Chapter 1
Routine maintenance and servicing

Contents

Degrees of difficulty

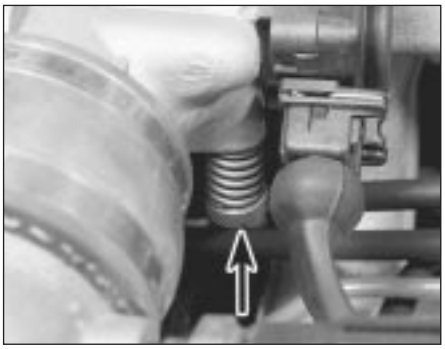
Easy, suitable for novice with little experience

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



10.27 Idle speed adjustment screw (arrowed) on KE-Jetronic system

idle speed adjustment screw as required until the engine is idling at the specified speed.

31 To check the mixture adjustment an exhaust gas analyser is needed and should be connected in accordance with the manufacturer's instructions. A 3 mm Allen key will also be required to make any adjustments.

32 Before proceeding ensure that the idle speed is correct.

33 Unscrew the tamperproof plug from the mixture adjustment orifice on top of the fuel distributor **(see illustration)**.

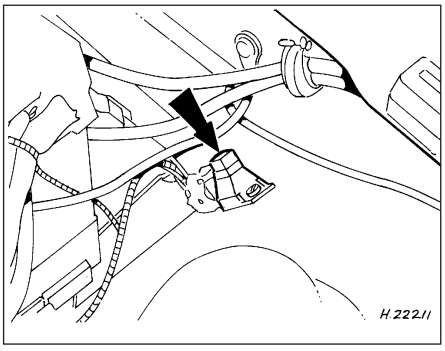
34 Stabilise the exhaust gases (paragraph 30).

35 Insert the Allen key into the mixture adjustment orifice and push down to engage the adjustment screw. Turn the adjustment screw clockwise to increase the CO reading and anti-clockwise to decrease it. Remove the Allen key, plug the orifice and check the CO reading.

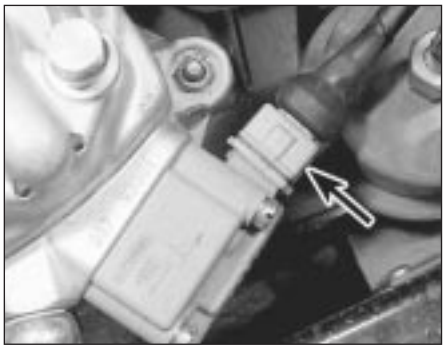
36 If the mixture adjustment cannot be finalised within 30 seconds from the moment of stabilising the exhaust gases, repeat the operations in paragraph 30 before continuing the adjustment procedure. Make sure that the Allen key is removed before increasing the engine speed otherwise the fuel distributor will be damaged.

37 Continue adjustment until the correct CO reading is obtained, then if necessary readjust the idle speed.

38 Refit the tamperproof screw and reconnect the pressure actuator multi-plug. Disconnect the tachometer and exhaust gas analyser.



10.45 CO adjustment potentiometer location (arrowed) - 1.6 EFI engine



10.29 Pressure actuator wiring multi-plug (arrowed) - KE-Jetronic system

Models with Central (single-point) Fuel Injection (CFI) system

39 Both the idle speed and mixture are controlled by the engine management system. Adjustment requires the use of specialist equipment. If the idle speed is suspected of being incorrect, the vehicle must be taken to a Ford dealer for diagnostic checks and, if necessary, adjustment.

Models with Electronic Fuel Injection (EFI) system

40 Idle speed is controlled by the EEC IV module, and cannot be adjusted.

41 To adjust the mixture (CO content), first run the engine until it reaches normal operating temperature.

42 Connect a CO meter and a tachometer in accordance with the manufacturer's instructions.

43 Clear any excess fuel in the inlet manifold by running the engine at 3000 rpm for approximately 15 seconds, then allow the engine to idle.

44 Wait for the test instrument readings to stabilise, then record the CO content and the idle speed.

45 If adjustment of the CO content is required, remove the tamperproof cap from the CO adjustment potentiometer (located on the wing panel behind the left-hand suspension turret) and adjust the screw to obtain the correct CO setting at the specified idle speed **(see illustration)**. Note that any adjustment must be made within 30 seconds of the instrument readings stabilising, otherwise the procedure described in paragraph 43 must be repeated.

46 On completion of adjustment, stop the engine and disconnect all test equipment. Fit a new tamperproof cap to the CO adjustment potentiometer.

11 Ignition system component check

1 Where applicable, remove the distributor cap and thoroughly clean it inside and out with a dry lint-free cloth. Examine the four HT lead segments inside the cap. If the segments appear badly burnt or pitted, renew the cap.

10.33 KE-Jetronic system mixture adjustment tamperproof plug (arrowed)

Make sure that the carbon brush in the centre of the cap is free to move and that it protrudes significantly from its holder.

2 Check the distributor cap for signs of tracking (indicated by thin black lines on the surface of the cap). Renew the cap if tracking is evident.

3 Wipe clean the HT leads and the coil tower.

4 Check the condition and security of all leads and wiring associated with the ignition system. Make sure that no chafing is occurring on any of the wires and that all connections are secure, clean and free from corrosion.

12 Distributor lubrication - models with contact breaker distributor

1 Remove the distributor cap and the rotor arm.

2 Apply a couple of drops of light oil to the felt pad in the top of the shaft.

3 Wipe clean the distributor cam, then apply a trace of high melting-point grease to the four cam lobes.

4 Refit the rotor arm and the distributor cap.

13 Contact breaker points adjustment - models with contact breaker distributor

1 Spring back the retaining clips or undo the screws as appropriate and lift off the distributor cap.

2 Withdraw the rotor arm from the distributor shaft.

3 Using a screwdriver, gently prise the contact breaker points open to examine the condition of their faces. If they are rough, pitted or dirty they should be renewed as described in the next Section.

4 Assuming that the points are in a satisfactory condition or that they have just been renewed, the gap between the two faces should be checked and if necessary adjusted. This can be done using feeler blades as described in the following paragraphs, or preferably by using the more accurate dwell angle method as described from paragraph 8 onwards.

34.1a Removing the air cleaner retaining screws on a 1.3 litre CVH engine . . .

34.1b . . . and air cleaner retaining screw locations on 1.4 litre CVH engine

34.2 Release the air cleaner lid retaining clips, where fitted

16 It is recommended that Ford Super Plus antifreeze is used for filling and topping-up, as it has been specially formulated for use in Ford mixed metal engines (see *"Lubricants and fluids"*).
17 A solution of 45% antifreeze must be maintained in the system all year round which will provide adequate protection against frost, rust and corrosion.
18 After filling with antifreeze, a label should be attached to the radiator stating the type of antifreeze and the date installed. Any subsequent topping-up should be made with the same type and concentration of antifreeze.
19 Do not use engine antifreeze in the screen washer system, as it will cause damage to the vehicle paintwork. Screen wash antifreeze is available from most motor accessory shops.

34 Air cleaner element renewal

Carburettor and Central Fuel Injection (CFI) models

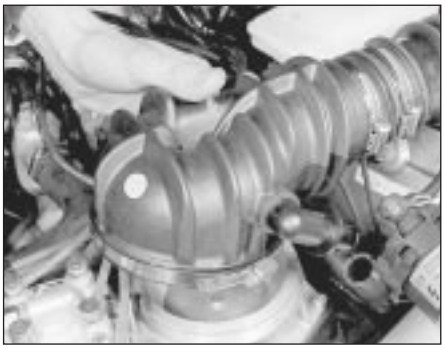
1 To remove the air cleaner lid undo and remove the retaining screws or bolts on the top face of the lid **(see illustrations)**.
2 Where applicable release the lid retaining clips around the side of the air cleaner body **(see illustration)**.
3 Lift off the lid, remove and discard the paper element and wipe out the inside of the air cleaner body and lid **(see illustration)**.
4 Place a new element in position and refit the lid.

34. 3 Removing the air cleaner element

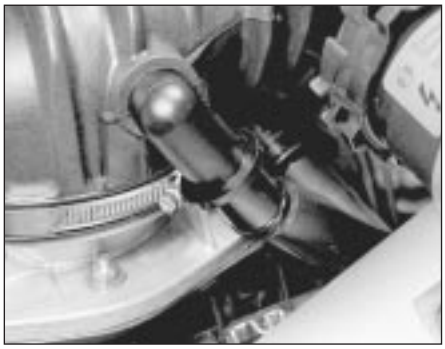
34.6a Slacken the securing band screw . . .

Bosch K-Jetronic fuel injection models

5 Disconnect the battery earth lead.
6 Unscrew and loosen off the air ducting-to-sensor plate unit securing band, then separate the two **(see illustrations)**.
7 Carefully pull free the shut-off valve hose from the air ducting connector. The hose is a press fit **(see illustration)**.
8 Unscrew and remove the six air sensor plate-to-cleaner top cover retaining screws, but leave the plate unit in position.
9 Prise free and release the air cleaner cover retaining clips and detach the hose from the cover at the front **(see illustration)**.
10 Carefully lift the sensor plate clear, together with its gasket, and pivot it back out of the way. Withdraw the shut-off valve from the rear end of the cleaner case cover, then lift out the cover and remove the element from the casing **(see illustrations)**.
11 If the air cleaner casing is to be removed you will need to detach the fuel filter from the side of the cleaner casing (leave the fuel lines attached to the filter) and the air inlet hose from the front end of the case. Unscrew and remove the casing retaining nuts from the inner wing panel and lift out the casing.
12 Refitting is the reversal of the removal procedure. Wipe the casing clean before inserting the new element. When fitting the



34.6b . . . and lift the air duct away from the sensor plate unit - K-Jetronic system



34.7 Detach the shut-off valve hose - K-Jetronic system

34.9 Detach the hose from the front of the air cleaner cover - K-Jetronic system

on all except HCS engines with M11 necked-shank (a reduced diameter section between the bolt head and the threaded portion) cylinder head bolts there are four tightening stages. On HCS engines with M11 necked-shank cylinder head bolts there are three tightening stages.

28 Refit the pushrods in their original order.

29 Lower the rocker shaft assembly into position, making sure that the rocker adjusting screws engage in the sockets at the ends of the pushrods.

30 Screw in the rocker pedestal bolts finger tight. At this stage, some of the rocker arms will be applying pressure to the ends of the valve stems and some of the rocker pedestals will not be in contact with the cylinder head. The pedestals will be pulled down however when the bolts are tightened to the specified torque, which should now be done.

31 Adjust the valve clearances as described in Chapter 1.

32 Refit the rocker cover, using a new gasket. Do not exceed the specified torque for the securing screws; this may result in oil leaks at the rocker cover/cylinder head mating face.

33 Fit the oil filler cap and breather hose and the spark plugs. Tighten these to the specified torque. They are of tapered seat type, no sealing washers being used.

34 Connect the exhaust downpipe and fit the hot air box.

35 Reconnect all electrical leads, vacuum and coolant hoses.

36 Reconnect the throttle and choke cables as described in Chapter 4**,** Part A.

37 Refit the air cleaner as described in Chapter 4**,** Part A and fill the cooling system as described in Chapter 1.

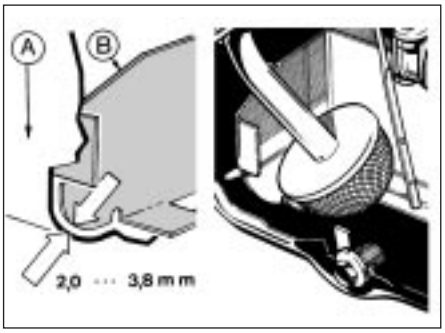
38 Reconnect the battery negative terminal.

5 Sump - removal and refitting

Note: *New gaskets and sealing strips must be used on refitting.*

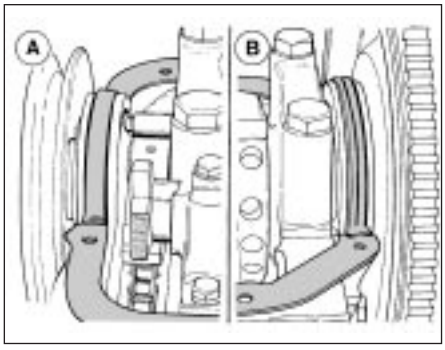
Removal

1 Disconnect the battery negative lead and drain the engine oil (see Chapter 1).



5.7 Sump and oil baffle clearance details

A Sump *B Baffle*



5.6a Sump gasket fitting details at timing cover end (A) and flywheel end (B)

2 Refer to Chapter 5**,** Part A and remove the starter motor.

3 Unbolt and remove the clutch cover plate.

4 Extract the sump securing bolts and remove the sump. If it is stuck, prise it gently with a screwdriver but do not use excessive leverage. If it is very tight, cut round the gasket joint using a sharp knife.

Refitting

5 Before refitting the sump, remove the front and rear sealing strips and gaskets. Clean the mating surfaces of the sump and cylinder block.

6 Stick new gaskets into position on the block using thick grease to retain them, then install new sealing strips into their grooves so that they overlap the gaskets **(see illustrations)**.

7 Before offering up the sump, check that the gap between the sump and the oil baffle is between 2.0 and 3.8 mm **(see illustration)**.

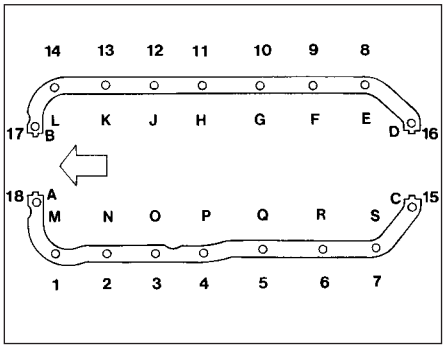
8 Screw in the sump bolts and tighten in three stages to the specified torque in the sequence shown **(see illustration)**.

a) Stage 1- in alphabetical order
b) Stage 2 - in numerical order
c) Stage 3 - in alphabetical order

9 It is important to follow this procedure in order to provide positive sealing against oil leakage.

10 Refit the clutch cover plate and the starter motor and reconnect the battery.

11 Refill the engine with the correct grade and quantity of oil.



5.8 Sump bolt tightening sequence

5.6b Fitting the sump gasket sealing strips to overlap the tabs on the gasket

6 Rocker gear - dismantling and reassembly

Dismantling

1 With the rocker assembly removed as described in Section 4, extract the split pin from one end of the rocker shaft **(see illustration)**.

2 Take off the spring and plain washers from the end of the shaft.

3 Slide off the rocker arms, support pedestals and coil springs, keeping them in their originally fitted order. Clean out the oil holes in the shaft.

Reassembly

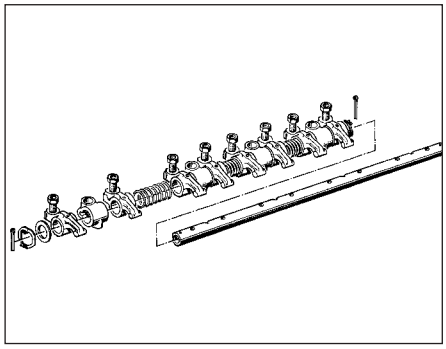
4 Apply engine oil to the rocker shaft before reassembling and make sure that the flat on the end of the shaft is to the same side as the rocker arm adjuster screws. This is essential for proper lubrication of the components.

