ROVER SD1

CONTENTS

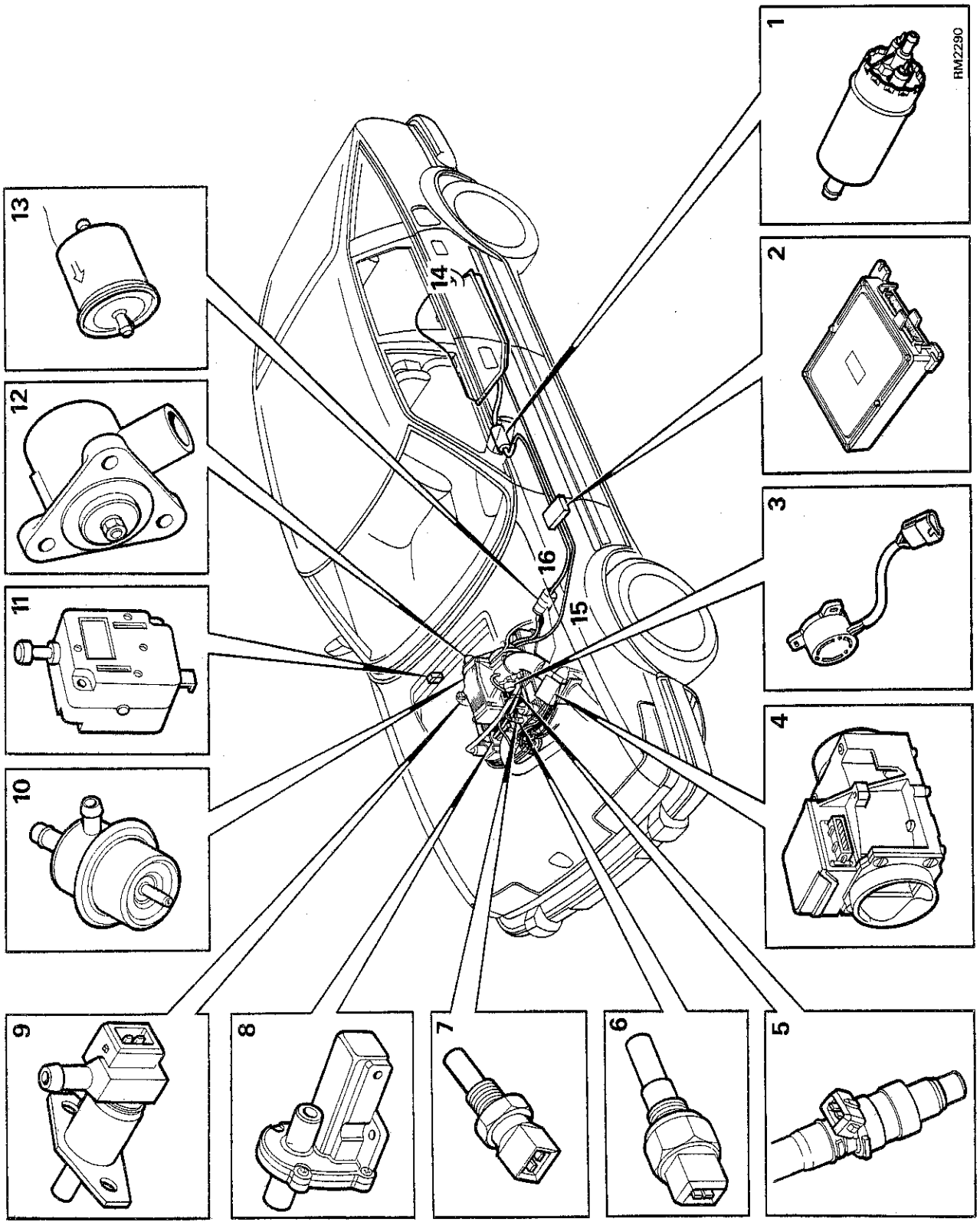
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
RM2290

Fig. 1
Fuel injection system components - Vitesse

1. Fuel pump
2. Electronic Control Unit
3. Throttle Potentiometer
4. Air flow meter
5. Injector
6. Thermotime switch
7. Coolant temperature sensor
8. Extra air valve
9. Cold start injector
10. Fuel pressure regulator
11. Inertia switch
12. Over-run valve
13. Fuel line filter
14. Fuel tank
15. Return fuel line
16. Supply fuel line

