






Chapter 4 Part D: Fuel and exhaust systems – Honda PGM-Fi injection engines

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Degrees of difficulty

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

General

System type	Programmed fuel injection system with sequential injection
Idle speed:	
2.5 litre engines	720 to 820 rpm
2.7 litre engines	670 to 770 rpm
Idle mixture CO content	
Models without catalytic converter	0.25 to 0.75%
Models with catalytic converter *	0.1%
* <i>Non-adjustable - controlled by ECU</i>	
Fuel octane rating **:	
Models without catalytic converter	97 RON leaded or 95 RON unleaded
Models with catalytic converter	95 RON unleaded only
** <i>See text - Section 9</i>	

Fuel Pump

Type	Nippon Denso, electric
Output pressure	4.1 bar
Regulated pressure	2.0 bar
Delivery rate (at 12 volts in 10 seconds)	230 cc

Torque wrench settings

	Nm	lbf ft
Electronic idle control valve retaining bolts	22	16
Fast idle valve retaining bolts	12	9
Fuel filter banjo union bolts	38	28
Fuel pump banjo union bolt	22	16
Fuel rail banjo union bolts	22	16
Throttle body retaining nuts and bolts	22	16
Fuel tank drain plug	50	37
Fuel tank strap locknuts	22	16
Exhaust front pipes to manifold	35	26
Exhaust section flange nuts	35	26

1 General information and precautions

The fuel system used on V6 engine Rover models consists of a centrally-mounted fuel tank, electric fuel pump and Honda PGM-Fi programmed fuel injection system. A more detailed description of the system is contained in Section 10.

The exhaust system consists of a front, intermediate and rear section, suspended from the underbody on rubber mountings, and bolted to two cast iron manifolds at the front. A catalytic converter is fitted between the front and intermediate sections on later models and a flexible joint is also incorporated in the front section, to allow for engine and exhaust system movement.

Precautions



Warning: Many of the procedures in this Chapter require the removal of fuel lines and connections, which may result in some fuel spillage. Petrol is extremely flammable, so take extra precautions when you work on any part of the fuel system. Don't smoke, or allow open flames or bare light bulbs, near the work area. Don't work in a garage where a natural gas-type appliance (such as a water heater or clothes dryer) with a pilot light is present. If you spill any fuel on your skin, rinse it off immediately with soap and water. When you perform any kind of work on the fuel system, wear safety glasses, and have a Class B type fire extinguisher on hand. Before carrying out any operation on the fuel system, refer also 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.

Reference must also be made to Chapter 5, Section 1 for precautionary notes concerning the ignition system and battery disconnection, and to any further safety-related text



2.1 Release the coil HT cable from the clip on top of the upper intake trunking

contained within the appropriate Section, before working on the vehicle.

Certain adjustment points in the fuel system are protected by tamperproof caps, plugs or seals. In some territories, it is an offence to drive a vehicle with broken or missing tamperproof seals. Before disturbing a tamperproof seal, first check that no local or national laws will be broken by doing so, and fit a new tamperproof seal after adjustment is complete, where required by law. Do not break tamperproof seals on any vehicle whilst it is still under warranty.

When working on fuel system components, scrupulous cleanliness must be observed and care must be taken not to introduce any foreign matter into the fuel lines or components.

2 Air cleaner assembly and intake components - removal and refitting



Note: Air cleaner element renewal is described in Chapter 1.

Note: Due to the limited space available, access to the air intake trunking and air cleaner assembly can be improved if the battery is removed first. If this is to be done, refer to Chapter 5, Section 1, for precautions concerning battery disconnection.

Air intake trunking

Removal

1 Release the coil HT cable from the clip on



2.2 Remove the breather pipe from the side of the upper intake trunking

top of the upper intake trunking (see illustration).

2 Undo the breather pipe support bracket bolt and remove the breather pipe from the side of the upper intake trunking (see illustration).

3 Slacken the clip securing the upper trunking to the throttle body and the clip securing the lower intake trunking to the air cleaner assembly.

4 Release the trunking from the throttle body and air cleaner; slacken the centre clip, securing the upper and lower trunking parts together.

5 Separate the upper trunking from the lower trunking and manipulate both parts out of the engine compartment.

Refitting

6 Refitting is a reversal of removal.

Air cleaner assembly

Removal

7 Remove the air intake trunking as described previously.

8 Release the clip securing the resonator vacuum hose to the front of the air cleaner assembly and undo the wiring harness support clip bolt at the rear (see illustrations).

9 Slacken the air duct retaining clip.

10 Undo the two bolts securing the air cleaner assembly to the battery tray (see illustrations).



2.8a Release the clip securing the resonator vacuum hose to the front of the air cleaner assembly . . .



2.8b . . . and undo the wiring harness support clip bolt (arrowed) at the rear



2.10a Undo the rear bolt arrowed . . .



2.10b ... and front bolt, securing the air cleaner assembly to the battery tray



3.1 Slip the accelerator inner cable end out of the slot on the throttle lever



3.2 Slacken the outer cable locknuts, then withdraw the outer cable from the support bracket

11 Release the air cleaner assembly from the air duct, disengage the locating pegs and lift the assembly out of the engine compartment.

Refitting

12 Refitting is a reversal of removal.

Air duct

Removal

13 Remove the battery as described in Chapter 5.

14 Remove the air intake trunking and the air cleaner assembly as described previously.

15 Undo the three bolts and lift out the battery tray.

16 Undo the air duct upper retaining bolt, release the duct from the resonator and manipulate the assembly from its location.

Refitting

17 Refitting is a reversal of removal.

3 Accelerator cable - removal, refitting and adjustment



Removal

1 Open the throttle fully by hand, and slip the inner cable end out of the slot on the throttle lever (see illustration).

