Emission control systems

Cars conforming to
1981/1987 (inclusive) model year
North American specifications

This chapter contains information applicable to 1981, 1982, 1983, 1984, 1985, 1986, and 1987 model year cars, regardless of the date printed at the bottom of each page.

Where the information only applies to a particular model year, it is clearly stated within the text.

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Introduction

This chapter has been written specifically for cars fitted with emission control systems conforming to the North American emission control regulations. It applies to 1981/1987 (inclusive) model year new motor vehicles.

It is important therefore that Service Personnel fully understand the contents of this chapter so that the special servicing can be correctly carried out.

Rolls-Royce and Bentley motor cars conforming to the above regulations and produced to the 1981/1987 (inclusive) model year specifications can be readily identified as follows.

a. Vehicle identification number

1981 model year cars can be identified by having the letter B as the tength digit of the vehicle identification number (e.g. *SCAZS42A3BCX01011*).

1982 model year cars can be identified by having the letter C as the tenth digit of the vehicle identification number (e.g. *SCAZS42A7CCX05001*).

1983 model year cars can be identified by having the letter D as the tength digit of the vehicle identification number (e.g. *SCAZS42A0DCX07805*).

1984 model year cars can be identified by having the letter E as the tenth digit of the vehicle identification number (e.g. *SCAZS42A0ECX08597 *).

1985 model years cars can be identified by having the letter F as the tenth digit of the vehicle identification number (e.g. *SCAZS42A3FCX12001*).

1986 model year cars can be identified by having the letter G as the tenth digit of the vehicle identification number (e.g. * SCAZS42A4GCX13871 *).

1987 model year cars can be identified by having the letter H as the tenth digit of the vehicle identification number (e.g.*SCAZS42A5HCX16348*).

b. Emission control certification label

An emission control certification label (similar to figure U1-1) is located inside the engine compartment.

Engine compartment

Figures U2-1 and U2-2 show the location of the major emission related components within the engine compartment.

Fuel injection system

Figure U2-3 provides layout details of the fuel injection system which is described in Section U2.

Hose routing diagram

Figure U2-6 gives details of the various hose runs and connections in and around the engine compartment, that are associated with the emission related components.

Torque tightening

When fitting the various emission control systems components, ensure that the securing nuts and setscrews are tightened to the torque figures given in Chapter P, unless otherwise stated in this Chapter.

Fig. U1-1 Emission control certification label

Fuel injection system

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Fuel injection system

The purpose of the following description is to provide elementary details of the fuel injection system. This information will enable service personnel to familiarize themselves with the operation of the system, so that the servicing procedures given in this Workshop Manual can be carried out.

Description of the system

To comply with the exhaust emission control regulations, it is necessary to use a three-way exhaust catalytic converter. In order to achieve maximum efficiency the catalytic converter requires very accurate control of the engine air/fuel ratio. This has been accomplished by using a continuous fuel injection system with 'closed loop' mixture control and an exhaust gas oxygen sensor.

The system utilizes many parts of the Bosch K-Jetronic continuous fuel injection system.

The basic principle of operation is that the accelerator pedal controls the movement of the throttle plate which regulates the amount of air drawn into the engine. An air flow sensor fitted upstream of the throttle plate, monitors the quantity of intake air entering the system. Dependent upon the volume of air metered, a fuel distributor apportions a quantity of fuel to the injector adjacent to each cylinder.

The air flow sensor and the fuel distributor are combined into one assembly known as the mixture control unit (see fig. U2-4).

The precisely metered quantity of fuel is continuously sprayed from the injectors in a finely atomized form into the induction manifold behind the engine inlet valves. The air/fuel mixture is then drawn into the engine cylinders whenever an inlet valve opens.

Air flow sensing

The air flow sensor consists of an air funnel in which moves an air flow sensor plate mounted on a pivoted lever (see fig.U2-5). When the engine is operating the sensor plate is deflected into the air funnel, the deflection being dependent upon the volume of air passing through the funnel. The air will deflect the sensor plate until a state of balance exists between the force on the air sensor plate and the counter force provided by fuel at a constant pressure acting on the end of the control piston.

The weight of the air sensor plate and connecting lever are balanced by a counterweight on the fuel distributor side of the lever.

Movement of the control piston and its horizontal control edge (see fig. U2-5) either increases or decreases the open area of the eight metering slits (one for each engine cylinder) in the fuel distributor.

Differential pressure valves (one for each cylinder) located within the fuel distributor, maintain a constant pressure drop across the metering slits.

Since the air flow sensor plate and the control piston are operated by the same lever, the rate of fuel discharge is proportional to the deflection of the air sensor plate which is governed by the calibrated cone within the funnel.

The mixture strength of each engine is adjusted at the engine idle speed setting, during manufacture of the vehicle. This is achieved by turning a screw which alters the position of the air flow sensor plate lever relative to the control piston. Turning the adjustment screw either raises or lowers the control piston for a given engine idle speed position of the air flow sensor plate, thereby richening or weakening the idle mixture. The adjustment screw is subsequently sealed and no further mixture adjustment should be necessary.

Fuel circuit

The fuel supply system comprises the primary circuit, control circuit, and the lambda control circuit.

The fuel is at different pressures in various parts of the circuit as follows.

Primary circuit	5,2 bar to 5,8 bar (75.4 lbf/in² to 84.1 lbf/in²)
Differential pressure valves (upper chambers)	4,6 bar (67 lbf/in²)
Differential pressure valves (lower chambers – lambda control)	4,65 bar to 4,75 bar (67.4 lbf/in² to 68.9 lbf/in²)
Control circuit (variable dependent upon engine temperature)	0,5 bar to 3,7 bar (7.25 lbf/in² to 54 lbf/in²)
Injection pressure	3,6 bar (52 lbf/in²)

Primary fuel circuit (see fig. U2-3)

In the primary circuit a roller cell pump driven by an electric motor draws fuel from the fuel tank and pumps it via a fuel accumulator and main filter to the fuel distributor.

The voltage to operate the fuel pump is fed from a relay which is triggered by pulses from the ignition. This relay is by-passed during engine cranking to provide an immediate fuel supply. If however, the engine speed drops below 150 rev/min the relay de-energises and the pump stops operating. This ensures that in the event of an accident the fuel pump will not operate if the engine stops.

The fuel accumulator maintains pressure in the system after the engine has stopped (to ensure good hot starting).

The primary circuit fuel pressure is regulated by a plunger type valve to nominally 5,2 bar to 5,8 bar (75.4 lbf/in² to 84.1 lbf/in²).

In the fuel distributor the fuel initially enters a passage which joins with the lower chambers of the differential pressure valves via a small fixed orifice (see fig. U2-9).

When the engine is operating the fuel flows through the metering slits (machined into the barrel of the fuel distributor) to the upper side of the diaphragm in the differential pressure valves. Then through injector lines to the injector valves.

The injector valves have an opening pressure of approximately 3,6 bar (52 lbf/in²) and are designed to spray finely atomized fuel under all operating conditions.

From the primary fuel circuit a fuel line feeds the cold start injector.

When the engine is stopped, the primary system pressure regulator allows the system pressure to drop rapidly to a pressure governed by the fuel accumulator

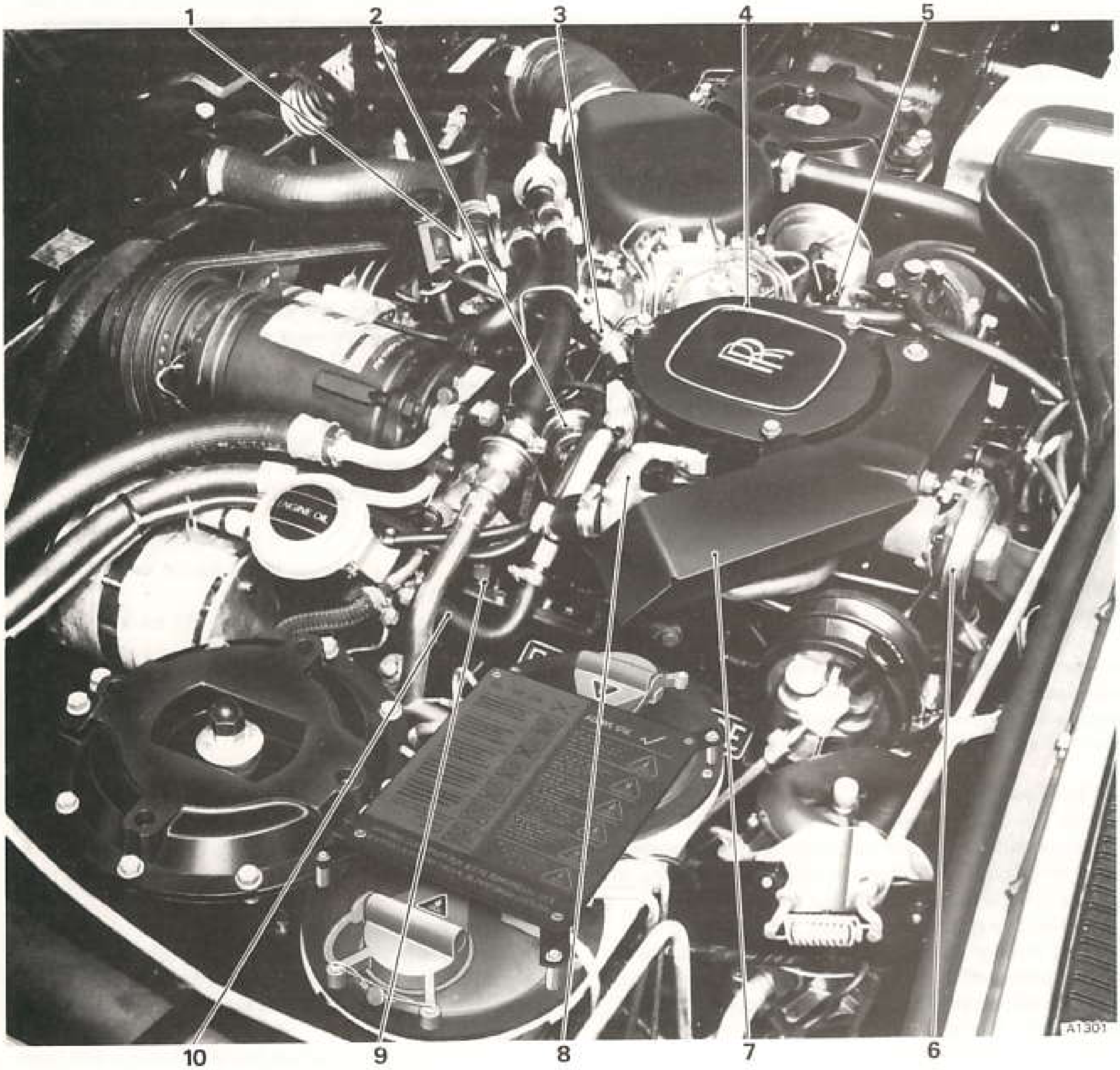


Fig. U2-1 Engine compartment details (left-hand side)

1 Air switching valve
2 Pressure damper
3 Cold start injector
4 Plenum chamber cover
5 'Closed loop' wide throttle micro-switch
6 Exhaust gas recirculation (E.G.R.) valve
7 E.G.R. heatshield
8 Auxiliary air valve
9 Injector
10 Crankcase breather pipe

which is just below the injector opening pressure and maintains it at this level by sealing the return line to the fuel tank. This seal is effected by a rubber 'O' ring fitted to the valve which is compressed against the fuel distributor housing (see fig. U2-7). Simultaneously a push valve, integral with the system pressure regulator closes and prevents leakage through the control circuit. This retention of fuel pressure in the system is important because during 'hot soak' conditions it prevents fuel vapourization and subsequent poor starting. In addition, the sudden pressure drop at the fuel injectors (causing them to close) prevents 'dieseling' (i.e. the tendency of an engine to continue 'running-on' after the ignition has been switched off).

Control fuel circuit (see fig. U2-3)
The control circuit provides the control pressure that acts upon the upper end of the control piston and provides the balancing force for the air load acting on the air sensor plate. In addition, it also provides a means of enriching the mixture for cold starting.

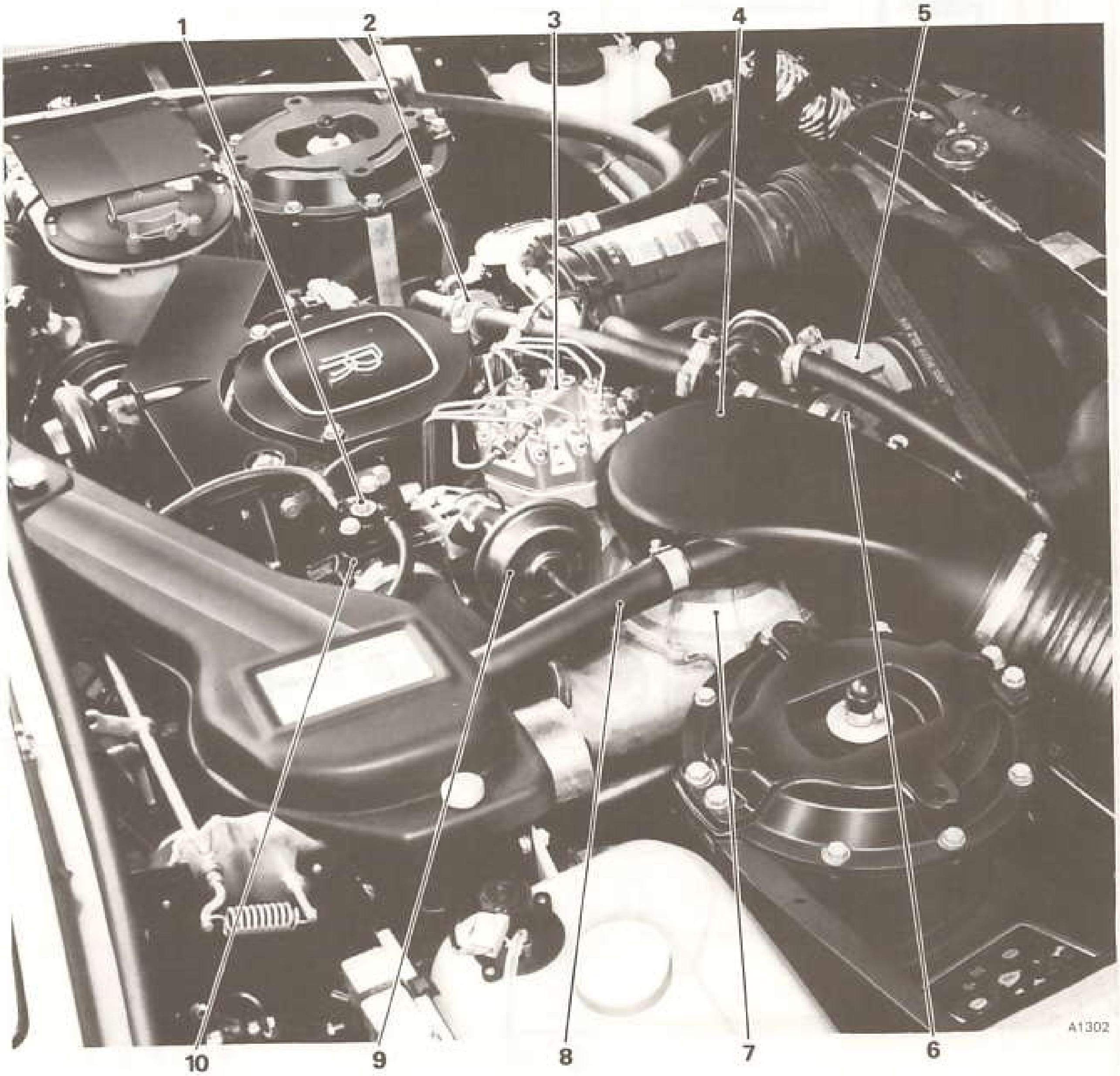


Fig. U2-2 Engine compartment details (right-hand side)
1 Idle speed adjustment screw
2 'B' bank check valve
3 Fuel distributor
4 Air intake
5 Air injection pump
6 'A' bank check valve
7 Air meter
8 Crankcase breather pipe
9 Overrun valve
10 Throttle body

