Chapter 4 Part A:
Fuel system - single-point injection

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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 

Specifications

System type

1.4 litre models	Bosch Mono-Motronic

Fuel injection system data

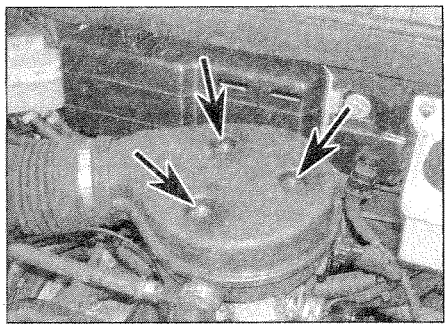
Fuel pump type	Electric, immersed in fuel tank
Fuel pump delivery rate	120 litres/hour minimum
Regulated fuel pressure	1.0 ± 0.2 bar
Inlet air temperature sensor resistance (approx.):	
At 20°C	2300 ohms
At -10°C	9000 ohms
Coolant temperature sensor resistance (approx.):	
At -10°C	9000 ohms
At 20°C	2300 ohms
At 100°C	180 ohms
Injector duration (at idle)	1.5 ms
Engine idle speed (not adjustable)	850 ± 50 rpm
Exhaust emissions limits:	
CO	0.35 % maximum
HC	90 ppm maximum
CO_2	13 % maximum
Accelerator cable throttle disc cam-to-stop clearance	0.2 to 0.5 mm

Recommended fuel

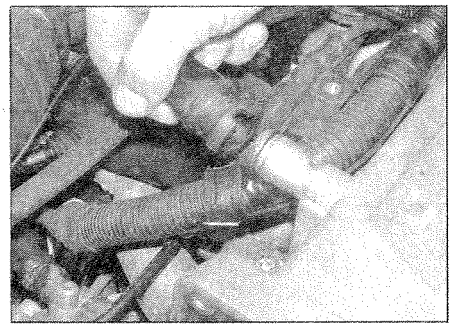
Minimum octane rating	95 RON unleaded (Premium unleaded)

Torque wrench settings

	Nm	lbf ft
Coolant temperature sensor	25	18
Fuel filter collar nut	5	4
Fuel tank	28	21
Idle control stepper motor	4	3
Inlet manifold	25	18
Inlet union to filter	31	23
Outlet union to filter	15	11
Throttle body-to-manifold bolts:		
M6 bolts	9	7
M8 bolts	25	18
Throttle potentiometer	25	18



2.2a Unscrew the air box securing nuts . . .



2.2b . . . and pull off the breather hose from the camshaft cover

1 General information and precautions

General information

The Bosch Mono-Motronic single point injection (SPI) system fitted only to 1.4 litre engine models is a self-contained engine management system, which controls both the fuel injection and ignition. This Chapter deals with the fuel supply and fuel injection system components only - refer to Chapter 5B for details of the ignition system components.

The fuel supply system comprises a fuel tank, an electric fuel pump, a fuel filter, fuel supply and return lines. The fuel injection system components include the throttle body with an integral electromagnetic fuel injector, and an Electronic Control Unit (ECU) together with its associated sensors, actuators and wiring.

The fuel pump is mounted inside the fuel tank, submerged in the fuel. It delivers a constant supply of fuel through a cartridge filter, mounted underneath the floorpan, to the throttle body. The fuel pressure regulator (integral with the throttle body) maintains a constant fuel pressure at the fuel injector and returns excess fuel to the tank via the return line. This constant flow system also helps to reduce fuel temperature and prevents vaporisation.

The fuel injector is opened and closed by an Electronic Control Unit (ECU), which calculates the injection timing and duration according to engine speed, throttle position and rate of opening, inlet air temperature, coolant temperature and exhaust gas oxygen content information, received from sensors mounted on the engine.

Inlet air is drawn into the engine through the air cleaner, which contains a renewable paper filter element. The inlet air temperature is regulated by a vacuum operated valve mounted in the air ducting, which blends air at ambient temperature with hot air, drawn from over the exhaust manifold.

Idle speed is controlled principally by a stepper motor located on the side of the throttle body. In addition, fine control of the idle speed is achieved by the ECU advancing or retarding the ignition timing in small increments, to adjust the torque produced by the engine. The ECU provides cold starting enrichment by monitoring the coolant and inlet air temperature parameters and increasing the injector opening duration accordingly.

The exhaust gas oxygen content is constantly monitored by the ECU via the oxygen (or lambda) sensor, which is mounted in the exhaust downpipe. The ECU then uses this information to modify the injection timing and duration to maintain the optimum air/fuel ratio. An exhaust catalyst is fitted to all SPI models. The ECU also controls the operation of the activated charcoal filter evaporative loss system - refer to Chapter 4C for further details.

It should be noted that fault diagnosis of the Bosch Mono-Motronic system is only possible with dedicated electronic test equipment. Problems with the system should therefore be referred to a FIAT dealer for assessment. Once the fault has been identified, the appropriate removal/refitting procedures detailed in the following Sections can then be followed.

Precautions

Many procedures in this Chapter require the disconnection and/or removal of fuel lines, which may result in fuel spillage. Before carrying out any work 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.

Note that residual pressure will remain in the fuel lines long after the vehicle was last used. When disconnecting any fuel line, first depressurise the fuel system as described in Section 8.

2 Air cleaner and inlet system - removal and refitting

Removal

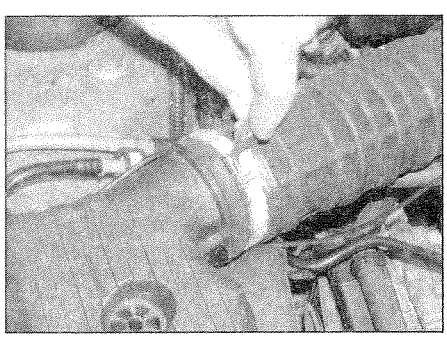
1 Remove the air cleaner element as described in Chapter 1.

2 Slacken and withdraw the three nuts and release the air box from the top of the throttle body. Release the clips and disconnect the breather hoses from the side of the air box or from the camshaft cover **(see illustrations)**.

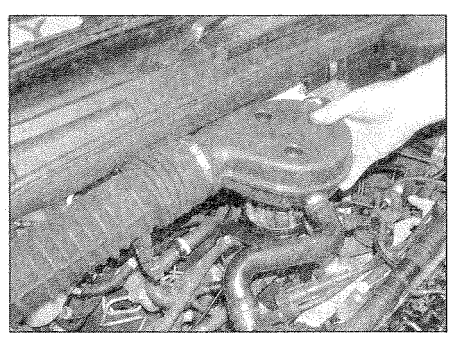
3 Disconnect the air duct from the air cleaner, then lift the air box and duct from the engine compartment **(see illustrations)**. Recover the sealing ring from the throttle body aperture.

4 Disconnect the vacuum hoses from the throttle body and the air temperature control valve **(see illustration)**.

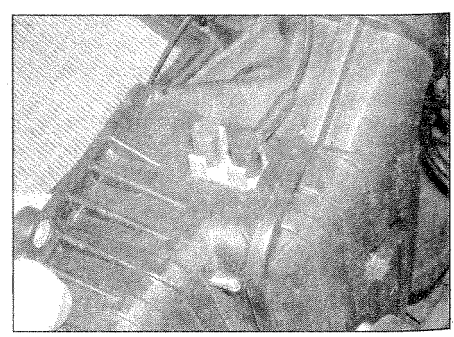
5 Detach the warm-air inlet hose from the exhaust manifold cowl. Undo the securing screws and detach the air inlet elbow from the inner wing; pull off the (front) air inlet duct which fits between the elbow and the air cleaner lid **(see illustrations)**.



2.3a Release the clip securing the air inlet duct . . .



2.3b . . . and lift the duct and air box from the throttle body



2.4 Disconnect the vacuum hoses from the temperature control valve

6 Slacken and withdraw the securing screws and remove the air cleaner from the engine compartment **(see illustrations)**.

Refitting

7 Refitting is a reversal of removal.

3 Inlet air temperature regulator - removal and refitting

Flap valve

Checking

1 The flap valve is located in the section of intake ducting that runs between the intake scoop, at the front of the engine compartment, and the front of the air cleaner.
2 To check the operation of the valve, disconnect the hot-air inlet hose with the engine cold, and use a mirror to check that the flap is positioned horizontally, to admit only air from the hot-air inlet hose exhaust manifold.
3 Next, warm up the engine and check that the flap moves to admit a mixture of cold air and hot air from the inlet ducts. If no movement is observed, apply vacuum directly to the flap valve vacuum hose and check for movement. If the valve now operates, the thermostatic vacuum valve may be faulty.

Removal

4 Remove the front intake duct from the air cleaner lid as described in Section 2.
5 Unscrew the retaining screw and remove the flap valve unit from the air duct.