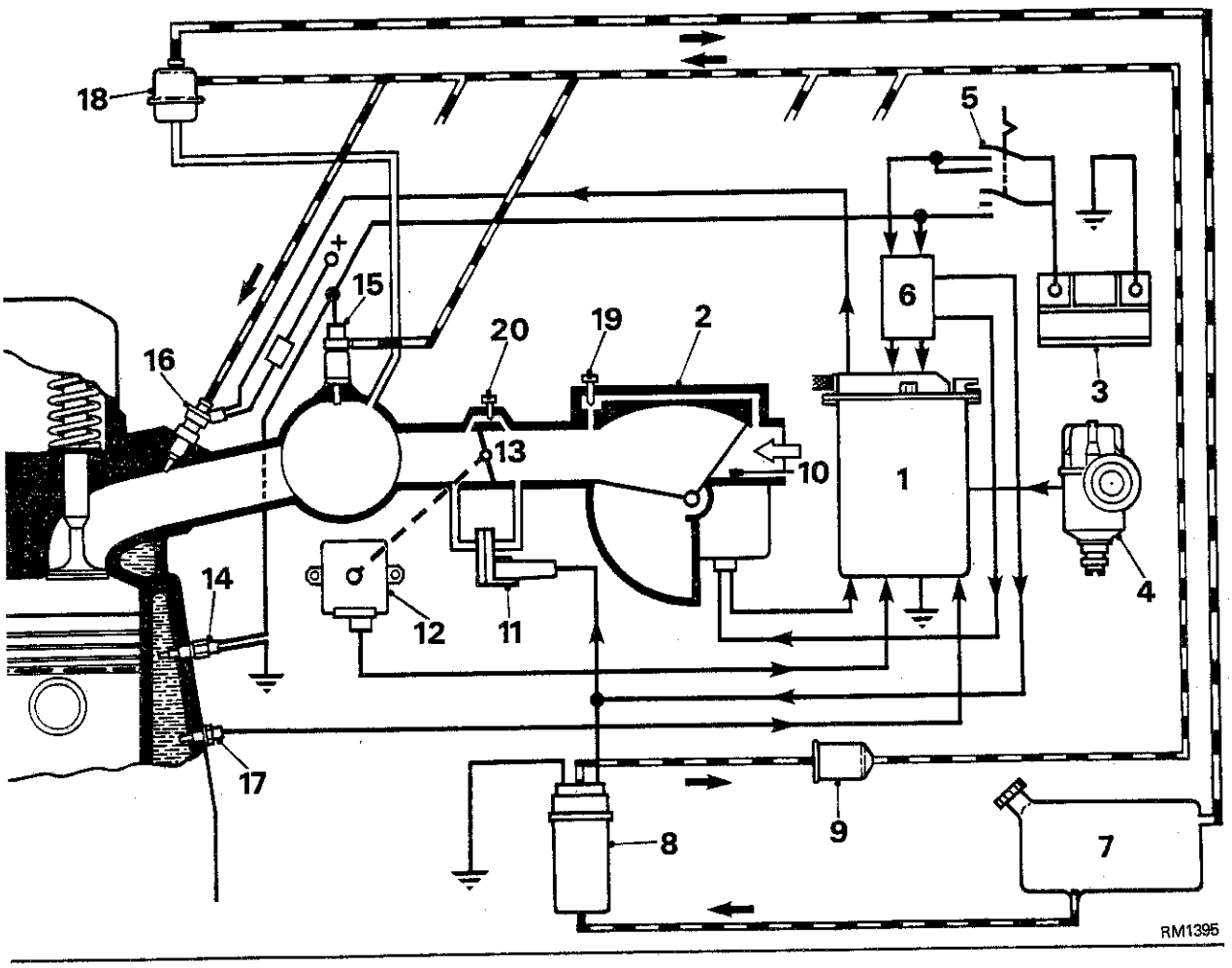

Fig. 2
Electronic fuel injection control and metering system - Vitesse

1. Electronic Control Unit - E.C.U.
2. Air flow meter
3. Battery
4. Distributor
5. Ignition switch
6. Relay
7. Fuel tank
8. Fuel pump
9. Fuel line filter
10. Air temperature sensor
11. Extra air valve
12. Throttle potentiometer
13. Throttle butterfly
14. Thermotime switch
15. Cold start injector
16. Injector
17. Coolant temperature sensor
18. Fuel pressure regulator
19. Idle air mixture adjustment screw
20. Idle speed adjustment screw

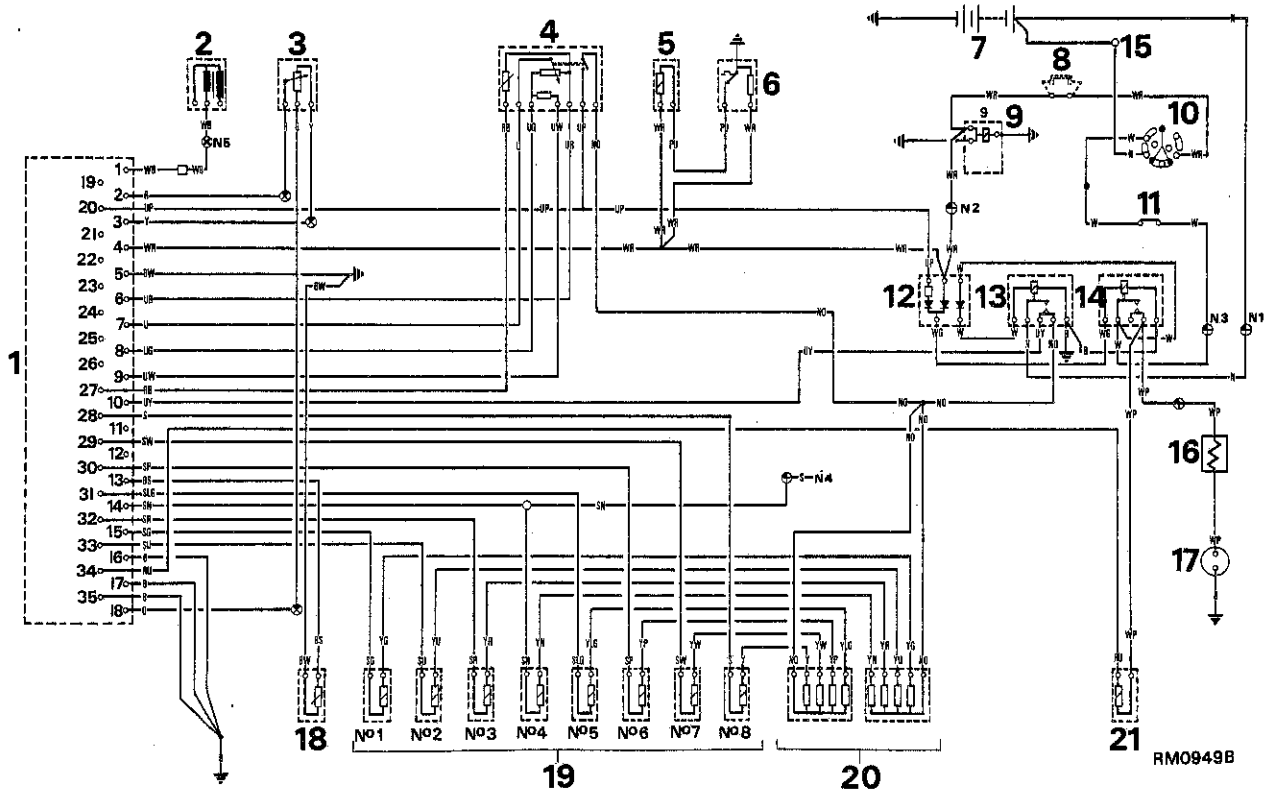

Fig. 3
Electronic fuel injection electrical circuit diagram - Vitesse

1. Electronic control unit
2. Ignition coil
3. Throttle potentiometer
4. Air flow meter
5. Cold start injector
6. Thermotime switch
7. Battery
8. Starter inhibitor switch - Automatic only
9. Starter relay
10. Ignition switch
11. Inertia switch
12. Injection diode pack
13. Main relay
14. Pump relay
15. Terminal stud
16. Fuel pump resistor
17. Fuel pump
18. Coolant temperature sensor
19. Injectors, 1 to 8
20. Power resistors
21. Extra air valve

Connection codes

No	Description
N1	Pick-up point
N2	Pick-up point
N3	Pick-up point
N4	Trip computer interface unit
N5	Control unit pick-up point

ELECTRONIC FUEL INJECTION

Description

1. Ignition on

When the ignition is switched on the white wire ignition circuit provides 12 volts to the fuel pump relay switch terminal, and energises the main relay coil via one of the PI 'steering module' diodes. Battery voltage is provided to the injector power resistors and the E.C.U., via a main relay switch terminal. A 12 volt supply is also fed to the fuel pump switch housed in the air flow meter.

