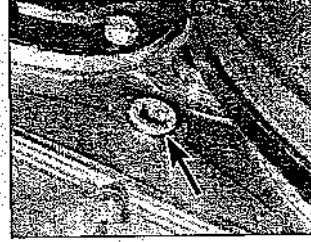


Fig. 13.94 Transfer gearbox filler/level plug (arrowed) (Sec 9B)

- 57 Extract the spring clip from the clevis pin securing the differential lock lever to the high/low gearchange housing.
- 58 Undo the two gearchange housing top cover retaining screws. Lift the cover for access and undo the gearchange housing-to-extension case retaining bolt located next to the reverse plunger assembly.
- 59 Undo the three remaining gearchange housing retaining bolts and remove the gearchange housing complete with transfer gear housing and gaiter.
- 60 Undo the nut securing the handbrake outer cable to the transmission tunnel and feed the cable assembly through its aperture to the underside of the vehicle.
- 61 The remainder of the procedure is basically the same as described previously for pre-1986 models and reference should be made to paragraphs 11 to 50 inclusive.

**1989-on models**

- 62 Position the vehicle over an inspection pit or jack it up and support on axle stands.
- 63 Disconnect the battery negative lead.
- 64 Remove the cooling fan blade assembly with reference to Chapter 2 noting that the screw thread is left-hand.
- 65 On fuel injection models disconnect the air flow meter to plenum chamber hose.
- 66 On carburettor models remove the air cleaner.

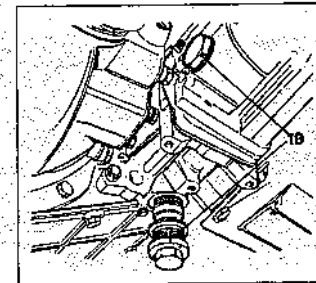


Fig. 13.96 Drain plugs (19) on the transmission extension housing and transfer box (Sec 9B)

- 67 Remove the main gear lever knob then select low range and remove the transfer gear lever knob.
- 68 Unscrew the screws and remove the glovebox liner.
- 69 Prise out the window lift switch panel from the front of the glovebox, then push the panel and switches back through the panel aperture and position them on the transmission tunnel.
- 70 Prise out the main gear lever centre panel.
- 71 Unscrew the screws and bolt securing the glovebox and console assembly to the transmission tunnel.
- 72 Remove the relay blocks from the glovebox.
- 73 Disconnect the wiring from the rear cigar lighter.
- 74 Release the handbrake then pull forward the gaiter. Extract the split pin, then remove the washer and clevis pin to release the inner cable from the handbrake lever.
- 75 While lifting the handbrake lever, move the glovebox to the rear away from the radio housing then remove the glovebox assembly.
- 76 Withdraw the sound deadening material from the top of the transmission tunnel.
- 77 Loosen the clamp bolt and remove the upper gear lever.
- 78 Unscrew the screws and remove the high/low lever and main gear lever retaining plates.
- 79 Working under the vehicle, position suitable containers beneath the transmission then unscrew the drain plugs from the transfer box, main gearbox and extension housing, and allow the oil to drain. Clean the filter on the extension housing. On completion refit and tighten the drain plugs using a suitable sealant on their threads before inserting them.
- 80 Unbolt and remove the chassis crossmember, if necessary the chassis members can be spread using a length of wood.
- 81 Referring to Chapter 3 remove the front exhaust downpipes and intermediate pipe together with the centre silencer.
- 82 Mark the drive flanges in relation to the propeller shafts then unbolt the propeller shafts and tie them to one side.
- 83 Loosen the clamp and disconnect the speedometer cable from the rear output housing. Unclip the cable and tie it to one side.
- 84 Unbolt the clutch slave cylinder from the transmission.
- 85 Support the weight of the transmission with a trolley jack then remove the mountings.
- 86 Lower the transmission until the top of the transfer box clears the rear passenger floor.
- 87 Remove the split pin, washer and clevis pin and disconnect the handbrake cable.
- 88 Unclip the handbrake cable and pass it through the support bracket, then tie the cable to one side.
- 89 Take the weight of the engine with a trolley jack and unscrew the bolts securing the transmission to the engine.
- 90 Check that all connections are released

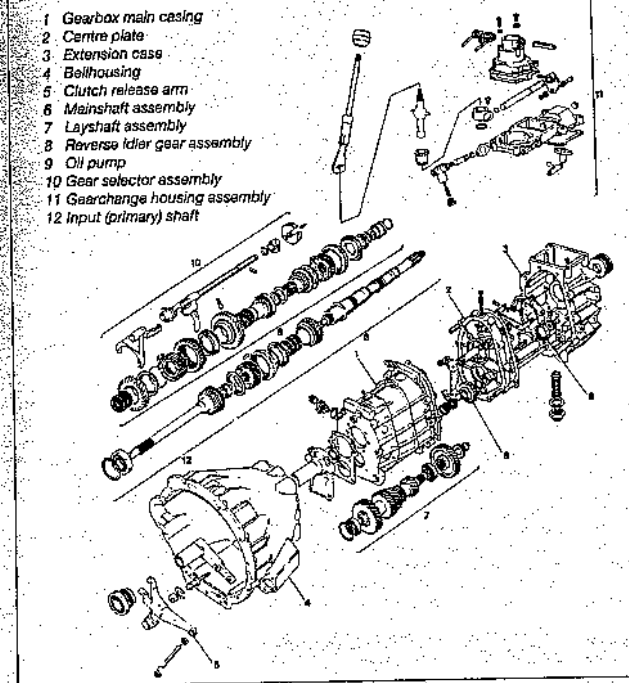
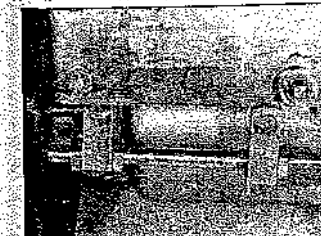