Refitting

6 Refitting is a reversal of removal.

Temperature control valve

Removal

7 Remove the lid from the air cleaner, as described in the air filter renewal procedure in Chapter 1 **(see illustration)**.
8 Disconnect the vacuum hoses from the valve ports **(see illustration)**. Make a careful note of their order of fitment - on the project car, the brown end fitting was the lower connection.
9 Carefully prise off the metal retaining clip and release the valve from the air cleaner lid **(see illustration)**. Recover the gasket and renew it.

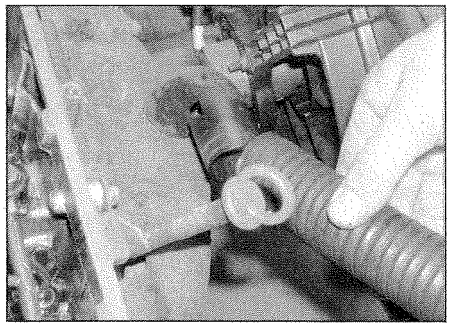
Refitting

10 Refitting is a reversal of removal.

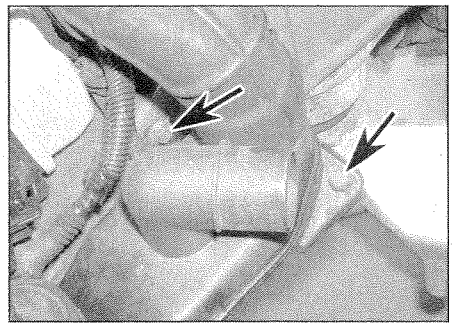
4 Accelerator cable - removal, refitting and adjustment

Removal

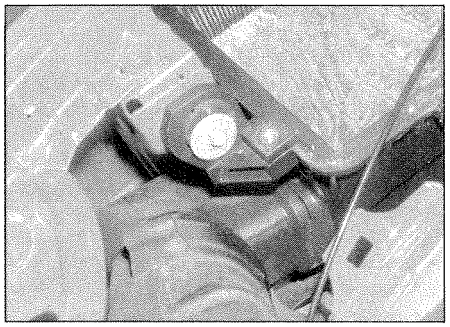
1 Disconnect the battery negative cable and position it away from the terminal.



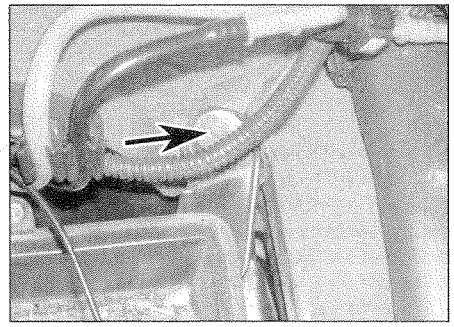
2.5a Pull off the warm-air inlet duct . . .



2.5b . . . and unscrew the air inlet elbow from the inner wing

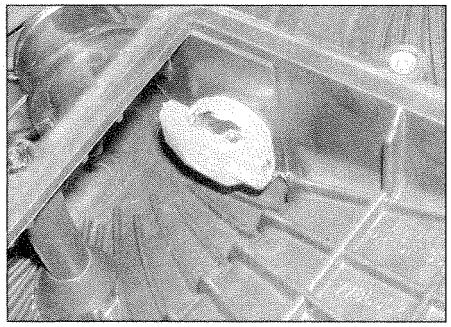


2.6a Air cleaner mounting bolt at the front . . .

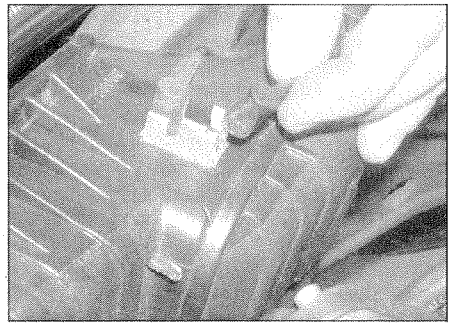


2.6b . . . and the rear of the inner wing (arrowed)

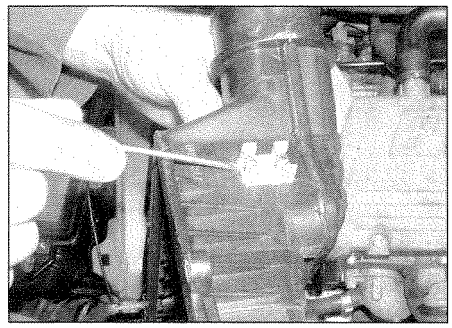
2 Remove the air box from the top of the throttle body as described in Section 2.
3 Relieve the strain from the accelerator cable by grasping the remote throttle disc cam and turning it by hand. Unhook the nipple at the end of the cable inner from the throttle disc cam **(see illustration)**.
4 Remove the outer cable locking clip, then



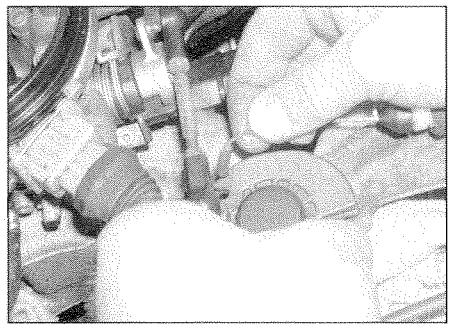
3.7 View of the temperature control valve with the air cleaner lid removed



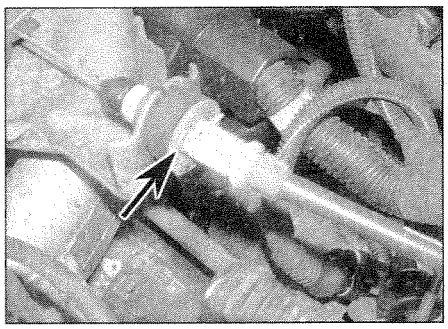
3.8 Disconnecting the temperature control valve vacuum hoses from the air cleaner



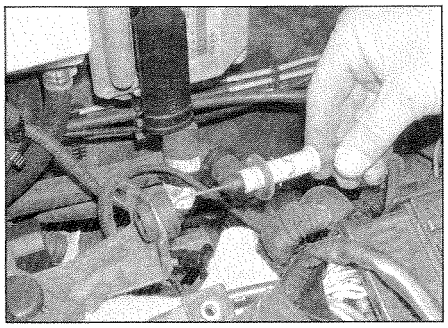
3.9 Carefully prise off the valve retaining clip



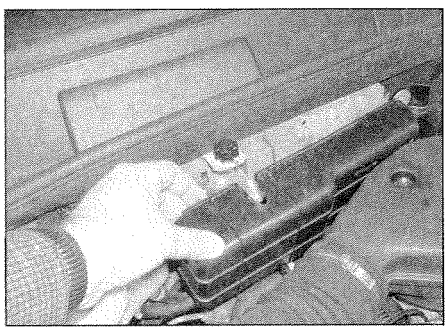
4.3 Unhook the throttle cable from the cam



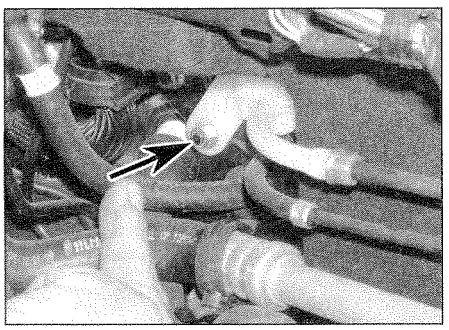
4.4a Remove the outer cable locking clip (arrowed) . . .



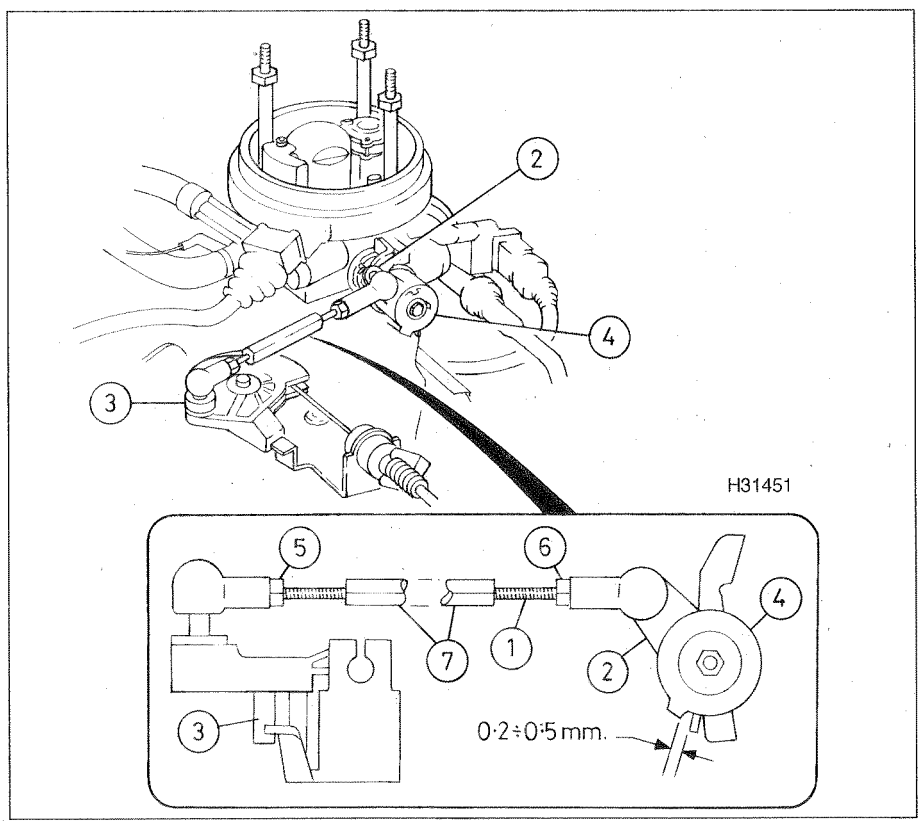
4.4b . . . and release the cable from the mounting bracket