2. Engine Cranking

The white/red ignition circuit activates the starter relay which in turn energises the fuel pump relay, causing fuel to be drawn from the fuel tank by a high pressure electric pump located adjacent to the propeller shaft.
Fuel passes to the pressure regulator via an in line filter. The pressure regulator varies pressure in direct proportion to manifold depression and thus varies injection pressure between 1.8 to 2.5 kgf/cm², 26 to 36 lbf/in². Excess fuel is returned to the fuel tank.

A fuel rail links the pressure regulator with the fuel injectors, one injector being fitted to each inlet manifold spur. The E.C.U. is triggered by signals from the ignition coil, and pulse energises the two banks of four injector solenoids by completing a circuit to earth. The injector solenoid banks are activated to 'open' alternately twice per engine cycle. When 'open' the injectors spray fuel into the inlet manifold to be drawn into the engine cylinders at the next induction stroke of each piston.
The quantity of fuel supplied to the engine is proportional to the injector 'open' time. and is governed by the E.C.U.'s computation of it's input sensor signals, rather than any formal relationship with engine ignition or timing. The E.C.U. receives inputs from the following engine components; air flow meter, ignition coil, coolant temperature sensor, air temperature sensor, throttle potentiometer, and the battery.

The E.C.U. provides automatic cranking enrichment from the starter switching circuit, decaying to normal after 30 seconds or less depending upon air temperature.

To assist cold starting, the cold start injector circuit is energised by the white/red ignition circuit. The injector sprays a fine jet of fuel against the air stream entering the plenum chamber for up to 12 seconds or until the engine fires. The cold start injector time is dependant on engine temperature and is controlled by a thermotime switch in series with the injector. The thermotime switch which is dual activated by the engine coolant temperature (heat) and a heater coil around a bi-metal strip (time), prevents the injector operating at normal temperature and for more than 12 seconds when operating below normal temperature.

During cranking the extra air valve is energised by the fuel pump relay, and remains on whilst the relay is activated.

3. Engine Running

The white/red ignition circuit is de-activated switching off the cold start injector. Air is drawn into the air flow meter, operating the fuel pump switch which replaces the 12 volt supply from the starter relay to the fuel pump relay. The extra air valve continues to provide air during warm-up. The E.C.U. now controls the air/fuel mixture entering the engine under different driving conditions by reacting to the input signals from the engine.

Fuel Pump
The fuel pump is energised initially during operation of the starter motor solenoid and then by a switch operated by the air flow meter and is independent of the E.C.U.

An inertia switch is included in the electrical circuit to isolate the fuel pump relay, and in the event of abrupt deceleration cuts off the electrical supply to the electronic fuel injection circuit.

Electronic Control Unit
The E.C.U. is a sealed unit and receives input signals from various sensors and computes from these an output signal to the fuel injector solenoid circuits. When activated the solenoids 'open' the injectors to spray fuel into the engine inlet manifold spurs, the injectors remaining open for between 1.5 and 10 milliseconds depending on engine running requirements. The E.C.U. calculates fuel consumption by monitoring the fuel used by No. 8 injector.

The E.C.U. is protected by various devices; a ballast resistor, wired in series with each injector protects against current surge, and a diode pack protects against high input voltage. The main relay is controlled by the ignition switch and connects battery voltage directly to the E.C.U.

Engine Speed
Low tension circuit pulses from the ignition coil negative output terminal, are passed to the E.C.U. to be computed into an engine speed input.

Air Flow Meter
The air flow meter measures induction air flow mass. The plenum chamber absorbs any rapid fluctuations in air flow that might upset the air-flow meter signals.

The movement of the measuring flap is damped by a compensating flap which prevents flutter. The position of the flap is controlled by the air drawn into the engine and the action of a return spring. The mass of air drawn into the engine at any time is indicative of the engine load. Conversion of the measuring flap's angle into a voltage signal, is passed to the E.C.U. as a measurement of air flow. However, the air mass and air density is dependant upon air temperature. Therefore an air temperature sensor is mounted into the air flow meter to provide an incoming air temperature signal to the E.C.U., which adjusts the air/fuel mixture accordingly.

A 'latching' switch for the fuel pump relay utilises the first 5° of measuring flap movement to operate the fuel pump. This ensures the pump is not activated should the ignition be switched on with the engine stalled.

Due to the action of the return spring, the measuring flap is almost closed when the engine is idling and an idle air by-pass channel is provided to assist the engine to breath at low speed. Air passing through the by-pass channel is not registered by the air flow meter measuring flap. The idle air mixture screw is fitted into the by-pass channel to regulate the air flow to adjust the air to fuel ratio CO content at idle speed.

Throttle Switch
The switch is a potentiometer whose electrical signal to the E.C.U. depends upon the position of the throttle butterfly spindle and hence the accelerator pedal. By using the variable voltage output in conjunction with the information from the other sensors, the E.C.U. adjusts fuel input to accommodate requirements for acceleration, deceleration and constant engine speed. When sudden acceleration is signalled to the E.C.U. by the throttle potentiometer, all injectors are instantly pulsed to operate once simultaneously to ensure adequate engine response.

Coolant Temperature Sensor
The sensor provides coolant temperature information to the E.C.U. The signal from the sensor serves two purposes:

First, it causes the E.C.U. to slightly lengthen the time that the main injectors are 'open' reducing this time as the engine warms up and cutting it off when normal engine operating temperature is reached.

Second, it completes an 'earth' return circuit in the E.C.U. for the heater element in the extra air valve when the engine is running below normal operating temperature.

Extra Air Valve
This valve is mounted above a water passage in the inlet manifold and registers engine coolant temperature. The valve provides the additional air required to maintain satisfactory cold start mixture until the engine reaches normal operating temperature. This air is taken after the air flow meter, so that the air is registered by the E.C.U., and returned to the plenum chamber bypassing the throttle

butterfly disc, on whose position it does not depend.

The valve allows extra air to pass under cold start conditions, the extra air source is reduced and finally terminated as normal engine operating temperature is reached.

The valve is controlled by a bi-metal strip which is heated from two sources; the coolant and a heater coil around the strip. The heater coil is energised from the ignition circuit and comes into operation whenever the coolant temperature sensor causes the E.C.U. to complete the heater coil circuit to earth.

Over-Run Valve
This valve bleeds air into the inlet plenum chamber during over-run to maintain combustion under conditions of high manifold depression. The valve adjuster nut, pre-set during manufacture, should not normally be altered, however excessive valve noise during over-run can be eliminated by tightening the nut a maximum of 1 1/2 turns.

DEPRESSURISING THE FUEL SYSTEM

WARNING: The fuel system must be depressurised before any part of the fuel line between the fuel pump and the fuel regulator is disconnected.