2 Slacken the outer cable locknuts, then withdraw the outer cable from the support bracket (see illustration).



3.5 Release the cable from the support clips

3 From inside the car, release the turnbuckles and lift out the trim panel over the clutch, brake and accelerator pedals.

4 Prise the retaining clip from the top of the accelerator pedal, and disconnect the inner cable.

5 Release the cable from the engine compartment bulkhead, and the support clips; withdraw the cable from the car (see illustration).

Refitting and adjustment

6 Refitting is a reversal of removal. Adjust the cable by means of the outer cable locknuts, to give a small amount of free play with the throttle closed. The adjustment is correct when there is approximately 10 to 12 mm of deflection on the inner cable.

7 Check that the throttle butterfly opens fully with the accelerator pedal depressed to the floor, and closes completely when released.

4 Accelerator pedal - removal and refitting

Refer to Part A, Section 4, but note that the accelerator pedal switch is only fitted to certain models. On models equipped with cruise control, release the cruise control cable from the pedal in the same way as the accelerator cable.



5.4 Releasing the fuel system pressure at the bleed screw on the banjo union

5 Fuel system - depressurisation



Note: Refer to the precautions contained in Section 1 before proceeding.

1 The fuel system referred to in this Chapter is defined as the fuel tank and tank-mounted fuel pump/fuel gauge sender unit, the fuel filter, the fuel pressure regulator, the fuel injectors, and the metal pipes and flexible hoses of the fuel lines between these components. Most of these contain fuel which will be under pressure while the engine is running and/or while the ignition is switched on.

2 The pressure will remain for some time after the ignition has been switched off, and must be relieved before any of these components are disturbed for servicing or repair work.

3 Disconnect the battery negative (earth) lead (refer to Chapter 5, Section 1).

4 Place absorbent rags around the bleed screw in the centre of fuel filter outlet union banjo bolt, then slowly unscrew the bleed screw to release the system pressure (see illustration).

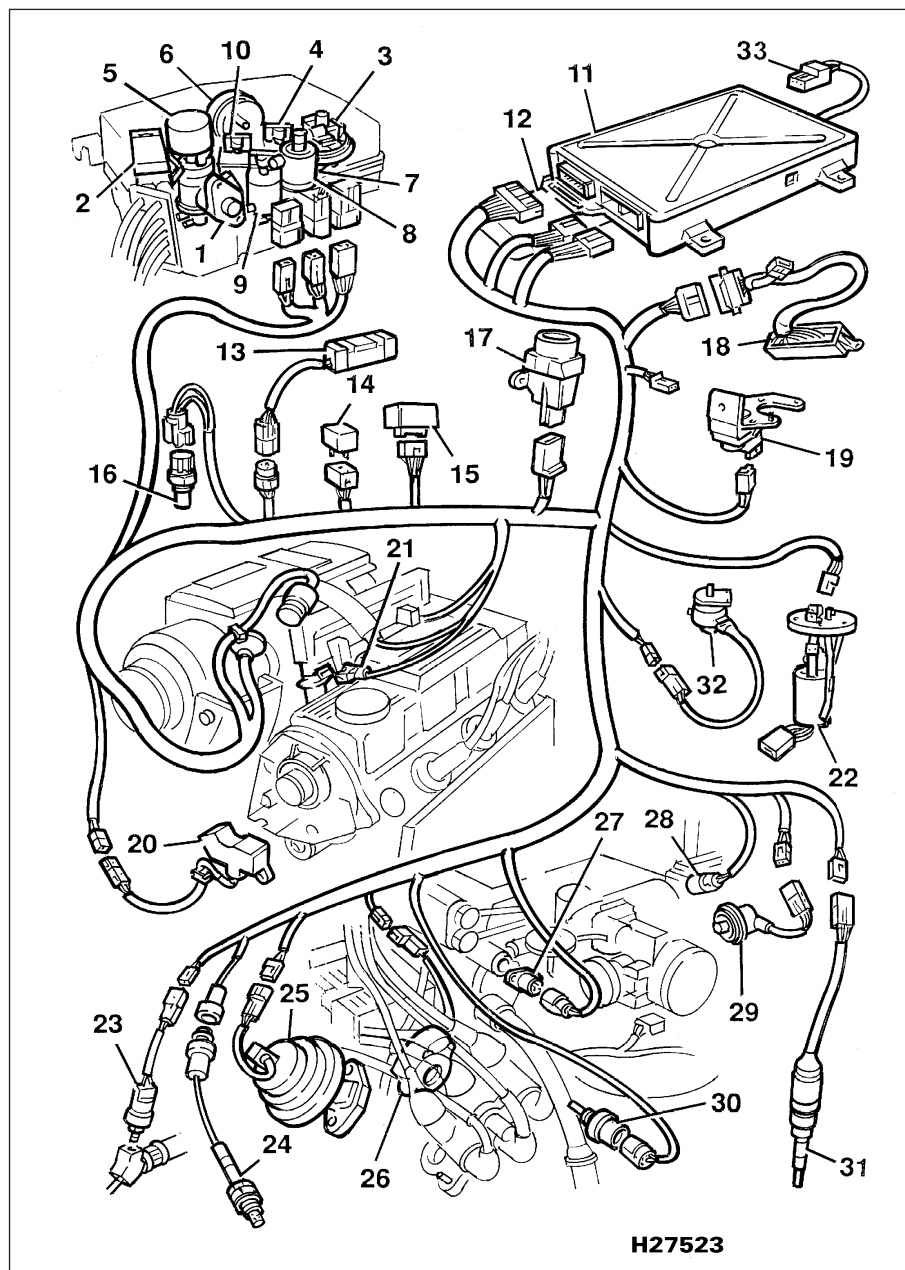
5 Once the pressure has been completely relieved, tighten the bleed screw and dispose of the rags safely.

6 Fuel pump - removal and refitting

Refer to Part A, Section 6.

7 Fuel gauge sender unit - removal and refitting

Refer to Part A, Section 7.