7 Crankshaft front oil seal - renewal

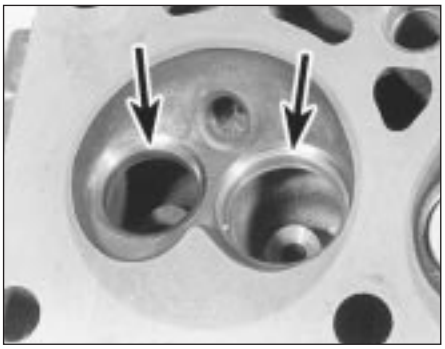
1 Disconnect the battery negative lead.

2 Slacken the alternator mounting and adjuster bolts and after pushing the alternator in towards the engine, slip off the drivebelt.

3 Unscrew and remove the crankshaft pulley bolt. To prevent the crankshaft turning while the bolt is being released, jam the teeth of the



6.1 Rocker shaft assembly components



14.14a View of the swirl chamber in the cylinder head showing the valve seats (arrowed) - HCS engine

5 Before starting to grind in a valve, support the cylinder head so that there is sufficient clearance under for the valve stem to project fully without being obstructed.

6 Take the first valve and apply a little coarse grinding paste to the bevelled edge of the valve head. Insert the valve into its guide and apply the suction grinding tool to its head. Rotate the tool between the palms of the hands in a back-and-forth rotary movement until the gritty action of the grinding-in process disappears. Repeat the operation with fine paste and then wipe away all traces of grinding paste and examine the seat and bevelled edge of the valve. A matt silver mating band should be observed on both components, without any sign of black spots. If some spots do remain, repeat the grinding-in-process until they have disappeared. A drop or two of paraffin applied to the contact surfaces will increase the speed of grinding-in, but do not allow any paste to run down into the valve guide. On completion, wipe away every trace of grinding paste using a paraffin-moistened cloth.

7 Repeat the operations on the remaining valves, taking care not to mix up their originally fitted sequence.

8 The valves are refitted as described in Section 13.

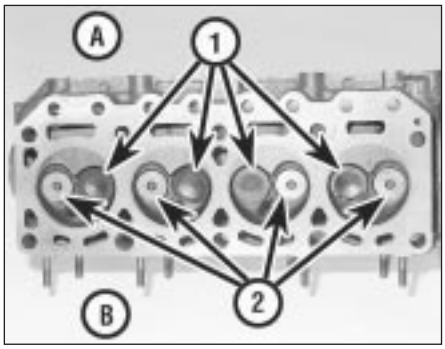
9 An important part of the decarbonising operation is to remove the carbon deposits from the piston crowns. To do this, turn the crankshaft so that two pistons are at the top of their stroke and press some grease between these pistons and the cylinder walls. This will prevent carbon particles falling down into the piston ring grooves. Stuff rags into the other two bores.

10 Cover the oilways and coolant passages with masking tape and then using a blunt scraper remove all the carbon from the piston crowns. Take care not to score the soft alloy of the crown or the surface of the cylinder bore.

11 Rotate the crankshaft to bring the other two pistons to TDC and repeat the operations.

12 Wipe away the circle of grease and carbon from the cylinder bores.

13 Clean the top surface of the cylinder block by careful scraping.



14.14b View of the cylinder head with valves fitted - HCS engine

A Inlet side
B Exhaust side
1 Inlet valves
2 Exhaust valves

HCS engines

14 The procedure is as described previously in this Section for OHV engines, noting the following.

*a) When cleaning out the swirl ports, great care must be exercised not to damage the valve seats, especially if using power tools **(see illustration)**.*

*b) The valve arrangement is different, being of mirror effect, where the inlet valves for number 2 and 3 cylinders are next to each other **(see illustration)**.*

*c) When refitting the valve stem oil seals, tape the end of the stem to prevent damage to the seal as it is fitted, and use a long reach socket or length of tube to push the seals fully down **(see illustrations)**. Remove the tape on completion.*

d) The valve seats cannot be re-worked using conventional tools.

15 Engine - reassembly

Note: *Ensure that all necessary new oil seals and gaskets have been obtained before starting the reassembly procedure.*

OHV engines

1 With everything clean, commence reassembly by oiling the bores for the cam followers and inserting them fully in their original sequence.

2 Lubricate the camshaft bearings and insert the camshaft from the timing cover end of the engine.

3 Fit the thrust plate and tighten the fixing bolts to the specified torque. The endfloat will already have been checked as described in Section 13. Secure the bolts with the locktabs **(see illustration)**.

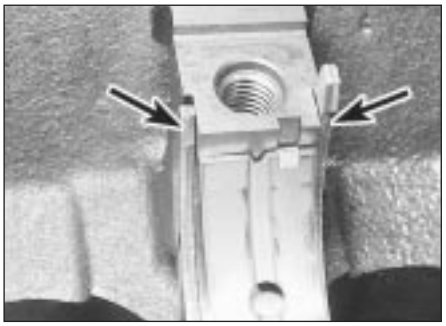
4 Wipe clean the main bearing shell seats in the crankcase and fit the shells. Using a little grease, stick the semi-circular thrustwashers on either side of the centre bearing so that the oil grooves are visible when the washers are installed **(see illustration)**.

5 Check that the Woodruff key is in position on the front end of the crankshaft and tap the

14.14c Tape the end of the valve stem before fitting the valve stem seal - HCS engine

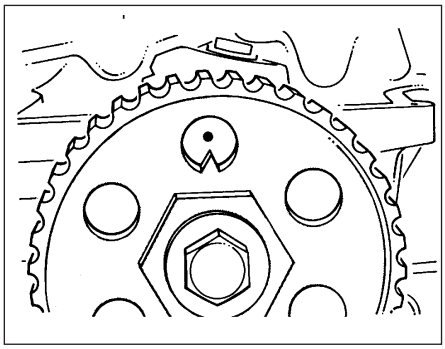
14.14d Using a long reach socket to push the seal fully home - HCS engine

15.3 Secure the camshaft thrust plate bolts with the locktabs



15.4 Fit the upper main bearing shell and thrustwashers (arrowed) to the centre bearing

4.3a Crankshaft pulley notch (arrowed) aligned with TDC (0) mark on belt cover scale



4.3b Camshaft sprocket at TDC position

4.4a Where a two-piece timing belt cover is fitted, undo the bolts . . .

4 Timing belt - removal, refitting and adjustment

Removal

Note: *From April 1988 (build code JG) a modified timing belt tensioner incorporating a larger diameter tensioner roller was introduced, and from October 1988 an improved timing belt was used. When renewal of the timing belt becomes necessary, only the latest, improved timing belt must be used (the older type will no longer be available). On models produced before April 1988 this will also entail renewal of the tensioner roller.*

1 Disconnect the battery negative lead.

2 Release the alternator mounting and adjuster link bolts, push the alternator in towards the engine and slip the drivebelt off the pulleys.

3 Using a spanner on the crankshaft pulley bolt, turn the crankshaft until the notch on the pulley is aligned with the TDC (0) mark on the timing belt cover scale. On models with a distributor, now remove the distributor cap and check that the rotor arm is pointing towards the No 1 cylinder HT lead segment in the cap. If the rotor arm is pointing towards the No 4 cylinder segment, turn the crankshaft through another complete turn and realign the pulley notch with the TDC mark. On EFI engine models (see Chapter 4, Part D), check that the timing mark on the camshaft sprocket is opposite the TDC mark on the cylinder head **(see illustrations)**.

4 On early models unscrew the four bolts and remove the one-piece timing belt cover. On later models fitted with a two-piece cover, unscrew the two upper bolts and remove the top half, then unscrew the two lower bolts. The lower half cannot be removed at this stage **(see illustrations)**.

5 Undo the bolts and remove the right-hand engine splash shield.

6 Using a ring spanner unscrew the crankshaft pulley retaining bolt. Remove the starter motor as described in Chapter 5, Part A and lock the flywheel ring gear with a cold chisel or similar tool to prevent the crankshaft rotating **(see illustration)**. Remove the pulley, followed by the timing belt cover lower half on later models.

7 Slacken the two bolts which secure the timing belt tensioner and, using a large screwdriver, prise the tensioner to one side to relieve the tautness of the belt **(see illustration)**. If the tensioner is spring-loaded, tighten one of the bolts to retain it in the slackened position.

8 If the original belt is to be refitted, mark it for direction of travel and also the exact tooth positions on all three sprockets.

9 Slip the timing belt off the camshaft, water pump and crankshaft sprockets.

Refitting

10 Before refitting the belt, check that the crankshaft is still at TDC (the small projection on the belt sprocket front flange in line with the TDC mark on the oil pump housing) and that the timing mark on the camshaft sprocket is opposite the TDC mark on the cylinder head **(see illustrations)**. Adjust the position of the sprockets slightly, but avoid any excessive movement of the sprockets while the belt is off, as the piston crowns and valve heads may make contact.

11 Engage the timing belt with the teeth of the crankshaft sprocket and then pull the belt vertically upright on its right-hand run. Keep it taut and engage it with the teeth of the camshaft sprocket. Check that the positions of the sprockets have not altered **(see illustration)**.

12 Wind the belt round the camshaft sprocket, around and under the tensioner and over the water pump sprocket.

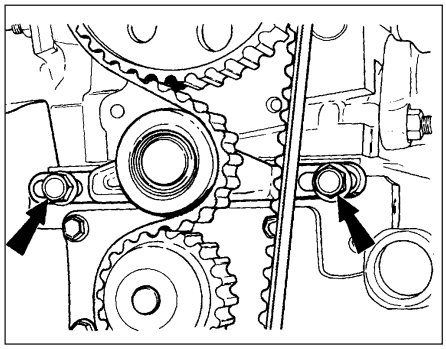
13 Refit the crankshaft pulley and tighten the bolt, using the same procedure as used previously to stop the crankshaft turning. On later models make sure that the timing belt cover lower half is placed in position before refitting the pulley.

Adjustment

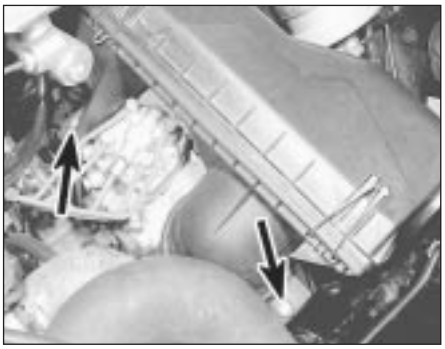
Note: *Accurate adjustment of the timing belt entails the use of Ford special tools. An approximate setting can be achieved using the*

4.4b . . . and remove the upper half

4.6 Using a stout bar to lock the flywheel ring gear



4.7 Timing belt tensioner retaining bolts (arrowed)



11.66 Air cleaner retaining bolts (arrowed) on RS Turbo models

unscrew and remove the four nuts securing the driveplate to the torque converter. For this to be accomplished it will be necessary to progressively turn the crankshaft for access to each nut in turn. Unscrew the nuts in a progressive manner, one turn at a time until removed.

40 Unscrew and remove the engine-to-transmission flange bolts and then separate the two units, but take care not to catch the torque converter studs on the driveplate. The torque converter is only loosely attached, so keep it in position in the transmission housing during and after removal of the transmission.

Fuel injection engines

Removal

XR3i and Cabriolet models with mechanical (Bosch K-Jetronic) fuel injection

41 The engine is removed complete with the transmission in a downward direction and then withdrawn from under the front of the car.

42 Disconnect the battery negative lead.

43 Place the transmission in fourth gear on four-speed models or reverse gear on the five-speed unit to aid adjustment of the gearchange linkage when refitting. On models produced from February 1987 onwards, place the transmission in second gear on four-speed versions, or fourth gear on five-speed versions.

44 Remove the bonnet (Chapter 11).

45 Drain the cooling system (Chapter 1).

46 Remove the air inlet hose between the fuel distributor and throttle housing.

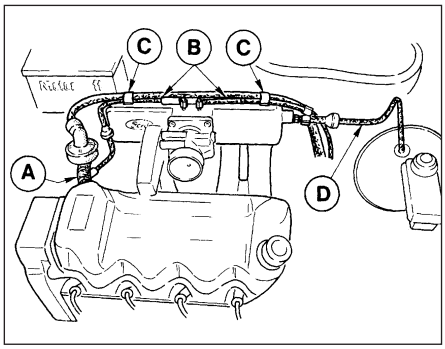
47 Disconnect the radiator top and bottom hoses and the expansion tank hose at the thermostat housing.

48 Disconnect the heater hoses from the thermostat housing, and the three-way connection fitting on the oil cooler.

49 Disconnect the throttle cable end from the throttle lever and unbolt the cable bracket from the throttle housing.

50 Relieve the fuel system pressure by *slowly* loosening the fuel feed pipe union at the warm-up regulator. Absorb fuel leakage in a cloth. Reference to the fuel-injection system layout in Chapter 4, Part B will assist in identification of the relevant components where necessary.

51 Disconnect the vacuum servo hose from the inlet manifold.



11.70 Vacuum and breather hose connections - RS Turbo

A Crankcase ventilation hose at rocker cover
B Vacuum hoses at inlet manifold
C Retaining clips
D Vacuum servo hose

52 Disconnect the two fuel pipe unions at the warm-up regulator, the single pipe to the cold start valve and the four injector feed pipes at the fuel distributor. Recover the sealing washers located on each side of the banjo unions and seal all disconnected pipes and orifices to prevent dirt ingress.

53 Disconnect the leads from the following electrical components:

a) Alternator.
b) Cooling fan temperature switch.
c) Oil pressure sender.
d) Reversing lamp switch.
e) Ignition coil.
f) Distributor.
g) Starter motor solenoid.
h) Cold start valve.
j) Warm-up regulator.
k) Auxiliary air device.
l) Throttle valve stop earth cable.

54 Unscrew the speedometer drive cable from the transmission and release the breather hose.

55 Disconnect the transmission earth strap.

56 Disconnect the clutch cable from the release lever and from the transmission support.

57 The remainder of the removal procedure is the same as described previously for carburettor engines in paragraphs 16 to 32 inclusive.

1.4 CFI (Central Fuel Injection) and 1.6 EFI (Electronic Fuel Injection) engines

58 Proceed as described in paragraphs 41 to 49 inclusive, ignoring the reference to the fuel distributor.

59 Disconnect all relevant hoses, pipes and wiring to facilitate engine removal, with reference to the relevant Parts of Chapters 4 and 5.

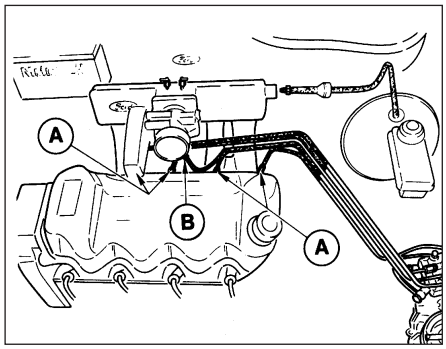
60 Proceed as described in paragraphs 54 to 57 inclusive.

RS Turbo models

61 Disconnect the battery negative lead.

62 Place the transmission in reverse gear to aid adjustment of the gearchange linkage when refitting. On models produced from February 1987 onwards, place the transmission in fourth gear.