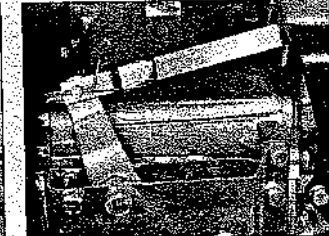
Fig. 13.97 Exploded view of the five-speed main gearbox (Sec 9B)

- 91 Apply sealant to the mating faces of the engine and transmission.
- 92 Select any gear in the main and transfer box to aid refitting and check that the clutch centre plate is centred correctly.
- 93 Raise the transmission and pass the handbrake cable through the aperture in the tunnel. Check that all wiring is clear of the end of the transmission.
- 94 Locate the transmission on the engine

- then insert the bolts and tighten them to the specified torque.
- 95 The remaining procedure is a reversal of the removal procedure but note the following points:
  - (a) Tighten all nuts and bolts to the specified torque
  - (b) Unscrew the main gearbox and transfer box filler/level plugs and refill with the correct grade of oil until the level is to the bottom of the hole. Apply sealant to the threads of the plugs then refit and tighten them



9C.2 Handbrake link rod connection and mounting plate



9C.3 Handbrake lever mounting to the transfer gearbox

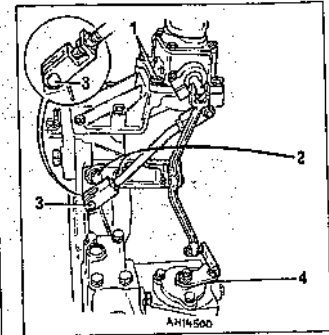


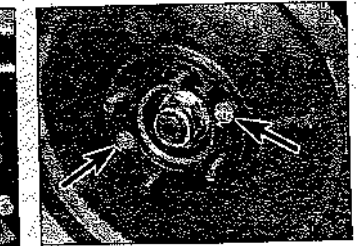
Fig. 13.98 Gearchange housing and associated connections - early models (Sec 9C)

- 1 Gearchange housing retaining bolts
- 2 Differential lock cross-shaft lever pivot bracket
- 3 High/low connecting rod-to-arm attachment
- 4 Differential lock lever assembly (early type)

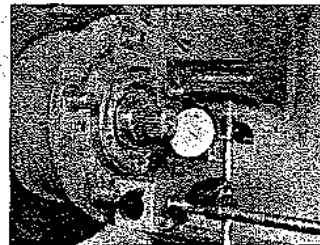
**PART C: TRANSFER GEARBOX - REMOVAL AND REFITTING**

**Pre-1989 models**

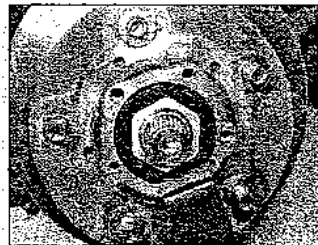
- 1 With the main gearbox and transfer box removed and on the bench proceed as follows.
  - 2 Extract the split pin and withdraw the clevis pin from the transmission brake link-to-handbrake link rod clevis (photo).
  - 3 Undo the four retaining bolts and remove the handbrake lever mounting bracket from the side of the transfer gearbox (photo).
  - 4 Unscrew and remove the two countersunk screws securing the transmission brake drum in position. Withdraw the brake drum, then undo the four bolts securing the brake unit/backplate assembly in position (photo). Withdraw the brake assembly, complete with the backplate.



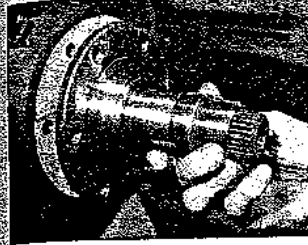
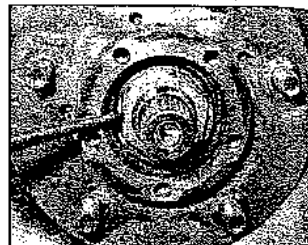
9C.4 Transmission brake drum retaining screws (arrowed)



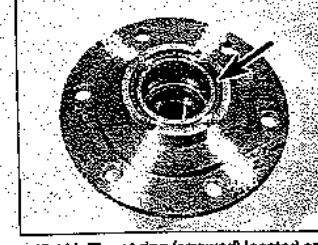
13.98 Adjusting the front hub endplay using a dial gauge



13.99A Tightening the hub nut



13.110 Removing the front stub axle



13.111 Thrust ring (arrowed) located on the inner end of the stub axle

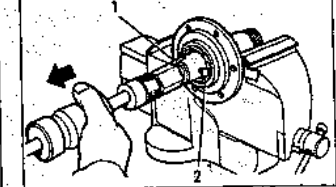


Fig. 13.140 Using a slide hammer to remove the bearing and seal from the stub axle (Sec. 13)

- 1 Slide hammer adaptor
- 2 Bearing and seal

the complete hub should be renewed, if there is any doubt how many of the studs have been renewed, renew the complete hub as a safety precaution.

89 Examine the bearing rollers and tracks for signs of pitting and wear, and if necessary renew them.

90 Using a soft metal drift, drive the outer tracks into the hub squarely until they abut the shoulder.

91 Pack the inner bearing with grease then locate it in the hub; press a new oil seal into position using a block of wood. The oil seal must be fitted with its closed side facing outwards, and it must be flush with the inner end of the hub.