10.1 Main components of the PGM-Fi programmed fuel injection system

Note: Components and locations may differ slightly between models

- | | | |
|---|---------------------------------------|-------------------------------------|
| 1 Ignition timing sensor | 10 Bypass control solenoid valve B | 22 Fuel pump |
| 2 Manifold absolute pressure sensor | 11 Main system ECU | 23 Power steering switch |
| 3 Constant vacuum control valve | 12 Cooling fan timer module | 24 Oxygen sensor |
| 4 Air suction control solenoid valve | 13 Injector resistor pack | 25 EGR valve lift sensor |
| 5 EGR control solenoid valve | 14 Air conditioning clutch relay | 26 TDC sensor |
| 6 Throttle dashpot air filter | 15 Main system relay | 27 Intake air temperature sensor |
| 7 Air reservoir | 16 Oil temperature sensor | 28 Electronic idle control valve |
| 8 Pressure regulator control cut-off solenoid valve | 17 Inertia switch | 29 Throttle angle sensor |
| 9 Bypass control solenoid valve A | 18 Transmission shift position switch | 30 Coolant temperature sensor |
| | 19 Absolute pressure sensor | 31 Speedometer transducer |
| | 20 Crank/cylinder sensor | 32 Resonator control valve solenoid |
| | 21 Fuel injectors | 33 ECU link connector |

8 Fuel tank - removal, inspection and refitting

Refer to Part A, Section 8.

9 Unleaded petrol - general information and usage

Note: The information given in this Chapter is correct at the time of writing, and applies only to petrols currently available in the UK. If updated information is thought to be required, check with a Rover dealer. If travelling abroad, consult one of the motoring organisations (or a similar authority) for advice on the petrols available and their suitability for your vehicle.

1 The recommended fuel is given in the Specifications at the beginning of this Chapter, followed by the equivalent petrol on sale in the UK.

2 RON and MON are different testing standards; RON stands for Research Octane Number (also written as RM), while MON stands for Motor Octane Number (also written as MN).

3 All non-catalyst equipped V6 engine models covered by this manual are designed to run on leaded or unleaded petrols. Depending on the petrol used, the ignition timing will have to be adjusted accordingly. Details of this procedure are covered in Chapter 5, Section 10. Only unleaded petrol may be used in those models fitted with a catalytic converter.

10 Fuel injection system - general information

The Honda PGM-Fi programmed fuel injection system is used on all V6 engine models covered by this manual. There are detail differences between the system used on the 2.5 litre engines and that used on 2.7 litre models, but these are of a minor nature and mainly reflect the system's development over the years. The system is a complex and highly sophisticated total engine management package, controlling the fuel injection, the fuel and exhaust emissions, and the ignition system, from one electronic control unit (ECU) (see illustration).

The tank-mounted fuel pump supplies fuel under pressure to the fuel rails; the pressure being controlled by the fuel pressure regulator. Fuel from the fuel rails is supplied to the fuel injectors which are then operated by the ECU according to a number of operating parameters.

The ECU contains memories for the basic fuel injector opening times for various engine speed and load conditions. Numerous sensors on and around the engine are used to

modify these basic values to "fine-tune" the injector opening times to suit precise operating conditions. Information on crankshaft speed and position, coolant temperature, intake air temperature, ambient air temperature, manifold pressure, atmospheric pressure and vehicle speed is supplied to the ECU by the sensors, to enable initial injection time to be established. Additional sensors are used, according to model and equipment levels, to supply information on exhaust emissions, air conditioning system operation, automatic transmission shift position, etc.

Engine idle speed is also controlled by the ECU in conjunction with an electronic idle control valve. This valve changes the amount of air bypassing into the inlet manifold in response to sensor information processed by the ECU. This results in a stabilized idle speed irrespective of additional loads imposed on the engine from such sources as the alternator, power steering pump, automatic transmission, air conditioning compressor, or other external factors such as temperature and altitude. Additionally, a temperature conscious fast idle control bypass valve is used to increase the amount of air bypassing into the inlet manifold during warm-up conditions.

Should certain elements of the system fail, the ECU can implement a back-up facility, allowing the system to operate at reduced performance until the fault can be rectified.

A self-diagnosis function is also provided whereby any faults detected by the ECU are stored in its memory and displayed as codes by a flashing red LED whenever the ignition is switched on. A second LED is also provided to indicate whether the initial (manually set) idle speed adjustment is correct. Both these LED's are located on the front of the ECU and can be seen by looking under the front of the driver's seat.

11 Fuel injection system - testing and adjustment



Testing

1 If a fault appears in the fuel injection system (indicated by the red LED on the ECU flashing a series of codes), first ensure that all the system wiring connectors are securely connected and free of corrosion. Then ensure that the fault is not due to poor maintenance; ie, check that the air cleaner filter element is clean, the spark plugs are in good condition and correctly gapped, the cylinder compression pressures are correct, and that the engine breather hoses are clear and undamaged, referring to the relevant Parts and Sections of this Chapter, and to Chapters 1 and 2 for further information.

2 If these checks fail to reveal the cause of

the problem, the vehicle should be taken to a suitably equipped Rover dealer for the fault codes to be interpreted and the fault isolated. This will alleviate the need to test all the system components individually, which is a time-consuming operation that carries an element of risk of damaging the ECU.

Adjustment

Engine tuning procedure

3 The fuel injection system is such that once the initial engine idle speed and mixture settings have been set, they are then controlled by the system's ECU for all operating conditions. Although the settings should be checked at the recommended service intervals, it is unlikely that any adjustment will be needed unless a new component has been fitted. Note also that the idle mixture setting can only be adjusted on early models that are not equipped with a catalytic converter.

4 Before making any changes to the settings of the fuel injection system, ensure that the spark plug gaps are correctly set, the air cleaner element is clean, there are no leaks in the exhaust system, and the ignition system is operating correctly. Ensure that all breather and vacuum hoses are connected, and that none are perished or kinked.