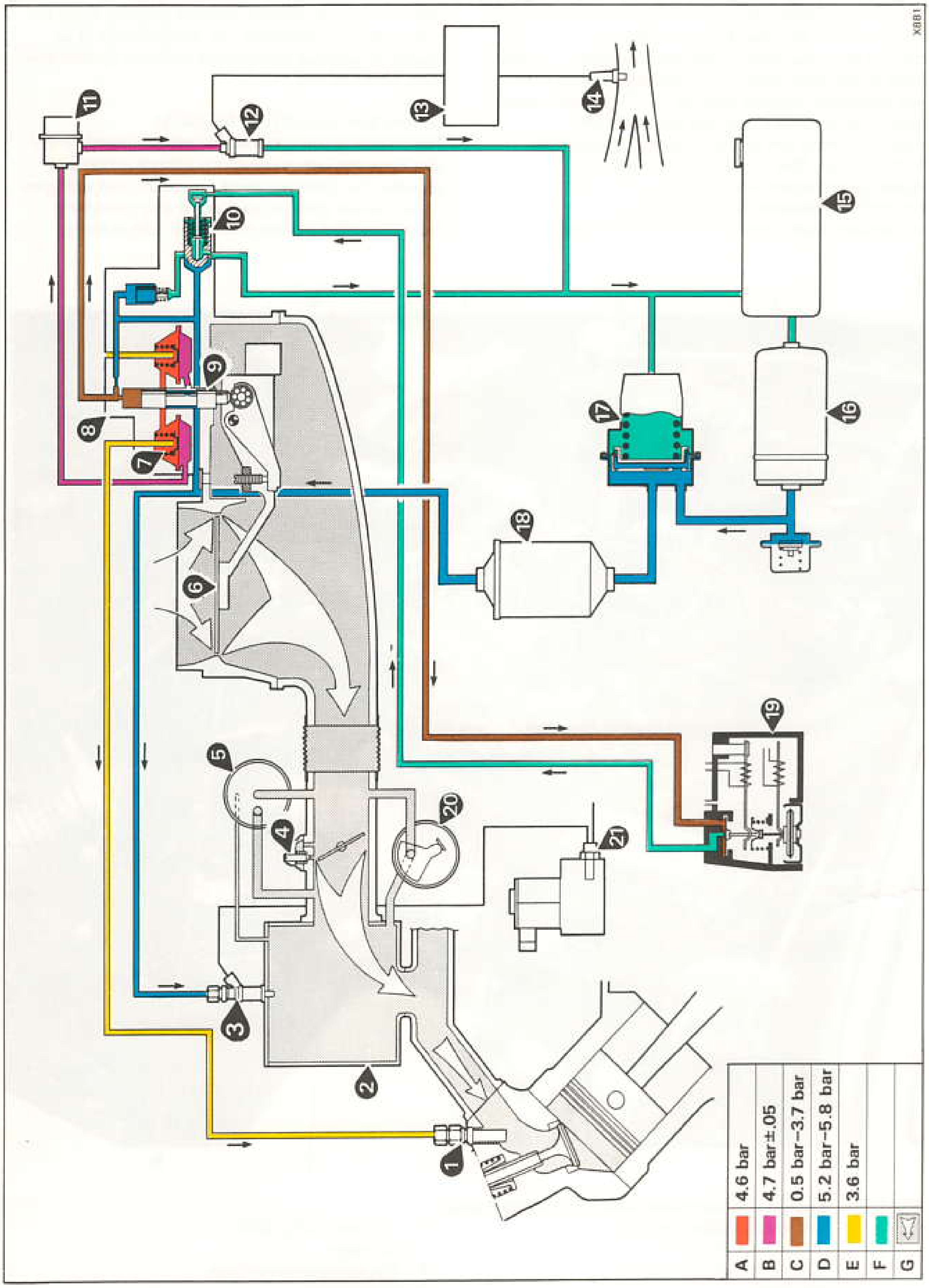


Fig. U2-3 Fuel injection system

Key to fig. U2-3 Fuel injection system

1 Injector
2 Plenum chamber
3 Cold start injector
4 Idle speed adjustment screw
5 Overrun valve
6 Air sensor plate
7 Differential pressure valve
8 Fuel distributor
9 Control piston
10 System pressure regulator
11 Pressure damper
12 Pressure control valve
13 Electronic control unit
14 Oxygen sensor
15 Fuel tank
16 Fuel pump
17 Fuel accumulator
18 Fuel filter
19 Warm-up regulator
20 Auxiliary air valve
21 Thermal time switch
A Upper chamber pressure
B Lower chamber pressure (variable)
C Control pressure
D System pressure
E Injection pressure
F Unpressurized
G Intake air

The control circuit is supplied with fuel from the primary circuit through a restrictor in the fuel distributor (see fig. U2-8). The fuel then passes either into the chamber above the control piston via a damping restrictor or via an external connection to the warm-up regulator, where nominal control pressure of 3,7 bar (54 lbf/in²) is maintained at normal engine operating temperature (at sea level).

The pressure regulator in the warm-up regulator is tensioned by a bi-metal spring when the engine is cold, this in turn reduces the load on the regulating valve and correspondingly lowers the control pressure.

With a lower control circuit pressure, the air flow sensor plate is allowed to travel further downwards in the air funnel for a given rate of air consumption which in turn, moves the control piston further up in the barrel of the fuel distributor. This increases the opening of the fuel metering slits and thereby enriches the mixture.

The bi-metal of the warm-up regulator is heated electrically whenever the engine is running. This causes the effect of the bi-metal to be reduced with a corresponding reduction in the amount of mixture enrichment.

The warm-up regulator is mounted so that is can assume the temperature of the engine. Therefore, when the engine is started in the semi-warm condition, unnecessary enrichment of the air/fuel mixture is avoided.

Fuel from the warm-up regulator flows through the push valve assembly which assists in maintaining the pressure by closing the primary circuit when the

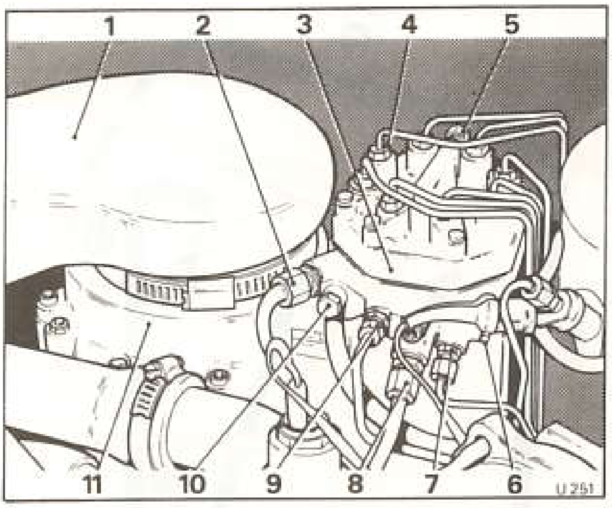


Fig. U2-4 Mixture control unit

1 Air intake
2 Fuel supply to distributor
3 Fuel distributor
4 Fuel feed to injector
5 Fuel feed to warm-up regulator
6 System pressure regulator
7 Fuel return from warm-up regulator
8 Fuel return to tank
9 Fuel feed to cold start injector
10 Fuel feed to pressure control valve (via pressure damper)
11 Air meter

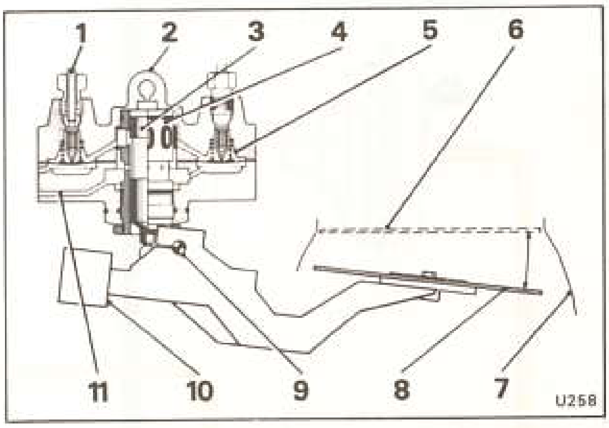


Fig. U2-5 Air flow sensor and fuel distributor (mixture control unit)

1 Fuel feed pipe to injector
2 Fuel distributor assembly
3 Control piston
4 Fuel distributor barrel
5 Differential pressure valve
6 Position of air sensor plate at idle speed
7 Air meter
8 Air flow sensor plate
9 Pivot
10 Counterbalance weight
11 Fuel inlet

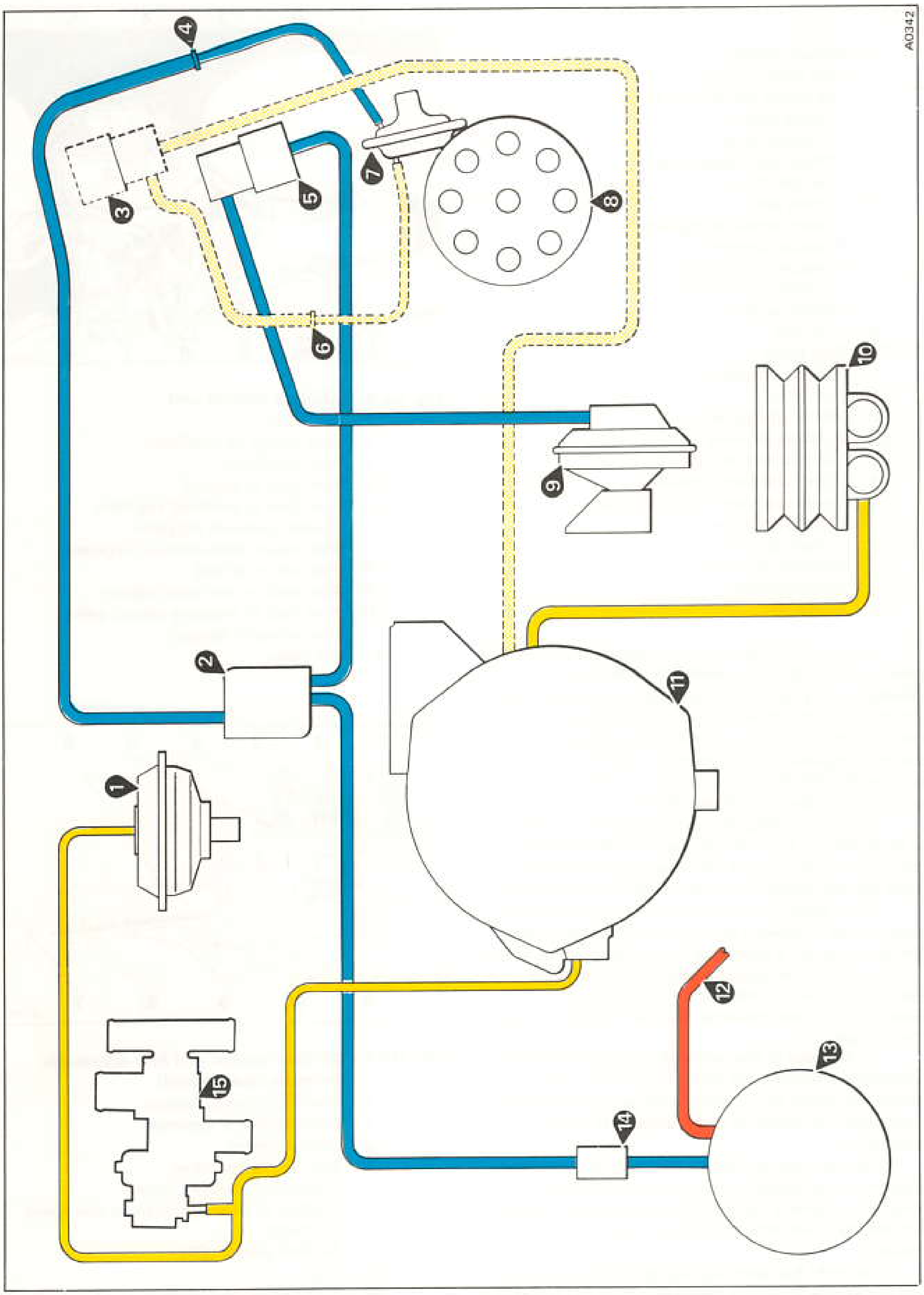


Fig. U2-6 **Vacuum hose routing diagram**

Key to fig.U2-6 Vacuum hose routing diagram

1 Overrun valve
2 Throttle body
3 Ignition vacuum retard cut-off solenoid (if fitted)
4 Vacuum advance signal hose adapter
5 E.G.R. valve cut-off solenoid
6 Vacuum retard signal hose adapter (if fitted)
7 Vacuum advance/retard capsule
8 Ignition distributor
9 Exhaust gas recirculation (E.G.R.) valve
10 Speed control unit
11 Plenum chamber
12 Hose to fuel tank vent
13 Fuel evaporative emission control canister
14 Purge line restrictor
15 Air switching valve

engine is switched off. Excess fuel flows around the push valve and into the fuel tank return line which is not under pressure (see fig. U2-3).