92 Apply a little grease between the lips of the oil seal.

93 Fit the brake disc to the hub making sure that the previously made marks are aligned. Apply a little locking fluid to the threads of the bolts then insert them in the holes and tighten them progressively to the specified torque.

94 Pack the outer bearing with grease then locate it in the outer track.

95 Clean the front stub axle and driveshaft.

96 Locate the hub assembly on the stub axle, and fit the keyed washer.

97 Fit the hub adjusting nut and tighten by hand whilst rotating the hub until all endplay is eliminated.

98 If a dial gauge is available back off the adjusting nut until the endfloat is between 0.013 and 0.05 mm (0.0005 and 0.002 in) (photo). If a dial gauge is not available back off the nut until it is just possible to detect a small endfloat.

99 Fit a new keyed locktab washer, then fit and tighten the hub nut. Recheck the endfloat then bend over the locktab washer (photos).

100 Refit the driving member together with a new gasket and tighten the bolts progressively to the specified torque.

101 Fit the shim and circlip to the driveshaft making sure that the shim locates in the groove correctly.

102 The endplay of the driveshaft must now be checked using a dial gauge in contact with the outer end of the driveshaft. Fit a suitable bolt to the end of the driveshaft, and move the

driveshaft out and in while noting the reading on the dial gauge. The endplay should be between 0.08 and 0.25 mm (0.003 to 0.010 in), if the endplay requires adjustment, measure the thickness of the existing shim and renew it with one which will give the correct endplay (photo).

103 Tap the dust cap onto the hub.

104 Refit the brake caliper with reference to Chapter 8, then bleed the brake hydraulic system with reference to Section 14 of this Supplement.

105 Refit the roadwheel and tighten the nuts. Lower the vehicle to the ground.

106 Depress the footbrake pedal several times to set the brake pads in their normal position.

**Front stub axle (models with ABS) - removal, overhaul and refitting**

107 Remove the front hub as described earlier in this Section.

108 Unscrew the drain plug and drain the oil from the swivel pin housing into a suitable container. On completion refit and tighten the drain plug.

109 Unscrew the bolts retaining the stub axle to the swivel pin housing (photos).

110 Withdraw the mud shield followed by the stub axle (photo). Remove the gasket.

111 Drill and chisel off the thrust ring from the inner end of the stub axle taking care not to cause any damage (photo).

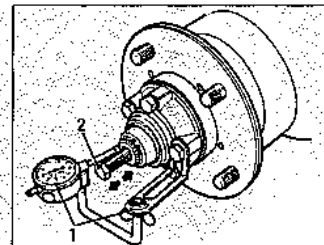
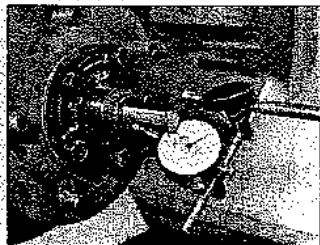
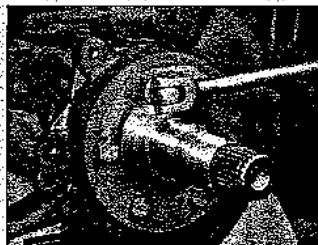


Fig. 13.139 Checking the endfloat of the driveshaft with a dial gauge (Sec 13)

- 1 Dial gauge and support bracket
- 2 Bolt screwed into the end of the driveshaft



13.102 Checking the endplay of the front driveshaft using a dial gauge



13.109A Unscrew the bolts . . .



13.109B . . . and remove them from the stub axle

112 Using a soft metal drift, drive the bearing and oil seal out of the stub axle. Alternatively, use a slide hammer to remove the bearing and seal.

113 Clean the stub axle and swivel pin housing, and examine all of the components for wear and damage. Spin the bearings by hand and check for roughness and tight spots.

114 Apply some EP 90 oil to the new oil seal, then press it into the stub axle using a metal tube to keep it square. Make sure that the closed end of the seal is towards the outer end of the stub axle.

115 Press the bearing into the stub axle with its part number visible. Use a metal tube on the outer track only and press the bearing into the stub axle until flush with the inner face of the stub axle.

116 Press a new thrust ring onto the stub axle.

117 Refit the stub axle together with a new gasket followed by the mud shield. Apply locking fluid to the threads of the bolts then insert and tighten them to the specified torque.

118 Refit the front hub as described earlier in this Section.

119 Remove the filler and level plugs from the swivel pin housing.

120 Inject approximately 0.35 litre (0.6 pint) of the recommended oil into the swivel pin

housing until it reaches the bottom of the level plug hole (photo). Fit and tighten the filler and level plugs, and wipe away any surplus oil.