5 Check that there is the correct amount of free play in the accelerator cable, and that the throttle lever rests against its stop in the released condition. Adjust the cable as described in Section 3 if necessary.

6 Temperature effects, and engine and transmission oil drag, can influence the idle speed and mixture settings, and it is important that the following warm-up procedure is adopted before attempting any adjustments.

7 Drive the car on the road for approximately two to four miles, dependent on summer or winter conditions, in a normal manner, without excessive load, engine speed or road speed.

8 Return the car to the working area, ensure that the steering is in the straight ahead position then switch the engine off and connect a tachometer to the engine in accordance with the equipment

manufacturer's instructions. If the mixture setting is being checked, connect an exhaust gas analyser (CO meter) in accordance with the equipment manufacturer's instructions also. The analyser should be warmed up, correctly calibrated and ready for immediate use. Commence the adjustment procedure described below immediately.

Idle speed adjustment

9 With the engine idling, check the yellow LED display on the fuel system ECU, by looking under the front of the driver's seat. The LED is visible through the window on the ECU case (see illustration). If the LED is not illuminated, the idle speed is correct and no adjustment is required. If the LED is illuminated or blinking, adjustment is required.

10 Switch off all electrical accessories, and ensure that they remain switched off throughout the adjustment procedure.

11 If the LED is illuminated constantly (not blinking), turn the adjustment screw on the idle valve anti-clockwise to correct the setting. If the LED is blinking, turn the adjustment screw clockwise (see illustration). Always turn the adjustment screw in 90° increments, and wait thirty seconds for the idle speed to stabilise. Check the idling speed on the tachometer and compare it with the figures given in the Specifications. Repeat the adjustment until the setting is correct.

Idle mixture adjustment

12 As mentioned earlier, the idle mixture can only be adjusted on models without a catalytic converter.

13 According to model, the idle mixture adjuster will be located in one of three places:
2.5 litre models - In the control box on the engine compartment bulkhead (see illustration).

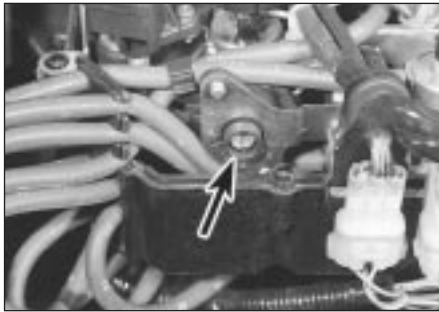
2.7 litre models - In the control box on the engine compartment bulkhead, or on the fuse and relay box in the fascia on the driver's side, or in front of the fuel system ECU under the driver's seat (see illustrations).



11.9 The ECU viewing window where the red and yellow LEDs can be seen (driver's seat removed for clarity)



11.11 Idle speed adjustment screw (arrowed) on the idle valve. (On 2.5 litre engines the screw is on the side of the valve)



11.13a This is actually the ignition timing sensor/adjuster (arrowed) in the control box on 2.7 litre engines, but on 2.5 litre models, this is where you will find the idle mixture adjuster

14 Locate the adjuster and hook out the tamperproof cap over the adjusting screw, if fitted.

15 Refer to the engine tuning procedure information contained above before starting.

16 Switch off all electrical accessories, and ensure that they remain switched off throughout the adjustment procedure.

17 If, during the adjustment procedure, the cooling fan operates, or if adjustment is not completed within two minutes, accelerate the engine to 2000 rpm, and hold this speed for ten seconds. Repeat this every two minutes until the adjustments are completed.

18 With the engine idling and the exhaust gas analyser connected, take a reading of the exhaust gas CO content. If this is not as given in the Specifications, turn the screw clockwise to enrich the mixture, or anti-clockwise to weaken it as necessary.

19 On completion, disconnect the exhaust gas analyser and check the idle speed setting as described above.

12 Fuel injection system components - removal and refitting



Note: Refer to the precautions contained in Section 1 before proceeding.

Atmospheric pressure sensor Removal

1 Open the fusebox cover under the fascia on the driver's side.

2 Undo the retaining screw and withdraw the sensor from the mounting bracket.

3 Disconnect the wiring multiplug and remove the sensor.

Refitting

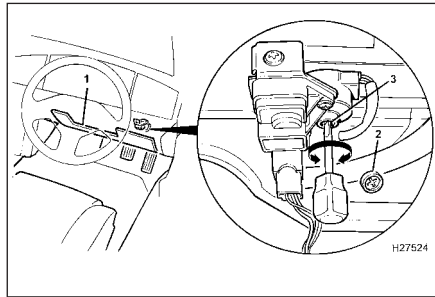
4 Refitting is a reversal of removal.

Resonator

Removal

5 Apply the handbrake, jack up the front of the car and support it on axle stands.

6 Undo the two screws and one bolt securing



11.13b Idle mixture adjuster location on early 2.7 litre non-catalyst engines

1 Remove fusebox cover for access

2 Hook out tamperproof cap

3 Turn adjuster as required

the access panel to the underside of the front wheelarch on the left-hand side.

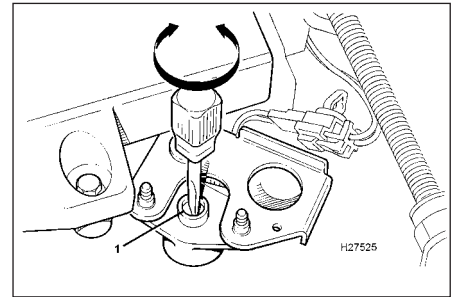
7 Undo the four remaining screws, disengage the access panel from the front spoiler, and remove it from under the car.