1. Remove the fuel pump relay from the wiring harness. If it is unsafe for the engine to run, also disconnect the white h.t. lead from the coil.

2. To release line pressure, operate the starter and allow the engine to run until it stops, or crank the engine for at least 10 seconds.

3. Disconnect the battery. Position a suitable container under the fuel line, disconnect the fuel line and release the residual fuel pressure. A quantity of fuel will be released.

ELECTRONIC FUEL INJECTION FAST CHECK DIAGNOSIS

The Electronic Fuel Injection Fast Check has been designed to be connected to the wiring harness in place of the E.C.U., and inform the user of the condition of a variety of electrical circuits and sensors by illuminating or not illuminating a series of red and green Light Emitting Diodes (L.E.D.s).
If the engine develops a fault, undertake the following checks before investigating the fuel injection system using Fast Check.
Visually check all wiring connections and the air intake system. Check the fuel level and ensure the battery charge is in good condition. Check that all the elements of the ignition system, including the idle speed, mixture setting, and ignition timing are as given.

Connecting Fast Check:

Switch off the ignition, and disconnect the E.C.U., located under a plate in the front passengers footwell, from the wiring harness. Connect the Fast Check to the harness and switch on the ignition.

Testing:

1. The following L.E.D.s should be illuminated; Both 'THROTTLE POT' L.E.D.'s, 'IGN', 'COIL', and 'AIRFLOW' L.E.D's.

If an incorrect response is obtained, check under the appropriate heading.

2. Ignition L.E.D. does not glow:

Check the battery voltage, the wiring continuity from E.C.U. pin 10 to main relay, and the white feed wire from ignition switch to main relay. If all correct replace the main relay.

3. Coil L.E.D. does not glow:

Check the wiring continuity from E.C.U. pin 1 to the coil, and the operation of the 6.8 kilohm ignition amplifier resistor. Rectify as necessary.

4. Throttle potentiometer L.E.D.'s do not glow:

Adjust the throttle potentiometers until both illuminate. Check for open or short-circuit to E.C.U. pins 2, 3, and 18. If the wiring is correct renew the potentiometer and retest.

5. Coolant L.E.D. illuminated:

Disconnect the coolant sensor and check its connections, black/grey wire to E.C.U. pin 13, and black/white wire to earth, and rectify. If the wiring is correct renew the sensor and retest.

6. Air Temperature L.E.D. illuminated:

Check the wiring continuity of the air flow meter connections to E.C.U. pins 6 and 27, and rectify as necessary. If the connections are correct, proceed to the Air Flow Meter Test as the suspect air temperature sensor is sealed within the meter.

7. Air Flow Meter Test.

Ensure the air intake hose is removed and ignition switched on. Slowly move the air flow meter measuring flap from the closed position to fully open. The L.E.D. illuminates with the flap closed, goes out as the flap opens, and illuminates again as the flap reaches three quarters of its total travel. If this sequence is incorrect renew the air flow meter.

Cranking Test

Disconnect and earth the coil king lead and crank the engine for a few seconds. The Fast Check should now illuminate the 'Air Valve', 'Crank', and 'Running' L.E.D.'s, in addition to those illuminated with the ignition switched on.

8. Air Flow L.E.D. does not glow:

The air flow L.E.D. should remain on when the engine is cranked. If the L.E.D. is already out when the engine is switched on, or flickers during cranking, test for open or short-circuit condition between E.C.U. pins 6, 7, 8, 9 and the air flow meter. If the wiring is correct proceed with the Air Flow Meter Test.

9. Air Valve L.E.D. does not glow:

Ensure the inertia switch button is depressed. Check the wiring continuity between E.C.U. pin 34 and the extra air valve, with the red/blue wire disconnected from the air flow meter. Check that the fuel pump relay is switching, by connecting a voltmeter to the white/purple extra air valve wire and earth. The reading should be zero with the ignition switched on, and 12 volts during cranking. If the fuel pump relay is switching, renew the air valve and retest. If necessary check the engine cranking circuit to the fuel pump relay and the relay itself.

10. Crank L.E.D. does not glow:

Check the 12 volt feed along the white/red ignition switch wire to E.C.U. pin 4, and rectify as necessary.

11. Running L.E.D. does not glow:

Check that the inertia switch button is depressed. Using a voltmeter check that the brown/orange connection at the air flow meter reads 12 volts with the ignition on. Check that E.C.U. pin 20 reads 12 volts when the engine is cranked. If the wiring is correct check the main relay and relay switching circuit, and rectify as necessary.

12. Fuel Pump Diagnosis

Remove the air flow meter intake pipe, switch on the ignition, operate the measuring flap and listen for the pump running. If the pump is not operating, open the measuring flap and check for 12 volts on the white/purple wire at the fuel pump relay connection. Check the fuel pump resistor and if it is operating, renew the pump and retest.

AIR TEMPERATURE SENSOR

The air temperature sensor is an integral part of the air-flow meter and cannot be replaced as a separate item.

Test

1. Disconnect the battery and the electrical multiplug from air-flow meter.

2. Connect the ohmmeter between terminals 6 and 27 of the air-flow meter and note the resistance reading. The reading should closely approximate the following according to temperature:

Ambient Air Temperature (°C)	Resistance Kilohms
-10	9.2
0	5.9
20	2.5
40	1.18
60	0.60

4. Disconnect the ohmmeter. Re-connect the multiplug and the battery.

FUEL INJECTION IDLE AND MIXTURE SETTING - PLENUM CHAMBER WITH SINGLE THROTTLE

Service tools: Tachometer, CO meter

After checking or dismantling the air intake components, it is imperative that the idle speed and air/fuel mixture is correctly reset.

Adjust

Before making any adjustment to the fuel settings it is essential that the ignition timing, distributor operation and plug gaps are checked.

The idle and mixture setting adjustments require the removal of tamperproof plugs and, when adjustments have been made, new plugs must be fitted where regulations require this to be done.

1. Attach a tachometer and run the engine until it has been working at normal operating temperature for at least two minutes. Run the engine at approximately 2000 rev/min for 30 seconds.
NOTE: Before adjustments are made, and every three minutes during adjustment, the engine must be run at approximately 2000 rev/min for 30 seconds to clear the intake system of residual fuel.