63 Remove the bonnet (Chapter 11).



11.74 Fuel pipe connections - RS Turbo

A Fuel injectors *B Cold start valve*

64 Drain the cooling system (Chapter 1).

65 Disconnect the air inlet hose and connecting hose at the inlet air duct. Disconnect the charge air temperature sensor multi plug, undo the two bolts securing the air duct to the rocker cover and remove the duct.

66 Undo the two bolts and remove the air cleaner assembly from the fuel distributor **(see illustration)**.

67 Disconnect the radiator top and bottom hoses at the thermostat housing, radiator and turbocharger return pipe as applicable.

68 Disconnect the heater hoses from the thermostat housing, three-way connector piece and inlet manifold as applicable.

69 Remove the turbocharger (Chapter 4, Part B).

70 Disconnect the crankcase ventilation hose at the rocker cover and the two vacuum hoses from the top of the inlet manifold **(see illustration)**. Release the hoses from their clips.

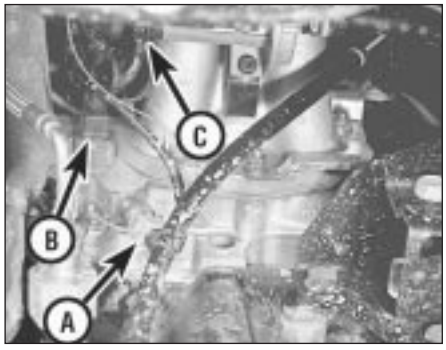
71 Disconnect the vacuum servo hose from the inlet manifold.

72 Disconnect the hose at the solenoid control valve.

73 Disconnect the throttle cable at the throttle housing.

74 Relieve the fuel system pressure by *slowly* loosening the cold start valve union on the top of the fuel distributor. Absorb fuel leakage in a cloth **(see illustration)**.

75 Disconnect the fuel pipes at the fuel injectors and at the cold start valve. Recover the sealing washers located on each side of the banjo unions and seal all disconnected pipes and orifices to prevent dirt ingress.



11.76 Coolant temperature sensor (A) thermo-time switch (B) and auxiliary air device (C) multi-plugs on RS Turbo models

Chapter 3
Cooling, heating and ventilation systems

Contents

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 

Specifications

System type	Pressurised, pump-assisted thermo-syphon with front mounted radiator and electric cooling fan

Pressure cap rating

Up to 1986:	
1.1 litre OHV engine	0.9 bar (13.0 lbf/in^2)
1.3 and 1.6 litre CVH engine	0.85 to 1.1 bar (12.0 to 15.7 lbf/in^2)
1986 onwards	0.98 to 1.2 bar (14.2 to 17.0 lbf/in^2)

Thermostat

Type	Wax
Start to open temperature	85° to 89°C (189° to 192°F)
Fully open temperature	102°C (223°F) (±3°C/5°F for used thermostats)

Torque wrench settings

	Nm	lbf ft
Radiator mounting bolts:		
Pre-1986 models	7 to 10	5 to 7
1986 models onwards	20 to 27	15 to 20
Thermostat housing bolts:		
OHV engines	17 to 21	13 to 16
CVH engines	9 to 12	7 to 9
Water pump bolts:		
OHV engines	7 to 10	5 to 7
CVH engines	7 to 10	5 to 7
Water pump pulley (OHV engines)	9 to 11	6 to 8
Fan shroud to radiator:		
Pre-1986 models	7 to 10	5 to 7
1986 models onwards	3 to 5	2 to 4
Fan motor to shroud	9 to 12	7 to 9

Fuel requirement

Fuel octane rating:

All except HCS engines	97 RON (four-star)
HCS engines	97 RON (four-star) or 95 RON (unleaded)

Torque wrench settings

	Nm	lbf ft
Carburettor to manifold	17 to 21	12 to 15
Fuel pump	16 to 20	11 to 14
Inlet manifold	16 to 20	11 to 14
Exhaust manifold	14 to 17	10 to 12
Exhaust downpipe to manifold	35 to 40	25 to 29
U-bolt clamps	35 to 40	25 to 29
Downpipe to front section connecting flange	35 to 47	25 to 34

1 General information and precautions

The fuel system on all models with carburettor induction is composed of a centrally mounted fuel tank, a fuel pump, a carburettor and an air cleaner.

The fuel tank is mounted under the floor pan beneath the rear seats. The tank is ventilated, has a simple filler pipe and a fuel gauge sender unit.

The fuel pump is a mechanical diaphragm type actuated by means of a pushrod bearing on an eccentric cam on the camshaft. The pump is a sealed unit and cannot be dismantled.

The carburettor may be either a Ford variable venturi (VV) type or one of four versions of the Weber 2V type, depending on model.

The air cleaner has a thermostatically or waxstat-controlled air inlet, supplying either hot air from the exhaust manifold heat box or cold air from the front of the engine compartment. On the thermostatically-controlled type, a flap valve within the air cleaner unit regulates the air inlet temperature according to operating conditions in conjunction with a vacuum diaphragm unit and a heat sensor unit. On the waxstat air cleaner, being progressively introduced from 1986 onwards the air cleaner operates in the same way as the thermostatically-controlled type, but the flap valve is controlled by a wax capsule. The capsule is mounted in the inlet spout and operates the flap valve by expansion and contraction of the wax which varies according to temperature.

Warning: **Many of the procedures in this Chapter entail the removal of fuel pipes 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**

2 Air cleaner assembly - removal and refitting

Removal

1 Disconnect the battery negative terminal.

2 Disconnect the crankcase ventilation hoses which are accessible from above, from the air cleaner body **(see illustration)**.

3 Disconnect the cold air inlet hose from the end of the air cleaner spout where applicable **(see illustration)**.

4 Where fitted, on CVH engines, pull out the crankcase emission valve from the underside of the air cleaner body.

5 Undo the retaining screws or bolts on the air cleaner lid and lift the unit off the carburettor.

6 On 1.1 and 1.3 litre HCS engines, unclip the fuel trap from the side of the air cleaner casing.

7 According to model, disconnect the vacuum hose and the remaining crankcase ventilation hose(s) as applicable, then remove the air cleaner from the engine.

2.2 Disconnecting the crankcase ventilation hose at the air cleaner body

2.3 Cold air inlet hose removal from air cleaner spout

Refitting

8 Refitting is a reversal of removal.

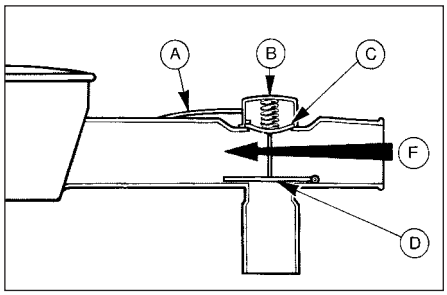
3 Air cleaner air temperature control - description and testing

Thermostatically-controlled air cleaner

1 On all pre-1986 models and certain models from 1986 onwards, the air cleaner is thermostatically-controlled by a vacuum operated system to provide air at the most suitable temperature for combustion with minimum emission levels.

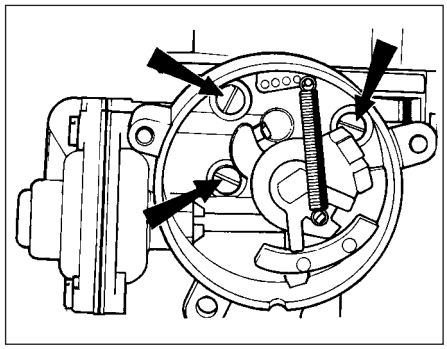
2 This is accomplished by drawing in cold air from an inlet at the front of the car, and hot air from a collector box on the exhaust manifold and blending them. The proportion of hot and cold air is varied by the position of a flap valve in the inlet spout which itself is controlled by a vacuum diaphragm. The vacuum pressure is regulated by a heat sensor located within the air cleaner body to ensure that the appropriate degree of inlet manifold vacuum is applied to the flap valve, thus maintaining the air temperature within the preset limits.

3 To check the thermostatic control of the air cleaner the engine must be cold. First observe the position of the flap valve which should be fully closed prior to starting the engine **(see illustration)**. The flap valve can be observed using a mirror after disconnecting the inlet hose.



3.3 Thermostatically controlled air cleaner operation under low vacuum conditions

A Vacuum hose to heat sensor
B Vacuum diaphragm
C Diaphragm
D Flap valve closed
F Cold air inlet



15.5 Weber 2V carburettor choke housing retaining screw locations - XR3 models

22 Place the bi-metal coil housing in position with the coil engaged with the slot in the choke lever which projects through the cut-out in the heat shield.
23 Screw in the retaining screws finger tight and then rotate the housing to set the mark opposite the dot punch mark on the choke body. Secure the housing.
24 Reconnect the hoses and refit the air cleaner.
25 Check and if necessary top-up the cooling system as described in Chapter 1.

15 Weber 2V carburettor automatic choke unit - removal, checking and refitting

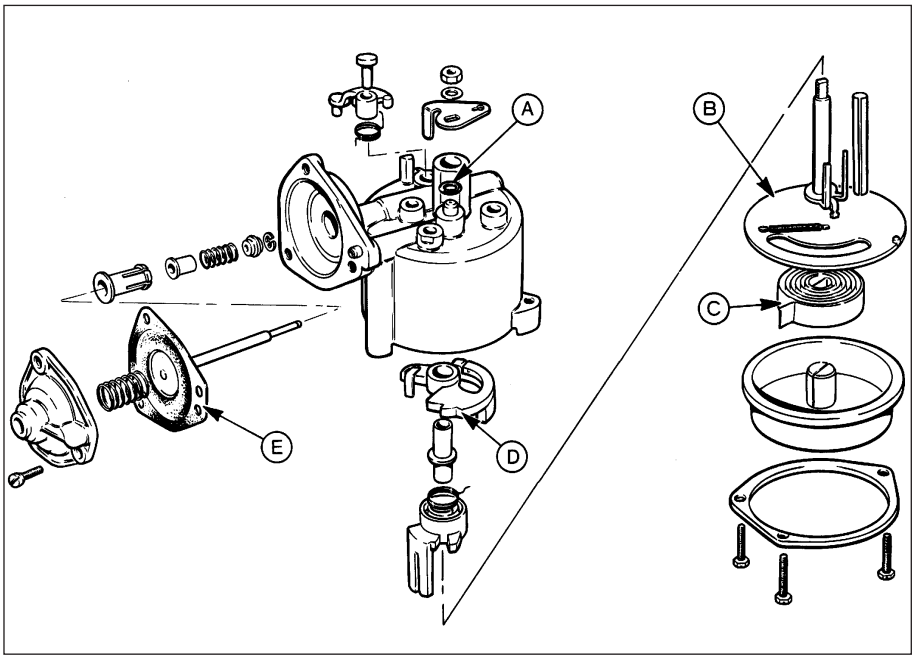
XR3 models

Removal

1 Remove the air cleaner (Section 2).
2 Disconnect the electrical lead to the automatic choke.
3 Undo the three choke housing cover retaining screws, withdraw the cover and bi-metal coil, followed by the internal heat shield.
4 Undo the six carburettor upper body retaining screws, hold the fast idle operating lever clear of the choke housing and lift off the upper body.
5 Undo the three screws securing the choke housing to the upper body, disconnect the link rod and remove the choke housing **(see illustration)**.
6 Undo the three screws and remove the vacuum pull-down housing cover, then withdraw the spring, diaphragm and operating rod assembly **(see illustration)**.
7 Extract the circlip on the end of the vacuum pull-down operating rod and slide off the rod components.
8 Make a note of the exact position of the choke mechanism return and tension springs then undo the shaft nut, withdraw the shaft from the choke housing and remove the linkages and cams.

Checking

9 Clean and inspect all the parts for wear, damage, cracking, or distortion. Pay particular attention to the condition of the pull-down diaphragm and the choke housing O-ring seal. Renew any parts as necessary.



15.6 Exploded view of the Weber 2V carburettor automatic choke unit - XR3 models

A Housing O-ring
B Heat shield
C Bi-metal coil
D Fast idle cam
E Pull-down diaphragm

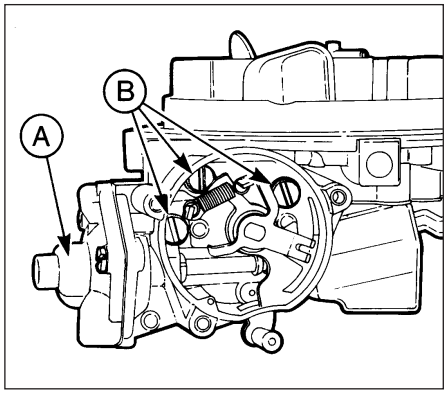
Refitting

10 Reassemble the choke mechanism shaft, linkages, cams and tension springs with reference to illustration 15.6 and the notes made during removal. Secure the shaft with the retaining nut.
11 Assemble the components to the vacuum pull-down operating rod and secure with the circlip.
12 Locate the vacuum pull-down diaphragm and operating rod to the choke housing and with the diaphragm laying flat on the housing face refit the cover and secure with the three screws.
13 Place the O-ring seal on the choke housing, then connect the housing to the link rod.
14 Position the housing on the carburettor upper body and secure with the three screws.
15 Refit the upper body to the carburettor.
16 Before refitting the housing cover and bi-metal coil, refer to Section 14 and adjust the vacuum pull-down and choke phasing, then fit the cover and bi-metal coil as described.

1.6 litre models - 1986 onwards

Removal

17 Remove the air cleaner as described in Section 2.
18 Release any pressure in the cooling system by loosening the filler cap, then detach the water inlet and outlet hoses at the automatic choke unit. Clamp the hoses or position them with their ends facing upwards to minimise coolant leakage.
19 Disconnect the lead at the anti-run-on valve solenoid.
20 Disconnect the fuel supply and return hoses at the carburettor. If crimped type hose clips are used, cut them off and use screw type clips at reassembly.
21 Undo the six carburettor upper body retaining screws and remove the upper body. Note that four of the screws are of the Torx type and a suitable key or socket bit will be needed for removal.
22 With the upper body removed, undo the three screws and remove the choke bi-metal coil housing followed by the internal heat shield.



15.23 Weber 2V carburettor pull-down housing cover (A) and choke housing retaining screws (B) - 1.6 litre models

2 Air cleaner - removal and refitting

K-Jetronic system

Removal

1 Remove the air cleaner element as described in Chapter 1.
2 Detach the fuel filter from the side of the cleaner casing (leave the fuel lines attached to the filter) and the air inlet hose from the front end of the case.
3 Unscrew and remove the casing retaining nuts from the inner wing panel and lift out the casing.

Refitting

4 Refitting is the reversal of the removal procedure. Refit the air cleaner element as described in Chapter 1.

KE-Jetronic system

Removal

5 Undo the two bolts securing the air cleaner assembly to the air sensor plate unit and remove the air cleaner assembly **(see illustration)**.

Refitting

6 Refit the unit to the air sensor plate and secure with the two bolts.

2.5 KE-Jetronic air cleaner retaining bolts (arrowed)

3 Fuel tank - removal and refitting

The procedures are the same as described in Part A of this Chapter for carburettor engines, but in addition disconnect the fuel tank-to-fuel pump hose from the rear face of the tank.