8 Disconnect the wiring multiplug from the control solenoid.

9 Disconnect the vacuum hose at the T-piece connector.

10 Undo the two bolts and withdraw the resonator assembly from under the front wheelarch.

11 Remove the spacers and rubber mountings from the resonator.



11.13c Idle mixture adjuster screw (1) under the driver's seat on later 2.7 litre non-catalyst engines

12 With the unit removed, the control solenoid and valve control diaphragm, together with the pipes and hoses, can be removed as required.

Refitting

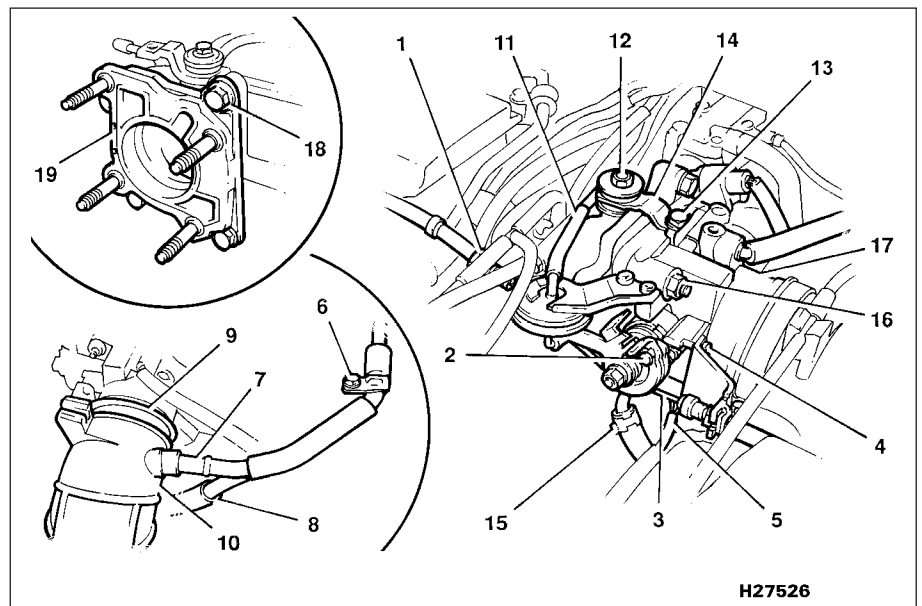
13 Refitting is a reversal of removal.

Throttle body

Removal

14 Partially drain the cooling system as described in Chapter 1, to below the level of the throttle body.

15 Open the throttle fully by hand, and slip the accelerator inner cable end out of the slot on the throttle lever (see illustration).



12.15 Throttle body components and attachment details

1 Outer accelerator cable

2 Inner accelerator connection

3 Kick-down cable

4 Kickdown cable support bracket screws

5 Throttle angle sensor wiring multiplug

6 Breather pipe retaining bolt

7 Breather pipe upper connection

8 Breather pipe lower connection

9 Intake trunking clip

10 Intake trunking

11 Throttle diaphragm vacuum hose

12 Support strap rear bolt

13 Support strap front bolt

14 Support strap

15 Lower air hose

16 Throttle body retaining nuts

17 Throttle body

18 Rubber insulator retaining bolts

19 Rubber insulator



12.19 Throttle angle sensor wiring multiplug location



12.30 Undo the bolts securing the vacuum pipe and crankcase ventilation pipe support brackets



12.31 Disconnect the wiring multiplug from the idle control valve

16 Slacken the outer cable locknuts, then withdraw the outer cable from the support bracket.

17 On automatic transmission models, release the kickdown cable inner cable end from the throttle lever.

18 Undo the two screws securing the kickdown cable support bracket to the throttle body and move the bracket and cable to one side.

19 Disconnect the wiring multiplug from the throttle angle sensor (see illustration).

20 Release the coil HT cable from the clip on top of the air intake trunking.

21 Undo the breather pipe support bracket bolt and remove the breather pipe from the side of the intake trunking.

22 Slacken the clip and release the trunking from the throttle body.

23 Disconnect the vacuum hose from the throttle diaphragm.

24 Undo the two bolts and remove the support strap from the top of the throttle body.

25 Release the clip and disconnect the lower air hose from the underside of the throttle body.

26 Undo the four nuts, move the air intake trunking aside, and withdraw the throttle body from the studs of the rubber insulator.

27 If required, the rubber insulator can be removed from the inlet manifold after undoing the four retaining bolts.

Refitting

28 Refitting is a reversal of removal. Adjust the accelerator cable as described in Section 3, and refill the cooling system (Chapter 1).

Electronic idle control valve

Removal

29 Partially drain the cooling system as described in Chapter 1, to below the level of the idle control valve.

30 Undo the bolts securing the vacuum pipe and crankcase ventilation pipe support brackets (see illustration).

31 Disconnect the wiring multiplug from the idle control valve (see illustration).

32 Release the clips and disconnect the two coolant hoses from the idle control valve.

33 Undo the two bolts and remove the idle control valve from the inlet manifold. Recover the sealing O-ring from the base of the valve.

Refitting

34 Refitting is a reversal of removal but use a new O-ring seal. Refill the cooling system (Chapter 1), and adjust the idle speed (Section 11).

Dashpot diaphragm assembly

Removal

35 Disconnect the vacuum hose from the top of the diaphragm (see illustration).

36 Undo the two screws securing the diaphragm bracket to the throttle body.

37 Disconnect the operating rod from the throttle lever and remove the diaphragm assembly.

Refitting

38 Refitting is a reversal of removal.

Fast idle valve

Removal

39 Partially drain the cooling system as described in Chapter 1, to below the level of the fast idle valve.

40 Release the clips and disconnect the two coolant hoses from the fast idle valve (see illustration).

41 Undo the three bolts and remove the

valve from the inlet manifold. Recover the two O-ring seals.

Refitting

42 Refitting is a reversal of removal, but renew the O-ring seals and refill the cooling system, as described in Chapter, 1 on completion.