Fuel distribution (see fig. U2-3)

To ensure that the fuel is uniformly distributed to the cylinders a control piston and barrel assembly is used (see fig. U2-14). This assembly operates by controlling the open cross sectional area of the metering slits machined in the barrel.

The barrel has one slot shaped opening (the rectangular metering slit) for each cylinder. Each metering slit has a differential pressure valve to hold the drop in pressure at the metering slits constant at the various flow rates. As a result possible effects of variations in the primary system pressure and differences in the opening pressure of the injector valves are eliminated.

With a constant drop in pressure at the metering slits, the amount of fuel flowing to the injector valves depends solely upon the open cross sectional area of the slits.

Differential pressure valves (see figs. U2-3 and U2-9)

There is a differential pressure valve for each engine cylinder. The valve is a diaphragm type consisting of an upper and lower chamber with the diaphragm separating the two halves (see fig. U2-9). The basic principle of operation is that the fuel pressure in the upper chamber is at approximately 0,1 bar (1.5 lbf/in²) less than the pressure in the lower chamber. The pressure differential is produced by the helical spring built into the upper chamber. Under these conditions equilibrium of forces exists at the diaphragm.

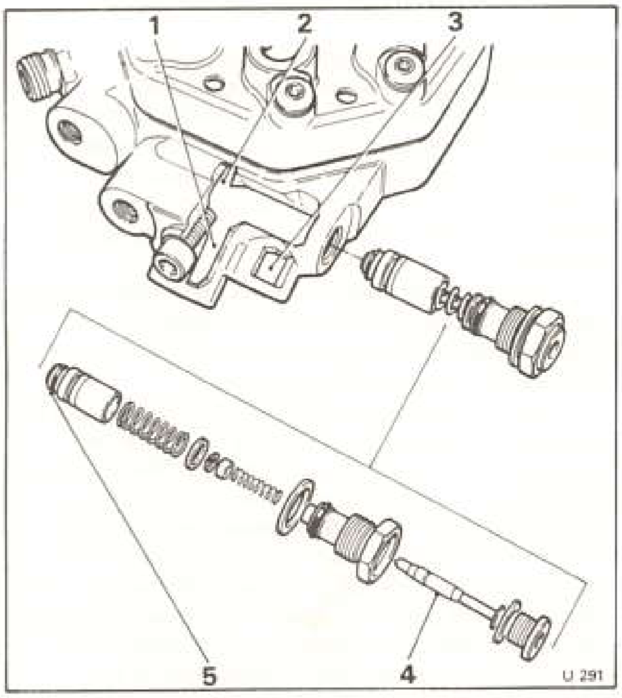


Fig. U2-7 System pressure regulator

1 Fuel return to tank
2 System pressure line
3 Fuel return from warm-up regulator
4 Push valve
5 Regulator valve sealing face

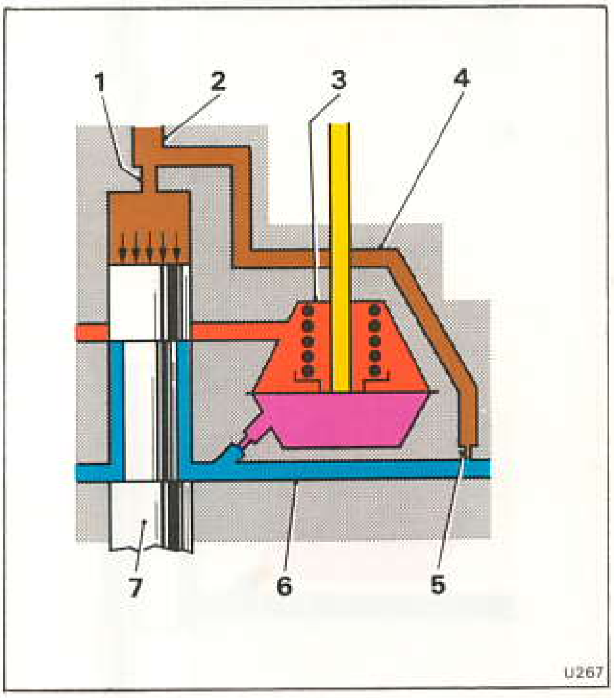


Fig. U2-8 Relationship between primary circuit pressure and control pressure

1 Damping restrictor
2 Fuel feed to warm-up regulator
3 Differential pressure valve
4 Control circuit pressure
5 Control circuit restrictor
6 Primary circuit pressure
7 Control piston

If additional fuel flows through the metering slit into the upper chamber, the pressure rises temporarily. This increase in pressure will force the diaphragm downwards until a differential pressure of 0,1 bar (1.5 lbf/in²) again prevails at the metering slit.

At higher rates of fuel flow, the diaphragm opens a larger annular cross section, so that the pressure differential remains constant. If the rate of fuel flow decreases, the diaphragm reduces the amount of fuel flowing into the injector line.

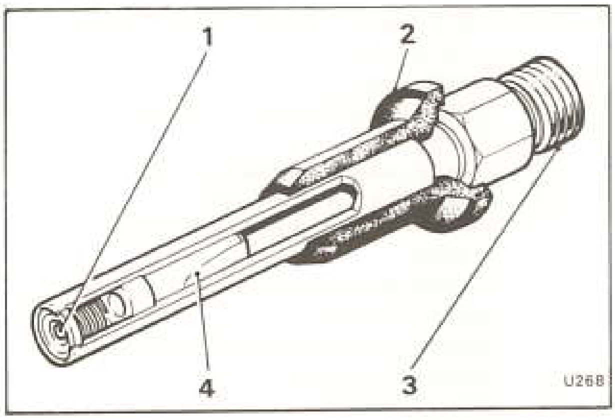


Fig. U2-10 Injector
1 Nozzle
2 Insulating sleeve
3 Fuel supply connection
4 Filter

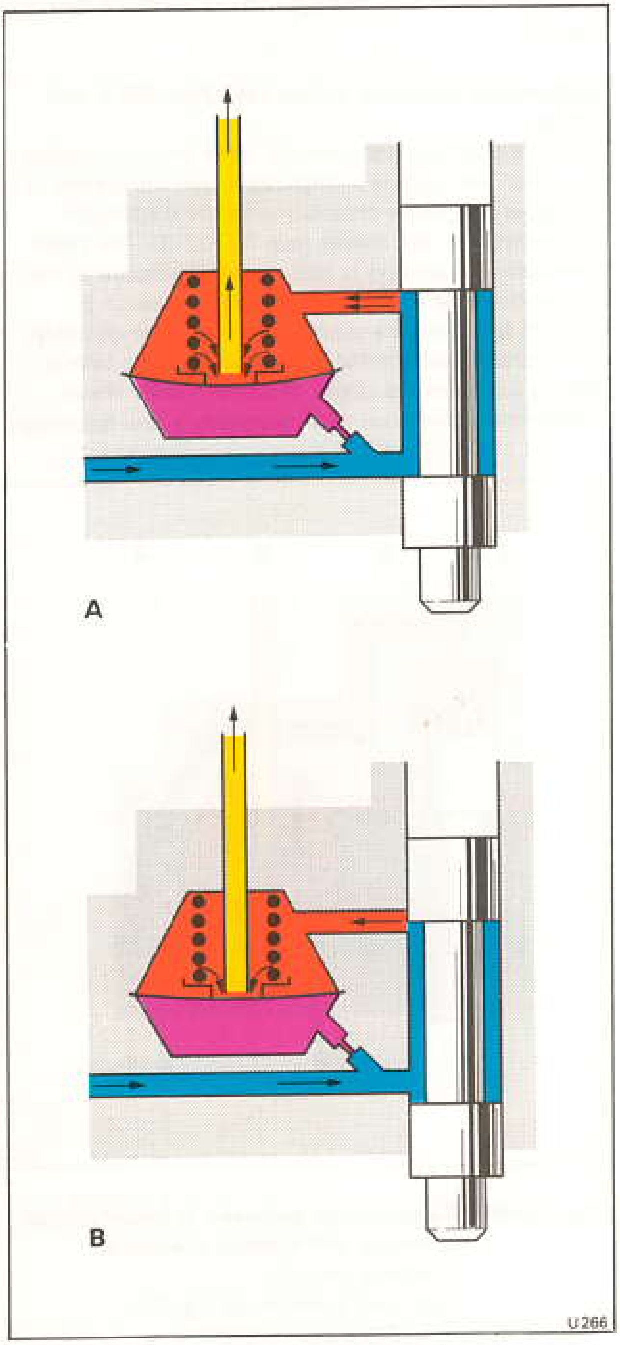


Fig. U2-9 Differential pressure valve
A – High flow rate
B – Low flow rate

The total travel of the diaphragm is only a few hundredths of a millimetre.

Note
The fuel pressure in the lower system and therefore, the pressure differential between the two halves of the chamber is affected slightly by the operation of the lambda control system.

'Closed loop' mixture control system (Lambda control system) (see fig. U2-3)
The lambda control system is an addition to the K-Jetronic fuel injection system and is fitted to give accurate control of the air/fuel ratio about the stoichiometric value which is necessary to achieve efficient operation of the three-way exhaust catalytic converter.

The control principle is based on the fact that by means of the oxygen sensor the exhaust is continuously monitored and the amount of fuel fed to the engine is continuously corrected.

With an ideal (stoichiometric) air/fuel mixture the air factor is identified by the value *$\lambda = 1$. At this mixture ratio the output signal from the oxygen sensor develops a voltage jump which is processed by the electronic control unit. This voltage changes sharply for small deviations from the stoichiometric mixture (the air/fuel ratio for full combustion of the fuel). The electronic unit therefore, controls the injection system for 'closed loop' fuel metering by modulating the signal to the pressure control valve. This in turn, affects the pressure in the lower chambers of the differential pressure valves.

By responding to the unconsumed oxygen content of the exhaust gas, the sensor registers the extent of the complete combustion and regulates the air/fuel mixture to the ideal or stoichiometric ratio.

$$\lambda = \frac{\text{Actual intake air}}{\text{Theoretical requirement}}$$

Description of the components

Injector (see fig. U2-10)

An injector is fitted into the induction system just behind each inlet valve. The injector opens automatically when the fuel pressure in the injection lines reaches 3,6 bar (52 lbf/in²). It has no metering functions, its purpose being to continually spray finely atomized fuel under all running conditions. The injector is supported in a specially shaped moulded rubber sleeve, it is pressed (not screwed) into position. The hexagonal section is provided to hold the injector while the fuel line is attached. A retention plate is fitted over the injector and secured to the cylinder head by two small setscrews, each plate retains two injectors.

Plenum chamber

This chamber is mounted centrally over an eight branch induction manifold, it is filled with air ready for induction into the engine.

Cold start injector (see fig. U2-11)

In order to facilitate engine starting particularly from low ambient temperatures, a cold start injector is fitted into the plenum chamber and sprays additional finely atomized fuel during engine cranking. A thermal time switch mounted in the thermostat housing controls the operation of the cold start injector. This injector ceases to operate when the ignition key is released from the START postion.

In the cold start injector a helical spring presses the movable armature and seal against the valve seat, closing the fuel inlet. When the armature is energized (and therefore drawn upwards) the fuel port is opened and the pressurized fuel flows along the sides of the armature to the swirl nozzle.

Idle speed adjustment screw (see fig. U2-12)

This adjustment screw is situated on top of the throttle body and allows limited adjustment of the engine idle speed. During manufacture of the vehicle the engine idle speed is set using the throttle butterfly valve adjusting screw. The screw is situated on the side of the throttle body and is sealed after the initial adjustment. Afterwards, adjustment to the engine idle speed is by means of the idle air bleed screw situated on top of the throttle body, this screw is the only means of limited adjustment to the engine idle speed.

Overrun valve (see fig. U2-13)

During engine overrun (i.e. when deceleration with a closed throttle) insufficient mixture is supplied to the engine to maintain satisfactory combustion. The overrun valve alleviates this condition by allowing some air to by-pass the closed throttle plate when a high intake manifold depression exists.

When the throttle plate is closed suddenly, the high manifold depression signal generated in the plenum chamber is transmitted via a hose to the housing of the overrun valve. This signal deflects a diaphragm against a return spring and simultaneously allows a spring loaded valve to open the air intake

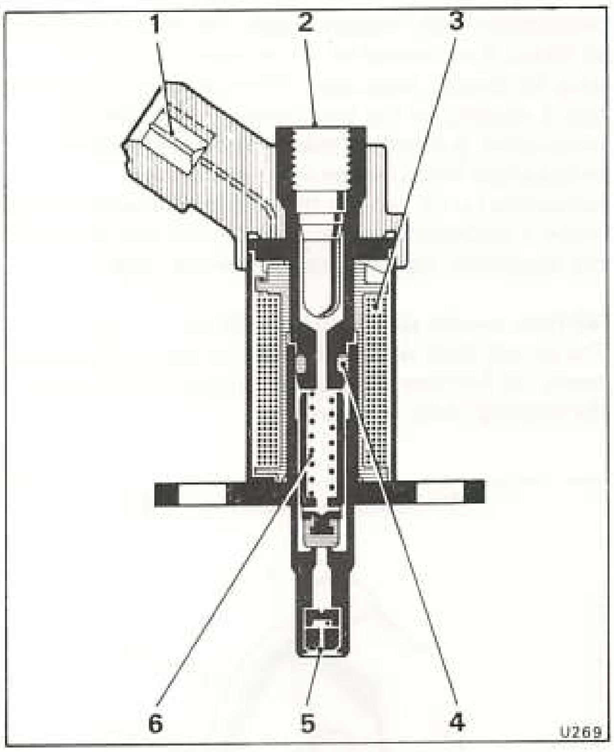


Fig. U2-11 Cold start injector
1 Electrical connection
2 Fuel inlet
3 Magnetic coil
4 Sealing ring
5 Swirl nozzle
6 Armature

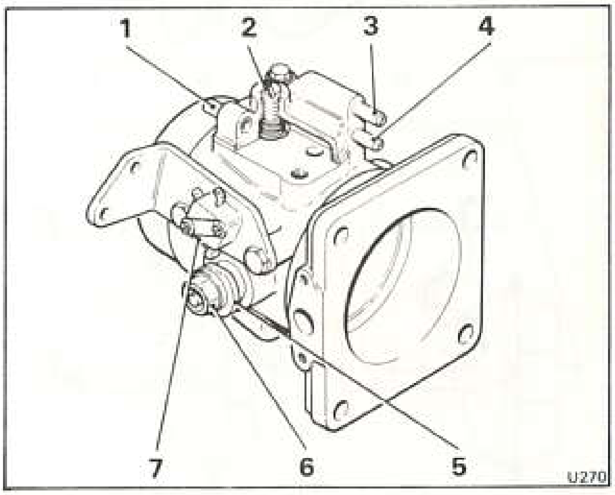


Fig. U2-12 Throttle body
1 Ignition distributor vacuum advance signal connection
2 Idle speed adjusting screw
3 E.G.R. signal connection
4 Evaporative emission control canister purge connection
5 Micro-switch actuating cam
6 Throttle spindle nut
7 'Closed loop' wide throttle micro-switch

connection of the overrun device. This in turn permits air which is monitored by the air sensor plate to by-pass the throttle plate and a corresponding amount of fuel is metered by the fuel distributor. Satisfactory combustion is therefore maintained which reduces hydrocarbon emissions and controls catalyst temperatures. As soon as the manifold depression falls below a predetermined value, the return spring pushes the diaphragm back closing the overrun valve.