4.5 Removing the fuse panel cover



4.7 Accelerator cable guide securing nut (arrowed)



4.18 Accelerator cable and linkrod adjustment details

1 *Linkrod*
2 *Throttle body throttle lever*
3 *Remote throttle disc cam*
4 *Throttle body throttle disc cam*
5 *Locknut*
6 *Locknut*
7 *Hexagonal section*

disengage the inner cable from the remote throttle disc cam, and release the outer cable from its mounting bracket **(see illustrations)**. Mark the slot in which the locking clip was fitted, to ensure correct refitting.

5 Undo the securing screw and remove the protective cover from the fuse panel at the rear of the engine compartment **(see illustration)**. Slacken and withdraw the bolts then detach the fuse panel from the bulkhead and position it one side. There is no need to unplug the harness connectors, but take care to avoid straining the wiring.

6 Prise out the stud and detach the right-hand end of the padding panel from the bulkhead, at the rear of the engine compartment.

7 Undo the nut and detach the accelerator cable guide from the bulkhead **(see illustration)**. Prise the rubber grommet from the bulkhead aperture.

8 Release the accelerator cable from the clip located underneath the engine management system ECU, at the rear of the engine compartment.

9 Working in the driver's footwell, undo the three securing screws and remove the footrest.

10 Remove the trim panels from the underside of the facia, as necessary to gain access to the foot pedal mountings. Release the nipple at the end of the accelerator cable from the spigot at the top of the accelerator pedal linkage.

11 Withdraw the accelerator cable through the bulkhead aperture from the inside of the vehicle into the engine compartment.

Refitting

12 Refitting is a reverse of the removal process

Adjustment

13 Disconnect the linkrod from the throttle disc cam by pressing off one of the ball joints.

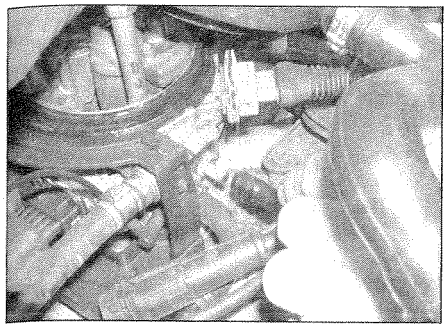
14 Remove the locking clip from the accelerator cable outer.

15 Adjust the position of the cable in its mounting bracket such that all slack is removed from the cable inner, then refit the clip by sliding it into the slot closest to the surface of the cable mounting bracket.

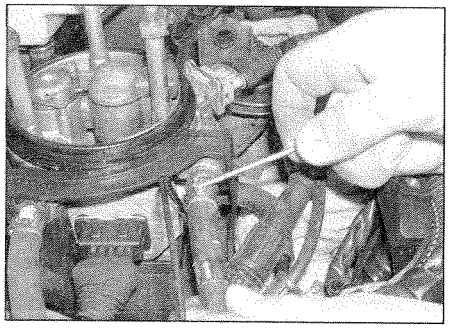
16 Check that throttle disc is positioned against its end stop - if it is not, there is too much tension in the accelerator cable; reposition the locking clip to slacken the cable slightly. When correctly adjusted, the accelerator cable should eliminate any free movement at the accelerator pedal; check this by moving the pedal by hand.

17 Reconnect the linkrod to the throttle disc cam by pressing the balljoint back onto its spigot. Start the engine and allow it to reach operating temperature, then switch the engine off.

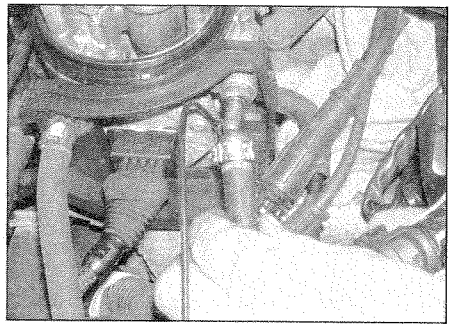
18 At the throttle body, with the accelerator pedal in the rest position, check that the clearance between the throttle disc cam and its stop is as listed in the Specifications. If



5.1 Disconnect the breather hose from the throttle body



5.2a Release the hose clips . . .



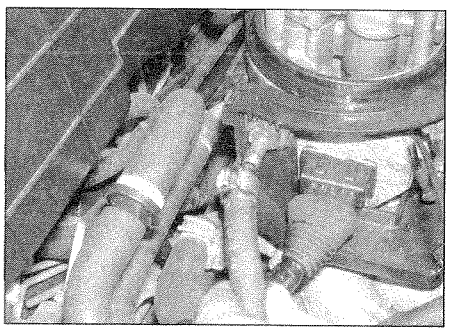
5.2b . . . and disconnect the fuel supply . . .

necessary, adjust the length of the linkrod by slackening the locknuts and rotating the hexagonal section of the rod, to obtain the correct clearance. On completion, tighten the locknuts securely **(see illustration)**.

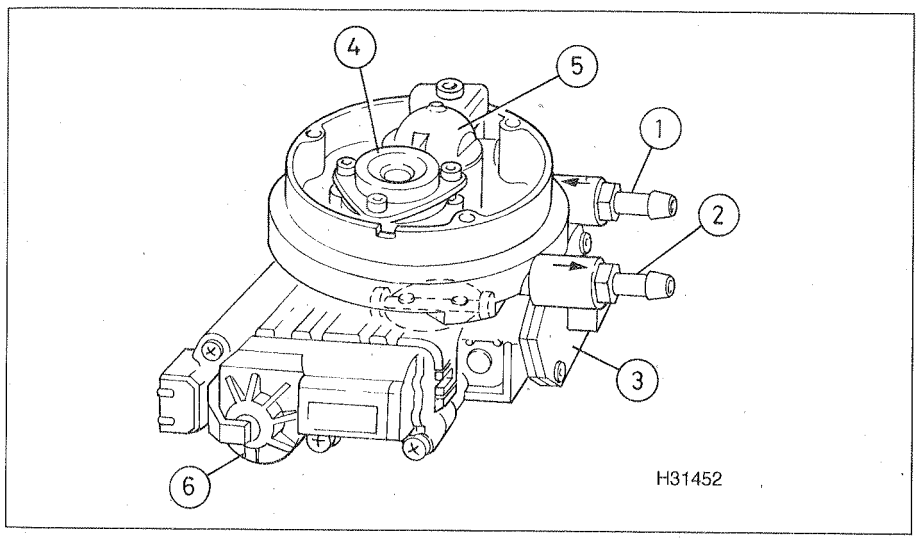
19 With the engine switched off, have an assistant depress the accelerator pedal fully, then check that the throttle disc is wide open by looking down into the throttle body. Repeat the adjustment process if this is not the case.

5 Engine management system components - removal and refitting

Note: *Refer to the precautions in Section 1 before proceeding. Also, check parts availability before dismantling - new parts may have to be sourced from a Bosch agent, rather than from a FIAT dealer.*



5.2c . . . and return hoses from the throttle body



5.3a Throttle body components

1 *Fuel inlet fitting*
2 *Fuel return fitting*
3 *Throttle potentiometer*
4 *Fuel pressure regulator*
5 *Fuel injector*
6 *Idle control stepper motor*

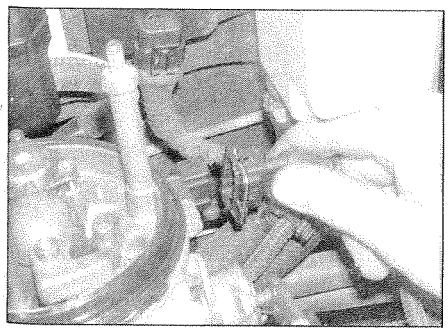
Throttle body assembly

Removal

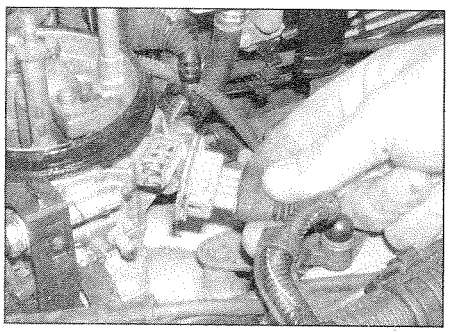
1 Remove the air box and the associated air ducting from the top of the throttle body as described in Section 2. Disconnect the crankcase breather hose from the front of the throttle body **(see illustration)**.