Front fuel rail and injectors

Removal

43 Disconnect the battery negative (earth) lead (refer to Chapter 5, Section 1).

44 Relieve the fuel system pressure as described in Section 5.

45 Disconnect the spark plug HT leads from the three rear spark plugs, and identify the leads for correct reconnection.

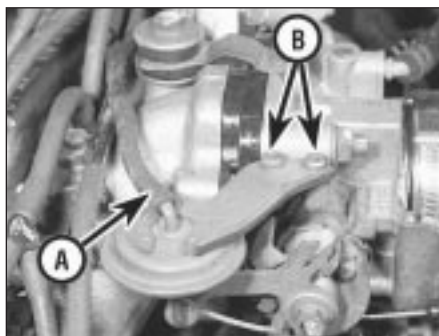
46 Release the HT leads from the support clips and from the top of the inlet manifold cover and move the leads clear (see illustration).

47 Undo the bolt securing the fuel pipe clip at the corner of the inlet manifold cover.

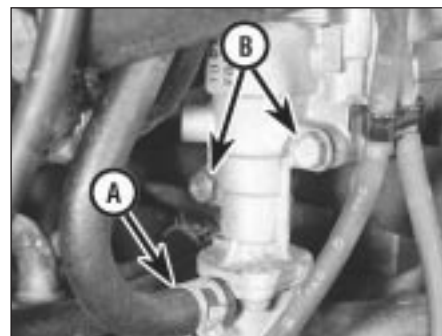
48 Release the clips and disconnect the breather hose from the inlet manifold cover and camshaft cover.

49 Open the throttle fully by hand, and slip the accelerator inner cable end out of the slot on the throttle lever.

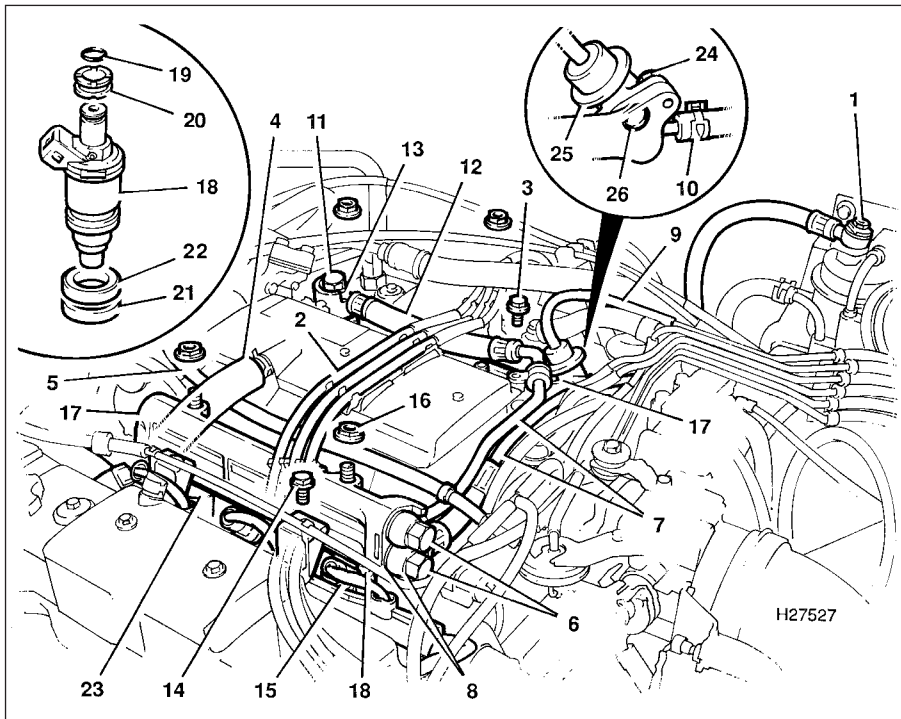
50 Slacken the outer cable locknuts; withdraw the outer cable from the support bracket. Release the cable from the clips and move it clear.



12.35 Dashpot diaphragm vacuum hose (A) and retaining screws (B)



12.40 Fast idle valve coolant hose (A) and mounting bolts (B)



12.46 Fuel rails and injector components and attachments

- | | | |
|--|---|--|
| 1 Fuel filter banjo bolt bleed screw | 9 Fuel pressure regulator vacuum hose | 17 Fuel rail |
| 2 HT lead support clips | 10 Fuel return hose | 18 Fuel injector |
| 3 Fuel pipe clip retaining bolt | 11 Fuel pipe banjo union bolt | 19 O-ring |
| 4 Breather hose | 12 Fuel pipe | 20 Cushion ring |
| 5 Accelerator cable | 13 Banjo union sealing washer locations | 21 Insulator |
| 6 Fuel pipe banjo union bolts | 14 Harness bracket retaining bolts | 22 Sealing ring |
| 7 Fuel pipes | 15 Fuel injector multiplugs | 23 Manifold spacers |
| 8 Banjo union sealing washer locations | 16 Fuel rail retaining nuts | 24 Fuel pressure regulator retaining bolts |
| | | 25 Fuel pressure regulator |
| | | 26 O-ring |

51 Disconnect the cruise control vacuum hose at the T-piece connector, release the hose from the support clips and move it clear.
52 Undo the two banjo union bolts securing the fuel pipes to the front fuel rail. Release the pipes and collect the copper washers. Cover the open unions after disconnection then move the pipes away.

53 Undo the bolts securing the two harness brackets at the front of the fuel rail and move the brackets aside.

54 Disconnect the wiring multiplugs from the three fuel injectors (**see illustration**).

55 Undo the two fuel rail retaining nuts and lift the fuel rail off the injectors.

56 Withdraw the injectors from their locations and collect the O-ring and cushion ring at the top, and the insulator and sealing ring at the bottom from each injector.