Air flow sensor plate (see fig. U2-5)
The sensor plate is housed in the air venturi of the air meter. Its function is described on page U2-5 under the heading of Air flow sensing.

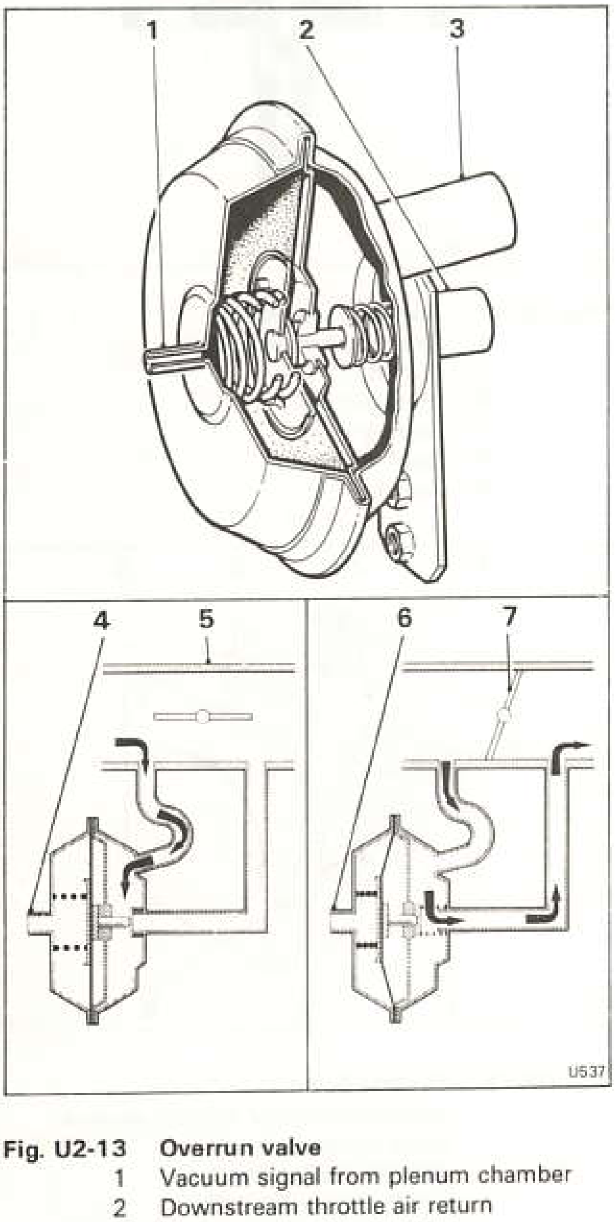


Fig. U2-13 Overrun valve
1 Vacuum signal from plenum chamber
2 Downstream throttle air return
3 Upstream throttle air intake
4 Weak vacuum signal
5 Throttle body
6 Strong vacuum signal
7 Throttle valve

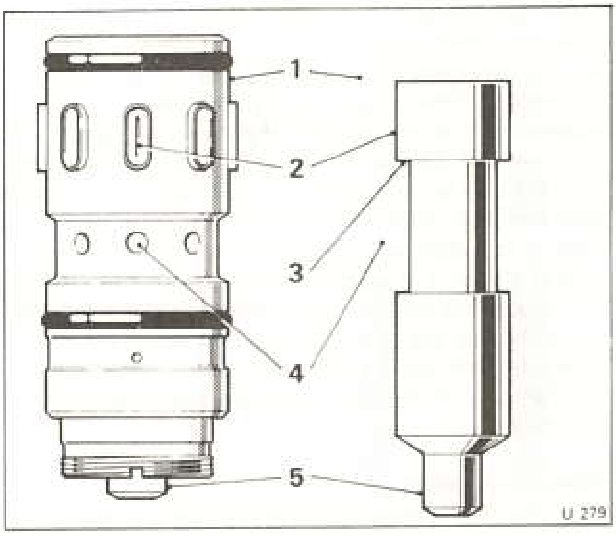


Fig. U2-14 Fuel distributor barrel and control piston
1 Fuel distributor barrel
2 Fuel metering slits
3 Piston control edge
4 Fuel inlet ports
5 Control piston

Differential pressure valves (see fig. U2-9)
The differential pressure valves (one for each engine cylinder) are housed in the fuel distributor. Their function is described on page U2-11 under the heading Differential pressure valves.

Fuel distributor (see fig. U2-5)
The fuel distributor forms part of the mixture control unit. Its function is described in the sections Description of the system and Fuel circuit.

Control piston (see figs U2-5 and U2-14)
This is a cylindrical plunger type of valve that moves vertically in the fuel distributor. It is operated by a lever connected to the air flow sensor plate.

A precision machined edge on the control piston opens the fuel metering slits in the fuel distributor barrel and therefore, controls the amount of fuel injected into the engine cylinders.

System pressure regulator (see fig. U2-7)
When the engine is operated this regulator maintains a constant primary circuit fuel pressure. When the engine is stopped, the regulator valve allows the fuel pressure in the primary circuit to fall rapidly to just below the injector opening pressure. In addition, the push valve (the small valve on the outer end of the regulator) closes and prevents leakage from the control circuit.

Pressure damper (see fig. U2-15)
This assembly is designed to 'damp' the pressure pulses caused by the operation of the pressure control valve.

Pressure control valve (see fig. U2-16)
This valve is operated by an electrical signal received from the electronic control unit.

The pressure control valve receives square-wave pulses of constant frequency (70 cycles per second) but of variable width (i.e. the proportion of time that the valve remains open during any one cycle is variable, controlling the flow rate through the valve). This action varies the fuel pressure in the lower chambers of the differential pressure valves.

Electronic control unit (see fig. U2-17)
The electronic control unit, converts the electrical signal from the oxygen sensor into a hydraulic correction of the fuel mixture. This is achieved by the signal it transmits to the pressure control valve.

The oxygen sensor reacts to a change from a weak to a rich mixture with a voltage jump which is processed by the electronic control unit.

As a result of this change to a richer mixture, the control unit changes the open-closed ratio of the pressure control valve smoothly towards a weaker mixture, until the oxygen sensor reacts to the resulting weaker mixture. This develops a voltage jump in the opposite direction, causing the open-closed ratio of the pressure control valve to be changed in the richer mixture direction.

To avoid driving continuously with a weak mixture if the oxygen sensor malfunctions, the control operation is periodically monitored within specified fixed time spans and, in the event of a defect, the control operation is switched to the 'internal-signal mode'. When in this operating mode the pressure control valve receives a constant pulse signal to control the on-off ratio. In addition a warning lamp situated on the facia will be illuminated to indicate that attention is necessary.

In addition to the basic function of the electronic control unit to evaluate the signal from the oxygen sensor, it also performs the following additional functions.

Until the oxygen sensor attains its operating temperature, a control function cannot take place. Therefore, during this warm-up period the electronic control unit is switched to the 'internal-signal mode' ('open loop control').

When it is necessary for the engine to operate under full load conditions it is also desirable to switch from the 'external-signal mode' or 'closed loop control'. This is achieved by a cam, situated on the side of the throttle housing activating a micro-switch and thereby, switching the electronic control unit into the 'internal-signal mode'.

Simultaneously, the electronic control unit modifies the signal to the pressure control valve to provide the additional enrichment required for satisfactory engine operation at full throttle.

Oxygen sensor (see fig. U2-18)
The oxygen sensor measures the oxygen content in the exhaust gas and by means of an electrical signal transmits the information to the electronic control unit.

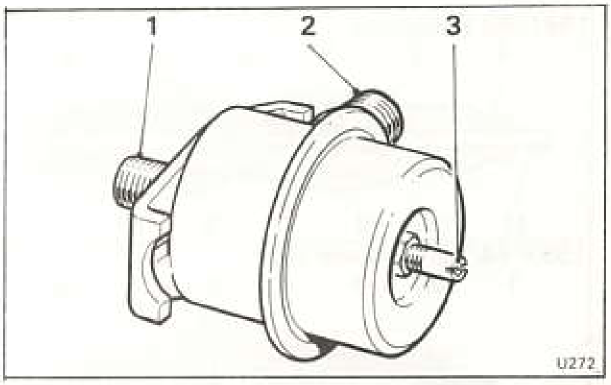


Fig. U2-15 **Pressure damper**
1 Fuel feed from distributor
2 Fuel supply to pressure control valve
3 Vent hose to oil filler housing

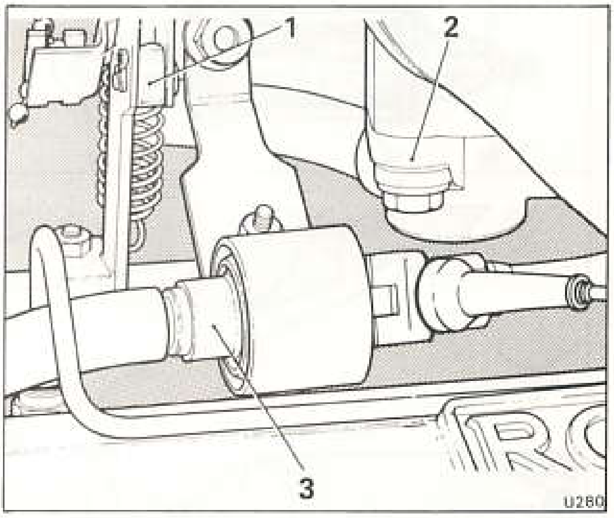


Fig. U2-16 **Pressure control valve**
1 Throttle lever
2 Throttle body
3 Pressure control valve

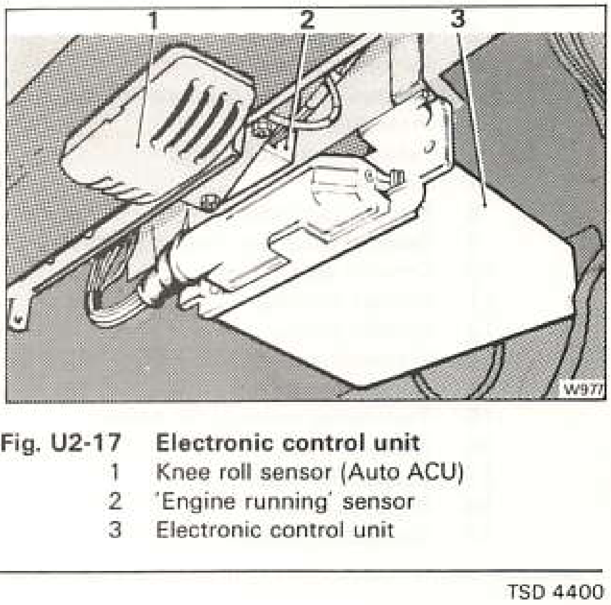


Fig. U2-17 **Electronic control unit**
1 Knee roll sensor (Auto ACU)
2 'Engine running' sensor
3 Electronic control unit

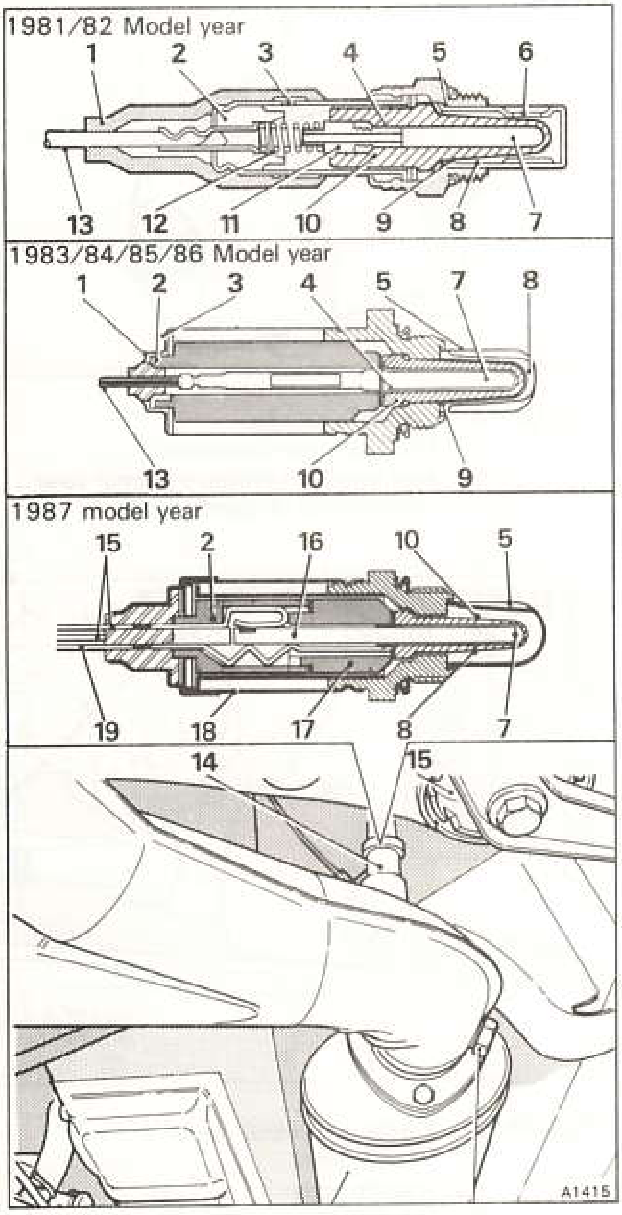


Fig. U2-18 Oxygen sensor
1 Protective cap
2 Ceramic insulator
3 Air intake opening
4 Internal electrical conductive layer
5 Protective tube
6 Exhaust gas intake slots
7 Air side
8 Exhaust gas side
9 External electrical conductive layer
10 Ceramic sensor body
11 Contact bushing
12 Contact spring
13 Connecting lead
14 Oxygen sensor
15 Two spring contacts for heater
16 Heater
17 Supporting ceramic
18 Protective sleeve
19 Contact for sensor