2 Depressurise the fuel system with reference to Section 8, then release the retaining clips and disconnect the fuel feed and return hoses from the throttle body assembly (the fuel supply hose is at the front, and has an arrow indicating direction of fuel flow). If the original FIAT retaining clips are still fitted, cut the clips and discard them; replace them with standard fuel hose clips on refitting **(see illustrations)**.

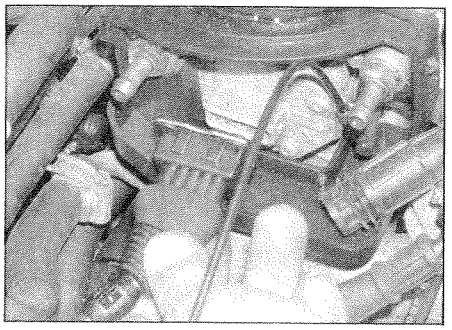
3 Unplug the wiring connectors for the idle control stepper motor, fuel injector, and throttle potentiometer **(see illustrations)**. Label each connector to avoid confusion on refitting.



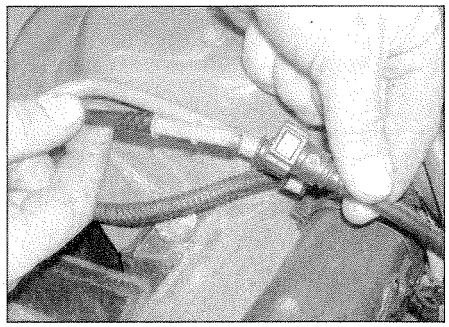
5.3b Disconnect the idle control stepper motor . . .



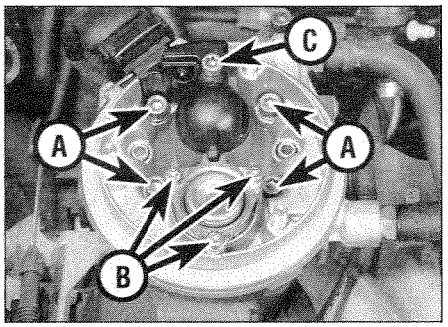
5.3c . . . fuel injector . . .



5.3d . . . and throttle potentiometer wiring plugs



5.5 Disconnecting the charcoal canister hose at the inner wing



5.6 Throttle body through-bolts (A), fuel pressure regulator screws (B) and injector securing screw (C)

4 Disconnect the accelerator cable inner from the remote throttle disc cam as described in Section 4, then disconnect the link rod from the spigot on the throttle disc cam.

5 Disconnect the vacuum hoses that serve the EVAP purge valve and intake air flap valve from the throttle body. Alternatively, the EVAP hose can be disconnected at the connector above the inner wing **(see illustration)**.

6 Slacken and remove the four through-bolts securing the throttle body assembly to the inlet manifold, then remove the assembly along with its insulating spacer **(see illustration)**. Unless specifically required, it is not recommended that the upper and lower halves of the throttle body are separated - these are held together by two inner through-bolts. If the two halves are split, a new gasket must be used on reassembly.

Refitting

7 Refitting is a reversal of the removal procedure, bearing in mind the following points:

a) Examine the insulating spacer for signs of damage, and renew if necessary.

b) Ensure that the throttle body, inlet manifold and insulating spacer mating surfaces are clean and dry, then fit the throttle body and spacer, and securely tighten the retaining bolts.

c) Ensure that all hoses are correctly reconnected and, where necessary, that their retaining clips are securely tightened.

d) Adjust the accelerator cable as described in Section 4.

Fuel injector

Note: *If a faulty injector is suspected, before condemning the injector, it is worth trying the effect of one of the proprietary injector cleaning treatments.*

Removal

8 Remove the air box and the associated air ducting from the top of the throttle body as described in Section 2.

9 Refer to Section 8 and depressurise the fuel system, then disconnect the battery negative lead and position it away from the terminal.

10 Unplug the wiring harness from the injector.

11 Remove the screw and lift off the injector retaining cap/inlet air temperature sensor housing. Recover the gasket.

12 Release the securing washer, then lift the injector out of the throttle body, recovering the O-ring seals **(see illustration)**.

Refitting

13 Refit the injector by following the removal procedure in reverse, renewing all O-ring seals and gaskets. Apply a suitable sealant to the screw threads, then insert and tighten the retaining screw.

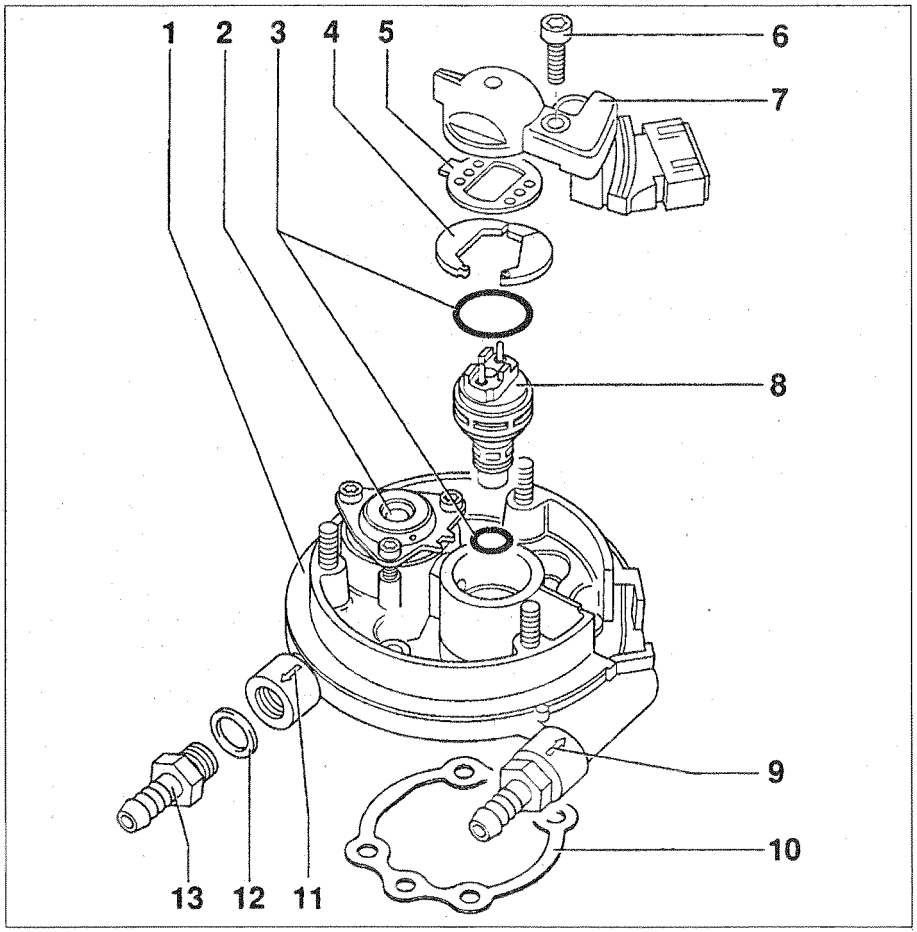
Fuel pressure regulator

Removal

14 Remove the air box and the associated air ducting from the top of the throttle body as described in Section 2.

15 Using a marker pen, make alignment marks between the regulator cover and the throttle body, then undo the three Torx retaining screws. As the screws are loosened, place a rag over the cover to catch any fuel spray which may be released.

16 Lift off the cover, then remove the spring and withdraw the diaphragm, noting its correct fitted orientation. Remove all traces of dirt, and examine the diaphragm for signs of splitting. If damage is found, it may be necessary to renew the complete throttle body assembly - consult a FIAT dealer or Bosch agent.



5.12 Upper half of throttle body, showing injector fitting details

1 Throttle body upper section
2 Fuel pressure regulator
3 O-ring
4 Securing washer
5 Gasket
6 Injector/air inlet temperature sensor securing screw
7 Air inlet temperature sensor
8 Fuel injector
9 Fuel supply connection
10 Upper-to lower section gasket
11 Fuel return connection
12 Seal
13 Fuel hose connection stub

Refitting

17 Refitting is a reversal of removal, ensuring that the diaphragm and cover are fitted the correct way round, and that the retaining screws are securely tightened.