**Front swivel pin housing - removal, overhaul and refitting**

121 Remove the front hub, stub axle and driveshaft as described earlier in this Section.

122 Unscrew the two nuts and bolt, and remove the brake disc backplate.

123 Unscrew the nut and disconnect the steering track rod end from the housing.

124 Unscrew the nut and disconnect the steering box drop arm balljoint.

125 Disconnect the hydraulic brake hoses from the bracket.

126 Remove the ABS sensor.

127 Unbolt the retaining plate from the housing, and prise out the oil seal.

128 Remove the countersunk screws, and remove the damper and shield bracket and

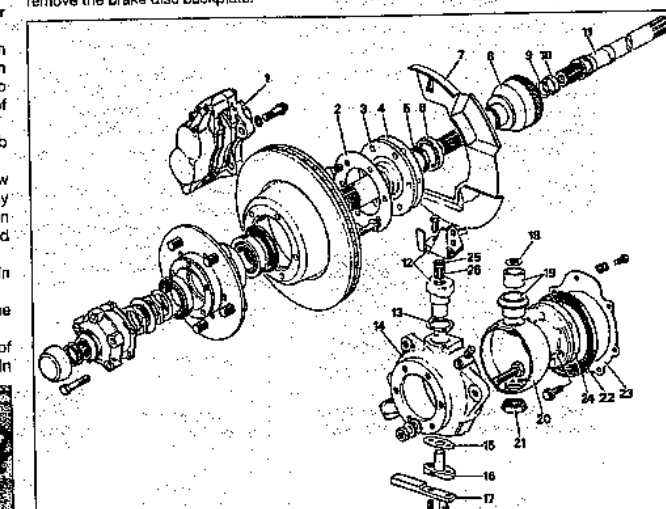
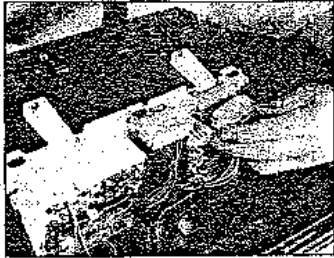


Fig. 13.141 Front swivel pin housing components (Sec 13)

- |                           |  |                               |
|---------------------------|--|-------------------------------|
| 1 Brake caliper           | 10 Bush                                    | 18 Thrustwasher               |
| 2 Mud shield              | 11 Inner section of driveshaft             | 19 Bush and housing           |
| 3 Stub axle               | 12 Upper swivel pin and brake hose bracket | 20 Swivel pin bearing housing |
| 4 Gasket                  | 13 Shim                                    | 21 Lower swivel pin bearing   |
| 5 Oil seal                | 14 Swivel pin housing                      | 22 Oil seal                   |
| 6 Bearing                 | 15 Gasket                                  | 23 Oil seal retaining plate   |
| 7 Brake disc backplate    | 16 Lower swivel pin                        | 24 Gasket                     |
| 8 Constant velocity joint | 17 Damper and shield bracket               | 25 Oil seal                   |
| 9 Circlip                 |  | 26 ABS sensor bush            |



15.122 Disconnecting the multi-plugs from the rear of the instrument panel

122 Unclip the cowl from the rear, then disconnect the multi-plugs and the single plug from the printed circuit connectors (photo).  
123 Withdraw the instrument panel from the fascia.

124 Refitting is a reversal of the removal procedure.

**Instruments (1990-on models) - removal and refitting**

125 With the instrument panel removed, unscrew the mounting screws and remove the mounting bracket (photo).

126 Unscrew the two upper screws and remove the bezel from the front of the instrument panel.

127 Remove the curved lens by depressing the tabs and easing the top of the lens followed by the bottom edge.

and lower tabs and

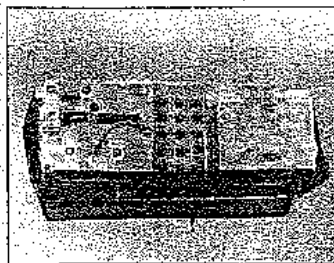
and temperature

two illumination bulb three large screws. of the black and white leads

on the screws.  
130 Remove the unit from the front of the instrument panel.

**Speedometer**

131 Remove the two illumination bulb holders, then unscrew the three large screws



15.125 Rear view of the instrument panel

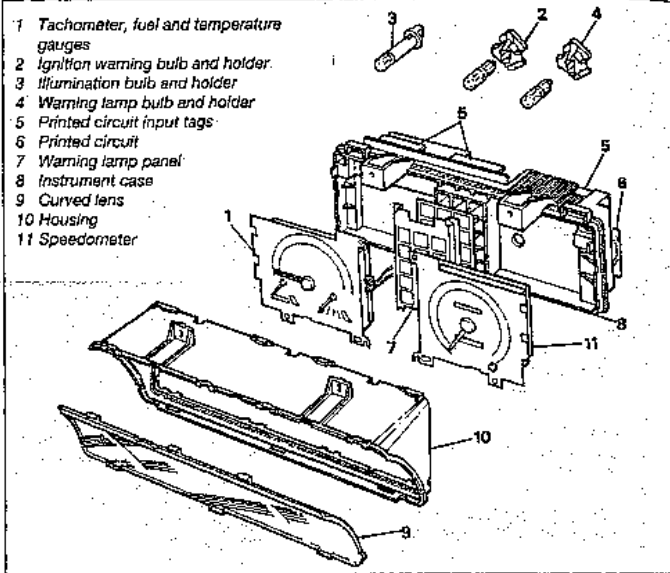


Fig. 13.190 Instrument panel components (1990-on models) (Sec 15)

and withdraw the speedometer from the front of the instrument panel.

**Printed circuit**

132 Remove the tachometer and speedometer as previously described.

133 Note the position of the warning light bulbs and remove them from the printed circuit.

134 Unscrew the screws and remove the wiring connectors to release the printed circuit tags and the input plug.

135 Unscrew the screws and remove the printed circuit taking care to release it from the locating pegs.

136 Refitting is a reversal of the removal procedure.

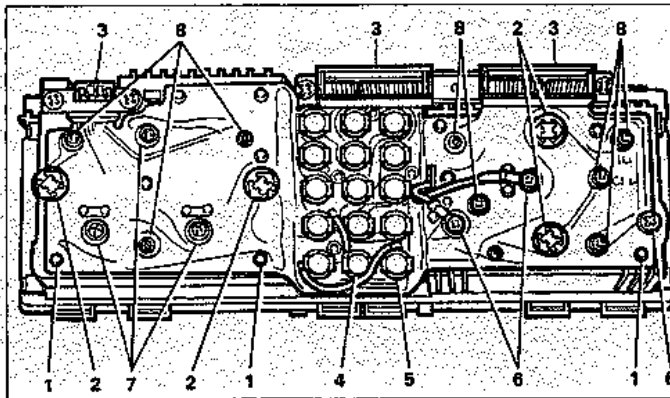
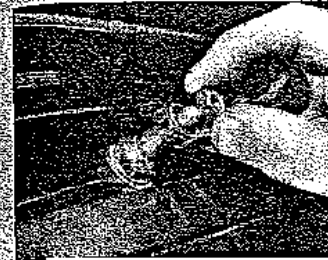