4 Throttle cable - adjustment, removal and refitting

Adjustment

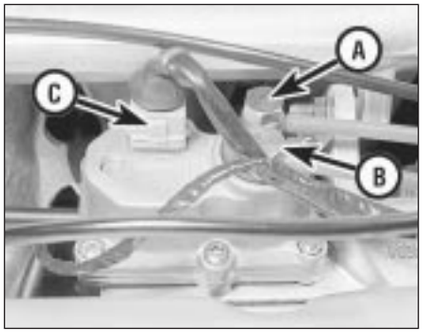
The procedure is the same as described in Part A of this Chapter for carburettor engines, except that the cable adjuster is situated in a bracket alongside the throttle housing.

Removal and refitting

The procedure is the same as described in Part A of this Chapter for carburettor engines, except that it is not necessary to remove the air cleaner, and the location of the mounting bracket is alongside the throttle housing.

5 Accelerator pedal - removal and refitting

The procedure is the same as described in Part A of this Chapter for carburettor models.



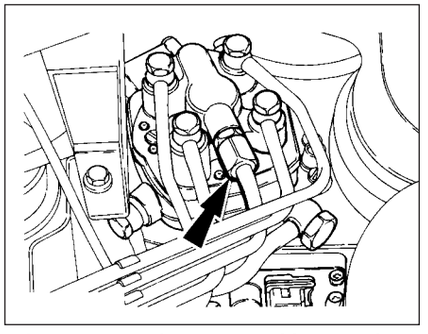
6.3 Warm-up regulator fuel feed pipe (A), outlet pipe (B) and wiring multi-plug (C)

6 Fuel pump - removal and refitting

Note: *Refer to the precautions at the end of Section 1 before proceeding.*

Removal

1 The fuel pump is bolted to the underside of the car just to the rear of the fuel tank. For access raise and support the car securely at the rear.
2 Disconnect the battery earth lead.
3 On the K-Jetronic system relieve the system pressure by slowly loosening the fuel feed pipe union at the warm-up regulator **(see illustration)**. Absorb the fuel leakage in a cloth.
4 On the KE-Jetronic system relieve the system pressure by slowly loosening the cold start valve union on the top of the fuel distributor **(see illustration)**. Absorb fuel leakage in a cloth.
5 Clamp the fuel inlet hose midway between the tank and the pump using a brake hose clamp, self-locking grips or similar. If the fuel level in the tank is low you may prefer to drain the fuel from the tank into a suitable container once the inlet hose is disconnected.
6 Disconnect the fuel inlet and outlet pipes from the pump, catching fuel spillage in a suitable container **(see illustration)**. Once disconnected do not allow dirt to enter the pipes, temporarily plug or seal them if necessary.
7 Note the electrical connections to the pump and disconnect them.
8 Loosen the pump bracket retaining bolt and then withdraw the pump unit with rubber protector sleeve.



6.4 KE-Jetronic system cold start valve pipe union (arrowed) on fuel distributor

Refitting

9 Refitting of the fuel pump is a reversal of the removal procedure. Renew the feed pipe from the tank if it is damaged or defective.
10 Check that the rubber protector sleeve is correctly positioned round the pump before tightening the clamp nut.
11 On completion, tighten the warm-up regulator or cold start valve fuel unions, reconnect the battery earth lead, start the engine and check for any fuel leaks.

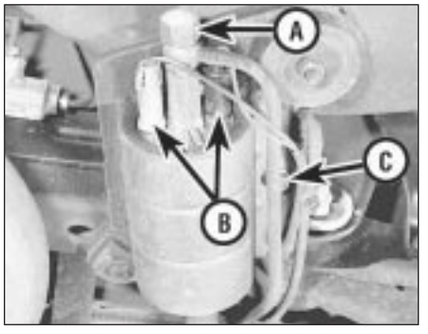
7 Fuel accumulator - removal and refitting

Note: *Refer to the precautions at the end of Section 1 before proceeding.*

Pre-1986 models

Removal

1 The fuel accumulator is mounted adjacent to the fuel pump, above the rear left-hand suspension arm.
2 Disconnect the battery negative lead.



6.6 Fuel pump outlet pipe (A), electrical connections (B) and pump bracket retaining bolt (C)

Precautions

Note: *Following disconnection of the battery, all Keep Alive Memory (KAM) values will be erased from the EEC IV system module memory, which may result in erratic idle, engine surge, hesitation and a general deterioration of driving characteristics.*

Warning: Many of the procedures in this Chapter entail the removal of fuel pipes 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

Refer to the precautions given in Part B of this Chapter for models with mechanical fuel injection.

2 Air cleaner - removal and refitting

The procedure is similar to that described in Part A of this Chapter for carburettor engines.

3 Fuel tank - removal and refitting

The procedure is as described in Part A of this Chapter for carburettor engines.

4 Throttle cable - adjustment, removal and refitting

The procedure is similar to that described in Part A of this Chapter for carburettor engines.

5 Accelerator pedal - removal and refitting

The procedure is the same as described in Part A of this Chapter for carburettor models.

6 Fuel system - depressurising

Warning: The fuel system will remain pressurised after the engine is switched off. Comply with all relevant safety precautions during this operation and refer to the "Safety first!" Section at the beginning of this manual before proceeding.

1 Disconnect the battery negative lead.
2 Remove the air cleaner assembly.
3 Position a suitable container or a sufficient quantity of absorbent cloth beneath the fuel inlet connection on the CFI unit.
4 Use an open-ended spanner on the flats of the inlet union screwed into the CFI unit to prevent it from turning while the inlet pipe union is loosened. Allow all pressure/fuel seepage to dissipate before fully unscrewing the union if it is to be disconnected, or tightened if another part of the system is to be worked on.
5 The system will remain depressurised until the fuel pump is primed prior to starting the engine. Remove the container or cloth, as applicable, on completion.

7 Fuel pump - removal and refitting

Removal

1 The fuel pump is integral with the fuel level sender unit in the fuel tank **(see illustration)**.
2 Chock the front wheels, then jack up the rear of the vehicle and support it securely on axle stands (see "*Jacking and Vehicle Support*").
3 Disconnect the battery negative lead.
4 Depressurise the fuel system (Section 6).
5 Remove the fuel tank, then proceed as described for fuel level sender unit removal and refitting. This is described as part of the fuel tank removal and refitting procedure in Part A of this Chapter.

Refitting

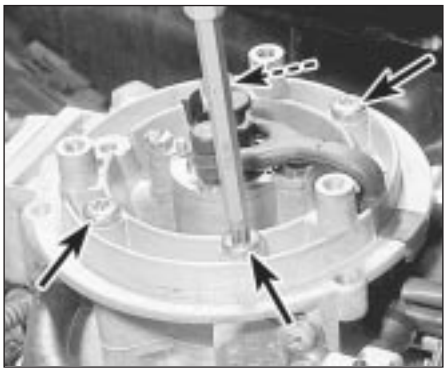
6 Refitting is a reversal of removal.

8 Central Fuel Injection (CFI) unit - removal and refitting

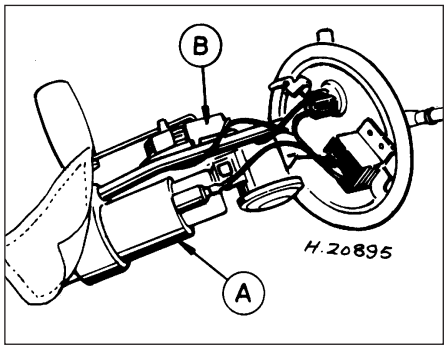
Note: *Refer to the precautions at the end of Section 1 before proceeding.*

Removal

1 Disconnect the battery negative lead.
2 Remove the air cleaner assembly.
3 Depressurise the fuel system as described in Section 6, and disconnect the fuel inlet pipe from the CFI unit.
4 Disconnect the fuel return pipe from the CFI unit.
5 Disconnect the throttle cable from the linkage on the CFI unit.



8.9 Unscrewing the CFI unit securing bolts (arrowed)



7.1 Integral fuel level sender unit/fuel pump - 1.4 CFI engine

A Fuel pump *B Sender unit*

6 Either drain the cooling system as described in Chapter 1, or clamp the coolant hoses as close as possible to the CFI unit to minimise coolant loss, then disconnect the hoses from the unit.
7 Disconnect the air charge temperature sensor, throttle position sensor, and throttle valve control motor wiring plugs.
8 Disconnect the vacuum pipe from the CFI unit.
9 Unscrew the four securing bolts, and lift the CFI unit from the inlet manifold **(see illustration)**.

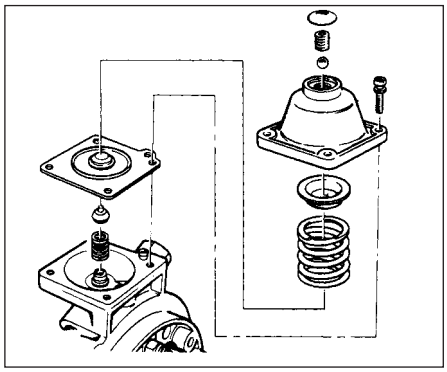
Refitting

10 Refitting is a reversal of removal, but on completion, refill or top-up the cooling system (as applicable) as described in Chapter 1, and check for fuel leaks with the engine running.

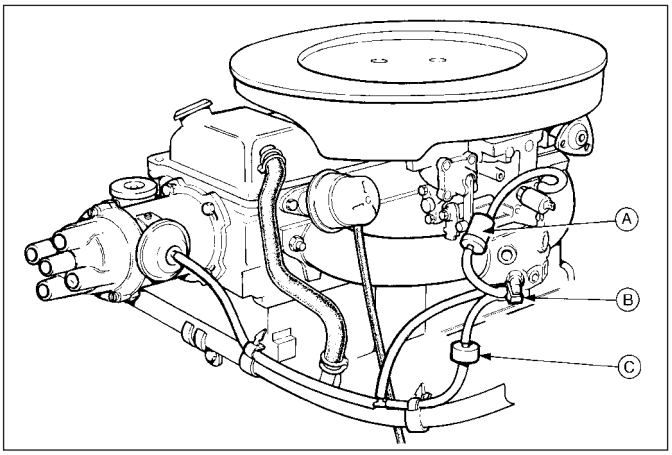
9 Fuel pressure regulator - removal and refitting

Removal

1 Remove the CFI unit as described in Section 8.
2 Remove the four screws securing the regulator housing to the CFI unit, then carefully lift off the housing and recover the ball, cup, large spring, diaphragm, valve, and small spring, noting the position and orientation of all components **(see illustration)**. Do not

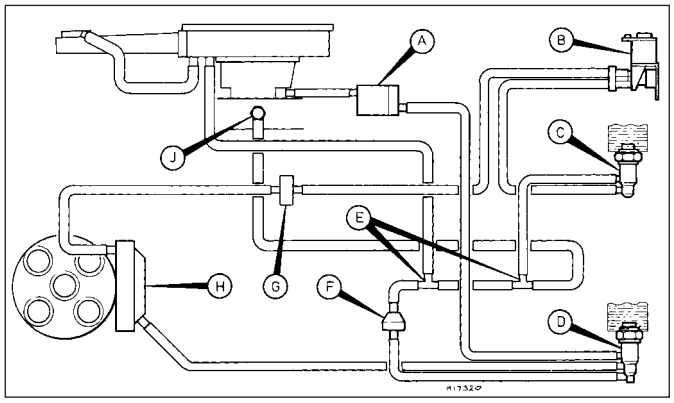


9.2 Exploded view of fuel pressure regulator - 1.4 CFI engine



1.15c Emission control system layout for manual transmission models with Weber 2V carburettor

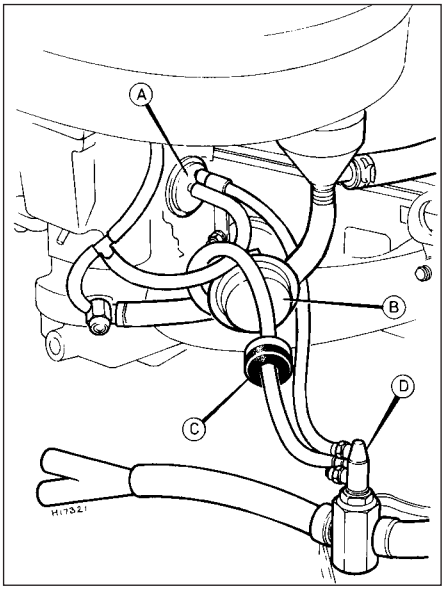
A Fuel trap
B Ported vacuum switch
C Spark sustain valve



1.15d Emission control system layout for automatic transmission models with Ford VV carburettor

A Fuel trap
B Two-way solenoid
C Ported vacuum switch (blue)
D Ported vacuum switch (green)
E T-connectors
F Check valve
G Restrictor
H Dual diaphragm distributor
J Inlet manifold connection

Under part throttle cruising conditions, distributor vacuum advance is required to allow time for the fuel/air mixture in the cylinders to burn. When returning to a part throttle opening after accelerating or decelerating, the distributor vacuum increases before the fuel/air mixture has stabilised. On certain engines this can lead to short periods of incomplete combustion and increased exhaust emission. To reduce this condition a spark delay valve is incorporated in the vacuum line between the carburettor and distributor to reduce the rate at which the distributor advances. Under certain conditions, particularly during the period of engine warm-up, some models may suffer from a lack of throttle response. To overcome this problem a spark sustain valve may be fitted in the vacuum line either individually or in conjunction with the spark delay valve. This valve is used to maintain distributor vacuum under transient throttle conditions, thus stabilising the combustion process.



1.16 Carburettor speed control system layout

A Temperature vacuum switch
B Carburettor speed control valve
C Spark delay valve
D Ported vacuum switch and adapter

The operation of the valves is controlled by a ported vacuum switch (PVS) which has the vacuum lines connected to it. The PVS is actuated by the engine cooling water and is sensitive to changes in engine operating temperature. A fuel trap prevents fuel or fuel vapour from being drawn into the distributor vacuum unit **(see illustrations)**.

The carburettor speed control system is an integral part of the emission control system on some UK models as well as for some overseas market models **(see illustration)**.

The system's function is to improve the air and fuel mixture when the engine is cold in low ambient temperatures. It achieves this by increasing the air volume to the inlet manifold in order to weaken the mixture ratio which has been enriched by choke operation.

The carburettor speed control valve is fitted to a vacuum hose which is located between the air cleaner unit and the inlet manifold on UK models.

Central Fuel Injection (CFI) engine models

To minimise the amount of pollutants which escape into the atmosphere, a catalytic converter is fitted in the exhaust system of CFI engine models.

The system is of a closed loop type. A Heated Exhaust Gas Oxygen (HEGO) sensor located in the exhaust system provides the fuel injection/ignition electronic control unit with constant feedback, enabling the control unit to adjust the mixture to provide the best possible conditions for the converter to operate.

2 Inlet manifold - removal and refitting

Note: *A new gasket will be required on refitting.*

Carburettor models

Removal

1 Disconnect the battery negative lead.
2 Remove the air cleaner as described in Part A of this Chapter.
3 Refer to Chapter 1 and drain the cooling system.
4 Remove the carburettor as described in Part A of this Chapter according to type.
5 Disconnect the manifold coolant hoses.
6 Make a careful note of all vacuum connections at the vacuum switches and solenoids and disconnect them.
7 Where applicable disconnect the switch wiring multi-plugs after noting their locations.
8 Undo the manifold retaining nuts and withdraw the manifold from the cylinder head studs. Recover the gasket.