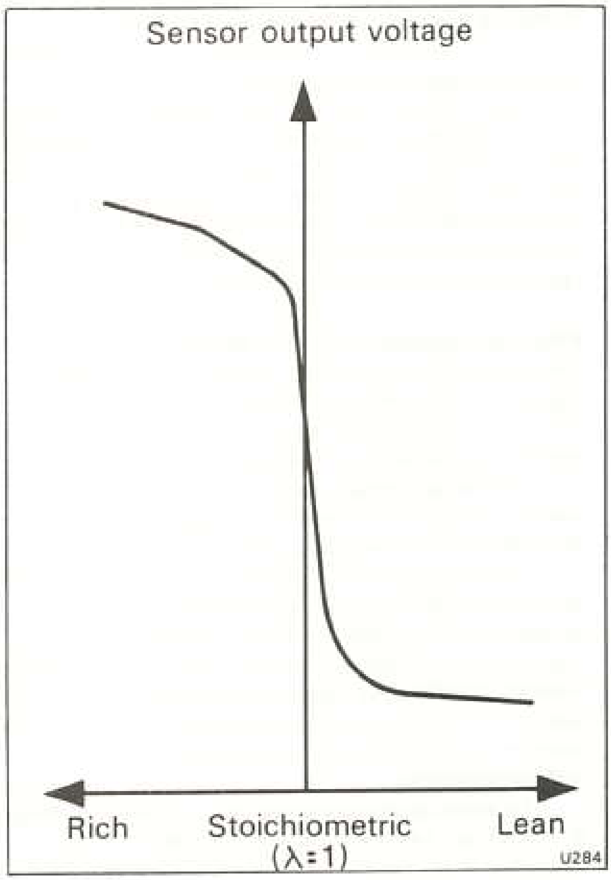


Fig. U2-19 Typical sensor output signal

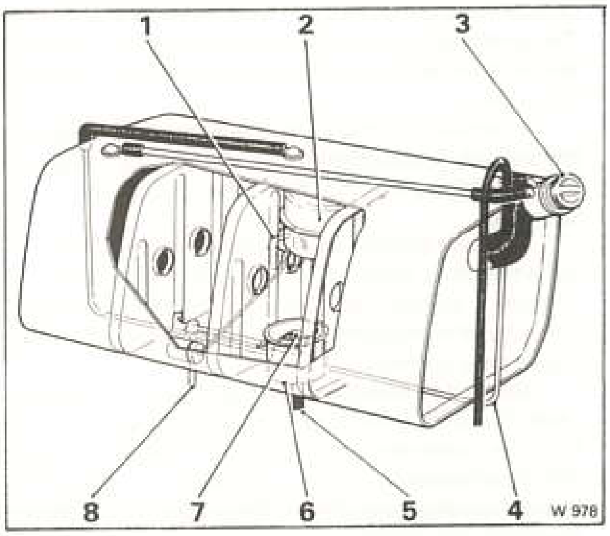


Fig. U2-20 Fuel tank
1 Fuel lever indicator
2 Expansion tank and overfill limiter
3 Fuel filler cap (incorporating combined pressure and vacuum relief valve)
4 Rollover tube
5 Fuel feed
6 Swirl pot
7 Filter
8 Fuel return

The assembly consists of a sintered zirconium dioxide ceramic, impregnated with certain metal oxides. The surfaces of the tube are coated with a thin layer of platinum. In addition, a porous ceramic layer is applied to the outer side which is exposed to the exhaust gas. The surface of the hollow inner side of the ceramic tube is in contact with the ambient air.

When in position, the ceramic sensor tube is subjected to the exhaust gas on the outside, whilst ambient air is allowed to pass inside the sensing tube. If the oxygen concentration inside the sensor differs from that outside, a voltage is generated between the two boundary surfaces due to the characteristics of the material used. This voltage is a measure of the difference in the oxygen concentration inside and outside the sensor.

The ceramic sensor tube exhibits a steep change in signal output (approximately 1000 mv) when stoichiometric conditions are approached (see fig. U2-19).

The oxygen sensor will only exhibit this steep change in signal output when a certain pre-determined operating temperature is attained.
On 1987 model year cars, 'closed loop control' is enhanced by reducing the oxygen sensor's dependency upon exhaust gas to maintain it at operating temperature. This is achieved by heating the sensor electrically, using a ceramic heating rod fitted inside the zirconium dioxide tube.

When starting the engine, particularly from cold, satisfactory 'closed loop control' is not possible. During these conditions the electronic control unit supplies a fixed on-off ratio signal)'internal-signal mode') until the oxygen sensor attains its operating temperature, otherwise driveability would be impaired at this time without the regulating effect of control valve operation. If the oxygen sensor fails to function, this fixed on-off ratio signal is transmitted to the control valve in addition to illuminating a warning lamp on the facia.

Fuel tank (see fig. U2-20)
The fuel tank is situated behind the rear seats. It is sealed by a ratchet type of screw-on filler cap which incorporates a combined pressure and vacuum relief valve.

In the upper part of the fuel tank assembly is located an expansion tank. This inhibits complete filling of the tank and provides fuel expansion volume to cope with variations in ambient temperature.

To prevent air entering the fuel supply line a 'swirl pot' is fitted into the base of the fuel tank. Fuel returning to the tank via the fuel recirculation pipe is fed throught a venturi into the swirl pot. The effect of the venturi is to continually top-up the 'swirl pot' even when there is a low fuel level in the tank, the swirling action that follows assists to deaerate the fuel prior to its circulation within the system.

Fuel pump (see fig. U2-21)
The fuel pump is a roller cell type of pump driven by a permanent magnetic motor. A rotor disc, mounted on

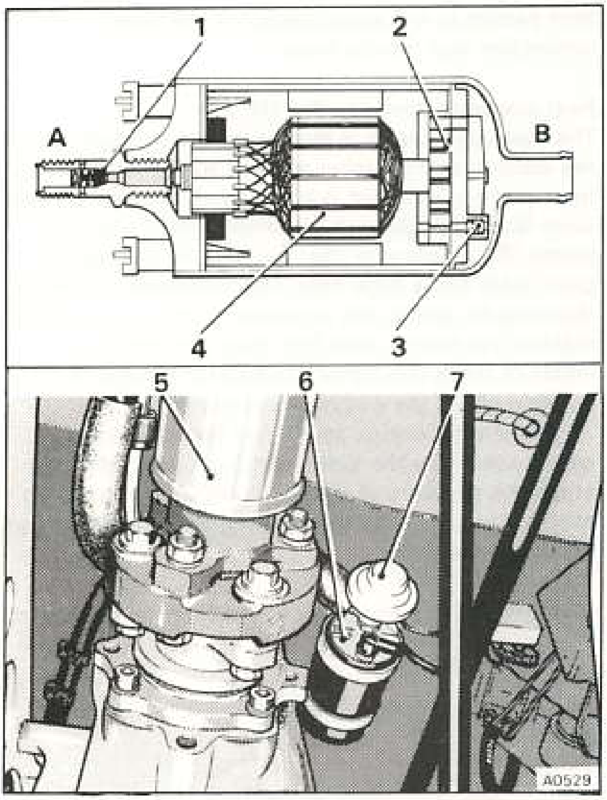


Fig. U2-21 Fuel pump
1 One-way valve
2 Roller cell
3 Safety valve
4 Armature
5 Propeller shaft
6 Fuel pump
7 Fuel pump pressure damper
A Pressure side
B Intake side

the motor shaft, is fitted with metal rollers in the notches around its circumference. These rollers are forced against the excentrically designed pump housing by centrifugal force and seal the individual fuel compartments (cells). Fuel is carried in the fuel compartments (cells) between the metal rollers and is forced into the fuel line to the fuel accumulator.

The pump delivers more fuel than is required. Therefore, the excess is diverted from the primary circuit by the pressure regulator and is returned to the fuel tank.

Fuel pump pressure damper (see fig. U2-21)
During production of 1985 model year cars, a modified fuel pump assembly was introduced.

The modified assembly incorporates a fuel pressure damper in the outlet end of the pump (see fig. U2-21).

The purpose of fitting this additional pressure damper is to reduce the noise of the fuel pump. This is achieved by damping the fluctuations in fuel pressure.

From the pump, fuel flows into the damper where it compresses a diaphragm against spring pressure. It then passes to the accumulator via the banjo connection and flexible hose.

Fuel accumulator (see fig. U2-22)
The fuel accumulator is divided by a diaphragm into the accumulator chamber and the spring chamber. In front of the diaphragm is a steel partition with a plate valve for fuel intake and restricted bore for the fuel outlet. The diaphragm chamber is filled through the plate valve and a large hole. The diaphragm is forced downwards against the pressure of the spring until it reaches the spring plate limit stop, formed on the inside of the accumulator casing and remains in this position whilst the engine is operating.

When the engine stops, fuel flows from the accumulator into the system through the restriction under the pressure of the accumulator spring. This maintains pressure in the primary fuel circuit to ensure good 'hot starting'.

Fuel filter (see fig. U2-23)
The main fuel filter is fitted into the fuel feed line. The filter contains a paper element and a fine mesh screen. The paper filter is used to trap any dirt in the fuel. The fine mesh screen catches any particles which may be released by the paper cartridge

Due to the construction of the filter it is most important that the direction of flow marked on the filter housing is strictly adhered to.

Warm-up regulator (see fig. U2-24)
The purpose of the warm-up regulator is to increase the control pressure as the engine warms-up so that at normal operating temperature full control pressure is exerted on the end of the control piston.

The unit is operated by a bi-metal strip which in cold conditions acts against the delivery valve spring and so determines the control pressure. When the engine is started, this bi-metal strip is electrically

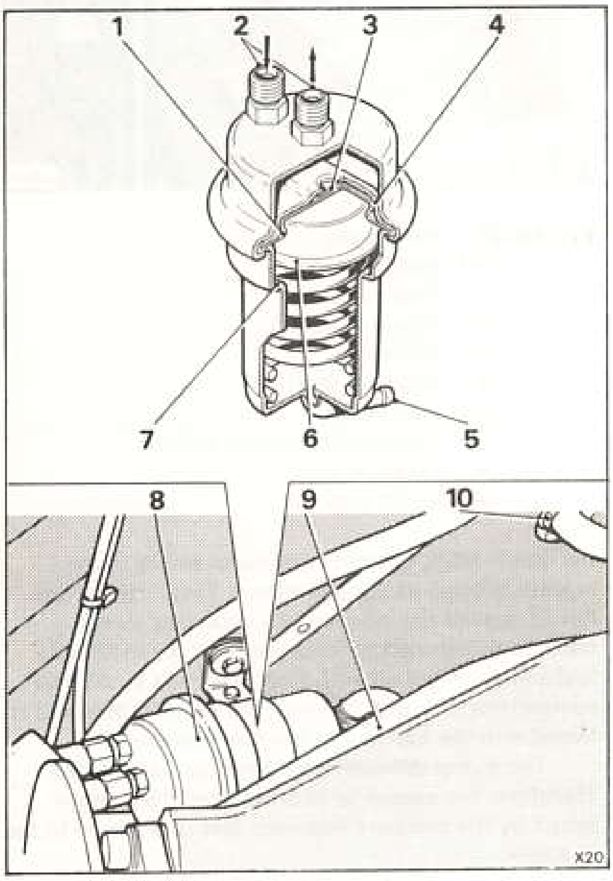


Fig. U2-22 **Fuel accumulator**
1 Diaphragm
2 Fuel connections
3 Depressurization restrictor
4 Upper limit stop
5 Vent pipe to fuel tank
6 Spring plate
7 Lower limit stop
8 Fuel accumulator
9 Final drive unit
10 Fuel tank return connection

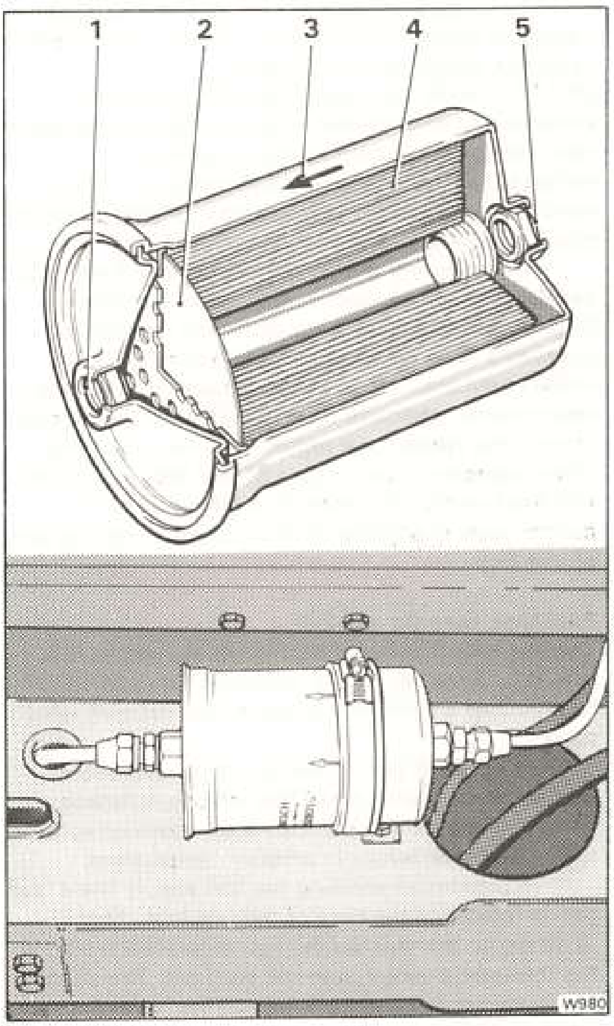


Fig. U2-23 **Fuel filter**
1 Outlet connection
2 Fibre glass paper filter element
3 Direction of flow arrow
4 Paper filter element
5 Inlet connection

heated and releases the delivery valve spring which in turn allows the spring pressure to close the fuel passage and increase the control pressure.

Also located in the warm-up regulator assembly is an aneroid cell which sligtly adjusts the control pressure for mixture compensation at high altitudes.

The warm-up regulator is located so that it will assume the temperature of the engine, this ensures that the mixture is not over enriched when starting a partially warmed-up engine.

Auxiliary air valve (see fig. U2-25)
When the engine is cold the auxiliary air valve supplies a larger volume of air to the engine than is dictated by the position of the throttle butterfly valve. The air passes through a hole in a pivoted blocking plate situated between the inlet and outlet connections. The movement of the blocking plate is dependent upon an electrically heated bi-metal strip.

When starting a cold engine the blocking plate is in the open position. However, as the bi-metal strip warms-up it progressively relaxes its force on the plate, allowing the return spring to pull the plate to the closed position. This reduces the engine speed to the normal idle speed setting.