Idle control stepper motor

Removal

18 Remove the air box and the associated air ducting from the top of the throttle body as described in Section 2.

19 Using a crosshead screwdriver, unscrew the three mounting screws and remove the stepper motor from the throttle body. Recover the gasket.

20 Clean the unit and check for damage and wear.

Refitting

21 When refitting the unit, use a new gasket and make sure that the plunger is inserted correctly using the following procedure:

a) Insert the unit and refit the mounting screws loosely.
b) Reconnect the wiring, then switch on the ignition several times so that the unit centralises itself.
c) Securely tighten the mounting screws.
d) Disconnect the battery negative cable, and leave it disconnected for about 20 minutes - the injection/ignition ECU will then position the idle control stepper motor correctly when the battery is reconnected and the engine is started for the first time.

Throttle potentiometer

22 The position of the throttle potentiometer with respect to the throttle disc is pre-set at the factory. Consequently, if the potentiometer is found to be faulty, the entire throttle body must be renewed.

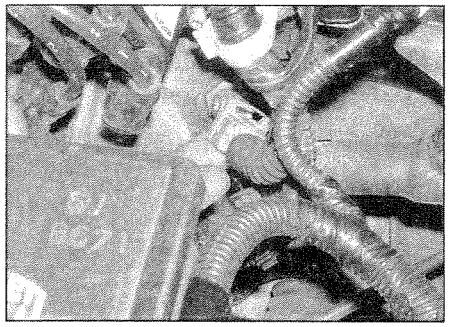
Inlet air temperature sensor

23 The inlet air temperature sensor is an integral part of the fuel injector assembly, and cannot apparently be renewed separately - check with a FIAT dealer or Bosch agent.

Coolant temperature sensor

Removal

24 The coolant temperature sensor is located on the left-hand side of the cylinder head, threaded into the coolant outlet elbow.



5.26 Disconnect the wiring from the coolant temperature sensor

25 Drain the cooling system with reference to Chapter 1.

26 Unplug the wiring from the sensor at the connector **(see illustration)**.

27 Unscrew the sensor and remove it from the cylinder head. Recover the sealing washer where fitted. If using a socket, take care not to damage the wiring connector on the sensor.

Refitting

28 Refitting is a reversal of removal. Where applicable, fit a new sealing washer. Tighten the sensor to the specified torque. Do not exceed the specified torque otherwise the unit's threads may be damaged.

Crankshaft TDC sensor

29 Refer to Chapter 5B, Section 6.

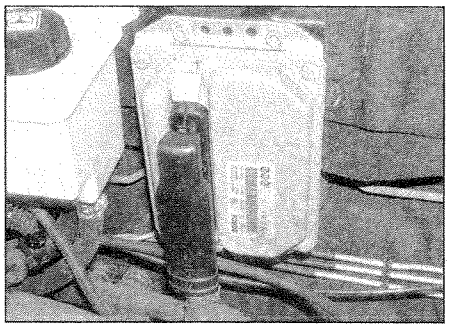
Electronic control unit (ECU)

Note: *The ECU communicates with the anti-theft/immobiliser system when the vehicle is started; once the ignition key electronic code has been stored by the ECU, it cannot be used on any other vehicle. For this reason, do not attempt to diagnose problems with the engine management system by connecting the ECU to another vehicle, or by substituting an ECU from another vehicle.*

Removal

30 The ECU (electronic control unit) is mounted on the bulkhead at the rear of the engine compartment.

31 Prior to removal, disconnect the battery negative cable from its terminal. Disconnecting the ECU multi-plug while there is any power connected to it may well result in damage to the ECU.



5.32 Engine management ECU

32 Release the locking clip at the lower end of the multiway connector, then unhook the upper end by pivoting the connector away from the ECU. Undo the retaining screws and remove the ECU from its bracket **(see illustration)**.

Refitting

33 Refitting is a reversal of removal, making sure that the wiring connector is securely reconnected.

Inertia switch

Removal - early models

34 The inertia safety switch is located underneath the driver's seat. Slide the seat back as far as possible then pull back the carpet for access.

35 Unscrew the two securing bolts, then disconnect the wiring and remove the switch from the vehicle.

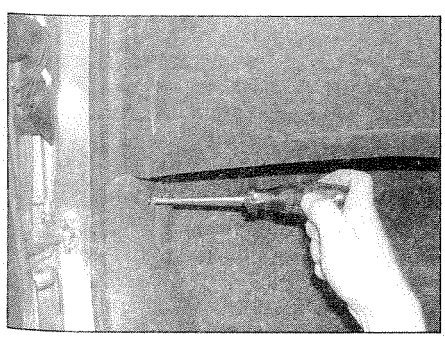
Refitting

36 Refitting is a reversal of removal. If the switch was tripped during removal, reset it after refitting by depressing the centre of the rubber cap.

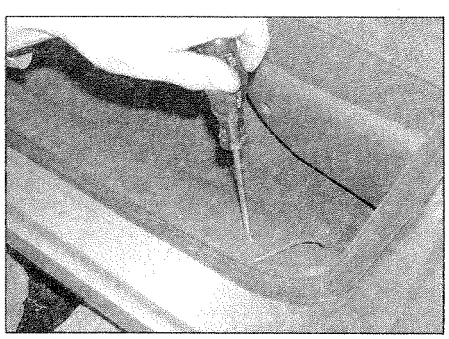
Removal - later models

37 On later models, the inertia switch is located behind a plastic panel to the left of the passenger's footwell.

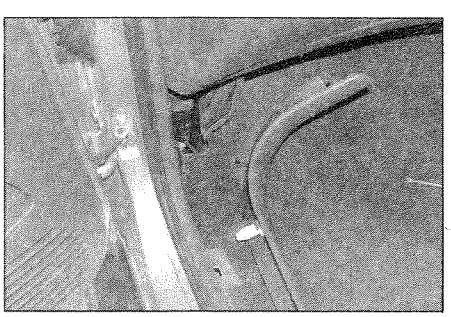
38 Remove the sill trim panel by removing the two screws and releasing the securing clips **(see illustrations)**.



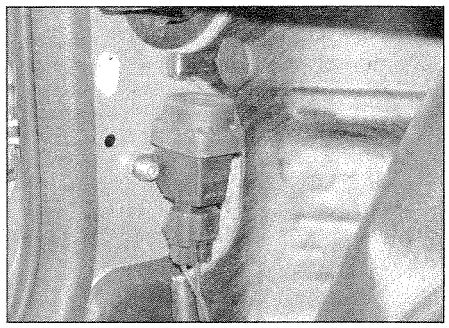
5.38a Remove the screw at the front . . .



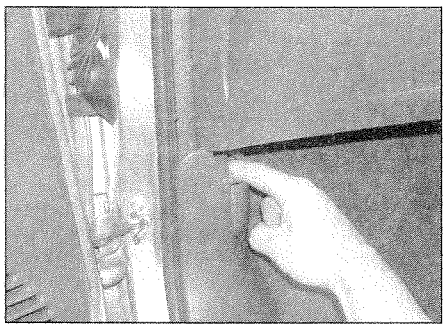
5.38b . . . and at the rear . . .



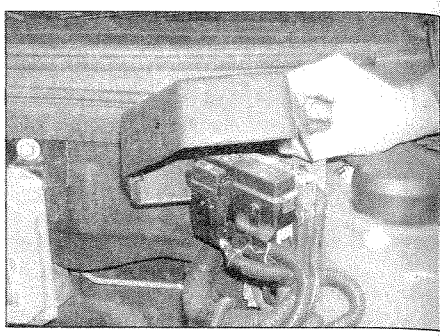
5.38c . . . then release the clips and remove the sill trim panel



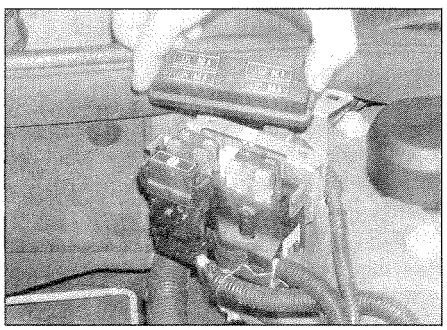
5.39 View of the inertia switch, showing the wiring plug and one of the securing bolts



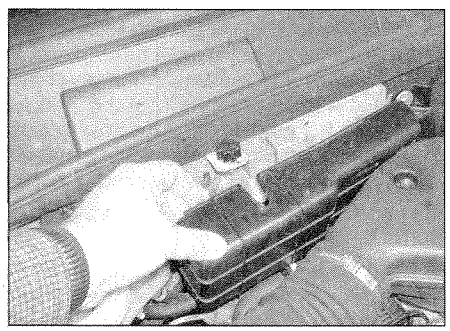
5.40 The inertia switch can be reset without removing the sill trim panel, if required



5.41a Remove the screw and lift off the engine compartment fusebox outer cover . . .