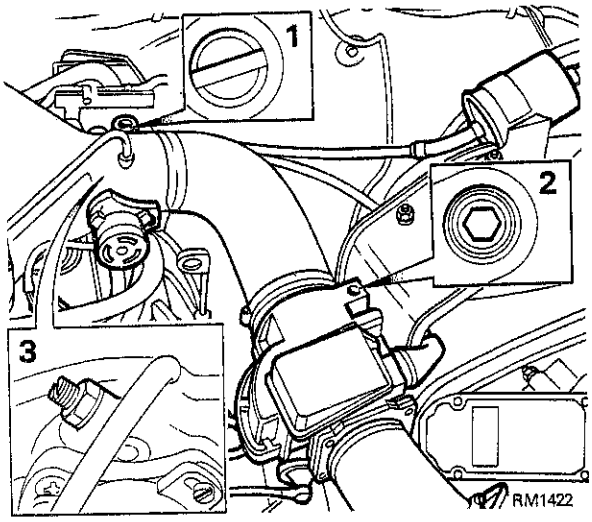

Fig. 4
Fuel injection system setting points - plenum chamber with single throttle
1. Idle speed adjustment screw
2. Mixture adjustment screw
3. Idle speed adjustment screw - alternative type

2. Check the engine idle speed, adjust by turning the adjustment screw clockwise to increase engine speed and anti-clockwise to reduce engine speed.
Alternative type: Slacken the locknut and turn the idle adjustment screw and re-tighten the locknut.

3. Insert a CO meter probe into exhaust pipe and check analyser CO reading which must be within the given tolerance.

4. If necessary, remove the plug from the adjustment screw in the air flow meter and turn the adjustment screw until the required reading is obtained.
If the correct CO reading can not be obtained, check that the air intake pipe between the air flow sensor and throttle housing is not loose or damaged.

5. Remove the CO meter and the tachometer.

AIR CLEANER

Remove - cylinder type

1. Release the clips securing the inlet tube to the air cleaner case.

2. Remove the nuts securing the air cleaner bracket to the support bracket and extract the air cleaner assembly from its location.

Remove - box type

1. Remove two hoses from the air cleaner case.

2. Locate and remove the single wind nut screw fixing securing the casing to its mounting bracket. Lift the air cleaner assembly from its location.

Refit - cylinder type

1. Engage the inlet tube and secure the air cleaner assembly to its mounting bracket. Ensure the inlet tube connections are tight.

Refit - box type

1. Fit and secure the air cleaner assembly to its mounting bracket.

2. Fit the two hoses to the air cleaner case ensuring that the connections are tight.

FUEL LINE FILTER

Remove

1. Depressurise the fuel system.

2. The filter is located on the left-hand side of the engine compartment, to the rear of the front suspension turret. Slacken off the filter clamp.

3. Release the retaining clips and withdraw the filter from the fuel hoses. Plug the hoses.

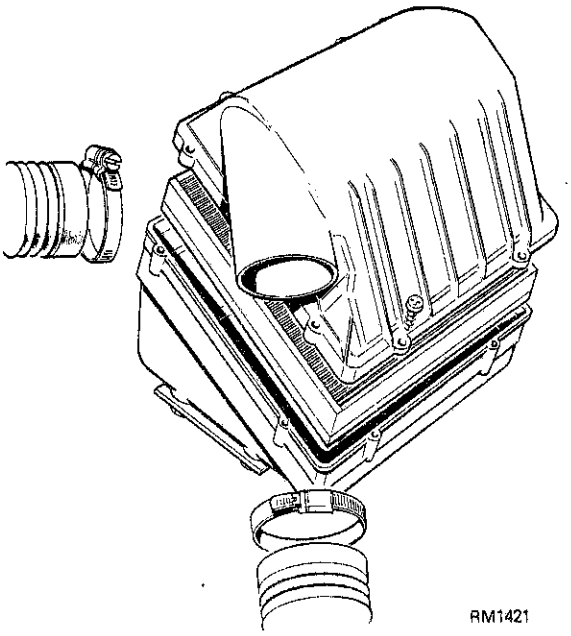

Fig. 5
Air cleaner components - box type

Refit

1. Fit the new fuel filter ensuring that the arrow on the casing points towards the outlet hose, and is secure with the retaining clips.
Connect the battery.

PLENUM CHAMBER - SINGLE THROTTLE

Remove

1. Partially drain the cooling system and disconnect the coolant hoses from the plenum chamber.

2. Release the hoses and cables from around the plenum chamber, disconnect the engine breather and vacuum hoses from the plenum chamber inlet.

3. Disconnect the pressure regulator hose from the plenum chamber.

4. Disconnect the electrical multiplugs from the throttle potentiometer and cold start injector.

5. Disconnect the throttle lever from the linkage at the plenum chamber.

6. Remove through bolts and lift off the plenum chamber assembly.
Remove ancillary units from the plenum chamber as required.

Refit

1. Ensure all mating surfaces are clean and fit the ancillary units to the plenum chamber, locate the chamber in position and secure with the through bolts.

2. Connect the throttle lever to the linkage at the plenum chamber and secure.

3. Connect the electrical multiplugs to the throttle potentiometer and the cold start injector.

4. Fit the pressure regulator and engine breather hoses to the plenum chamber. Secure piping and cables around the plenum chamber.

5. Connect the coolant hoses to the plenum chamber and refill the cooling system.

FUEL RAILS

Remove

1. Depressurise the fuel system.

2. Remove the plenum chamber and disconnect the fuel input pipe:
R.H. pipe from main fuel line.
L.H. pipe from R.H. rail.

3. Release the clips and remove the fuel rail(s) from the injector hoses.

Refit

1. Fit the rail(s) in position and tighten the hose clips.

2. Connect the fuel rail to the main fuel line and L.H. rail feed pipe to the from R.H. rail.

3. Fit the plenum chamber and connect the battery.

INJECTOR TESTING

Test without Fast Check:

1. Using an ohmmeter, measure the resistance of each injector winding, which should be 2.4 ohms at 20° C. , 68° F.

2. Check for a short-circuit to earth on the winding by connecting ohmmeter probes between each injector terminal and injector body. The meter should read infinity. Renew the injector if the winding is open or short-circuited.

Test with Electronic Fuel Injection Fast Check:

1. Switch off the ignition, disconnect the E.C.U. from the main harness, and connect the Fast Check to the harness.

2. Set the Fast Check injector select knob to Position 1, switch on the ignition, and press the injector activator button on the Fast Check. Do not press this button continuously otherwise flooding will occur.

3. An audible click will be heard, and the injector body will very slightly vibrate as the injector opens.

4. If all the injectors fail to operate, check that the inertia switch button is depressed, that the main relay is operating correctly, and check the individual power resistors with an ohmmeter. The resistance should be 6± 0.2 ohms.

5. If individual injectors fail to operate, check the suspect circuit and connections, and the resistance of the relevant power resistor. If the circuit appears correct renew the injector.

INJECTORS

Remove

1. Depressurise the fuel system.

2. Cold start injector: Disconnect the electrical connector and the fuel hose from the injector. Release the injector from the side of the plenum chamber.