Thermal time switch (see fig. U2-26)
The thermal time switch limits the length of time that the cold start injector remains open. During engine cranking the heating coil inside the switch causes the bi-metal contact to open which in turn, switches off the cold start injector.

The switch is mounted in the thermostat housing and inhibits operation of the cold start injector above a pre-determined coolant temperature.

Electrical circuit and System warning device

Electrical circuit (see fig. U2-27)
The electrical components associated with the fuel injection system comprise the following main circuits.
Engine running sensor/Air injection controller and fuel pump inhibit.
Cold start injector and thermal time switch.
Exhaust gas recirculation (E.G.R.) inhibit.

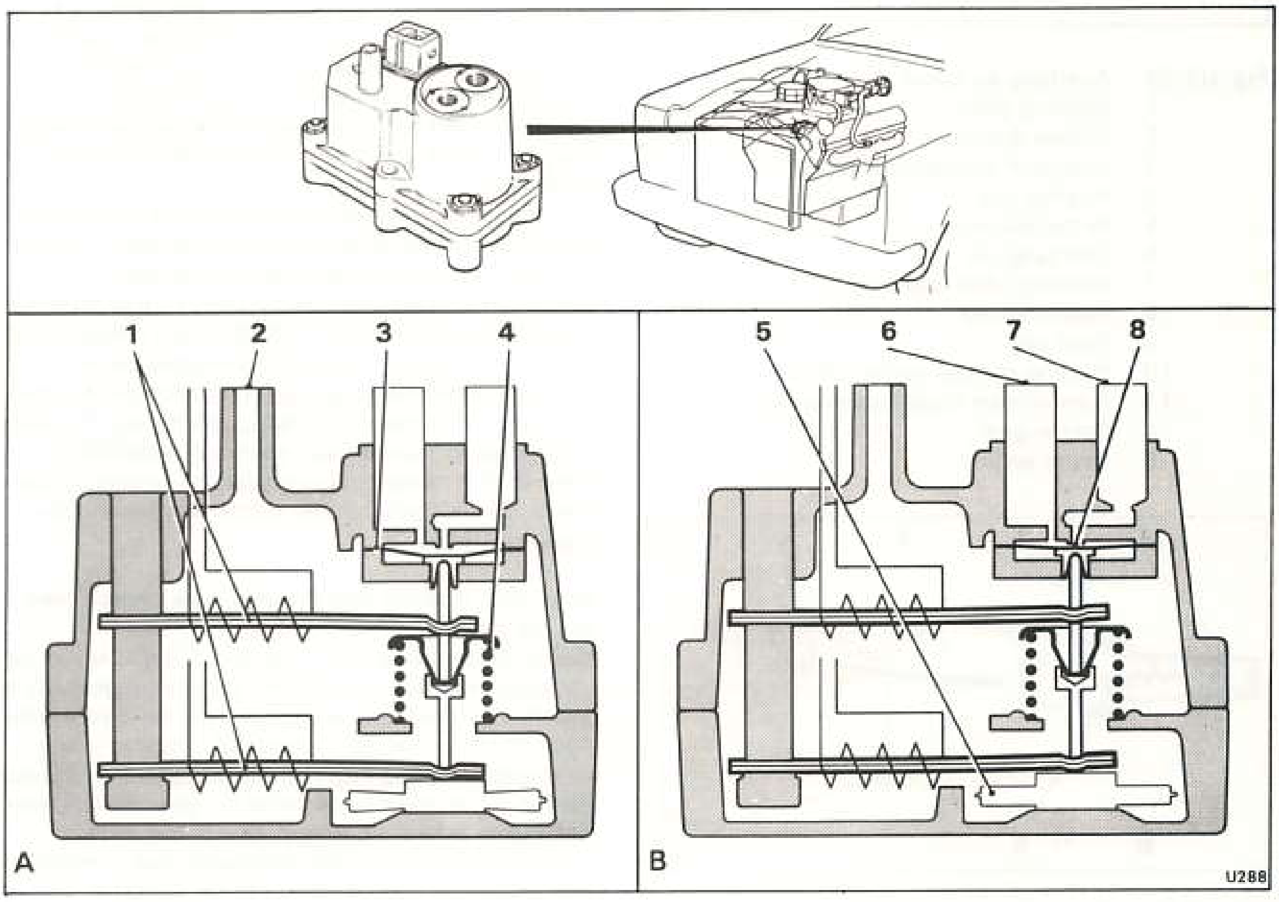


Fig. U2-24 Warm-up regulator
1 Bi-metal strip with heater elements
2 Vent to atmosphere
3 Diaphragm
4 Return spring
5 Aneroid cell
6 Fuel inlet connection
7 Fuel outlet connection
8 Bleed orifice
A Cold engine
B Warm engine

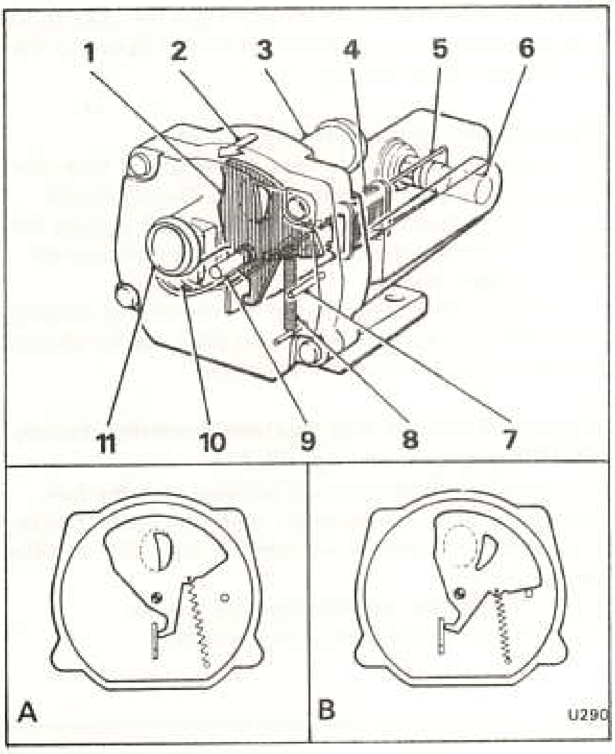


Fig. U2-25 Auxiliary air valve
1 Blocking plate
2 Airflow direction
3 Upstream throttle connection
4 Heating coil
5 Bi-metallic strip
6 Clamping pin
7 Blocking plate limit stop
8 Return spring
9 Pivot pin
10 Heating coil connection block
11 Downstream throttle connection
A Cold engine
B Warm engine

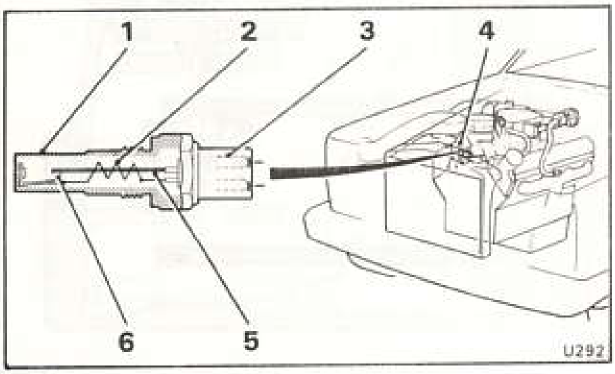


Fig. U2-26 Thermal time switch
1 Housing
2 Heating coil
3 Plug connector
4 Thermostat housing
5 Bi-metallic strip
6 Contacts

Ignition distributor vacuum retard (if fitted)
Pressure control valve, auxiliary air valve, and warm-up regulator.
Electronic control unit and oxygen sensor.

Engine running sensor/Air injection controller and fuel pump inhibit (see fig. U2-27)
The engine running sensor/air injection controller is located adjacent to the fuel injection system electronic control unit under the facia (see fig. U2-17).

The purpose of the engine running sensor is to inhibit the supply of power to the fuel pump unless the engine is running. There is however, one by-pass to the circuit which allows the fuel pump to operate when the engine is being 'cranked' by the starter motor. A relay within the engine running sensor assembly provides the means of switching on or off the power supply to the fuel pump.

The supply to the fuel pump is along the pink cable from the fuel injection system fuse to the 'engine running' sensor (item 5) and then out to the pump via the white/pink cable. The engine running sensor circuit is fed via the ignition fuse and the white cable, and earthed through the black cable. When the engine is being cranked, a 12 volt feed on the white/red cable causes the relay in the sensor to be 'pulled in' and thus the fuel pump is switched on. Once the engine is running the ignition pulses from the coil primary are fed to the engine running sensor through the white/black wire and the pump relay remains energized.

If the engine speed falls below 150 rev/min the time between the ignition pulses is too long to hold the relay in the energized state and therefore, the power to the fuel pump is switched off (also refer to fuel pump relay in Section U8, Electrical components).

The air injection controller energizes the air switching solenoid, so giving air injection during the time when the engine is running 'open loop'. However, if the onset of 'closed loop' operation is delayed for more than 2 minutes, the air injection solenoid is de-energized and the air pump output is vented to the engine air intake.

Cold start injector and thermal time switch (see fig. U2-27)
When the engine is being 'cranked' (i.e. the key in the switchbox is held in the START position) power will be supplied via the white/red cable from the starter relay (item 7) to the thermal time switch, situated in the thermostat housing (item 9) and the cold start injector (item 8). The injector will therefore, operate whenever the engine is being 'cranked', unless the earth is interrupted by the thermal timeswitch due to either the temperature of engine coolant or the length of operating time.

Exhaust gas recirculation (E.G.R.) inhibit (see fig. U2-27)
A feed from the ignition fuse (item 1) supplies power to the E.G.R. cut-out switch (item 12) via the white cable.

When the ignition is switched on and the engine is cold, the cut-off solenoid (item 27) is energised via the cut-out switch (item 12) situated in the thermostat housing. Whenever this solenoid is energised the vacuum signal to the E.G.R. valve is interrupted.

As the engine coolant temperature rises to approximately 33°C (91°F) the contacts in the thermal cut-out switch open, which de-energizes the solenoid and allows the vacuum signal to operate upon the diaphragm of the E.G.R. valve.

This inhibit circuit is also completed by a kick-down micro-switch (item 14) which is connected into the E.G.R. valve inhibit circuit via the white/green and white/blue cables. When the throttle is opened wide the kick-down plunger situated under the accelerator pedal operates the kick-down micro-switch, thus energizing the E.G.R. cut-off solenoid (item 27) and interrupting the vacuum signal to the E.G.R. valve.

Wide throttle enrichment micro-switch (see figs. U2-12 and U2-27)

This micro-switch is situated on the side of the throttle body adjacent to the overrun valve.

A cam on the throttle spindle activates the micro-switch and changes the fuel injection system from the 'closed loop' operating mode when the throttle is opened wide.

Ignition distributor vacuum retard (see fig. U2-27) (if fitted)

The feed from the ignition fuse (item 1) along the white cable also feeds the vacuum retard solenoid (item 10) which is fitted to inhibit the vacuum signal to the capsule on the ignition distributor.

The solenoid is energized when the ignition is switched on. However, if the engine is cold the vacuum retard cut-out relay (item 11) is energized via the brown/yellow cable and the engine oil temperature switch (item 28), thus breaking the vacuum retard solenoid circuit (i.e. no vacuum retard).

As the engine warms-up the contacts in the oil temperature switch (item 28) open at approximately 17°C (62°F) which de-energizes the cut-out relay (item 11) and allows the vacuum retard solenoid to become energized via the coolant temperature switch (item 29).

The vacuum retard solenoid is energized open therefore, the vacuum signal is applied to the retard side of the distributor capsule.

When the engine coolant temperature rises to approximately 55°C (131°F) the coolant temperature switch contacts open de-energizing the solenoid, therefore, the vacuum retard signal line is closed.

Pressure control valve, auxiliary air valve, and warm-up regulator.
Electronic control unit and oxygen sensor

Whenever the relay in the engine running sensor is energized a live connection is made to the components listed above via the cable shown in figure U2-27. The functions of the components have been described previously.

All 1986 model year 4-door cars are fitted with a heaters inhibit relay (see figs. U2-27 and U2-48). The relay inhibits the live connection to the auxiliary air valve and warm-up regulator heaters until the engine has started.

The purpose of fitting the relay to these cars, is to prevent premature weakening of the mixture during extended cranking.

System warning device (see fig. U2-27)
1981/1986 model year cars

To inform the driver that the oxygen sensor requires replacing, a warning lamp mounted on the facia will illuminate when activated by an elapsed mileage device (at a pre-determined service interval mileage).

The elapsed mileage is monitored by a unit which counts the electric pulses generated by an electro-magnetic device, gear driven from the transmission output shaft (these pulsations are also transmitted to the electronic speedometer to monitor the speed of the vehicle).

The method of counting electrical pulses to monitor the elapsed mileage is achieved by the use of a stepping motor and a series of reduction gears. This pulsed rotary motion is then used to drive a stepped cam which operates a set of contacts to illuminate the warning lamp at the predetermined mileage.

1981/1987 model year cars

Failure of the oxygen sensor is detected by the electronic control unit which relies upon the output of the sensor for 'closed loop control'. Failure will cause the system to change to the 'open loop control' and in addition, illuminate the warning lamp bulb on the facia to indicate the need for maintenance.

The warning lamp is checked in a similar manner to the other warning lamps mounted on the facia.

Whenever the engine is cranked the warning lamp bulb should be illuminated and then extinguished when the engine starts.

On 1987 model year cars, the warning lamp should be illuminated when cranking a cold engine but extinguished soon after the engine has started.

The warning lamp will remain illuminated if the oxygen sensor is below its normal operating temperature.