Refitting

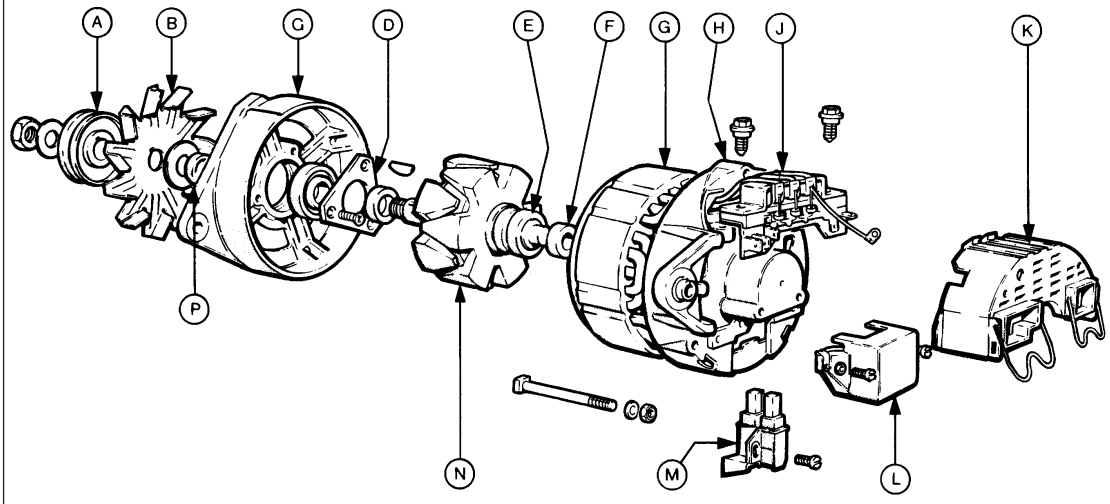
9 Refitting is the reverse sequence to removal but use a new gasket and ensure that the mating faces are clean. On completion refill the cooling system as described in Chapter 1.

XR3i and XR3i Cabriolet models with mechanical (Bosch K- and KE-Jetronic) fuel injection

Removal

10 Disconnect the battery negative lead.
11 Remove the warm-up regulator, throttle housing, fuel injectors and cold start valve as described in Part B of this Chapter.
12 Drain the cooling system (Chapter 1).

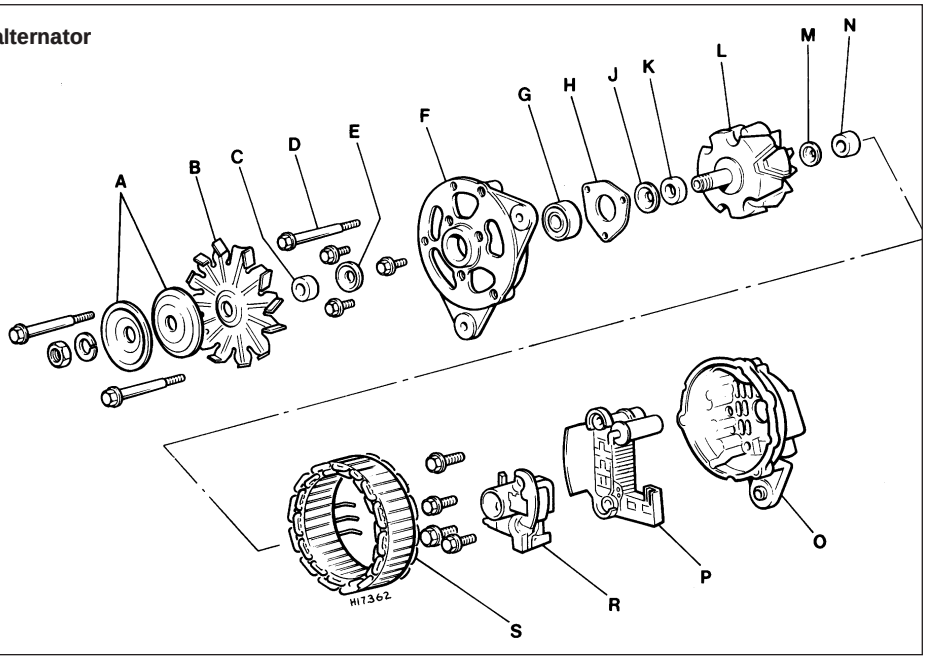
6.12 Exploded view of the Motorola alternator

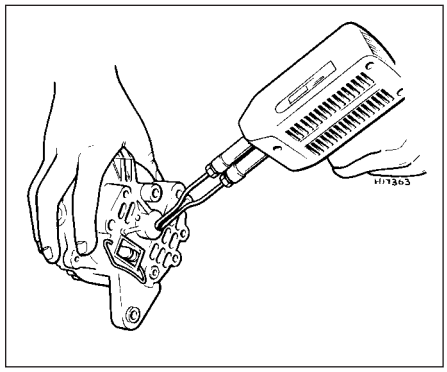


A Pulley
B Fan
C Drive end bearing
D Drive end bearing retaining plate
E Slip ring
F Slip ring end bearing
G Stator
H Slip ring end housing
J Rectifier assembly
K End cover
L Regulator
M Brush box
N Rotor
P Spacer

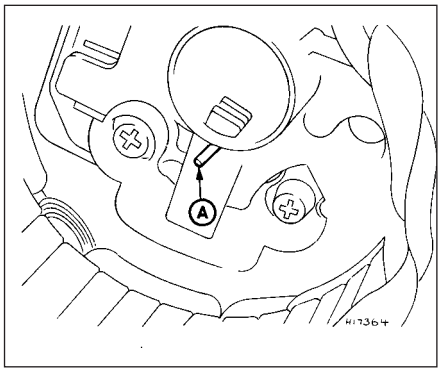
6.17a Exploded view of the Mitsubishi alternator

A Pulley
B Fan
C Large spacer
D Through-bolt
E Dust cap
F Drive end housing
G Drive end bearing
H Bearing retainer
J Dust seal
K Small spacer
L Rotor
M Seal
N Bearing
O Slip ring end housing
P Rectifier assembly
R Brush box
S Stator





6.17b Using a soldering iron to heat the slip ring end housing - Mitsubishi alternator



6.21 Using a length of wire (A) to hold brushes in the retracted position - Mitsubishi alternator

18 Undo the four bolts and remove the stator and rectifier assembly from the slip ring end housing.

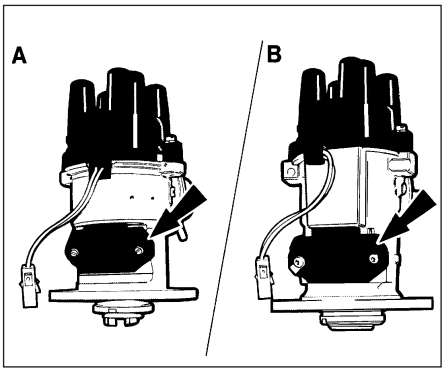
19 Unsolder the brush box-to-rectifier assembly terminal and remove the brush box.

20 Renew the brush box and brushes if they are worn below the specified minimum.

21 Fit the new brushes by reversing the removal operations.

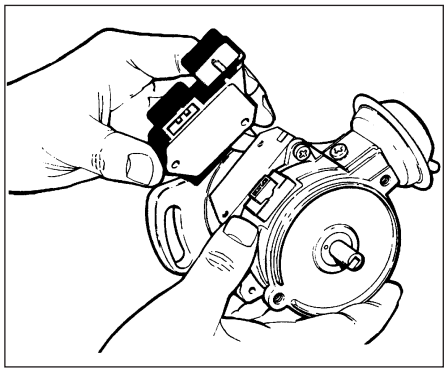
HAYNES HiNT ***Insert a suitable piece of wire through the access hole in the housing to keep the brushes retracted as the housing is fitted (see illustration). After fitting the housing release the brushes by removing the wire.***

5A



6.1 Electronic amplifier module locations
A Early type Bosch distributor
B Early type Lucas distributor

6.3a Electronic amplifier securing screw (arrowed) - later type Bosch distributor



6.3b Removing the electronic amplifier module - later type Lucas distributor

6.10a Release the retaining clips . . .

6.10b . . . and remove the plenum chamber top cover

head has been fitted, position the wiring plug as shown **(see illustration)**. Tighten the retaining bolts.

58 Reconnect the distributor wiring plug, then fit the distributor cap and reconnect the coil HT lead.

59 Reconnect the battery negative lead.

60 Take the vehicle to a Ford dealer at the earliest opportunity to have the ignition timing accurately adjusted.

6 Ignition system electronic modules - removal and refitting

Amplifier module - electronic breakerless system

Removal

1 The amplifier module is located on the side of the distributor **(see illustration)**.

2 If necessary, to improve access remove the distributor as described in Section 5.

3 Remove the two securing screws, and withdraw the module from the side of the distributor **(see illustrations)**.

Refitting

4 Start refitting by cleaning all traces of old heat sink compound from the distributor body.

5 Apply fresh heat sink compound (supplied with new amplifier modules) to the back of the amplifier before fitting.

6 Refit the module and tighten the securing screws.

7 Where applicable, refit the distributor as described in Section 5.

RS Turbo engines (ESC II)

Electronic Spark Control (ESC II) module

Removal

8 Disconnect the battery negative terminal.

9 Remove the heater plenum chamber top cover rubber seal,

10 Release the five retaining clips and lift off the plenum chamber top cover **(see illustrations)**.

11 Undo the two nuts securing the heater fan motor assembly to the bulkhead. Lift the unit off the studs and place it on the engine. Avoid straining the wiring **(see illustration)**.

12 Unclip and detach the wiring multi-plug from the spark control module **(see illustration)**.

13 Undo the retaining screws and remove the module from the bulkhead. Detach the module vacuum hose.

Refitting

14 Refitting is the reverse sequence to removal. Take care not to trap the motor wiring when refitting the fan motor assembly, and ensure that it is engaged in the slot provided in the housing.

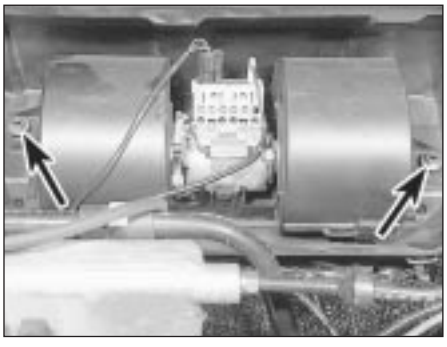
1.1 and 1.3 litre HCS engines (DIS/ESC)

Warning: The DIS system carries much higher voltages than conventional systems, and adequate precautions must be taken to avoid personal injury. Refer to the "Safety first!" Section at the beginning of this manual before proceeding, and always disconnect the battery negative lead before working on the system

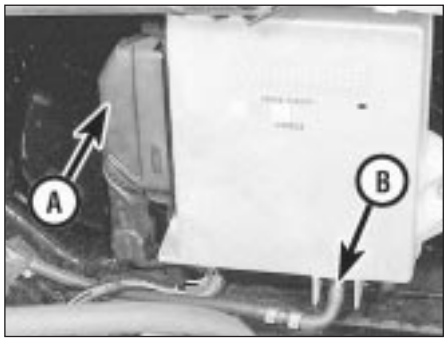
ESC module

Removal

15 The module is located on the front left-hand inner wing panel.



6.11 Undo the fan motor retaining nuts (arrowed)



6.12 Spark control module wiring multi-plug (A) and vacuum hose (B)

locking pin is used to lock the adjusting nut in position **(see illustration)**. If so remove the locking pin using pliers. Note that a new pin will be needed after adjustment.

15 Slacken the adjusting nut then apply the footbrake hard several times to ensure full self-adjustment of the brake shoes.

16 Turn the abutment sleeve as necessary until the total movement of both adjustment plungers added together is between 0.5 and 2.0 mm (0.02 and 0.08 in).

17 Tighten the adjusting nut against the abutment sleeve as tight as possible by hand (2 clicks) then tighten it by a further 2 clicks (maximum) using a suitable wrench.

18 Where applicable fit a new locking pin and tap it into place.

19 On completion lower the car to the ground.

9 Handbrake cables - renewal

1 Chock the front wheels, then fully release the handbrake.

2 Raise and support the vehicle at the rear with axle stands (see *"Jacking and Vehicle Support"*).

Primary cable

3 Extract the spring clip and clevis pin and disconnect the primary cable from the equaliser **(see illustrations)**.

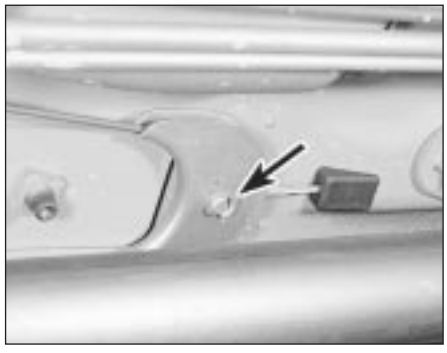
4 Working inside the vehicle, disconnect the cable from the hand-brake control lever, again by removal of clip and pin. Drift out the cable guide to the rear and withdraw the cable through the floorpan.

5 Refitting is a reversal of removal. Adjust the handbrake, if necessary, as described in Section 8.

Secondary cable

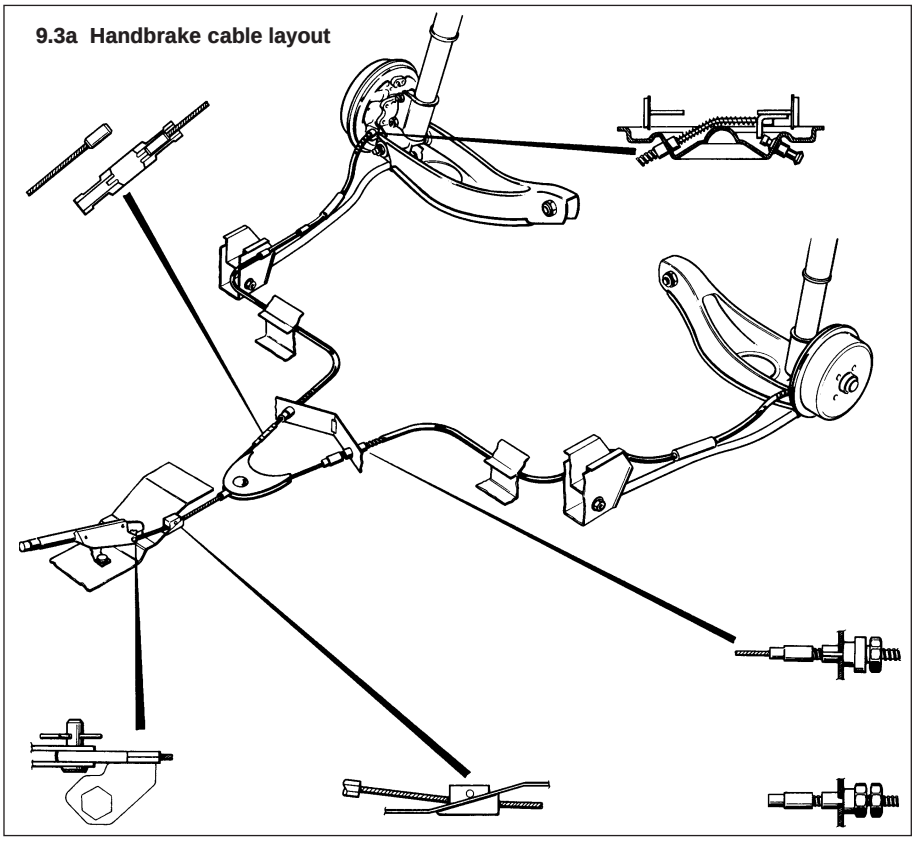
6 Using the procedure described in Section 8, slacken the cable adjusting nut so that the abutment sleeve can be disengaged from its body guide **(see illustration)**.