3. Manifold injector(s).
R.H. bank: Disconnect the electrical leads, remove the clip and free the hose from the fuel injector rail. Release the wiring P clip, remove the clamp plate and withdraw the injector from the manifold.
L.H. bank: Remove the plenum chamber and the fuel rail. Disconnect the electrical leads, remove the clamp plate and withdraw the injector from the manifold.

Refit

1. Fit new seating rubbers as necessary, position the injector with its wiring connector to the outside and press into place.

2. Fit and tighten the clamp to the correct torque.

3. Connect the hose to the fuel rail and connect the electrical leads.
L.H. bank: Fit the fuel rail and plenum chamber.
Connect the battery.

ELECTRONIC FUEL INJECTION RELAYS

Remove

1. Disconnect the battery. Lower or remove the passenger's glovebox.

2. Note the relays mounted on brackets above the toeboard, the fuel injection relays are in the bottom row to the right of the RED diode pack.

3. Hold the connectors and pull the relays from the connectors.

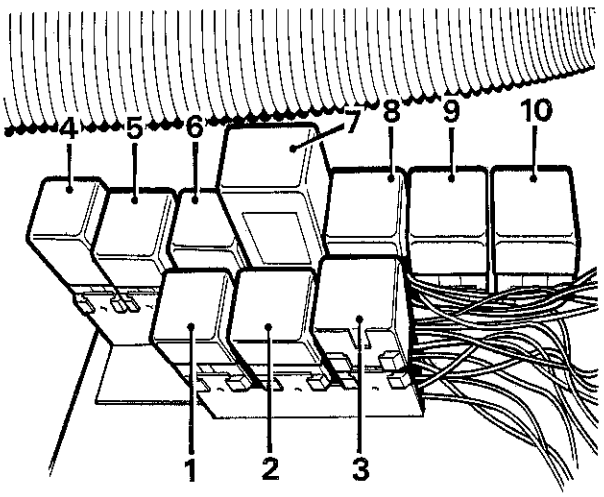

Fig. 6 RM2289
Relay Mounting Bracket.

1. Fuel pump relay
2. PI relay steering module
3. Main relay
4. Brake warning and dip beam relay diode unit
5. Headlamp main beam relay
6. Headlamp dip beam relay
7. Courtesy light delay unit
8. Air Conditioning magnetic clutch relay
9. Rear fog lamp relay
10. Electric aerial

Refit

1. Press the relays into the connectors.

2. Fit the passenger's glove box. Connect the battery.

THROTTLE SWITCH - POTENTIOMETER

Remove

1. Disconnect the extra air valve pipes for access and remove the electrical multi-plug from the switch.

2. Remove the two screws securing the switch to the plenum chamber and carefully pull the switch off the throttle spindle.

Refit

1. Align the switch and spindle flats, fit the switch on the throttle spindle and secure the switch to the plenum chamber.

2. Connect the electrical multiplug to the switch. Connect the extra air valve pipes.

ELECTRONIC CONTROL UNIT - E.C.U.

Remove

1. Disconnect the battery. Open the driver's glovebox and locate the E.C.U.

3. Release the retaining strap, disconnect the electrical multiplug and remove the E.C.U.

Refit

1. Connect the multiplug to the E.C.U. and secure the retaining strap.

3. Close the glovebox. Connect the battery.

COOLANT TEMPERATURE SENSOR

Test

1. Disconnect the battery and disconnect the electrical connector from the temperature sensor.

2. Connect an ohmmeter between the sensor terminals and note the resistance reading, disconnect the ohmmeter.
The reading should closely approximate the following according to temperature:

Coolant Temperature (°C)	Resistance Kilohms
-10	9.2
0	5.9
20	2.5
40	1.18
60	0.60
80	0.33

3. Check resistance between each terminal in turn and body of sensor. A very high resistance reading, open circuit, must be obtained.

4. Re-connect the sensor and the battery.

Remove

CAUTION: When the cooling system is hot take care to avoid scalding.

1. Remove the pressure relief cap from the coolant expansion tank.

2. Disconnect the electrical connector from the temperature sensor and unscrew the sensor from the cylinder head.

Refit

1. Screw the sensor into the cylinder head sufficiently tight to prevent water leaks without overstraining the threads. Connect the electrical connector.

2. Check the coolant level and top-up as necessary.

THERMOTIME SWITCH

Test

CAUTION: When the cooling system is hot take care to avoid scolding.

1. Remove the pressure relief cap from the coolant expansion tank and remove the filler plug from the radiator. Use a thermometer and note the coolant temperature.

2. Disconnect the battery and pull the electrical connector from the Thermotime switch.
Note the rated value stamped on body of the switch.

3. Connect ohmmeter between switch terminal 'W' and earth:

a. Coolant temperature higher than switch rated value; very high resistance reading, open circuit, should be obtained. Renew switch if low resistance, short circuit, is shown.

b. Coolant temperature lower than switch rated value; a very low resistance reading ,closed circuit, should be obtained. Renew the switch if a high reading, open circuit, is shown.

4. Connect a 12V supply via a isolating switch to terminal 'G' of Thermotime switch.
Use a stop-watch, check time delay between making isolating switch and the ohmmeter showing the change from low to high resistance. Delay period must closely approximate to time according to temperature:

Coolant Temperature (°C)	Delay in Seconds
-10	8
0	4.5
10	3.5
35	0

Renew thermotime switch if necessary.

6. Re-connect the plug to the switch and connect the battery.

Remove

1. Remove the pressure relief cap from the coolant expansion tank.
CAUTION: When the cooling system is hot take care to avoid scalding.

2. Locate the switch and disconnect the electrical plug.

3. Unscrew the switch from the cylinder head.

Refit

1. Screw the switch to the cylinder head sufficiently tight to prevent water leaks without overstraining the threads. Connect the electrical plug.

3. Check the coolant level and top-up as necessary.

AIR-FLOW METER

Remove

1. Disconnect the electrical multiplug and the two hoses from the air-flow meter.

2. Remove the two mounting bolts, release the inner mounting bolt, manoeuvre the meter from its mounting bracket and lift off the air-flow meter.

Refit

1. Wipe clean the mounting surfaces, manoeuvre the meter on to its mounting bracket and secure the inner bolt and the two mounting bolts.

2. Fit the hoses to the meter and connect the electrical multiplug.

EXTRA AIR VALVE

Test

1. Disconnect the electrical multiplug from the valve and connect a voltmeter across the terminals of the connector.

2. Operate the starter motor, battery voltage should be obtained on the voltmeter:

No voltage, check wiring for continuity and condition.
Battery voltage, check resistance of heating coils.