Modes of operation

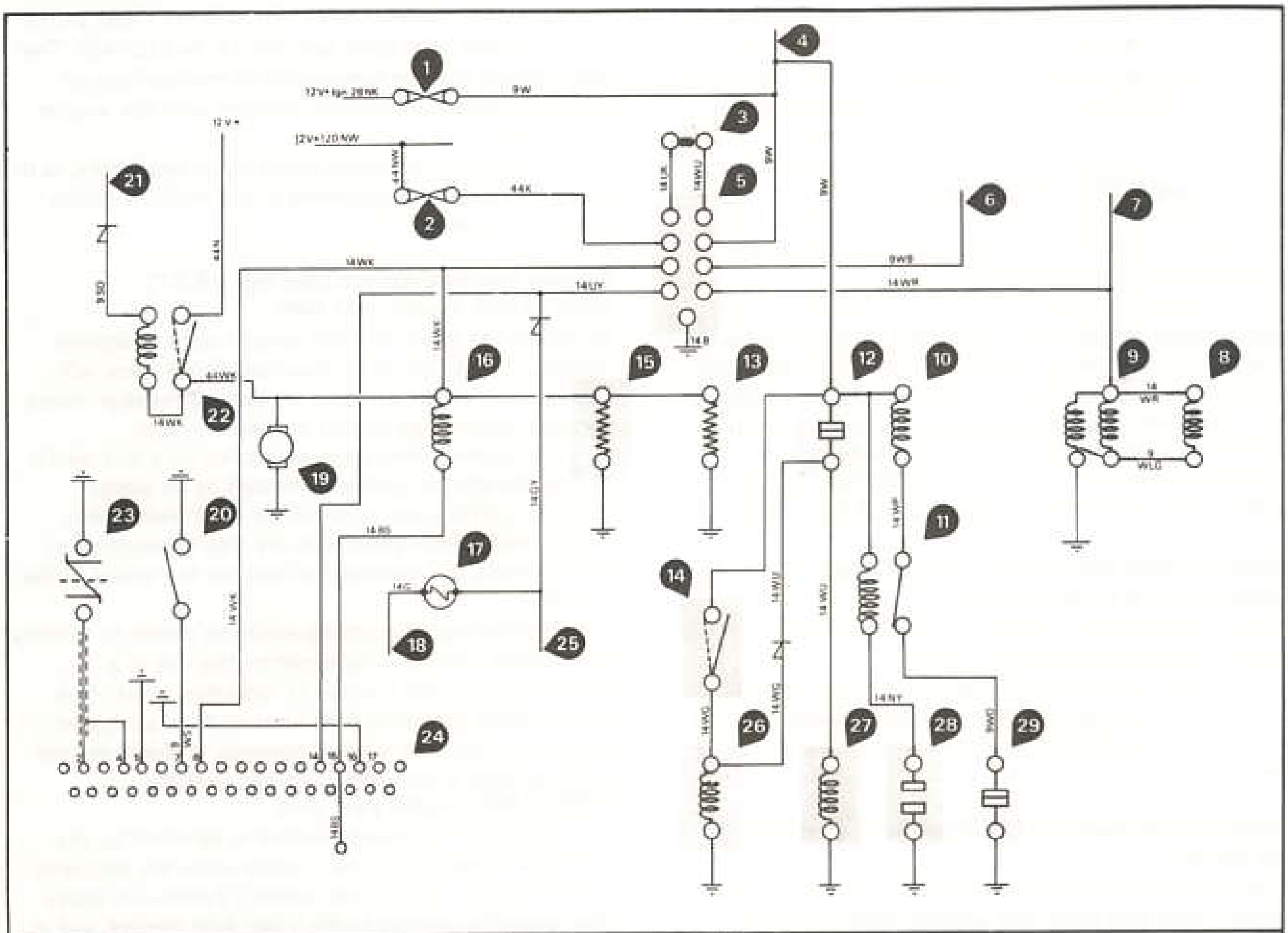
Engine warm-up

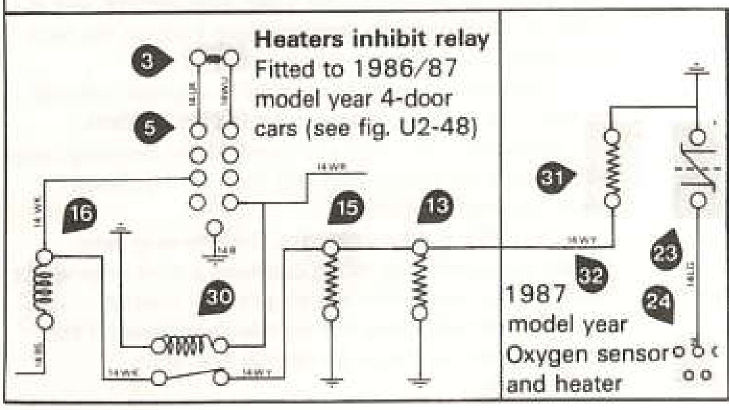
During the warm-up period two basic compensations are necessary.

The first compensation is for fuel condensation losses on the cold walls of the combustion chamber and inlet manifold. The second compensation is for power lost due to increased mechanical friction.

The compensation for condensation losses is achieved by increasing the fuel flow to the injectors. The power lost is overcome by feeding a larger volume of air into the engine than is dictated by the position of the throttle butterfly.

Prior to the engine starting the control piston is in its lowest position. However, once the air sensor plate is moved downwards by the force of the intake air, the





Key to diagram

Cable sizes (Metric)	Cable colours (Plastic)	
9 - 9/3 or 14/25	B - Black	LG - Light green
14 - 14/3	N - Brown	Y - Yellow
28 - 28/3	R - Red	W - White
44 - 44/3	P - Purple	S - Slate
65 - 65/3	U - Blue	O - Orange
120 - 120/3	G - Green	K - Pink

Example - 14UB - 14/3 Cable with blue base colour and black tracer

A1413

Fig. U2-27 Electrical wiring diagram (theoretical)

control piston will be moved upwards in the barrel of the fuel distributor.

The control piston is allowed to move further up the barrel of the distributor (for a given volume of intake air), because the control pressure acting against the upward movement of the piston, has been reduced by the action of the warm-up regulator.

The extra movement of the control piston increases the opening at the fuel metering slits and allows more fuel to flow to the injectors.

As the bi-metals in the warm-up regulator and the auxiliary air valve are heated they alter the characteristics of their respective components. The warm-up regulator gradually closes the return line to the fuel tank which therefore, increases control pressure and restricts the movement of the control piston in the fuel distributor. This action limits the opening of the fuel metering slits, reduces the fuel flowing to the injectors, and weakens the mixture.

The bi-metal of the auxiliary air valve progressively relaxes its force on the blocking plate, allowing the return spring to pull the plate to its closed position. This reduces the engine idling speed to its normal setting.

Engine idle speed

When the engine attains normal operating temperature it will adopt its normal idle speed. This is initially set

Key to Fig. U2-27 Electrical wiring diagram (theoretical)

1 Ignition fuse
2 Fuel injection system fuse
3 Air switching valve solenoid
4 Connection to ignition system
5 Engine running sensor and air injection controller
6 Tachometer connection
7 Connection to starter relay
8 Cold start injector
9 Thermal time switch
10 Ignition distributor vacuum retard signal solenoid (normally closed) (if fitted)
11 Ignition distributor vacuum retard cut-out relay (if fitted)
12 Coolant temperature switch [breaks on rise at 33°C (91°F)]
13 Warm-up regulator heater
14 Kick-down micro-switch
15 Auxiliary air valve heater
16 Pressure control valve ('closed loop control')
17 Oxygen sensor warning lamp
18 To elapsed mileage counter
19 Fuel pump
20 Throttle position micro-switch
21 To earth via warning lamps test relay
22 Fuel pump relay (engine cranking)
23 Oxygen sensor
24 Electronic control unit
25 To elapsed mileage counter
26 Kick-down solenoid
27 Exhaust gas recirculation valve signal solenoid (normally open)
28 Oil temperature switch [breaks on rise at 17°C 62°F)] (if fitted)
29 Coolant temperature switch [breaks on rise at 55°C (131°F)] (if fitted)
30 Heaters inhibit relay
31 Oxygen sensor heater
32 Connection to warm-up regulator heater

during the manufacture of the vehicle by adjusting a screw which acts directly on the throttle mechanism. The screw is then made tamperproof to prevent further adjustment.

After the engine has settled or 'run-in' minor corrections to the idle speed setting can be achieved by bleeding air around the throttle butterfly, using the bleed screw situated on top of the throttle body. This bleed screw has a limited range of adjustment.

The idle mixture is controlled by an adjusting screw which acts directly onto the air sensor plate lever, altering its position relative to the control piston. Turning the screw will either raise or lower the control piston for a given idle speed position of the air sensor plate, this will either richen or weaken the idle mixture.

Note

The idle mixture is pre-set at the factory and sealed. No further adjustment should be necessary.

Engine part load operation

As the engine speed and load are increased the air sensor plate is progressively forced downwards by the increased flow of intake air.

The downward movement of the sensor plate is transmitted via the sensor lever, to the control piston which is raised accordingly in the barrel of the fuel distributor, allowing additional fuel to pass through the metering slits.

The diaphragm in each of the differential pressure valves responds to this additional fuel flow by deflecting further away from the injection line outlet, thus allowing more fuel to flow to the injectors.

Engine full load operation

Under full load conditions the air sensor plate exhibits maximum deflection and the control piston is at its highest position in the barrel of the fuel distributor. This gives the largest openings of the metering slits.

The diaphragm in each differential pressure valve is deflected to its furthest point away from the outlet tube to the injectors, allowing maximum fuel flow.

Due to the action of a micro-switch actuated by a cam on the throttle spindle, the electronic control unit changes to the internal mode, thus blocking the 'closed loop' system and providing additional enrichment by modifying the fixed signal to the pressure control valve.

Engine overrun

During engine overrun (i.e. when decelerating with a closed throttle butterfly) insufficient mixture is supplied to the engine to maintain satisfactory combustion. This condition is alleviated by allowing some air to by-pass the closed throttle butterfly via an overrun valve, whenever a high intake manifold depression exists.

When the throttle plate is suddenly closed the high inlet manifold depression signal generated in the plenum chamber is transmitted via a hose to the housing of the overrun valve. This signal deflects a diaphragm against a return spring and simultaneously allows a spring loaded valve to open the air intake connection of the overrun device. This permits air monitored by the air sensor plate, to by-pass the closed throttle butterfly with a corresponding amount of fuel metered by the fuel distributor. By this means, satisfactory combustion is maintained on overrun.

As soon as the manifold depression falls below a predetermined value, the return spring pushes the diaphragm back to close the overrun valve.

Workshop safety precautions

General

Always ensure that the vehicle parking brake is firmly applied, the gear range selector lever is in the Park position and the gearbox isolator is removed from the fuseboard.

A number of the nuts, bolts, and setscrews used in the fuel injection system are dimensioned to the metric system, it is important therefore, that when new

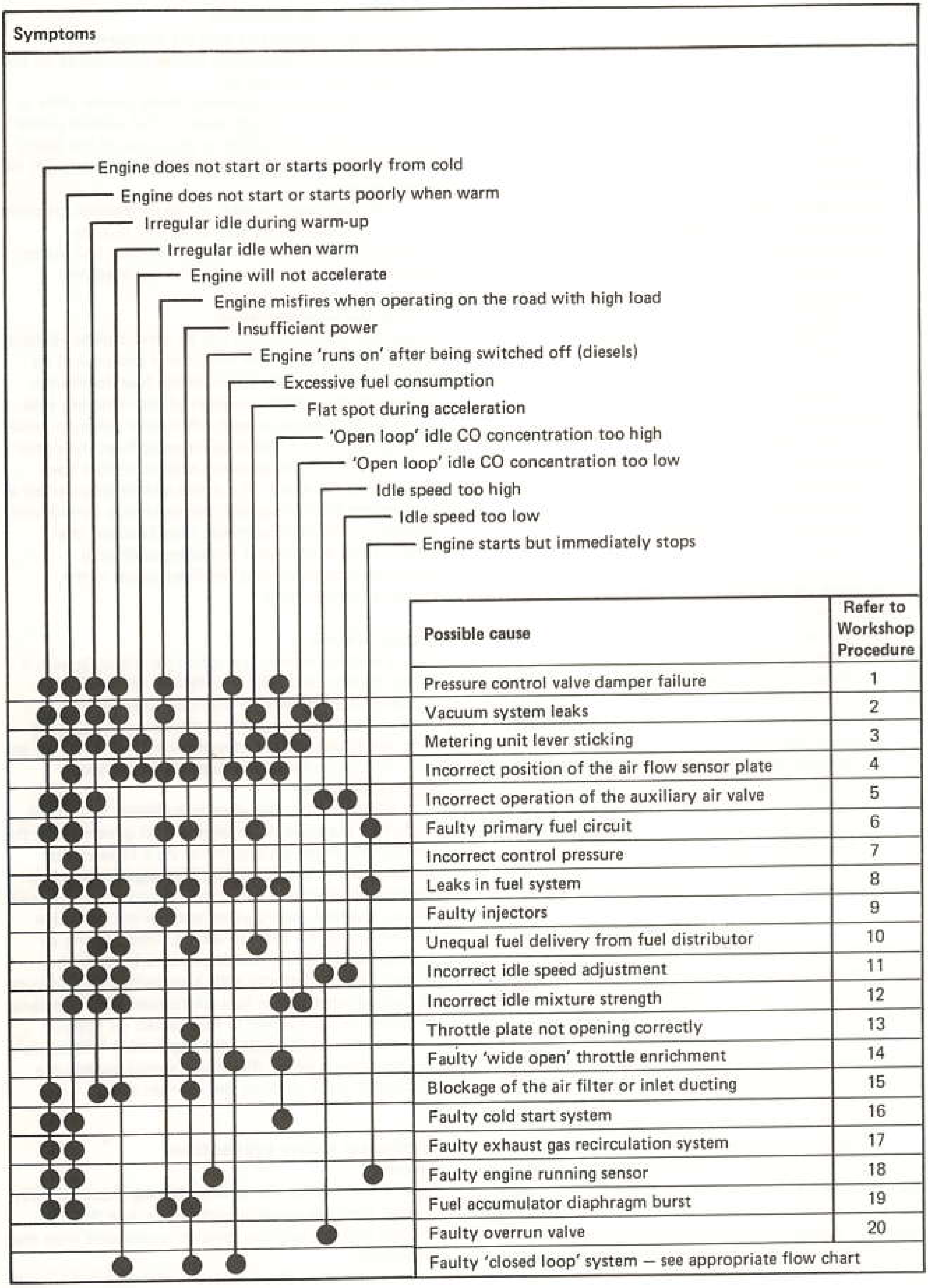


Fig. U2-28 Basic K-Jetronic fault diagnosis chart

Fuel injection system

'Closed loop' system fault
diagnosis flow chart
Sheet 1 of 2

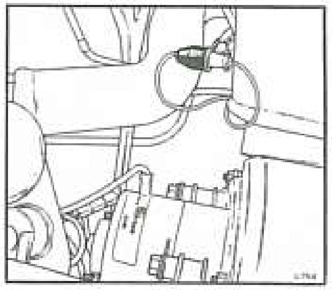
Important Before commencing work run the engine for 3 minutes and switch off the ignition.
Then ensure that
1. test meter is connected (see page U2-42)
2. engine running sensor has been bridged (see page U2-42)
3. electrical feed to the cold start injector has been disconnected
4. ignition is switched on

A

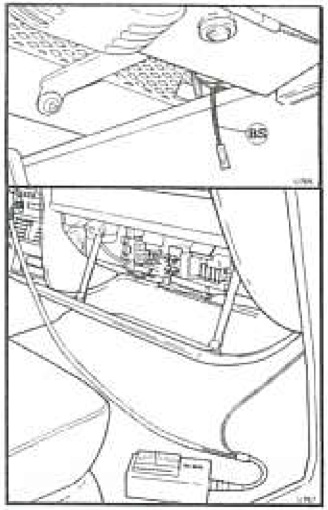
The meter readings quoted are nominal values. In practice, for a nominal value of 50% the meter reading can be between 45% and 55%. When checking the 'wide open' throttle enrichment the meter reading should increase by 7% from the actual reading measured at step A.