Fig. 13.191 Rear view of instrument panel (1990-on models) (Sec 15)

- |                                 |   |                                   |
|---------------------------------|---|-----------------------------------|
| 1 Printed circuit location pegs | 5 No-charge warning lamp bulb                       | 7 Speedometer securing screws     |
| 2 Illumination bulbs            | 6 Tachometer/fuel/temperature gauge securing screws | 8 Printed circuit securing screws |
| 3 Wiring harness connectors     |   |                                   |
| 4 Warning lamp bulbs            |   |                                   |



15.137

**Tailgate wiper arm (1987-on models) - removal and refitting**

137 If necessary operate the wipers until they stop at their rest position.

138 Pull up the end cap from the base of the wiper arm for access to the wiper arm spindle.  
139 Note the position of the wiper arm on the spindle, then unscrew the nut and withdraw the arm from the spindle (photo).

140 Refitting is a reversal of the removal procedure but make sure that the wiper blade is located at its rest position just clear of the windscreen surround.

**Tailgate wiper motor (1987-on models) - removal and refitting**

141 Disconnect the battery negative lead.  
142 Remove the headlining rear section for access to the tailgate wiper motor assembly.

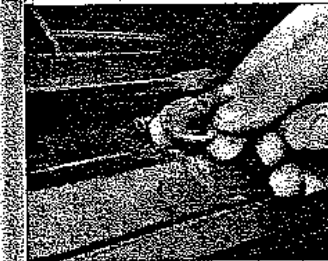
143 Remove the wiper arm and blade as described previously in this Section.

144 Loosen only the nut securing the wiper motor to the body. Do not remove it at this stage.

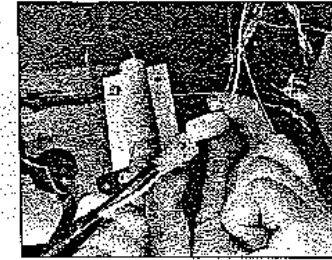
145 Disconnect the wiring at the multi-plug, and unscrew the earth wire screw (photos).

146 Unscrew and remove the two mounting screws (photo).

147 Support the wiper motor, then completely unscrew the nut and remove the cover from the spindle. Remove the washer and seal (photos).



15.147C ... washer and seal

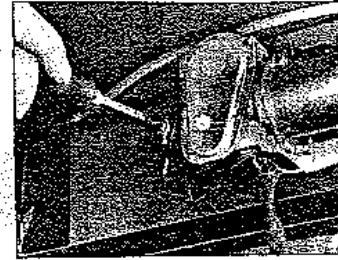


148 Withdraw the wiper motor from the body (photo).

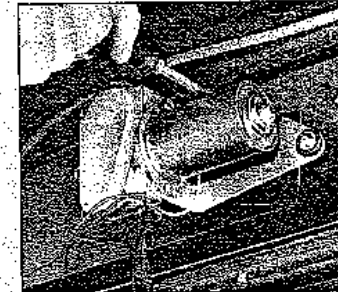
149 Refitting is a reversal of the removal procedure but make sure that the spacer is fitted correctly.

**Heated windscreen washer jets and thermostat (1989-on models) - removal and refitting**

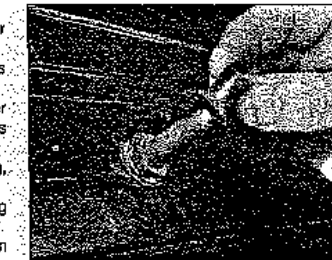
150 The windscreen washer jets are heated electrically when the temperature drops to 4°C or less, and the heating is switched off when the temperature rises to 10°C or higher. A thermostat is located by the side of the right-hand headlight.



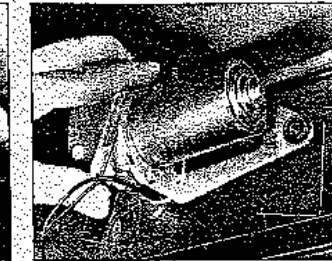
15.146 Unscrewing the tailgate wiper motor mounting screws



15.147B ... followed by the nut ...



15.147A Remove the cover ...



15.148 Removing the tailgate wiper motor

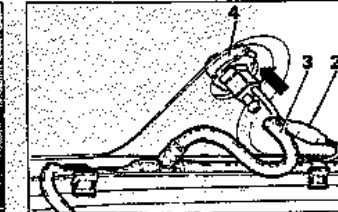


Fig. 13.192 Heated windscreen washer jet removal (1989-on models) (Sec 15)

- |                    |                |
|--------------------|----------------|
| 2 Wiring connector | 4 Jet assembly |
| 3 Washer tube      |                |