7 Release the cable connector from its body guide by extracting the spring clip and passing the inner cable through the slit in the guide **(see illustration)**.



9.3b Primary cable-to-equaliser clevis pin and spring clip (arrowed)

9.3a Handbrake cable layout



8 Now disconnect the cable from its body guide on the right-hand side of the vehicle.

9 Separate the cable assembly/equaliser from the primary cable by extracting the spring clip and clevis pin.

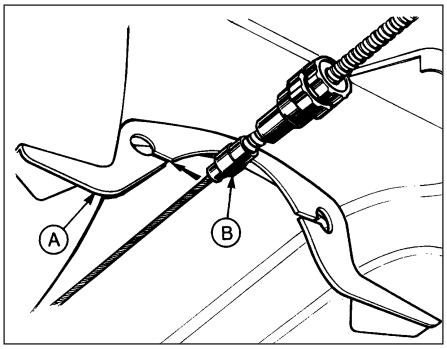
10 Release the cable from the body guides.

11 Remove the rear roadwheels and the brake drums.

12 Release the shoe hold-down spring so that the shoe can be swivelled and the handbrake lever unclipped from the relay lever.

13 Remove the cable ends through the brake backplate and withdraw the complete cable assembly from the vehicle.

14 Refitting is a reversal of removal. Grease the cable groove in the equaliser and adjust the handbrake, as described in Section 8.



9.6 Removing handbrake cable abutment sleeve from the body guide

A Body guide *B Secondary cable*

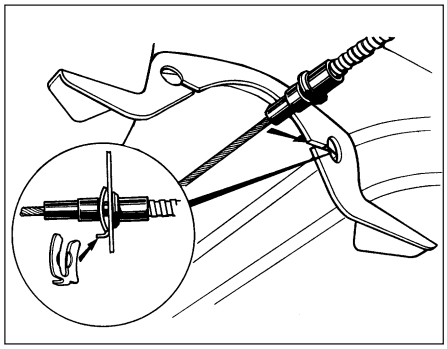
10 Handbrake lever - removal and refitting

Removal

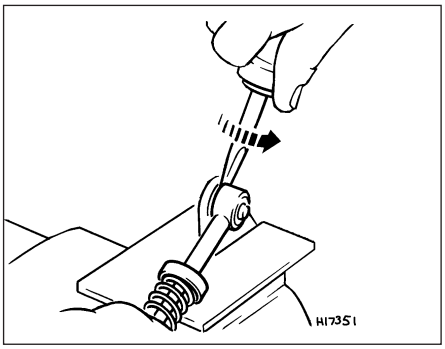
1 Chock the front wheels, raise and support the vehicle at the rear using stands (see *"Jacking and Vehicle Support"*) then release the handbrake.

2 Working underneath, extract the spring clip and clevis pin and disconnect the primary cable from the equaliser.

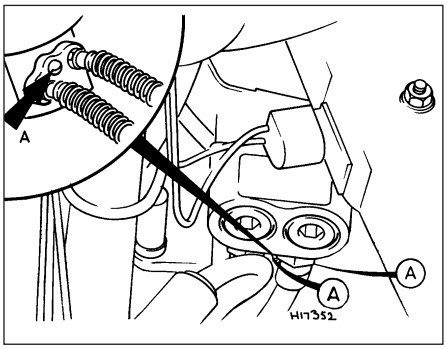
3 From inside the car detach the handbrake warning switch.



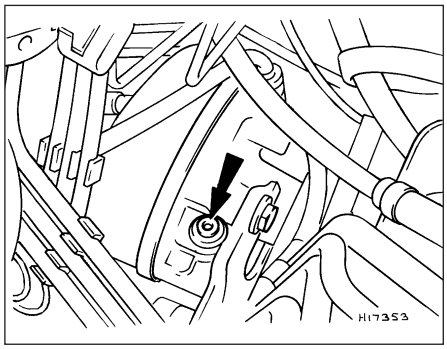
9.7 Handbrake cable connector spring clip removal



22.8 Separating apportioning valve pushrod from adjusting bracket



23.5 Modulator bypass valve (A) location



23.6 Modulator auto bleed plunger location (arrowed)

8 If required separate the valve pushrod from the adjusting bracket by levering off the pushrod trunnion with a screwdriver **(see illustration)**. Lubricate the trunnion rubber bush to aid removal.

Refitting

9 If a new valve is being fitted it will be supplied with nylon setting spacers and ties attached, to ensure correct adjustment of the valve. Leave these in position until the valve is installed.

10 Refit the pushrod trunnion to the adjusting bracket using a suitable socket and a vice.

11 Locate the valve on its mounting plate and secure with the retaining bolts.

12 Position the mounting plate over the suspension arm mounting bolts and secure with the nuts tightened to the specified torque.

13 Reconnect the hydraulic pipes to the valve.

14 Refit the stud plate and adjusting bracket to the suspension arm ensuring that the previously made marks are aligned if the original components are being refitted. Secure the adjusting bracket with the retaining nuts tightened to the specified torque.

15 If a new valve assembly is being fitted, remove the nylon setting spacers and ties.

16 Where applicable refit the fuel pump mounting bracket.

17 Lower the car to the ground.

18 Bleed the hydraulic system as described in Section 23.

19 It is recommended that the load apportioning valve adjustment be checked by a dealer if the original unit has been refitted. Special gauges are needed for this operation and it is not a DIY proposition.

23 Hydraulic system - bleeding (anti-lock braking system)

Note: *Before starting work, refer to the warning at the beginning of Section 11 concerning the dangers of hydraulic fluid.*

1 On cars equipped with the anti-lock braking system there are two bleed procedures possible according to which part of the hydraulic system has been disconnected.

2 If any one of the following conditions are present, bleed procedure A should be adopted:

a) A modulator has been removed.
b A modulator-to-master cylinder return hose has been drained.
c) The two modulator hydraulic hoses have been removed.

3 If any one of the following conditions are present, bleed procedure B should be adopted:

a) Any condition where the master cylinder has been drained providing that the modulator fluid return pipe has not lost its head of fluid.
b) Removal of any of the basic braking system components ie brake caliper, flexible hose or pipe, wheel cylinder, load apportioning valve.

Bleed procedure A

4 Top-up the master cylinder reservoir to the "MAX" mark using the specified type of fluid and keep it topped up throughout the bleed procedure.

5 Using a Torx type key or socket bit slacken the bypass valve on the relevant modulator by one to one and a half turns. The bypass valve is located between the two flexible hoses on the side of the modulator **(see illustration)**.

6 Fully depress and hold depressed the auto bleed plunger on the modulator so that the plunger circlip contacts the modulator body **(see illustration)**.

7 Have an assistant steadily pump the brake pedal at least twenty times while you observe the fluid returning to the master cylinder reservoir. Continue this operation until the returning fluid is free from air bubbles.

8 Release the auto bleed plunger ensuring that it has fully returned. Pull it out by hand if necessary.

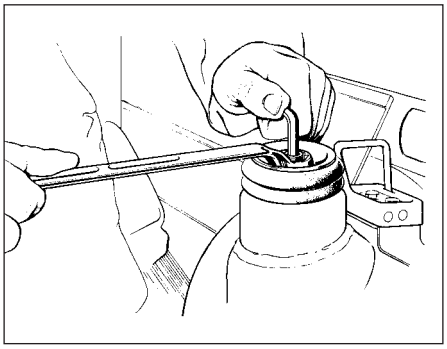
9 Tighten the bypass valve on the modulator.

10 Now carry out bleed procedure B.

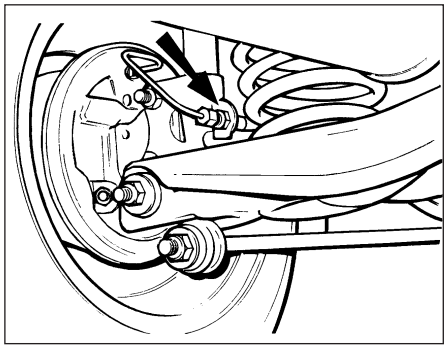
Bleed procedure B

11 This procedure is the same as for conventional braking systems and reference should be made to Section 11. Note, however, that all the weight of the car must be on the roadwheels, not suspended wheel free, otherwise the load apportioning valves will not bleed.

10.3 Rear shock absorber top mounting



10.4 Removing the shock absorber top mounting nut - Saloon and Estate models



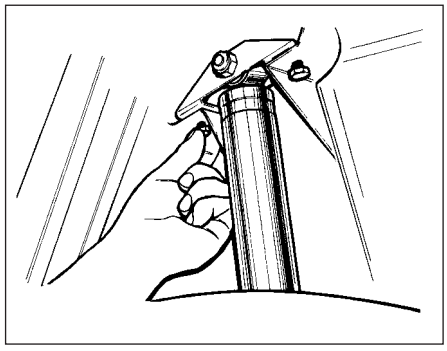
10.6 Brake hydraulic hose-to-shock absorber attachment (arrowed) - Saloon and Estate models

17 On fuel-injected models and Van versions refit the brake drum and secure with the retaining screw.
18 Refit the roadwheel and lower the car to the ground.

10 Rear shock absorber (Saloon and Estate models) - removal, testing and refitting

Removal

1 Slacken the roadwheel bolts, raise the rear of the vehicle, support it on stands (see *"Jacking and Vehicle Support"*) and remove the roadwheel.
2 Support the suspension lower arm with a jack.
3 Open the tailgate and lift the parcel tray to expose the shock absorber top mounting **(see illustration)**.
4 Remove the cap and then unscrew the nut from the shock absorber spindle. To prevent the spindle turning, use an Allen key in the socket provided **(see illustration)**.
5 Take off the cap and insulator.
6 Separate the brake hydraulic hose from the shock absorber by slackening the centre locking nut and easing the hose and pipe down and out of the slot in the bracket **(see illustration)**. On the right-hand side there is very little clearance for a spanner and it may be easier if the roadspring is removed as described in Section 13.



11.3 Removing the rear shock absorber top mounting bracket - Van models

7 Undo the two bolts securing the shock absorber to the stub axle carrier and withdraw the unit, together with cup and bump rubber, from under the wheel arch.

Testing

8 To test the shock absorber, grip its lower mounting in a vice so that the unit is vertical.
9 Fully extend and retract the shock absorber ten or twelve times. Any lack of resistance in either direction will indicate the need for renewal, as will evidence of leakage of fluid.

Refitting

10 Refitting is a reversal of removal, but if a new unit is being installed, prime it first in a similar way to that described for testing.

11 Rear shock absorbers (Van models) - removal, testing and refitting

Removal

1 Raise and support the rear of the vehicle on stands (see *"Jacking and Vehicle Support"*). Place a jack beneath the rear axle tube and just raise it slightly.
2 Disconnect the shock absorber lower mounting by unscrewing the nut and pivot bolt.
3 Unbolt the top mounting bracket from the body and withdraw the unit **(see illustration)**.
4 Undo the nut and pivot bolt to separate the mounting bracket from the shock absorber.

Testing

5 Proceed as described in Section 10.

Refitting

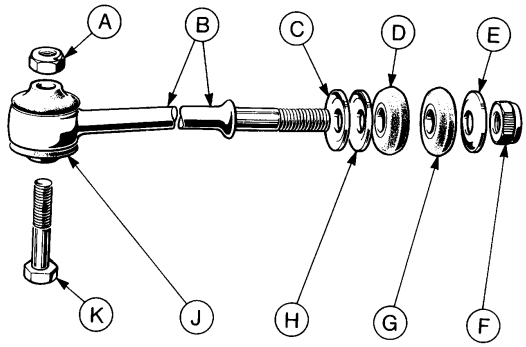
6 Refitting is a reversal of removal, but if a new unit is being installed, prime it first in a similar way to that described for testing.

12 Rear tie-bar (Saloon and Estate models) - removal and refitting

Removal

1 Before attempting to remove a tie-bar, note the location of all washers and bushes. These control the rear wheel alignment and they must be returned to their original locations.
2 Raise the rear of the vehicle and support it with stands (see *"Jacking and Vehicle Support"*).
3 Unscrew and remove the pivot bolt from the eye at the front end of the tie-bar **(see illustration)**.

12.3 Exploded view of the rear tie-bar mountings - Saloon and Estate models



A Nut
B Tie-bar
C Washer (additionalwashers may be fitted)
D Bush
E Washer
F Nut
G Bush
H Washer (additional washers may be fitted)
J Bush
K Pivot bolt

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 re-spraying

Before using this Section, see the Sections on dent, deep scratch, rust holes 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 - measure the hardener carefully (follow the maker's instructions on the pack) otherwise the filler will set too rapidly or too slowly. 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 surface. As soon as a contour that approximates to 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 400 grade wet-and-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-and-dry paper should be periodically rinsed in water. This will ensure that a very 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 the repair area with clean water, until all of the dust produced by the rubbing-down operation has gone.

Spray the whole repair area with a light coat of primer - this will show up any imperfections in the surface of the filler. Repair these 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 this spray and repair procedure 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 to dry fully.

The repair area is now ready for final 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, dousing the floor in the work area with water will help to settle the dust which would otherwise be in the atmosphere. If the repair area is confined to one body panel, mask off the surrounding panels; this will help to minimise the effects of a slight mis-match in paint colours. Bodywork fittings (eg chrome strips, door handles etc) will also need to be masked off. Use genuine masking tape and several thicknesses of newspaper for the masking operations.

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-and-dry paper, rub down the surface of the primer until it is really smooth. While doing this, the work area should be thoroughly doused with water, and the wet-and-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 work outwards, with a side-to-side motion, until the whole repair area and about 2 inches of the surrounding original paintwork is covered. Remove all masking material 10 to 15 minutes after spraying on the final coat of paint.

Allow the new paint at least two weeks to harden, then, using a paintwork renovator or a very fine cutting paste, blend the edges of the paint into the existing paintwork. Finally, apply wax polish.

Plastic components

With the use of more and more plastic body components by the vehicle manufacturers (eg bumpers, spoilers, and in some cases major body panels), rectification of more serious damage to such items has become a matter of either entrusting repair work to a specialist in this field, or renewing complete components. Repair of such damage by the DIY owner is not really feasible owing to the cost of the equipment and materials required for effecting such repairs. The basic technique involves making a groove along the line of the crack in the plastic using a rotary burr in a power drill. The damaged part is then welded back together by using a hot air gun to heat up and fuse a plastic filler rod into the groove. Any excess plastic is then removed and the area rubbed down to a smooth finish. It is important that a filler rod of the correct plastic is used, as body components can be made of a variety of different types (eg polycarbonate, ABS, polypropylene).