57 Collect the two spacers from the inlet manifold.

Refitting

58 Refitting is a reversal of removal, but renew the O-rings, cushion rings, insulators and sealing rings on each injector, and use new washers on the fuel pipe banjo unions.

Tighten the banjo union bolts to the specified torque.

59 Reconnect and adjust the accelerator cable as described in Section 3.

Rear fuel rail and injectors

Removal

60 Carry out the operations described in paragraphs 43 to 47 above.



12.54 Disconnect the injector wiring multiplugs

61 Disconnect the vacuum hose from the top of the fuel pressure regulator.

62 Release the clip and disconnect the fuel return hose from the fuel pressure regulator. Plug the hose and regulator union.

63 Undo the banjo union bolt securing the fuel pipe to the rear fuel rail. Release the pipe and collect the copper washers. Cover the open union after disconnection then move the pipe away.

64 Undo the bolts securing the two harness brackets at the rear of the fuel rail and move the brackets aside.

65 Disconnect the wiring multiplugs from the three fuel injectors.

66 Undo the two fuel rail retaining nuts and lift the fuel rail off the injectors.

67 Withdraw the injectors from their locations and collect the O-ring and cushion ring at the top, and the insulator and sealing ring at the bottom from each injector.

68 Collect the two spacers from the inlet manifold.

69 If required the fuel pressure regulator can be removed from the fuel rail after removing the two retaining bolts. Collect the O-ring seal between regulator and fuel rail.

Refitting

70 Refitting is a reversal of removal; renew the O-rings, cushion rings, insulators and sealing rings on each injector, and use new washers on the fuel pipe banjo unions. Tighten the banjo union bolts to the specified torque. Renew the regulator O-ring if the regulator was removed.

Fuel pressure regulator

Removal

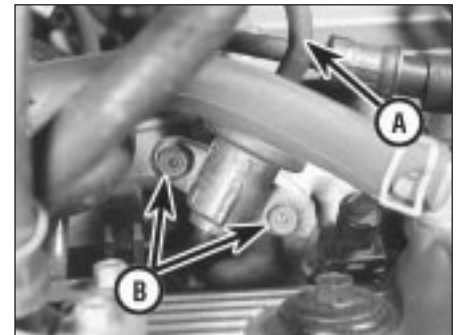
71 Disconnect the battery negative (earth) lead (refer to Chapter 5, Section 1).

72 Relieve the fuel system pressure as described in Section 5.

73 Disconnect the vacuum hose from the top of the fuel pressure regulator (**see illustration**).

74 Release the clip and disconnect the fuel return hose from the fuel pressure regulator. Plug the hose and pressure regulator union.

75 Undo the two bolts and remove the regulator. Collect the O-ring seal between regulator and fuel rail.



12.73 Fuel pressure regulator vacuum hose (A) and retaining bolts (B)



12.80 Disconnect the ECU wiring multiplugs



12.81 Where fitted, undo the two bolts and remove the cooling fan timer module



12.87 Inertia switch location on the engine compartment bulkhead

Refitting

76 Refitting is a reversal of removal but use a new sealing O-ring.

Electronic control unit

Removal

77 Disconnect the battery negative (earth) lead (refer to Chapter 5, Section 1).

78 Remove the driver's seat as described in Chapter 11.

79 Undo the four bolts securing the ECU to the floor. Lift off the ECU cover and collect the spacers between the ECU flange and the floor.

80 Disconnect the ECU wiring multiplugs (see illustration).

81 Where fitted, undo the two bolts and remove the cooling fan timer module from the ECU base (see illustration). Remove the ECU.

Refitting

82 Refitting is a reversal of removal.

Inertia switch

Removal

83 On early models the switch is located behind the centre console inside the car.

84 Remove the stud from the centre console side cover on the left-hand side, and remove the cover.

85 Undo the two screws securing the inertia switch to the mounting plate, disconnect the wiring multiplug and remove the switch.

86 Check the operation of the switch by striking the forward-facing side hard against the palm of your hand. The setting button should trip out when this is done. If not, renew the switch.

87 On later models, disconnect the wiring multiplug, undo the two screws and remove the switch from the engine compartment bulkhead (see illustration).

Refitting

88 Refitting is a reversal of removal. Press the button down to reset the switch after installation.

Main control box

89 In addition to the sensors, valves and

solenoids described previously in this Section, a number of additional units are located in the main control box mounted on the engine compartment bulkhead. These devices are used by the ECU for control of the fuel, ignition and emissions control systems. Many of the sensors utilise manifold vacuum for their operation and are connected by means of a series of numbered vacuum hoses and pipes to various locations on, and around, the engine. Three wiring multiplugs connect the sensors electrically to the main harness.

90 The layout, and number of sensors fitted, varies considerably according to engine, model year, emission equipment level, and vehicle accessories or options. Each of the sensors can be renewed separately, but testing, either individually, or as part of their respective system, must be entrusted to a dealer with dedicated test equipment.

Removal

91 Disconnect the battery negative (earth) lead (refer to Chapter 5, Section 1).

92 Slacken the two bolts securing the control box to the bulkhead.

93 Undo the three screws and lift off the control box upper cover (see illustration).

94 Note the connections, then release the wiring multiplugs from the mounting brackets on the front of the control box and disconnect them.

95 Remove the control box lower cover from the valve plate assembly.

96 Check that each of the vacuum hoses and

its corresponding pipe on the pipe block is numbered. If not, label each hose and pipe.

97 Some of the sensors are accessible at this stage and if they are to be renewed individually, disconnect the vacuum hose, undo the screws and remove the relevant unit. If the complete control box is being removed, proceed as follows.

98 Pull the vacuum hoses off the pipe stubs (see illustration).

99 Undo the bolts securing the valve plate mounting brackets and remove the assembly from the bulkhead.

100 Any sensors not previously accessible can now be removed from the valve plate.

Refitting

101 Refitting is a reversal of removal, but ensure that the labelled vacuum hoses are connected to the correct pipe stub.