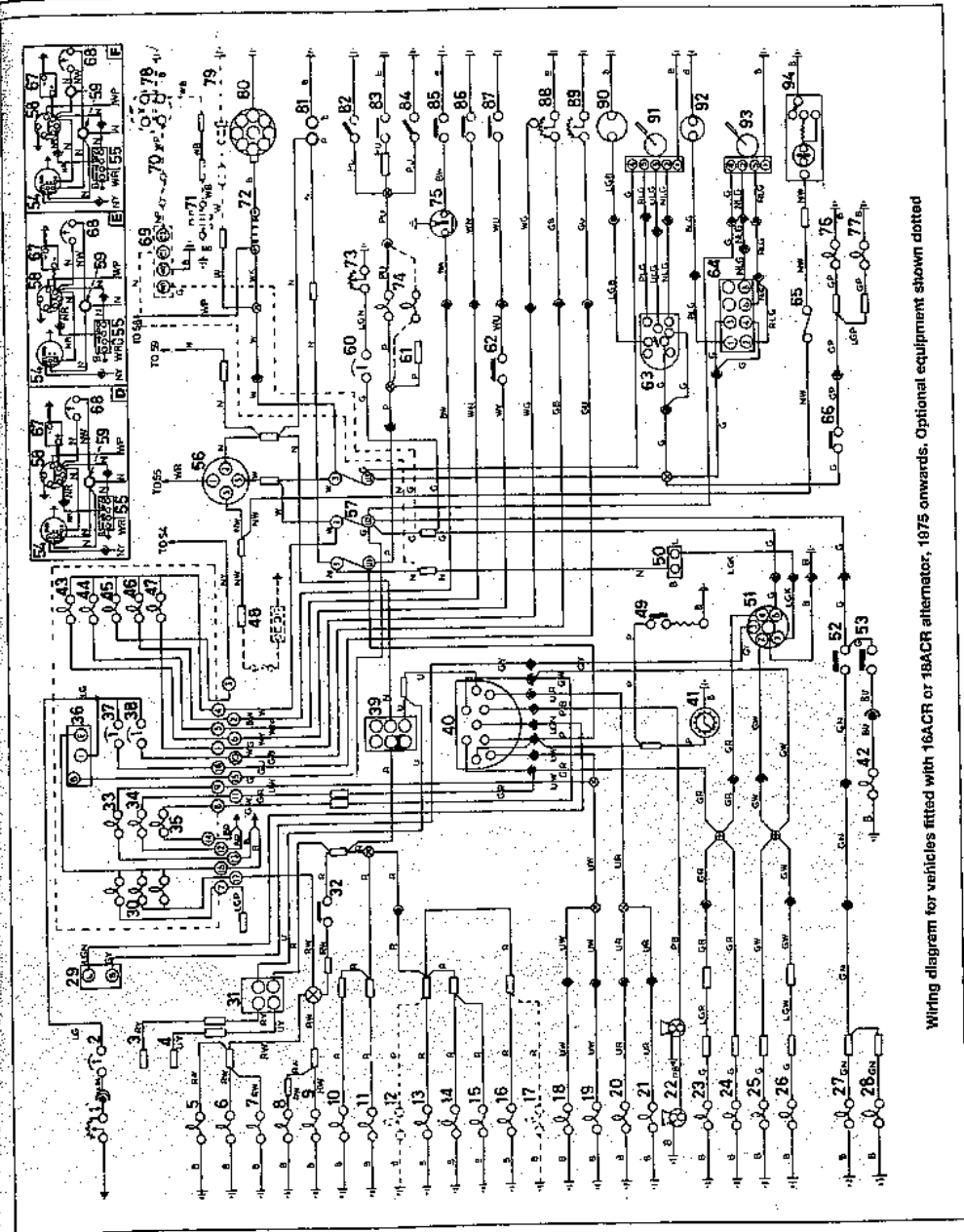
- 168 Refit the actuator unit in the reverse order of removal.
- 169 When attaching the actuator mounting plate to the inner door panel (front door units), adjust the mounting plate so that it is in the centre of the slotted holes.
- 170 Do not refit the door trim panel until the locking action is checked as follows.
- 171 Check the lock actuation manually and electrically to ensure that the actuator operating rod does not restrict the operation of either locking method. If necessary adjust the mounting position of the actuator to suit.

172 On the front doors, move the manual lock to the halfway position of its total movement then hold it in this position and check that the door locks electrically. Further adjustment of the mounting plate may be necessary to achieve this.