Damage of a less serious nature (abrasions, minor cracks etc) can be repaired by the DIY owner using a two-part epoxy filler repair material. Once mixed in equal proportions, this is used in similar fashion to the bodywork filler used on metal panels. The filler is usually cured in twenty to thirty minutes, ready for sanding and painting.

If the owner is renewing a complete component himself, or if he has repaired it with epoxy filler, he will be left with the problem of finding a suitable paint for finishing which is compatible with the type of plastic used. At one time the use of a universal paint was not possible owing to the complex range of plastics encountered in body component applications. Standard paints, generally speaking, will not bond to plastic or rubber satisfactorily, but paints to match any plastic or rubber finish can be obtained from dealers. However, it is now possible to obtain a plastic body parts finishing kit which consists of a pre-primer treatment, a primer and coloured top coat. Full instructions are normally supplied with a kit, but basically the method of use is to first apply the pre-primer to the component concerned and allow it to dry for up to 30 minutes. Then the primer is applied and left to dry for about an hour before finally applying the special coloured top coat. The result is a correctly coloured component where the paint will flex with the plastic or rubber, a property that standard paint does not normally possess.

5 Major body damage - repair

Where serious damage has occurred or large areas need renewal due to neglect, it means that completely new sections or panels will need welding in, and this is best left to professionals. If the damage is due to impact, it will also be necessary to completely check the alignment of the bodyshell structure. Due to the principle of construction, the strength and shape of the whole car can be affected by damage to one part. In such instances the service of a dealer with specialist checking jigs are essential. If a body is left misaligned, it is first of all dangerous, as the car will not handle properly, and secondly uneven stresses will be imposed on the steering, engine and transmission, causing abnormal wear or complete failure. Tyre wear may also be excessive.

5 The hinge assemblies can be removed from the lid by prising off the plastic covers and undoing the bolts securing the hinges to the lid. One is accessible from outside and one from inside.

Refitting

6 Refitting is a reversal of removal, but do not fully tighten the bolts until the lid has been lined up and closed properly.

18 Central door locking system components - removal and refitting

General

1 On pre-1986 models the locks, with the exception of the one on the driver's door, are actuated by solenoids **(see illustration)**. On 1986 models onwards, the locks are actuated by electric motors.

Switch (driver's door lock)

Removal

2 Raise the driver's door lock fully.
3 Disconnect the battery.
4 Remove the door trim panel (Section 11).
5 Disconnect the wiring plugs inside the door cavity and release the wires from their clips.
6 Release the lock control rods and remove the lock fixing screws.
7 Remove the lock from the door interior by guiding it round the glass guide channel.
8 Extract the two screws and remove the switch from the lock.

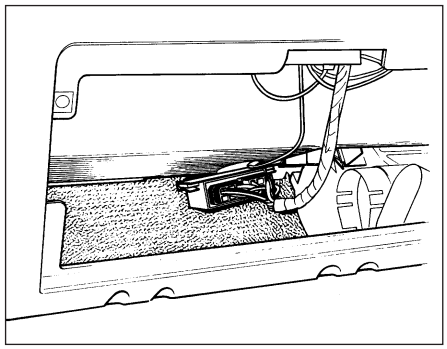
Refitting

9 Refitting is a reversal of removal, but before refitting the door trim panel check that the wires within the door cavity are out of the way of the window regulating mechanism and secured by strap clips.

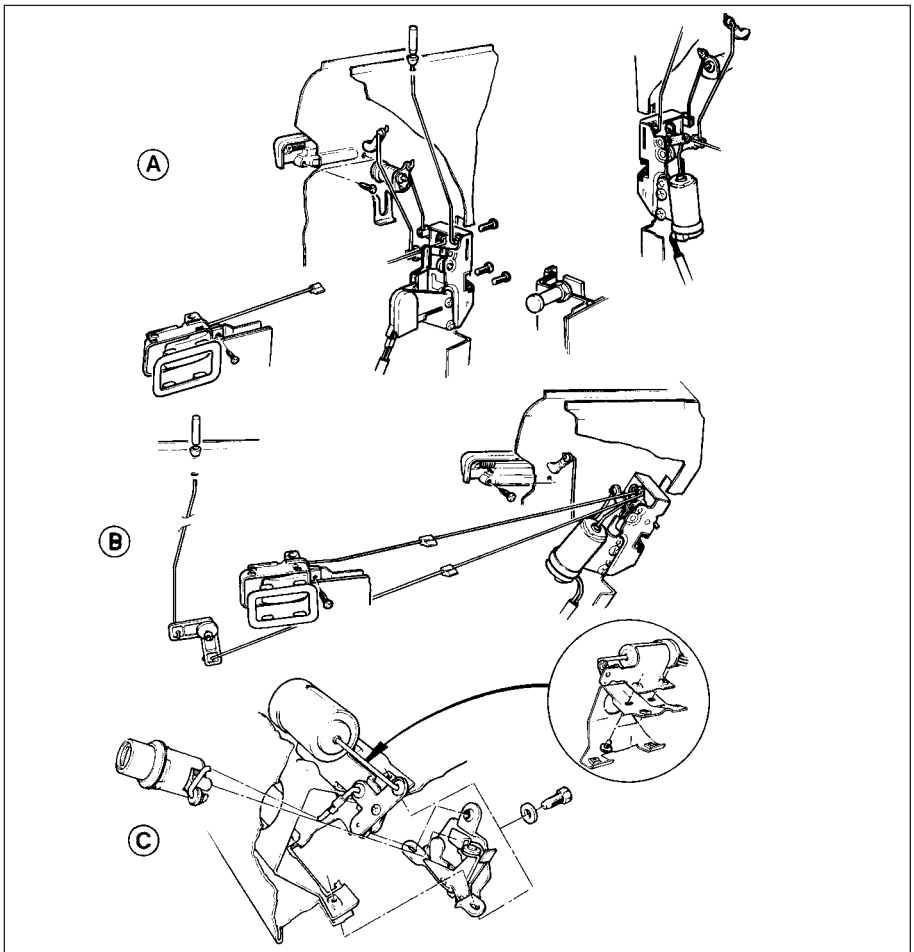
Control relay

Removal

10 Disconnect the battery.
11 Remove the under-facia trim panel from the passenger side.



18.12 Central locking solenoid relay location behind glovebox - pre-1986 models



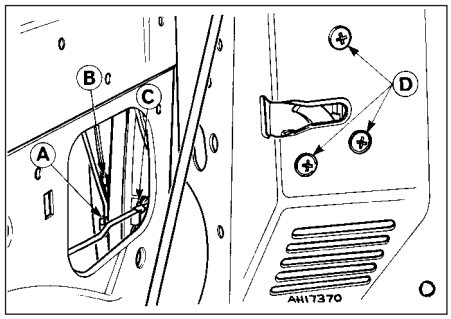
18.1 Layout of the solenoid operated central door locking system as fitted to pre-1986 models

A Front door components *B Rear door components* *C Tailgate components*

12 Pull the relay from its securing clips **(see illustration)**.
13 Disconnect the multi-plug and remove the relay.

Refitting

14 Refitting is a reversal of removal.



18.17 Door locking rod attachments - pre-1986 models

A, B and C Control rods
D Lock retaining screws

Solenoids - pre-1986 models

Front door

Removal

15 Disconnect the battery.
16 Remove the door trim panel as described in Section 11.
17 Disconnect the lock operating rods and extract the three lock fixing screws **(see illustration)**.
18 Release the wiring from the clips, manoeuvre the lock round the door glass guide channel and remove it through the cut-out in the door panel **(see illustration)**.
19 Separate the solenoid from the lock after extracting the fixing screws.

Refitting

20 Refitting is a reversal of removal, bearing in mind the following points.

a) When fitting the door lock solenoids, locate the guide lock assembly into position, but do not fully tighten the retaining screws until after the bellcrank and rubber operating rod guides, and the

Chapter 12
Electrical system

Contents

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

Specifications

System type	12 volt, negative earth
Bulbs	**Wattage**
Headlamp:	
Halogen	60/55
Tungsten	50/45W
Front sidelamp	4W
Front indicator lamp	21W
Stop/tail lamp	21/5W
Reversing lamp	21W
Rear foglamp	21 W
Rear indicator lamp	21W
Rear number plate lamp	5W
Auxiliary lamp (Halogen)	55W
Foglamp (Halogen)	55W
Instrument cluster warning lamps	1.3W
Panel illumination	2.6W
Cigar lighter illumination	1.4W
Glove compartment lamp	2W
Luggage compartment lamp	10W
Interior lamp	10W
Windscreen wipers	
Wiper blades:	
Front	Champion X-4503
Rear	Champion X-5103
Wiper arms:	
Front	Champion CCA6
Rear	Champion type not available

Refitting

3 Refit in reverse order of removal, checking that the grommet is correctly seated. On completion, check that the switch is operational and that there are no leaks around the grommet.

Low coolant warning switch

Removal

4 Drain the coolant from the expansion tank (see Chapter 1), having first depressurized the system if necessary.
5 Detach the switch multi-plug and then unscrew the threaded retainer. The switch can then be levered from the seal grommet using a flat-bladed screwdriver. Do not allow coolant to enter the connectors.

Refitting

6 Refit in reverse order, and, on completion, check the switch operation and, when the reservoir is refilled to the specified level, that there are no signs of leaks from the grommet/retainer.

Warning indicator control unit

Removal

7 Remove the radio speaker grille and speaker from the facia.
8 Disconnect the multi-plug from the warning indicator/control assembly and then remove the two nylon fixing nuts which hold the assembly in position on the facia panel. Take care when withdrawing and handling the unit not to knock it, as the integral micro-electronics could be damaged.

Refitting

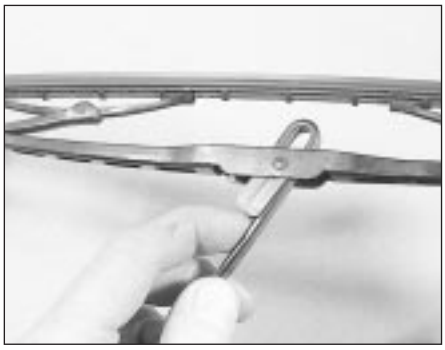
9 Refit in the reverse order of removal. On completion check that the warning lights function for the initial period of five seconds after the ignition is switched on.

Low fuel sensor unit

10 This is integral with the fuel tank sender unit and is removed from the tank as described in Chapter 4.

Brake pad wear indicators

11 The sensors are integral with the brake pads. Refer to Chapter 9 for details of brake pad removal and refitting.



17.2 Disconnecting wiper blade from arm

Auxiliary system warning light bulbs

12 The auxiliary warning light bulbs are integral with the instrument panel and are welded in position. They cannot be individually renewed. To remove the instrument panel refer to Section 9.

16 Horn - removal and refitting

Removal

1 The horn(s) are located in the left-hand front corner of the engine compartment. Before removing, disconnect the battery.
2 Disconnect the lead from the horn.
3 Unscrew the single bolt and remove the horn and bracket.

Refitting

4 Refitting is a reversal of removal.

17 Windscreen/tailgate wiper blades and arms - removal and refitting

Removal

1 Pull the wiper arm away from the glass until the arm locks.
2 Depress the small clip on the blade and slide the blade out of the hooked part of the arm **(see illustration)**.
3 Before removing the wiper arms it is worthwhile marking their parked position on the glass with a strip of masking tape as an aid to refitting. Raise the plastic nut cover.
4 Unscrew the nut which holds the arm to the pivot shaft and pull the arm from the splines.

Refitting

5 Refit by reversing the removal operations.

18 Windscreen wiper motor and linkage - removal and refitting

Removal

1 Remove the wiper arms and blades as described in Section 17.
2 Disconnect the battery negative terminal.
3 Remove the nut covers, the fixing nuts, washers and spacers from the pivot shafts.
4 Disconnect the wiper motor wiring at the multi-pin plugs.
5 Unscrew the two fixing bolts and withdraw the motor complete with linkage from the engine compartment **(see illustration)**.
6 Remove the spacers from the pivot shafts.
7 The motor can be separated from the linkage by removing the nut from the crankarm and then unbolting the motor from the mounting.

Refitting

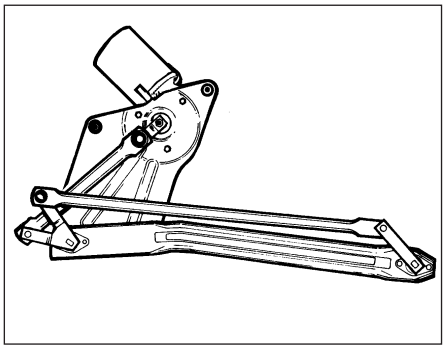
8 Refitting is a reversal of removal, but connect the motor crankarm when the link is aligned with it as shown **(see illustration)**.

19 Tailgate wiper motor - removal and refitting

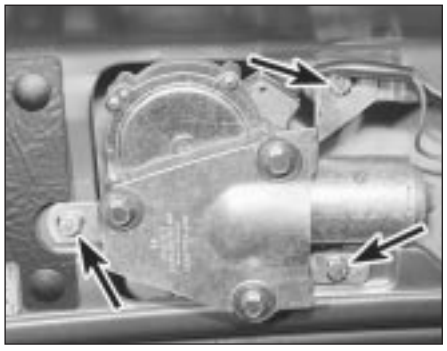
Removal

1 Disconnect the battery and remove the wiper arm/blade assembly.
2 Remove the pivot shaft nut, spacer and outer seals.
3 Open the tailgate and remove the trim panel (refer to Chapter 11).