3. Connect an ohmmeter between the terminals of the air valve. A resistance of 33 ohms should be obtained:

No resistance, renew the extra air valve.

Remove
CAUTION: The valve will be hot when the engine is at normal operating temperature.

1. Disconnect the electrical multiplug and the two air hoses from the valve.

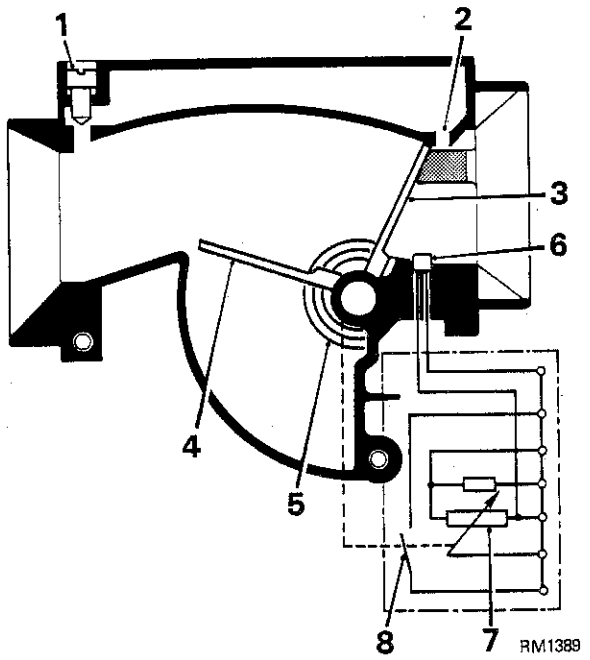

Fig. 7
Air-flow meter components

1. Idle mixture adjustment screw
2. Air by-pass channel
3. Measuring flap
4. Compensating flap
5. Coil spring - flap return
6. Air temperature sensor
7. Potentiometer
8. Fuel pump switch

2. Remove two mounting bolts securing the valve to the inlet manifold and lift off the valve.

Refit

1. Fit the valve to the inlet manifold and secure with two bolts.

2. Fit the two air hoses and the multiplug to the valve.

FUEL INERTIA CUT-OFF SWITCH

Remove

1. Disconnect the battery, remove the driver's glove box and find the switch mounted on a bracket adjacent to the pedal bracket.

2. Remove the inertia switch securing screws, disconnect the multiplug connector from the switch and remove the switch.

Refit

1. Position the inertia switch and connect the multiplug, align the switch to the bracket and fit the securing screws.

2. Connect the battery and start the engine, press the inertia switch reset button if necessary. Refit the glovebox.

THROTTLE CABLE

Remove

1. Release the outer cable from its support bracket, remove the split pin and disconnect the cable from the progressive throttle lever. Disconnect the cable from the accelerator pedal.

2. Release the outer cable from the clips in the engine compartment and feed the cable through the bulkhead grommet into the engine compartment.

Refit

1. Feed the cable from the engine compartment through the bulkhead grommet.

2. Connect the cable to the accelerator pedal, throttle lever and support bracket. Secure the split pin across the progressive throttle cam and fit the cable clips.

3. Adjust the outer cable to give 1.5 mm, 1/16 in free-play in the throttle cable and check throttle operation.

FUEL PUMP

Remove

NOTE: The pump will only operate when the engine is being turned by the starter motor or whilst air flow holds the switch closed.

1. Depressurise the fuel system.

2. Raise the front of the vehicle and support it on stands. The fuel pump unit is located adjacent to the propeller shaft.

3. Disconnect the pump electrical connector. Release the securing clips and disconnect the inlet and outlet hoses from the fuel pipes. Plug the pipes and hoses.

4. Remove the fuel pump cover.

5. Remove the bolts securing the pump mounting bracket to the cross-member and extract the pump unit.

6. Remove the mounting bracket and the insulating covers. Disconnect the electrical leads and the hoses from the pump.

Refit

1. Connect the electrical leads and hoses to the pump. Place the pump in the insulator with the wide flange, position leads and fit the second insulator and engage the flanges. Fit the mounting bracket so that it clamps across the insulator joint.

2. Secure the pump unit to the cross-member. Connect the inlet and outlet hoses and the electrical connector.

3. Fit the fuel pump cover.

4. Lower the vehicle. Press the knob down on the fuel inertia cut-off switch and connect the battery.

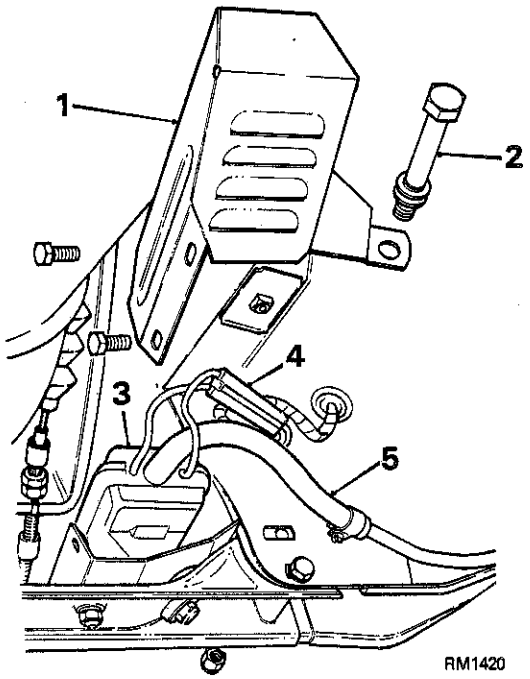

Fig. 8
Fuel pump location

1. Fuel pump cover
2. Through bolt - cross-member
3. Fuel pump unit
4. Wiring connector
5. Outlet hose - high pressure

FUEL PRESSURE TEST

Test

1. Depressurise the fuel system.

2. Release the clip and pull the cold start injector supply hose from the fuel rail. Connect a pressure gauge to the fuel rail.

3. Switch on the ignition, remove the air intake hose, and activate the fuel pump by moving the air flow meter flap.
The pressure gauge reading should register 36 - 40 lbf/in². If the pressure exceeds 40 lbf/in², check the fuel return line, fuel rail, and the pressure regulator for blockages.
Release the air flow meter flap to switch off the fuel pump. The fuel pressure drop

should not exceed 10.6 lbf/in² per minute. If the pressure is low or the pressure drop excessive, visually check the fuel inlet and fuel rail for leaks.

4. Clamp the fuel return pipe. If the fuel pressure reading stabilises, replace the fuel pressure regulator as faulty.

5. If the pressure reading continues to fall, remove the clamp and visually check the cold start injector for leaks.
WARNING: If the injector is leaking do not slacken any connection before first depressurising the fuel system.