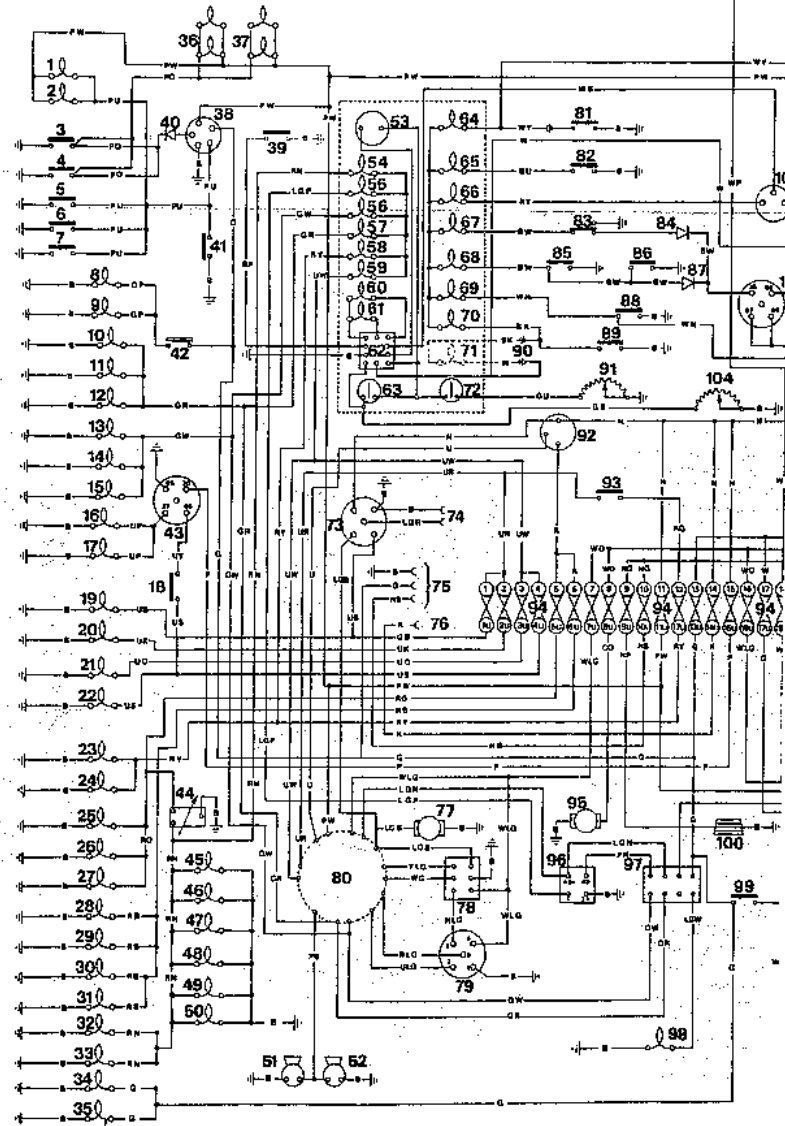
**Central door locking system control unit (1990-on models) - removal and refitting**

173 The central door locking system is now

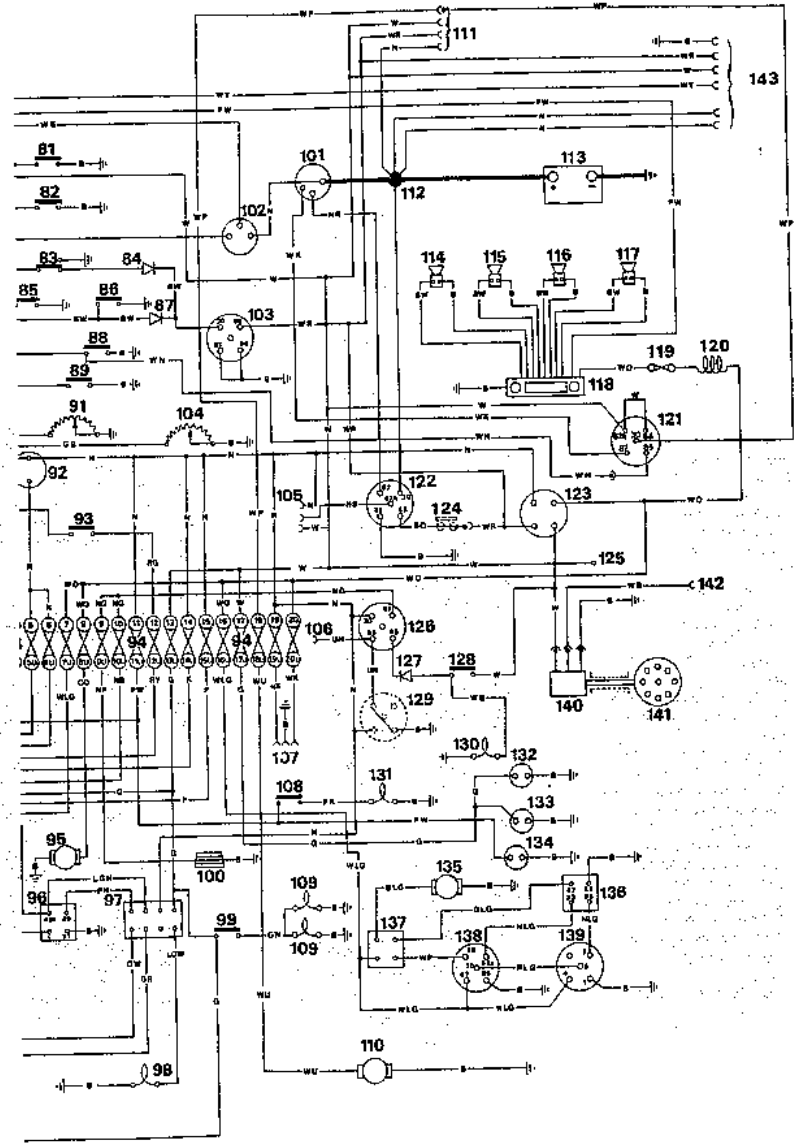
- activated from both driver's and passenger's doors, and an activator is located in both front doors. The electronic control unit is located on the steering column support bracket.
- 174 Disconnect the battery negative lead.
- 175 Remove the lower facia panel.
- 176 Disconnect the wiring multi-plug.
- 177 Unscrew the mounting screws and remove the control unit from the steering column support bracket.
- 178 Refitting is a reversal of the removal procedure.