5.41b . . . then lift off the inner cover for access to the fuses



5.42a Unscrew the knob and remove the cover . . .

39 Unscrew the two securing bolts, then disconnect the wiring and remove the switch from the vehicle **(see illustration).**

Refitting

40 Refitting is a reversal of removal. If the switch was tripped during removal, reset it after refitting by depressing the centre of the rubber cap **(see illustration).**

Fuel injection system fuses and relays

Removal

41 The main system 30A fuse is located underneath a plastic cover at the left-hand rear corner of the engine compartment **(see illustrations).**

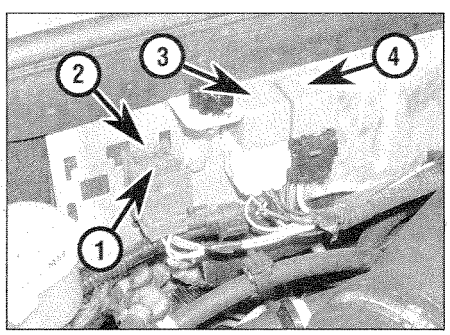
42 Individual fuses for the fuel pump and the injection/ignition system are mounted in the relay box, located to the rear of the engine compartment, directly behind the throttle body intake air box. To gain access, unscrew the knob and lift off the cover **(see illustrations).**

43 To renew a fuse, ensure that the battery negative cable is disconnected, then pull the existing fuse from its socket and press a new one into place.

44 To remove a relay, ensure that the battery negative cable is disconnected, then unclip the relay from its mountings and unplug the wiring connector.

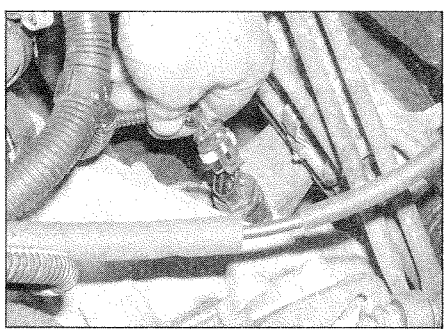
Refitting

45 Refitting is a reversal of removal.



5.42b . . . for access to the fuses and relays

1 Fuel pump fuse
2 Injection/ignition system fuse
3 Injection/ignition system relay
4 Fuel pump relay



5.47 Unplug the connector for the speedometer sensor

Vehicle speed (speedometer) sensor

Removal

46 The vehicle speed sensor is mounted on the top of the transmission casing.

47 Unplug the wiring connector, then unscrew the sensor from the transmission casing **(see illustration).**

Refitting

48 Refitting is a reversal of removal.

6 Fuel pump/ fuel gauge sender unit - removal and refitting

Removal

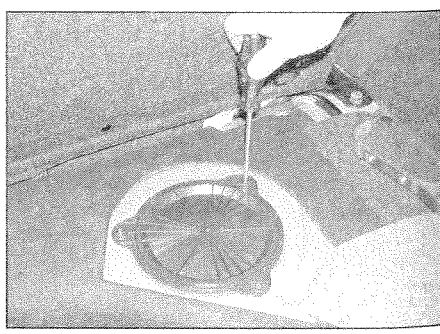
Note: *Refer to the precautions in Section 1 before proceeding.*

1 Disconnect the negative cable from the battery terminal.

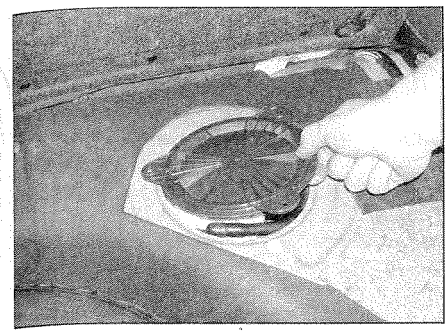
2 Remove the press-stud fixings and detach the carpet from the load space floor.

3 Undo the screws and remove the dust cover from the access aperture in the floorpan **(see illustrations).**

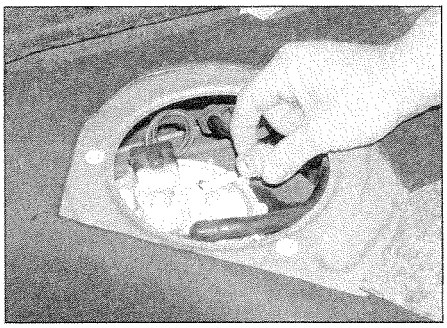
4 Bearing in mind the warning given in Section 1, disconnect the fuel supply and return lines from the fuel pump/gauge sender unit by pressing the tabs **(see illustration).** Plug the ends of the lines or cover them with adhesive tape, to prevent the ingress of



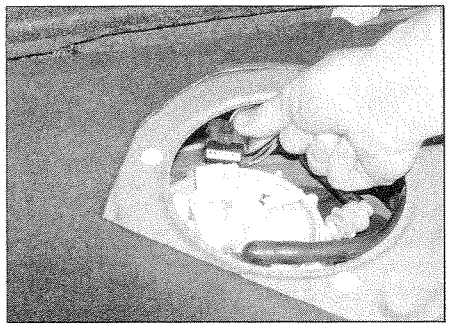
6.3a Remove the screws . . .



6.3b . . . and take off the dust cover for access to the sender unit



6.4 Disconnecting the fuel supply pipe from the sender unit



6.5 Unplug the wiring connector from the sender unit

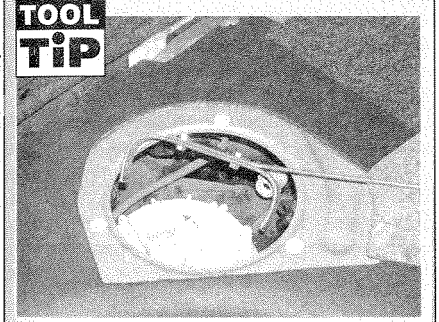
debris. Label the fuel lines to ensure correct refitting.

5 Unplug the wiring connector from the top of the fuel pump/gauge sender unit **(see illustration)**.

6 Where applicable, remove the nut securing the breather pipe to the tank, then prise the pipe end fitting out of the tank **(see illustration)**.

7 Using a suitable tool, unscrew the large ring nut that secures the pump/sender unit to the top of the fuel tank **(see Tool Tip)**.

TOOL TiP



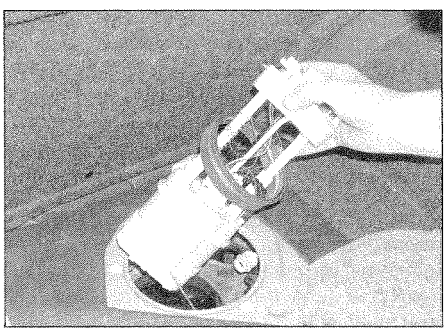
With the limited access available to the sender unit ring nut, and the fact that the nut is very tight, we had to make up a tool to unscrew it. The tool is made from two metal strips - one bent to fit across the ring nut to provide two 'legs' which engage in the ribs on the ring nut, and one bolted to the first, to act as a handle.

8 Carefully withdraw the unit from the fuel tank. Some careful manipulation will be required, to allow the sender unit float arm to exit the tank without snagging. Suspend the unit above the tank aperture for a few minutes, to allow the excess fuel to drain away **(see illustration)**.

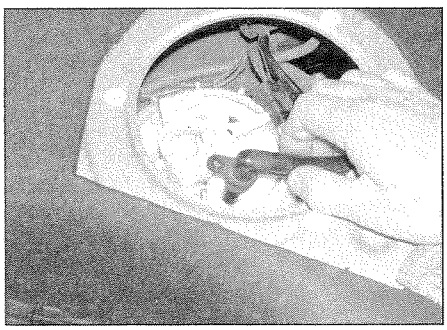
9 Recover the sealing ring from the fuel tank aperture.

HAYNES HiNT ***If the pump/sender unit is not being refitted immediately, screw the retaining nut back onto the tank temporarily, as the fittings may swell over a period of time, making refitting difficult.***

10 The sender unit fuel filter can be inspected by unclipping the round cover at the base of the unit. The float assembly can



6.8 Removing the pump/sender unit



6.6 Disconnecting the fuel tank breather pipe

also be unclipped from the side of the unit, and the wiring disconnected **(see illustrations)**. The pump unit hoses must be disconnected before it too is unclipped from the base of the unit - it appears, however, that separating the hose connections may destroy them, so have replacement hoses available for refitting.

11 From the FIAT information available at the time of writing, it appears that no pump/sender unit components are available separately.