18.5 Windscreen wiper motor fixing bolts (arrowed)



18.8 Windscreen wiper crankarm alignment for refitting



19.4 Tailgate wiper motor retaining bolts (arrowed)

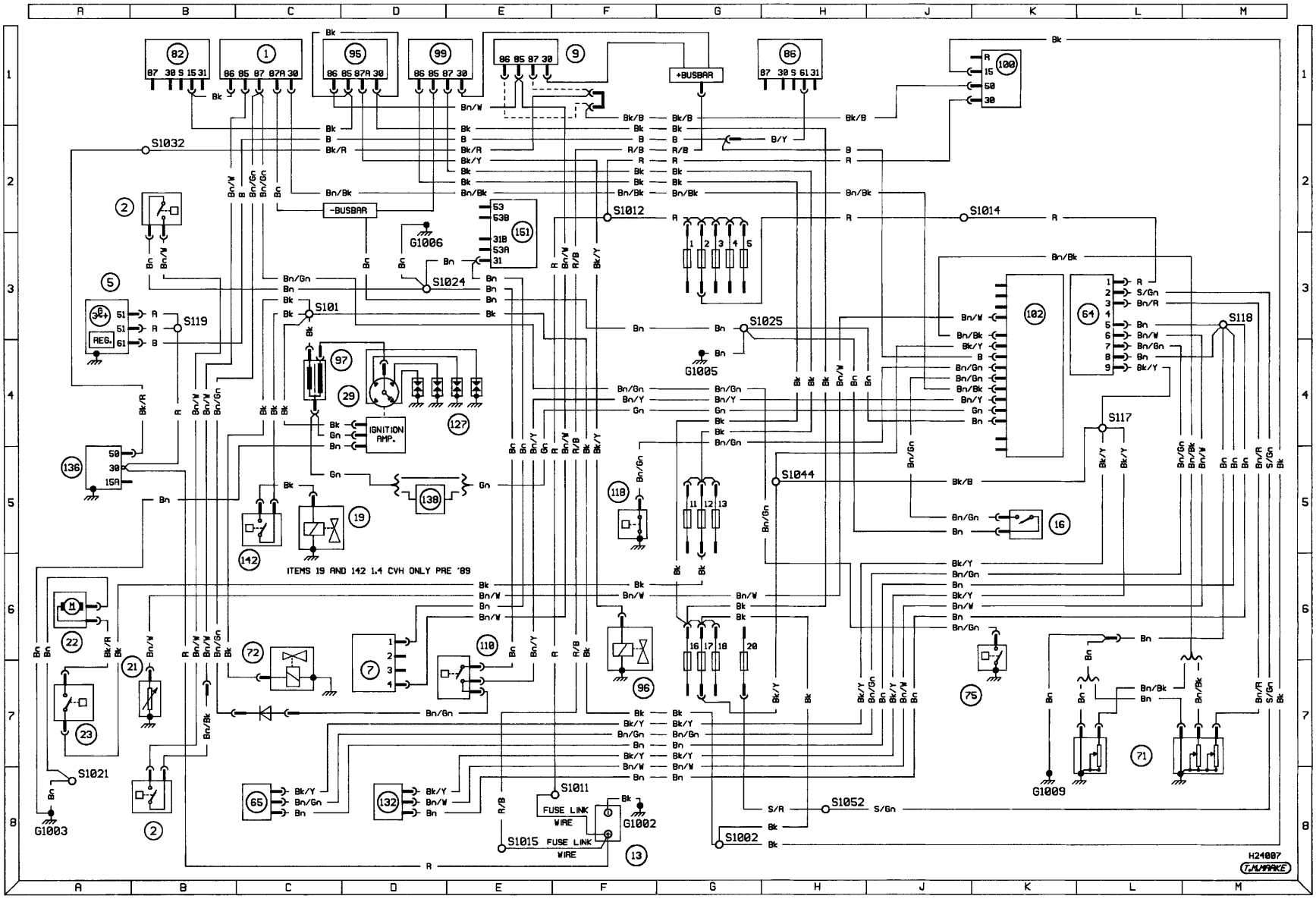


Diagram 1a: 1986-on Starting, charging, and ignition (except fuel injection) all models

Spare parts are available from many sources, including maker's appointed garages, accessory shops, and motor factors. To be sure of obtaining the correct parts, it will sometimes be necessary to quote the vehicle identification number. If possible, it can also be useful to take the old parts along for positive identification. Items such as starter motors and alternators may be available under a service exchange scheme - any parts returned should always be clean.

Our advice regarding spare part sources is as follows.

Officially-appointed garages

This is the best source of parts which are peculiar to your car, and are not otherwise generally available (eg badges, interior trim, certain body panels, etc). It is also the only place at which you should buy parts if the vehicle is still under warranty.

Accessory shops

These are very good places to buy materials and components needed for the maintenance of your car (oil, air and fuel filters, spark plugs, light bulbs, drivebelts, oils and greases, brake pads, touch-up paint, etc). Components of this nature sold by a reputable shop are of the same standard as those used by the car manufacturer.

Besides components, these shops also sell tools and general accessories, usually have convenient opening hours, charge lower prices, and can often be found not far from home. Some accessory shops have parts counters where the components needed for almost any repair job can be purchased or ordered.

Motor factors

Good factors will stock all the more important components which wear out comparatively quickly and can sometimes supply individual components needed for the overhaul of a larger assembly (eg brake seals and hydraulic parts, bearing shells, pistons, valves, alternator brushes). They may also handle work such as cylinder block reboring, crankshaft regrinding and balancing, etc.

Tyre and exhaust specialists

These outlets may be independent or members of a local or national chain. They frequently offer competitive prices when compared with a main dealer or local garage, but it will pay to obtain several quotes before making a decision. When researching prices, also ask what 'extras' may be added - for instance, fitting a new valve and balancing the wheel are both commonly charged on top of the price of a new tyre.

Other sources

Beware of parts or materials obtained from market stalls, car boot sales or similar outlets. Such items are not invariably sub-standard, but there is little chance of compensation if they do prove unsatisfactory. In the case of safety-critical components such as brake pads there is the risk not only of financial loss but also of an accident causing injury or death.

Second-hand components or assemblies obtained from a car breaker can be a good buy in some circumstances, but this sort of purchase is best made by the experienced DIY mechanic.

Vehicle Identification Numbers

Modifications are a continuing and unpublicised process in vehicle manufacture, quite apart from major model changes. Spare parts manuals and lists are compiled upon a numerical basis, the individual vehicle identification numbers being essential to correct identification of the component concerned.

When ordering spare parts, always give as much information as possible. Quote the vehicle model, year of manufacture, body and engine numbers as appropriate.

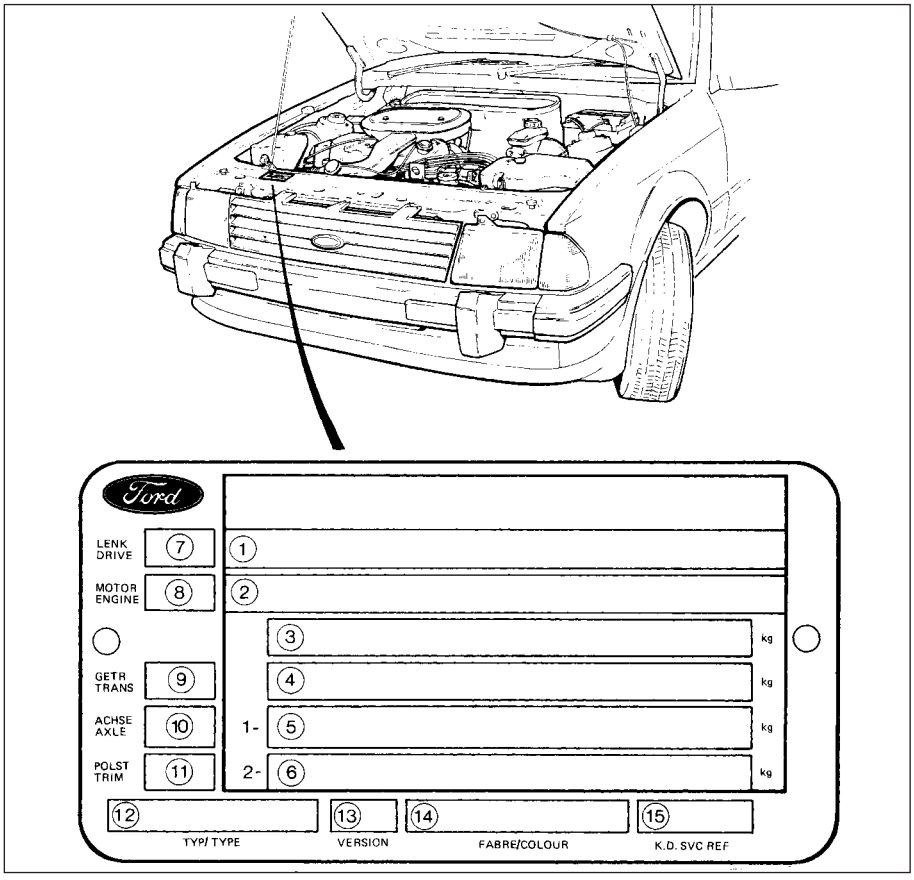
The Vehicle Identification Number is located on the plate found under the bonnet above the radiator. The plate also carries information concerning paint colour, final drive ratio etc.

The engine number is located in one of the following places, according to engine type:

Front right-hand side of engine block
Front face of cylinder block
Front left-hand side of engine block
Cylinder block above clutch bellhousing

A tuning decal will also be found under the bonnet. This illustrates graphically the basic tuning functions, typically plug gap, ignition timing, idle speed and CO level, and (where applicable) valve clearances, points gap and dwell angle.

Additionally, on later models a chassis number is stamped on the floor panel between the driver's seat and door, and is covered by a fold back plastic flap.



Vehicle identification plate location

1 Type Approval Number
2 Vehicle Identification Number
3 Gross vehicle weight
4 Gross train weight
5 Permitted front axle loading
6 Permitted rear axle loading
7 Steering (LHD/RHD)
8 Engine
9 Transmission
10 Axle (final drive ratio)
11 Trim (interior)
12 Body type
13 Special territory version
14 Body colour
15 KD reference (usually blank) or exhaust emission level

The pages which follow provide an easy reference guide to the more common problems which may occur during the operation of the vehicle. These problems and their possible causes are grouped under headings denoting various components or systems, such as Engine, Cooling system, etc. The Chapter and/or Section which deals with the problem is also shown in brackets. Whatever the fault, certain basic principles apply. These are as follows:

Verify the fault. This is simply a matter of being sure that you know what the symptoms are before starting work. This is particularly important if you are investigating a fault for someone else who may not have described it very accurately.

Don't overlook the obvious. For example, if the vehicle won't start, is there petrol in the tank? (Don't take anyone else's word on this particular point, and don't trust the fuel gauge either!) If an electrical fault is indicated, look for loose or broken wires before digging out the test gear.

Cure the disease, not the symptom. Substituting a flat battery with a fully charged one will get you off the hard shoulder, but if the underlying cause is not attended to, the new battery will go the same way. Similarly, changing oil-fouled spark plugs for a new set will get you moving again, but remember that the reason for the fouling (if it wasn't simply an incorrect grade of plug) will have to be established and corrected.

Don't take anything for granted. Particularly, don't forget that a "new" component may itself be defective (especially if it's been rattling around in the boot for months), and don't leave components out of a fault diagnosis sequence just because they are new or recently fitted. When you do finally diagnose a difficult fault, you'll probably realise that all the evidence was there from the start.

1 Engine

Engine fails to rotate when attempting to start

- ☐ Battery terminal connections loose or corroded ("*Weekly checks*").
- ☐ Battery discharged or faulty (Chapter 5, Part A).
- ☐ Broken, loose or disconnected wiring in the starting circuit (Chapter 5, Part A).
- ☐ Defective starter solenoid or switch (Chapter 5, Part A).
- ☐ Defective starter motor (Chapter 5, Part A).
- ☐ Starter pinion or flywheel ring gear teeth loose or broken (Chapter 5, Part A and Chapter 2).
- ☐ Engine earth strap broken or disconnected (Chapter 5, Part A).
- ☐ Automatic transmission not in Park/Neutral position or starter inhibitor switch faulty (Chapter 7, Part B).

Engine rotates but will not start

- ☐ Fuel tank empty.
- ☐ Battery discharged (engine rotates slowly) (Chapter 5, Part A).
- ☐ Battery terminal connections loose or corroded ("*Weekly checks*").
- ☐ Ignition components damp or damaged (Chapter 1 and Chapter 5, Part B).
- ☐ Broken, loose or disconnected wiring in the ignition circuit (Chapter 1 and Chapter 5, Part B).
- ☐ Worn, faulty or incorrectly gapped spark plugs (Chapter 1).
- ☐ Carburettor or fuel injection system fault (Chapter 4).
- ☐ Major mechanical failure (eg camshaft drive) (Chapter 2).

Engine difficult to start when cold

- ☐ Battery discharged (Chapter 5, Part A).
- ☐ Battery terminal connections loose or corroded ("*Weekly checks*").
- ☐ Worn, faulty or incorrectly gapped spark plugs (Chapter 1).
- ☐ Carburettor or fuel injection system fault (Chapter 4).
- ☐ Other ignition system fault (Chapter 1 and Chapter 5, Part B).
- ☐ Low cylinder compressions (Chapter 2).
- ☐ Incorrect valve clearances - where applicable (Chapter 2, Part A).

Engine difficult to start when hot

- ☐ Air filter element dirty or clogged (Chapter 1).
- ☐ Carburettor or fuel injection system fault (Chapter 4).
- ☐ Low cylinder compressions (Chapter 2).
- ☐ Incorrect valve clearances - where applicable (Chapter 2, Part A).

Starter motor noisy or excessively rough in engagement

- ☐ Starter pinion or flywheel ring gear teeth loose or broken (Chapter 5, Part A and Chapter 2).
- ☐ Starter motor mounting bolts loose or missing (Chapter 5, Part A).
- ☐ Starter motor internal components worn or damaged (Chapter 5, Part A).

Engine starts but stops immediately

- ☐ Loose or faulty electrical connections in the ignition circuit (Chapter 1 and Chapter 5, Part B).
- ☐ Vacuum leak at the carburettor/fuel injection unit/throttle body or inlet manifold (Chapter 4).
- ☐ Carburettor or fuel injection system fault (Chapter 4).

Engine idles erratically

- ☐ Air filter element clogged (Chapter 1).
- ☐ Vacuum leak at the carburettor/fuel injection unit/throttle body, inlet manifold or associated hoses (Chapter 4).
- ☐ Worn, faulty or incorrectly gapped spark plugs (Chapter 1).
- ☐ Uneven or low cylinder compressions (Chapter 2).
- ☐ Camshaft lobes worn (Chapter 2).
- ☐ Timing belt incorrectly tensioned - where applicable (Chapter 2, Part B).
- ☐ Incorrect valve clearances - where applicable (Chapter 2, Part A).
- ☐ Carburettor or fuel injection system fault (Chapter 4).

Engine misfires at idle speed

- ☐ Worn, faulty or incorrectly gapped spark plugs (Chapter 1).
- ☐ Faulty spark plug HT leads (Chapter 1).
- ☐ Incorrect ignition timing (Chapter 1).
- ☐ Vacuum leak at the carburettor/fuel injection unit/throttle body, inlet manifold or associated hoses (Chapter 4).
- ☐ Distributor cap cracked or tracking internally - where applicable (Chapter 1).
- ☐ Uneven or low cylinder compressions (Chapter 2).
- ☐ Disconnected, leaking or perished crankcase ventilation hoses (Chapter 4, Part E).
- ☐ Carburettor or fuel injection system fault (Chapter 4).
- ☐ Incorrect valve clearances - where applicable (Chapter 2, Part A).

Engine misfires throughout the driving speed range

- ☐ Fuel filter choked (Chapter 1).
- ☐ Fuel pump faulty or delivery pressure low (Chapter 4).
- ☐ Fuel tank vent blocked or fuel pipes restricted (Chapter 4).
- ☐ Vacuum leak at the carburettor/fuel injection unit/throttle body, inlet manifold or associated hoses (Chapter 4).
- ☐ Worn, faulty or incorrectly gapped spark plugs (Chapter 1).
- ☐ Faulty spark plug HT leads (Chapter 1).
- ☐ Distributor cap cracked or tracking internally - where applicable (Chapter 1).
- ☐ Faulty ignition coil or DIS module (Chapter 5, Part B).
- ☐ Uneven or low cylinder compressions (Chapter 2).
- ☐ Carburettor or fuel injection system fault (Chapter 4).
- ☐ Incorrect valve clearances - where applicable (Chapter 2, Part A).