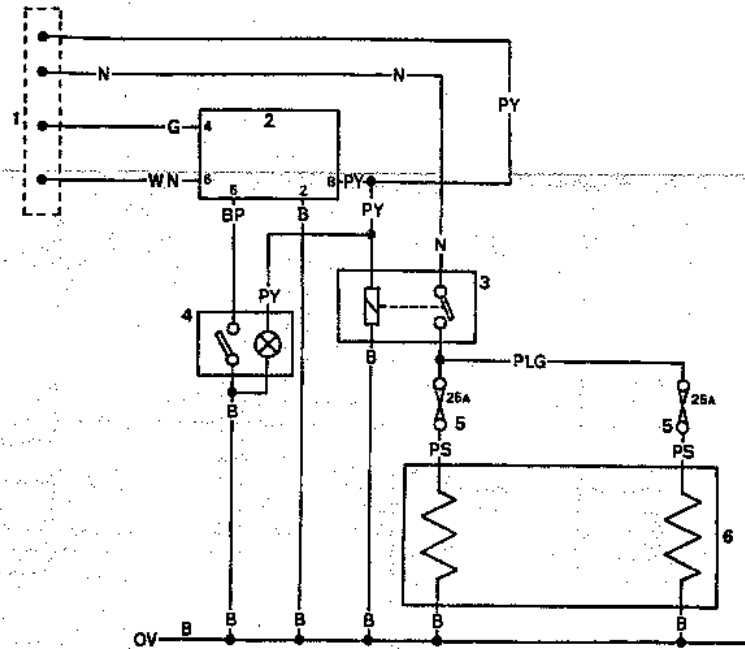
Wiring diagram for vehicles fitted with 16ACR or 18ACR alternator, 1875 onwards. Optional equipment shown dotted



Main wiring diagram for all models - 1986-on



Main wiring diagram for all models - 1986-on (continued)



Wiring diagram for heated front screen - 1990 models

- |     |                          |   |                     |
|-----|--------------------------|---|---------------------|
| 1   | Main harness connections | 2 | Timer               |
| N   | Battery feed (12V+)      | 3 | Load relay          |
| G   | Ignition feed (12V+)     | 4 | Switch/warning lamp |
| P/Y | EFI harness plug         | 5 | In-line fuses - 25A |
| W/N | Oil pressure switch      | 6 | Heated screen       |
| B   | Earth                    |   |                     |

This is a guide to getting your vehicle through the MOT test. Obviously it will not be possible to examine the vehicle to the same standard as the professional MOT tester. However, working through the following checks will enable you to identify any problem areas before submitting the vehicle for the test.

Where a testable component is in borderline condition, the tester has discretion in deciding whether to pass or fail it. The basis of such discretion is whether the tester would be happy for a close relative or friend to use the vehicle with the component in that condition. If the vehicle presented is clean and evidently well cared for, the tester may be more inclined to pass a borderline component than if the vehicle is scruffy and apparently neglected.

It has only been possible to summarise the test requirements here, based on the regulations in force at the time of printing. Test standards are becoming increasingly stringent, although there are some exemptions for older vehicles. For full details obtain a copy of the Haynes publication Pass the MOT! (available from stockists of Haynes manuals). An assistant will be needed to help carry out some of these checks.



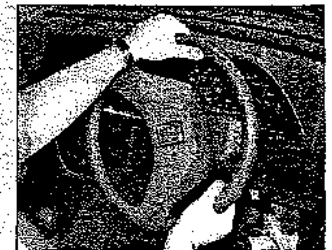
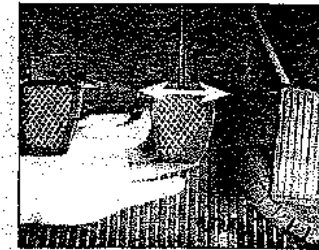
The checks have been sub-divided into four categories, as follows:

- |   |   |  |  |
|---|---|--|--|
| <p><b>1</b> Checks carried out FROM THE DRIVER'S SEAT</p> | <p><b>2</b> Checks carried out WITH THE VEHICLE ON THE GROUND</p> | <p><b>3</b> Checks carried out WITH THE VEHICLE RAISED AND THE WHEELS FREE TO TURN</p> | <p><b>4</b> Checks carried out on YOUR VEHICLE'S EXHAUST EMISSION SYSTEM</p> |
|---|---|--|--|

**1** Checks carried out FROM THE DRIVER'S SEAT

**Handbrake**

- Test the operation of the handbrake. Excessive travel (too many clicks) indicates incorrect brake or cable adjustment.
- Check that the handbrake cannot be released by tapping the lever sideways. Check the security of the lever mountings.

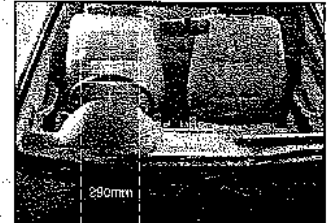


- Check that the brake pedal is secure and in good condition. Check also for signs of fluid leaks on the pedal, floor or carpets, which would indicate failed seals in the brake master cylinder.
- Check the servo unit (when applicable) by operating the brake pedal several times, then keeping the pedal depressed and starting the engine. As the engine starts, the pedal will move down slightly. If not, the vacuum hose or the servo itself may be faulty.

movement of the steering wheel, indicating wear in the column support bearings or couplings.

**Windscreen and mirrors**

- The windscreen must be free of cracks or other significant damage within the driver's field of view. (Small stone chips are acceptable.) Rear view mirrors must be secure, intact, and capable of being adjusted.



**Footbrake**

- Depress the brake pedal and check that it does not creep down to the floor, indicating a master cylinder fault. Release the pedal, wait a few seconds, then depress it again. If the pedal travels nearly to the floor before firm resistance is felt, brake adjustment or repair is necessary. If the pedal feels spongy, there is air in the hydraulic system which must be removed by bleeding.

**Steering wheel and column**

- Examine the steering wheel for fractures or looseness of the hub, spokes or rim.
- Move the steering wheel from side to side and then up and down. Check that the steering wheel is not loose on the column, indicating wear or a loose retaining nut. Continue moving the steering wheel as before, but also turn it slightly from left to right.
- Check that the steering wheel is not loose on the column, and that there is no abnormal

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