6. Ensure the system is pressurised and clamp the fuel inlet pipe at the connection into the fuel rail. If pressure stabilises, the fault exists in the fuel pump or fuel pipe connection between pump and regulator.

7. If pressure loss is still apparent, depressurise the system, remove the fuel rail, the fuel pressure regulator, and the injectors from the manifold as a complete assembly without breaking any further hose/line connections.
Switch on the ignition, pressurise the fuel system, and visually check each injector in turn for leaks. Hold the injectors over a suitable receptacle and operate each in turn using Fast Check diagnostic equipment to highlight a faulty or blocked injector. Repressurise the system after each injector test.

8. Check each injector flow rate by connecting a hose from the injector to a measuring container. Activate the injectors for one minute using Fast Check, ensuring the air flow meter flap remains open. The flow rate should be 185 cm³/minute at a pressure of approximately 36 lbf/in².

FUEL PRESSURE REGULATOR

Remove

1. Depressurise the fuel system.

2. Remove the bolt securing the pressure regulator mounting bracket and carefully pull the regulator and bracket upwards. Note orientation of regulator in its bracket.

3. Disconnect and plug the inlet and outlet hoses from the regulator.

4. Remove the regulator from its mounting bracket.

Refit

1. Locate the regulator in its mounting bracket, orientated as noted and secure.

2. Connect the inlet and outlet hoses to the regulator, ensure that the hoses are not kinked or twisted.

3. Carefully push the regulator bracket into position and secure. Connect the battery.

FUEL INJECTION IDLE AND MIXTURE SETTING - PLENUM CHAMBER WITH TWIN THROTTLE

Service tools: Tachometer, CO meter

After checking or dismantling the air intake components, it is imperative that the idle speed and air/fuel mixture is correctly reset.
The throttle coupling screws are set at the factory and need no further adjustment. However, if they have been moved, they must be re-set to close both butterflys together.

Adjust

Before making any adjustment to the fuel settings it is essential that the ignition timing, distributor operation and plug gaps are checked.

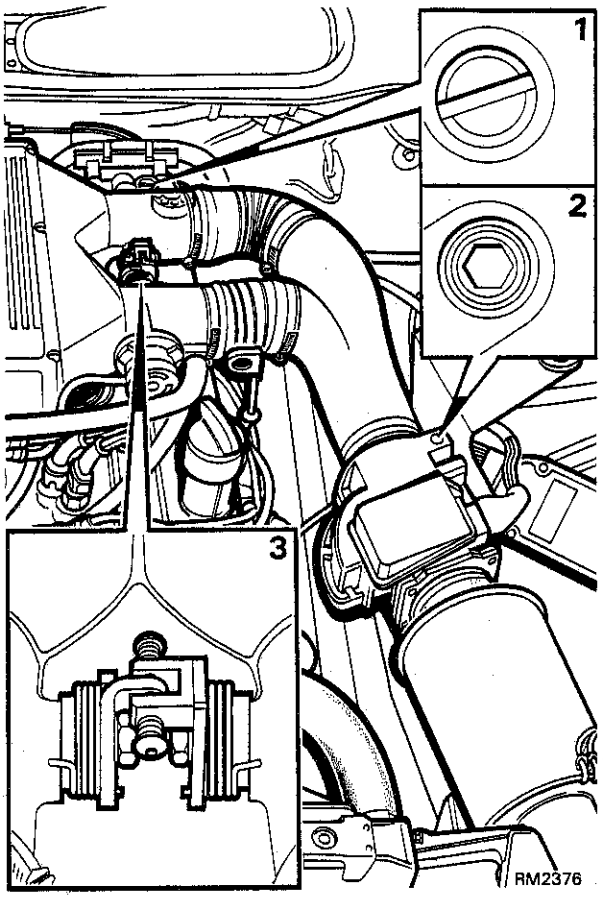

Fig. 9
Fuel injection system setting points -

plenum chamber with twin throttle
1. Idle speed adjustment screw
2. Mixture adjustment screw
3. Throttle coupling screws

The idle and mixture setting adjustments require the removal of tamperproof plugs and, when adjustments have been made, new plugs must be fitted where regulations require this to be done.

1. Attach a tachometer and run the engine until it has been working at normal operating temperature for at least two minutes. Run the engine at approximately 2000 rev/min for 30 seconds.
NOTE: Before adjustments are made, and every three minutes during adjustment, the engine must be run at approximately 2000 rev/min for 30 seconds to clear the intake system of residual fuel.

2. Check the engine idle speed, adjust by turning the adjustment screw clockwise to increase engine speed and anti-clockwise to reduce engine speed.

3. Insert a CO meter probe into exhaust pipe and check analyser CO reading which must be within the given tolerance.

4. If necessary, remove the plug from the adjustment screw in the air flow meter and turn the adjustment screw until the required reading is obtained.
If the correct CO reading can not be obtained, check that the air intake pipes between the air flow sensor and throttle housings are not loose or damaged.

5. Remove the CO meter and the tachometer.

PLENUM CHAMBER - TWIN THROTTLE

Remove

1. Remove the cold start injector securing screws, the cold start injector and gasket. Disconnect the pressure regulator hose from the plenum chamber and the harness multiplug from the throttle potentiometer.

2. Release the air intake hoses from the plenum chamber. Release the air intake locating stud from its mounting on the support bracket and remove the air intake assembly from the air flow meter.

3. Slacken the throttle cable adjuster locknut, release the cable adjuster from the mounting bracket and disconnect the throttle cable from the quadrant.

4. Disconnect the engine breather and vacuum hoses from the plenum chamber. Release the wiring harness from the bracket on the plenum chamber.

5. Partially drain the cooling system and disconnect the coolant hoses from the plenum chamber.

6. Remove the through bolts, raise the plenum chamber, release the fuel pipes from the clips on the mounting bracket and lift off the plenum chamber assembly.

Remove ancillary units from the plenum chamber as required.
NOTE: The throttle coupling screws are set at the factory and should not be moved.

Refit

1. Ensure all mating surfaces are clean and fit the ancillary units to the plenum chamber. Secure the fuel pipes to their clips, locate the plenum chamber in position and secure with the through bolts.

2. Connect the coolant, engine breather and vacuum hoses to the plenum chamber. Connect the wiring harness to the bracket.

3. Connect the throttle cable to the quadrant and the throttle adjuster to the bracket. Tighten the the adjuster locknut.

4. Connect the harness multiplug to the throttle potentiometer and the pressure regulator hose to the plenum chamber. Fit the cold start injector and gasket and tighten the securing screws.

5. Fit the air intake assembly to the air flow meter, locate the air intake stud and secure the air intake hoses to the plenum chamber.

6. Refill the cooling system.