4A

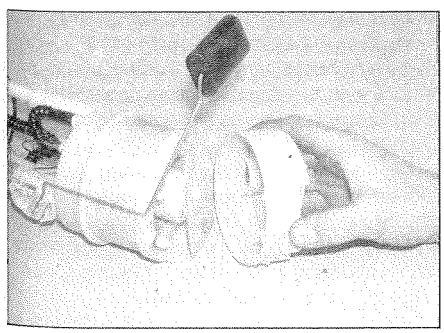
Refitting

12 Refitting is a reversal of the removal procedure, noting the following points:

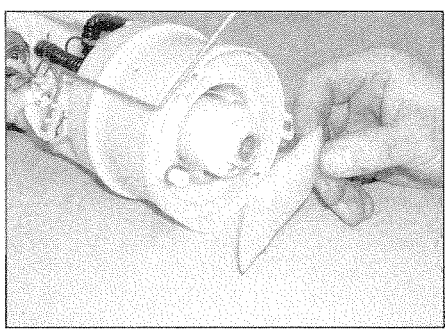
a) It is advisable to use a new sealing ring.

*b) Refit the ring nut loosely to the top of the sender unit before offering it into position **(see illustration)**.*

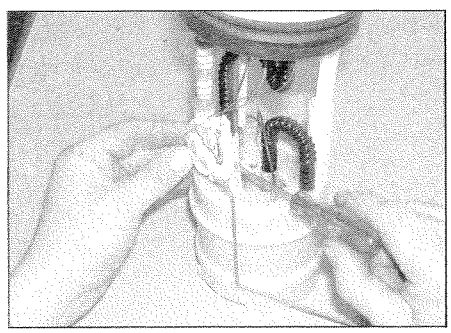
c) Take care as the unit is fitted that the



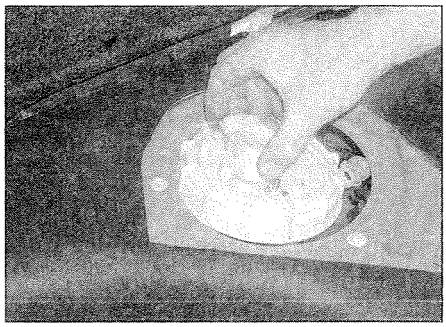
6.10a Once the base of the unit has been unclipped . . .



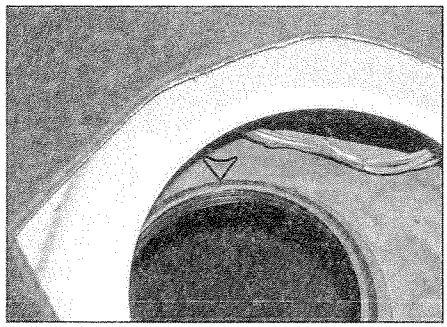
6.10b . . . the pump filter can also be unclipped and removed



6.10c Removing the float assembly



6.12a Make sure the ring nut is in position before fitting the unit



6.12b Arrowhead marking on top of the fuel tank

sealing ring does not get pushed into the tank.

*d) Align the arrowhead marking on top of the tank with the similar mark on the sender unit **(see illustration)**.*

e) Prior to refitting the access cover, reconnect the battery, then start the engine and check the unions for signs of leakage.

7 Fuel tank - removal and refitting

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

Removal

1 Before removing the fuel tank, all fuel must be drained from the tank. Since a fuel tank drain plug is not provided, it is therefore preferable to carry out the removal operation when the tank is nearly empty. Before proceeding, disconnect the battery negative lead and syphon or hand-pump the remaining fuel from the tank.

2 Remove the fuel pump/fuel gauge sender unit as described in Section 6.

3 Chock the front wheels, then jack up the rear of the vehicle and support on axle stands (see *Jacking and vehicle support*).

4 Open the fuel filler flap and carefully release the filler neck flexible gaiter from the bodywork.

5 To improve access, remove the fasteners securing the rear wheel arch liner(s). Working via the wheel arch, undo the screw and release the filler neck from the bodywork.

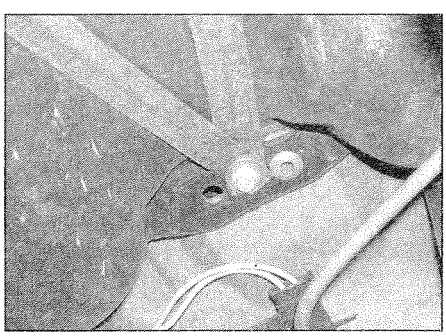
6 Position a trolley jack or similar centrally underneath the fuel tank and raise it until it is just supporting the weight of the tank. Prevent damage to the underside of the tank by placing a block of wood between the jack head and the tank.

7 Undo the front and rear fuel tank strap securing bolts, recover the spacer washers, then carefully lower the fuel tank away from the floorpan **(see illustrations)**. Loosen the clips and disconnect the EVAP purge hose and breather hose from the fuel tank as they become accessible.

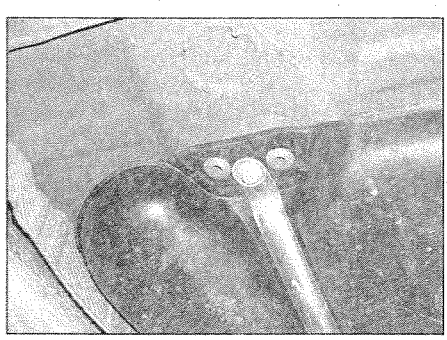
8 Check that all hoses and wiring are disconnected, then lower the tank to the ground and remove it from underneath the vehicle.

Refitting

9 Refitting is a reversal of the removal procedure, ensuring all hoses are correctly routed and securely reconnected.



7.7a Fuel tank retaining strap front . . .



7.7b . . . and rear bolts

8 Fuel injection system - depressurisation

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

1 The fuel supply system referred to in this Section is defined as the tank-mounted fuel pump, the fuel filter, the throttle body and pressure regulator components, and the metal pipes and flexible hoses of the fuel lines between these components. All these contain fuel which will be under pressure while the engine is running and/or while the ignition is switched on. 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 work.

2 Make sure that the ignition is switched off (take out the key). Unscrew the knob and remove the cover from the fuse/relay holder directly behind the throttle body air box.

3 Referring to Section 5, pull out the fuse for the fuel pump. If the injection/ignition fuse or the main system fuse are removed, the injector will not open, so defeating the purpose of this exercise.

4 Try to start the engine, keeping the engine cranking for several seconds. It may fire and run for a little while - if so, let it run until it stops.

5 Once the injector has opened and closed several times, this will reduce the fuel pressure to a safer level. However, fuel will still be present in the system, and care should still be taken.

6 Disconnect the negative cable from the battery terminal, then refit the fuel pump fuse and the fuse/relay box cover.

7 Place a container beneath the relevant connection/union to be disconnected, and have a large rag ready to soak up any escaping fuel not being caught by the container.

8 Slowly loosen the connection or union nut (as applicable) to avoid a sudden release of fuel, and wrap the rag around the connection to catch any fuel which may be expelled. Once the fuel has been soaked up, disconnect the fuel line, and insert plugs to minimise fuel loss and prevent the entry of dirt into the fuel system.

9 Inlet manifold - removal and refitting

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

Removal

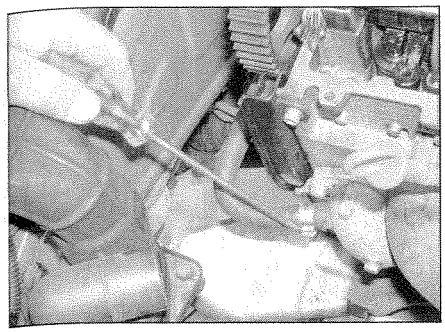
1 Remove the throttle body assembly as described in Section 5. Alternatively, using the information in Section 5, disconnect the wiring plugs and hoses from the throttle body, and remove with the manifold as an assembly.

2 Drain the cooling system as described in Chapter 1.

3 Disconnect the wiring connector from the coolant temperature sensor (situated on the left-hand side of the manifold).

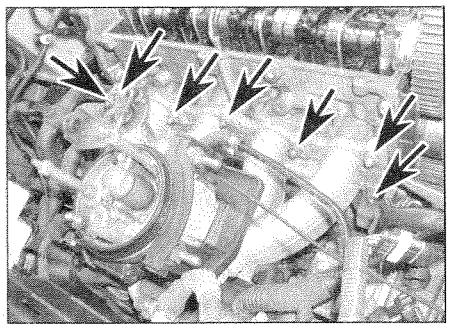
4 Undo the bolt securing the accelerator cable mounting bracket to the manifold, and position it clear of the manifold.