13 Cruise control system - general information

A cruise control system is available as standard or optional equipment on certain V6 engine models. The system uses electro-mechanical devices to accurately maintain the vehicle road speed without the use of the accelerator pedal.

The system is controlled by an electronic control unit (ECU) which responds to inputs from the master and set/resume switches, the



12.93 Undo the three screws and lift off the control box upper cover



12.98 Pull the vacuum hoses off the pipe stubs

vehicle speed sensor, the clutch and brake pedal switches and the shift control switch on the transmission. When the system is engaged, the ECU sends signals to the cruise control actuator which regulates the accelerator pedal position by means of a stepper motor and connecting cable. Once the driver has initiated the system, the road speed will be constantly monitored and maintained by the cruise control actuator.

The system can be disengaged at any time either by use of the control switches or by depressing the brake (and where applicable the clutch) pedals, or moving the automatic transmission gear selector to neutral. The ECU memory stores the previously set road speed which can be re-engaged by use of the resume switch.

14 Cruise control system components - removal and refitting



Cruise control actuator

Removal

- 1 Disconnect the wiring multiplug from the actuator stepper motor (**see illustration**).
- 2 Disconnect the vacuum and vent hoses from the actuator.
- 3 Slacken the locknuts on the operating cable at the support bracket on the actuator.
- 4 Release the rubber boot and disconnect the inner cable from the actuator rod.
- 5 Undo the two mounting bolts securing the actuator bracket to the body; remove the actuator and bracket from the engine compartment.
- 6 If necessary, the mounting brackets and solenoid valves can now be removed from the actuator.

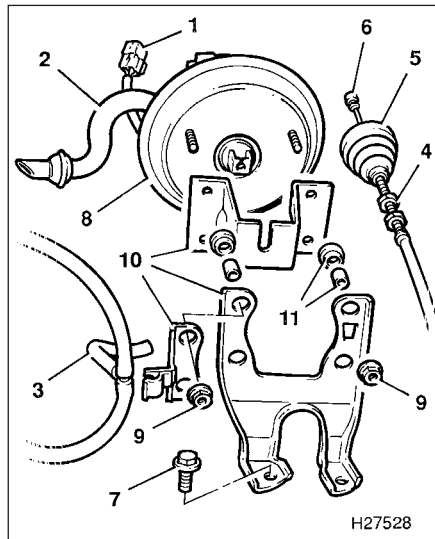
Refitting

- 7 Refitting is a reversal of removal, but adjust the operating cable as described in the following sub-Section on completion.

Operating cable

Removal

- 8 Slacken the outer cable locknuts at the support bracket on the cruise control actuator.
- 9 Release the rubber boot and disconnect the inner cable from the actuator rod.
- 10 From inside the car, release the turnbuckles and lift out the trim panel over the clutch, brake and accelerator pedals.
- 11 Disconnect the inner cable from the accelerator pedal.
- 12 Release the cable from the engine



14.1 Cruise control actuator attachment details

- 1 Stepper motor wiring multiplug
- 2 Vent hose
- 3 Vacuum hose
- 4 Outer operating cable locknuts
- 5 Rubber boot
- 6 Inner operating cable
- 7 Actuator bracket mounting bolts
- 8 Actuator
- 9 Actuator to bracket mounting nuts
- 10 Bracket components
- 11 Bushes and sleeves

compartment bulkhead, and the support clips, and withdraw the cable from the car.

Refitting and adjustment

- 13 Refit the cable using a reversal of removal then adjust it as follows.
- 14 First check that the accelerator cable is correctly adjusted as described in Section 3.
- 15 Start the engine and allow it to idle.
- 16 Release the rubber boot at the actuator rod.
- 17 Push the actuator rod in, and measure the movement until the engine speed just begins to rise.
- 18 Adjust the position of the outer cable, by means of the locknuts, so that there is 9.5 to 12.5 mm of actuator rod movement before the engine speed increases off idle.
- 19 Tighten the locknuts and refit the rubber boot on completion.

Cruise control switches

Main facia switch

- 20 The procedure for removal and refitting of the main switch is described in Chapter 12, Section 4.

Set/resume switch

- 21 Refer to Chapter 10, Section 18 and remove the steering wheel pad or the airbag module as applicable.
- 22 Disconnect the switch wiring multiplug and the two Lucas connectors at the steering wheel.
- 23 On early models, release the switch unit from the steering wheel pad. On later models, undo the two switch retaining screws and the single mounting bracket-to-steering wheel retaining bolt.
- 24 Remove the mounting bracket and withdraw the switch from the steering wheel.
- 25 Refit the switch using a reversal of removal then refit the steering wheel pad or airbag module as described in Chapter 10.

Clutch and brake switches

- 26 To remove the clutch switch, release the turnbuckles and lift out the trim panel over the clutch, brake and accelerator pedals.
- 27 Disconnect the switch wiring multiplug.
- 28 Slacken the locknut and unscrew the switch from the pedal bracket.
- 29 Refit the switch by screwing it in until the plunger is fully depressed, then tighten the locknut.
- 30 Reconnect the multiplug and refit trim panels.
- 31 The brake switch is combined with the stop-light switch and reference should be made to Chapter 9, Section 21.

Electronic control unit

Removal

- 32 Release the turnbuckles and lift out the trim panel over the clutch, brake and accelerator pedals.
- 33 Disconnect the ECU multiplug, undo the retaining bolt and withdraw the ECU from its location on the door pillar bracket.

Refitting

- 34 Refitting is a reversal of removal.

15 Exhaust system - general information and component renewal

With the exception of the twin downpipes, the exhaust system is the same as used on 4-cylinder engines. Refer to Part A, Section 13 for exhaust system details, and to Part E, Section 3, for information on the catalytic converter.