5 Slacken the retaining clip and disconnect the coolant hose from the rear of the manifold. Alternatively, this hose can be disconnected

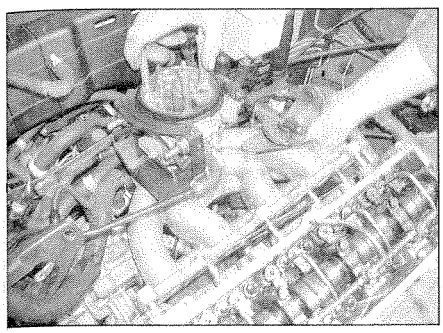


9.5 Disconnect the inlet manifold coolant supply hose

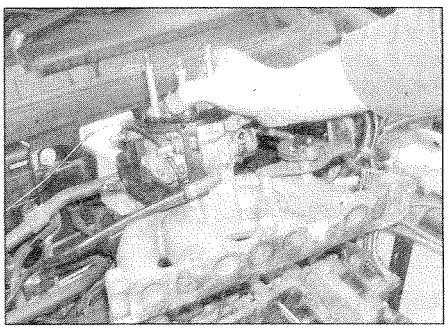
9.6 Unscrew the clip and disconnect the brake servo vacuum hose



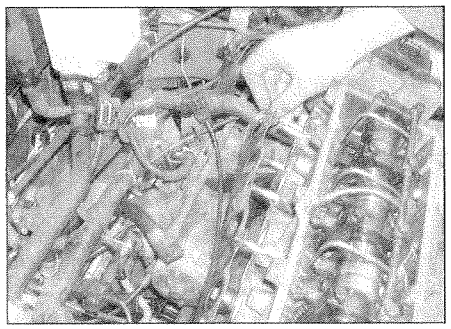
9.7a Unscrew the manifold retaining nuts (seven of eight arrowed) . . .



9.7b . . . withdraw the manifold from the cylinder head studs . . .



9.7c . . . and remove it from the engine



9.7d Removing the inlet manifold gasket

at the coolant elbow in front of the timing belt cover **(see illustration)**.

6 Disconnect the brake vacuum hose **(see illustration)**.

7 Undo the eight manifold retaining nuts, recover the split washers, and remove the manifold from the engine. Remove the gasket and discard it; a new one should be used on refitting **(see illustrations)**. Note the plastic locating pins used to secure the gasket to the inlet manifold - transfer them to the new gasket.

Refitting

8 Refitting is a reverse of the removal procedure, noting the following points:

a) Check the condition of the core plugs fitted to the base of the manifold. If signs of leakage are evident, the plugs should be removed, and new ones tapped in.

*b) Ensure that the manifold and cylinder head mating surfaces are clean and dry, and fit a new manifold gasket. Use the plastic locating pins to secure the gasket to the manifold - tap them in with a pin punch until they are flush with the gasket surface **(see illustrations)**.*

c) Refit the manifold and washers over the cylinder head studs, and securely tighten the retaining nuts.

d) Ensure that all relevant hoses are reconnected to their original positions and are securely held (where necessary) by the retaining clips.

e) Refit (or reconnect) the throttle body with reference to Section 5.

f) On completion, refill the cooling system as described in Chapter 1.

10 Fuel injection system - checking and adjustment

Checking

Note: *Also see Chapter 5B, Section 3.*

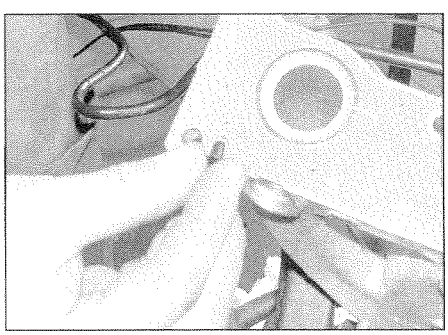
1 Before disconnecting any of the injection system wiring, ensure that the ignition is switched off (take out the key).

2 If a fault appears in the fuel injection system, first ensure that all the system wiring connectors are securely connected and free of corrosion. Also check the wiring harness for signs of damage, such as may result if the wiring is routed too close to a hot component, for example.

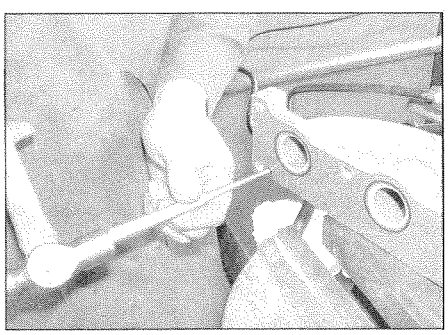
3 Remove the cover from the fuse/relay box behind the throttle body, and check the connections to the fuses and relays. With the ignition switched off, remove the fuses and relays in turn, and check that the fuse and relay contacts, and their sockets in the box, are clean. Refit the fuses and relays securely. Similarly check the 30A fuse in the box at the left rear corner of the engine compartment (refer to Section 5).

4 The system's main earth point is located at the right-hand rear of the cylinder head, just in front of No 1 spark plug. Remove the bolt securing the earth terminal, and clean all contact surfaces thoroughly **(see illustrations)**. Refit the terminal and bolt, and tighten it securely.

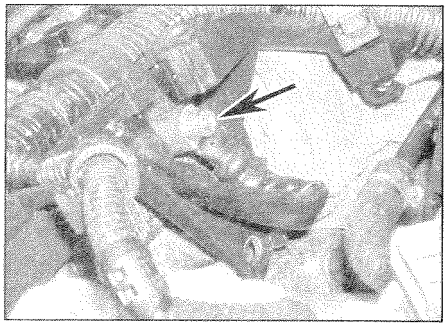
5 Then ensure that the fault is not due to poor maintenance; ie, check that the air cleaner filter element is clean, the spark plugs are in good condition and correctly gapped, the HT leads are securely connected and in good condition, and that the engine breather hoses are clear and undamaged.



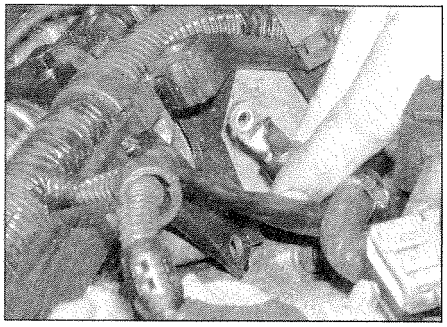
9.8a Transfer the plastic locating pins to the new gasket . . .



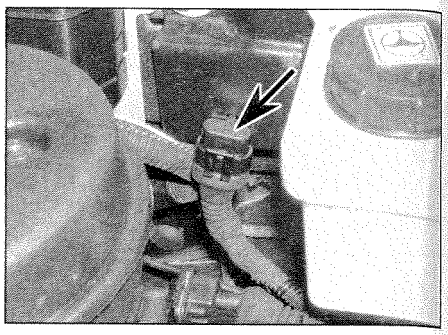
9.8b . . . and tap them in flush with a pin punch



10.4a Unscrew the bolt (arrowed) below the wiring harness bracket . . .



10.4b . . . and take off the earth lead



10.8 Diagnostic connector (arrowed) located behind the throttle body

6 Check all the ignition system components and wiring as far as possible, using the information in Chapters 1 and 5B. Sometimes it can be difficult to determine whether a misfire is fuel or ignition-related.

7 If the engine is difficult to start, or runs poorly, when cold, the problem may be that the engine management system has gone into emergency back-up mode. This, and the nature of the fault that caused it to happen, can only be determined using diagnostic equipment such as a fault code reader.

8 A diagnostic connector is located behind the throttle body, into which a fault code reader can be plugged **(see illustration)**. The test equipment is capable of 'interrogating' the engine management system electronically and accessing its internal fault log.

9 Fault codes can only be extracted from the ECU using a dedicated fault code reader. A FIAT dealer will obviously have such a reader, but they are also available from other suppliers, including Haynes. It is unlikely to be cost-effective for the private owner to purchase a fault code reader, but a well-equipped local garage or auto electrical specialist will have one.

10 Using this equipment, faults can be pinpointed quickly and simply, even if their occurrence is intermittent. Testing all the system components individually in an attempt to locate the fault by elimination is a time-consuming operation that is unlikely to be fruitful (particularly if the fault occurs dynamically), and carries high risk of damage to the ECU's internal components.

Adjustment

11 Experienced home mechanics equipped with an accurate tachometer and a carefully-calibrated exhaust gas analyser may be able to check the exhaust gas CO content and the engine idle speed; if these are found to be out of specification, then the vehicle must be taken to a suitably-equipped FIAT dealer for assessment.

12 Neither the air/fuel mixture (exhaust gas CO content) nor the engine idle speed are manually adjustable; incorrect test results indicate the need for maintenance (possibly, injector cleaning) or a fault within the fuel injection system.

11 Unleaded petrol - general information and usage

Note: *The information given in this Chapter is correct at the time of writing. If updated information is thought to be required, check with a FIAT dealer. If travelling abroad, consult one of the motoring organisations (or a similar authority) for advice on the fuel available.*

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

2 All models are fitted with a catalytic converter and must be run on unleaded fuel **only**, with a minimum octane rating of 95 RON. Under no circumstances should leaded fuel (eg UK 4-star) or lead replacement petrol (LRP) be used, as this may damage the converter.

3 Super unleaded petrol (98 octane) can also be used in all models if desired.