Can the vibration of the pressure control valve be heard?
- YES → A
- NO → Check the supply to the electronic control pin 8. Check for continuity from pin 16 to earth and from pin 5 to earth. **Are these satisfactory?**
  - NO → Faulty wiring loom or contacts.
  - YES → **Does the pressure control valve now work?**
    - YES → A
    - NO → Detach the electrical supply plug from the pressure control valve.

A Test meter reads 50%
- YES → Disconnect the oxygen sensor cable connector in the engine compartment. Meter still reads 50%. Connect sensor cable from electronic control unit to earth. Test meter rises slowly to 88% minimum of rich limit.
  Oxygen sensor cable
  1981/86 model year cars
  Sensor cable is blue.
  1987 model year cars
  3 pin cable connector, sensor cable is light green.
  - YES → **Continued on sheet 2**
  - NO → Check for continuity of cable from electronic control unit pin 2 to oxygen sensor.
    - YES → Electronic control unit faulty.
    - NO → Faulty wiring loom or contacts.
- NO → Test meter reads 57%
  - YES → Check the full throttle switch
- NO → Test meter reads 0%
  - YES → Detach the electrical supply plug from the pressure control valve. Test meter reads 50%
    - YES → Pressure control valve electrically defective.
    - NO → Check that the resistance of the pressure control valve is 2 to 3 ohms.
      - NO → Pressure control valve electrically defective.
      - YES → Check the electrical plug to the control valve. One contact is 12 volt supply. One contact is to electronic control unit pin 15 (check for continuity). **Is this test satisfactory?**
        - NO → Electronic control unit faulty.
        - YES → Pressure control valve faulty.
  - NO → Check the test meter connections. Test meter reads 50%
    - YES → Disconnect the oxygen sensor cable connector in the engine compartment...
    - NO → Disconnect the oxygen sensor. Test meter reads 50%
      - YES → Faulty oxygen sensor.
      - NO → Electronic control unit faulty.



Disconnect the oxygen sensor cable at the connector (see page U2-29 for 1987 model year cars)



Test meter in position

Fuel injection system

'Closed loop' system fault
diagnosis flow chart
Sheet 2 of 2

Continued from sheet 1

Fully open the throttle. Test meter reads 57%.

NO → Ensure 'wide open' throttle micro-switch is set correctly.

NO → Adjust the micro-switch.

YES → Check for cable continuity from the electronic control unit pin 7 to the micro-switch and the micro-switch to vehicle earth.

NO → Faulty wiring loom or contacts.

YES → Electronic control unit faulty.

YES (from "Fully open the throttle") → Connect the 2 volt supply on test meter to the disconnected oxygen sensor cable (feed to the electronic control unit).
Test meter reads less than 20%.
Oxygen sensor cable
1981/86 model year cars
Sensor cable is blue
1987 model year cars
3-pin cable connector, sensor cable is light green.

NO → Electronic control unit faulty.

YES → With the oxygen sensor cable still disconnected, connect a CO analyzer into the exhaust pipe sample tapping using the adapter RH 9611. Run the engine until normal operating temperature is attained. Check that the idle CO is between 0.5% and 0.7% at 650 rev/min in Neutral.

NO → Carry out tests to basic K-Jetronic fuel injection system.

YES → Connect the oxygen sensor cable.
Is the CO value unchanged?

YES → Check the engine idle speed and adjust if necessary.

NO → Increase the engine speed to approximately 1500 rev/min the CO reading should fall below the idle speed value.

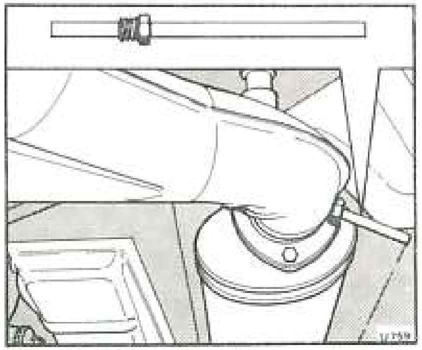
YES → Check for exhaust gas leaks at the exhaust manifolds and oxygen sensor.

NO → Disconnect the oxygen sensor cable.
Does the engine idle speed become regular and increase?

YES → Oxygen sensor is faulty.

NO → Pressure control valve has failed mechanically.

The meter readings quoted are nominal values. In practice, for a nominal value of 50% the meter reading can be between 45% and 55%. When checking the 'wide open' throttle enrichment the meter reading should increase by 7% from the actual reading measured at step A on Sheet 1.



Adapter RH 9611 fitted into exhaust sample tapping

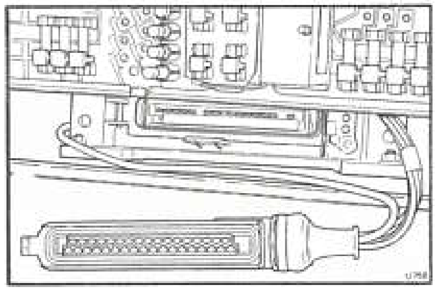
Fuel injection system

Wiring loom fault
diagnosis flow chart

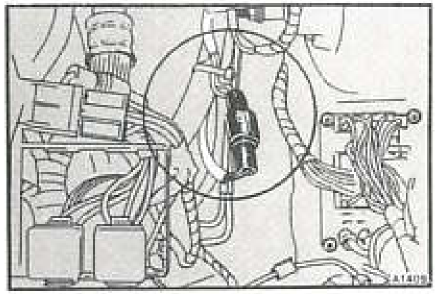
Important Before commencing work ensure that the

1. fuel injection system and ignition fuses are in good condition
2. multi-pin plug has been disconnected from the electronic control unit
3. engine running sensor is bridged (see page U2-42)
4. ignition is switched on

Measure the supply voltage between the plug pin 8 and the vehicle earth. **Is it 12 volts?**
- NO → Measure the supply voltage between the engine running sensor terminal 5 and the vehicle earth. **Is it 12 volts?**
  - YES → Check for cable continuity between the engine running sensor pin 5 and plug pin 8.
  - NO → Measure the supply voltage between the engine running sensor terminal 7 and the vehicle earth. **Is it 12 volts?**
    - NO → Check for cable continuity between the fuse and terminal 7 on engine running sensor.
    - YES → Measure the supply voltage between the engine running sensor terminal 6 and terminal 1. **Is it 12 volts?**
      - NO → (a) Check for cable continuity between the ignition fuse and terminal 6. (b) Check for cable continuity between pin 1 and earth.
      - YES → Measure the supply voltage between the engine running sensor terminal 2 and the vehicle earth. **Is it 12 volts?**
        - NO → Check for cable continuity between the starter relay and terminal 2 on the engine running sensor.
        - YES → Check for cable continuity between the engine running sensor terminal 4 and the connection to the ignition system. **Is this satisfactory?**
          - YES → Faulty engine running sensor.
- YES → Measure the supply voltage between the plug pin 8 and the plug pin 5. **Is it 12 volts?**
  - NO → Check for cable continuity between plug pin 5 and the vehicle earth.
  - YES → Measure the supply voltage between the plug pin 8 and the plug pin 16. **Is it 12 volts?**
    - NO → Check for cable continuity between plug pin 16 and the vehicle earth.
    - YES → Measure the supply voltage between the plug pin 15 and the plug pin 16. **Is it 12 volts?**
      - NO → Disconnect the electrical plug from the pressure control valve and measure the supply voltage between each plug pin and the vehicle earth. **Is one 12 volts and the other zero?**
        - YES → Check that the resistance of the pressure control valve is 2 to 3 ohms.
          - NO → Pressure control valve faulty.
          - YES → Check for cable continuity between plug pin 15 and the pressure control valve plug.
      - YES →
        - **1981/1986 model year cars**: Disconnect the blue cable to the oxygen sensor in the engine compartment and check for cable continuity between the cable connector and plug pin 2. **Is this correct?**
          - YES → Check for continuity between the sensor cable screen and the plug pin 4 (approximately zero ohms)
            - YES → Check the cable between the electronic control unit pin 15 and the test connection. Check the connection continuity.
        - **1987 model year cars**: Disconnect the 3-pin cable connector to the oxygen sensor in the engine compartment and check for cable continuity between the light green cable connector and plug pin 2. **Is this correct?**
          - YES → Measure the supply voltage between each of the oxygen sensor heater circuit plug pins and the vehicle earth. **Is one 12 volts and the other zero?**
            - YES → Check the cable between the electronic control unit pin 15 and the test connection. Check the connection continuity.



Disconnect the multi-pin plug



Disconnect the oxygen sensor cable at the connector (1987 model year cars) see page U2-25 for early cars.

parts become necessary the correct replacements are obtained and fitted.

Fire

The fuel is highly inflammable, therefore great care must be exercised whenever the fuel system is opened (i.e. pipes or unions disturbed) or the fuel is drained. Always ensure that 'no smoking' signs and foam, dry powder, or CO_2 (carbon dioxide) fire extinguishers are placed in the vicinity of the vehicle.

Always ensure that the battery is disconnected before opening any fuel lines.

If the fuel is to be drained from the tank, ensure that it is siphoned into a suitable covered container.

Fuel pressure

The fuel injection system contains fuel that may be under high pressure approximately 5,2 bar to 5,8 bar (75.4 lbf/in² to 84.1 lbf/in²). Therefore, to reduce the risk of possible injury and fire, always ensure that the system is depressurized by one of the following methods before commencing any work that will entail opening the system.

a. Clean the inlet connection to the fuel filter. Wrap an obsorbent cloth around the joint and carefully slacken the pipe nut to release any pressurized fuel from the system. Tighten the pipe nut.

b. Allow the pressure to fall naturally by switching off the engine and allowing the vehicle to stand for two hours before opening the system.

Health risk

Unleaded fuel may contain up to 5% of benzene as an anti-knock additive. Benzene is extremely injurious to health (being carcinogenic) therefore, **all contact should be kept to an absolute minimum, particularly inhalation.**

The fuel has a sufficient high vapour pressure to allow a hazardous build-up of vapour in poorly ventilated areas. The vapour is an irritant to the eyes and lungs, if high concentrations are inhaled it may cause nausea, headache, and depression. The liquid is an irritant to the eyes and skin and may cause dermatitis following prolonged or repeated contact.

When it becomes necessary to carry out work involving the risk of contact with the fuel, particularly for prolonged periods, it is advisable to wear protective clothing including safety goggles, gloves, and aprons. Any work should be carried out in a well ventilated area.

If there is contact with the fuel the following emergency treatment is advised.

Ingestion (swallowing)

Do not induce vomiting. Give the patient milk to drink (if none available water can be given). The main hazard after swallowing fuel is that some of the liquid may get into the lungs. Send the patient to hospital immediately.

Eyes

Wash with a good supply of clean water for at least 10 minutes.

Skin contact

Immediately drench the effected parts of the skin with water. Remove contaminated clothing and then wash all contaminated skin with soap and water.

Inhalation (breathing in vapour)

Move the patient into the fresh air. Keep the patient warm and at rest. If there is loss of consciousness give artificial respiration. Send the patient to hospital.

Cleanliness

It is extremely important to ensure maximum cleanliness whenever work is carried out on the system.

The main points are.

a. In order to prevent the ingress of dirt, always clean the area around a connection before dismantling a joint.

b. Having disconnected a joint (either fuel or air) always blank off any open connections as soon as possible.

c. Any components that require cleaning should be washed in clean fuel and dried, using compressed air.

d. If it is necessary to use a cloth when working on the system, ensure that it is lint-free.

Fault diagnosis

This fault diagnosis section includes.

a. **Basic system test procedure**

b. **Electrical and Electronic components fault diagnosis**

c. **Mechanical components fault diagnosis**

It is important that fault finding is carried out in the sequence given, otherwise, as electrical and electronic faults sometimes exhibit symptoms similar to mechanical faults, an incorrect diagnosis may be made which could result in both lengthy and costly repairs.

Often, a mechanical fault has sufficiently well defined symptoms to enable a very rapid diagnosis to be made. However, in such cases the operation of the 'closed loop' system should always be checked after correcting the mechanical fault.

The **basic fault finding procedure** is as follows, noting that any faults found in one system should be rectified before moving on to the next stage of the procedure.

1. Carry out a **compression test** on the engine cylinders (to inhibit the operation of the system during this test, remove the fuel injection fuse).
2. Check that the **ignition system** is operating satisfactorily (use an ignition system analyser for this test).
3. Ensure that the **vacuum system** is free from leaks (refer to fig. U2-6, Vacuum hose routing diagram).
4. Ensure that the **E.G.R. system** is free from leaks, particularly the joint at the plenum chamber.
5. Ensure that all **auxiliary air hoses** and **crankcase breather system hoses** are free from leaks.
6. Check that the **solenoid valves** and their **thermal switches** are working correctly (see Section U8).
7. Test the **basic K-Jetronic system** for correct

operation (refer to the list of symptoms and possible causes).

8. Test the **'closed loop' system** for correct operation (refer to Fault diagnosis flow charts).

Before commencing any fault diagnosis or work on the fuel injection system ensure that the Workshop safety precautions are fully understood.

Important

During manufacture, the components of the fuel injection system are precisely adjusted in order to comply with the relevant emission control regulations and therefore, alterations to any of the settings should not normally be necessary.

If however, due to a fault and subsequent service work or if the settings become inadvertently disturbed, the following procedures should be adhered to.

Diagnosing and correcting faults

The workshop procedure number given before the title of the operation refers to the fault diagnosis chart for the basic K-Jetronic system given in Figure U2-28.

Before carrying out any tests, ensure that the battery is in a fully charged condition.

It should be noted that all components of the system (except the injectors and the overrun valve) can be tested on the vehicle.

Procedure 1 Pressure control valve damper failure

To check the pressure control valve damper for failure of the diaphragm, remove the small diameter rubber pipe from the rear of the unit and check for the presence of fuel. If a diaphragm failure is suspected **do not run the engine** as high pressure fuel will emerge from the damper pipe.

Fit a new damper assembly if a failure of the diaphragm is suspected.

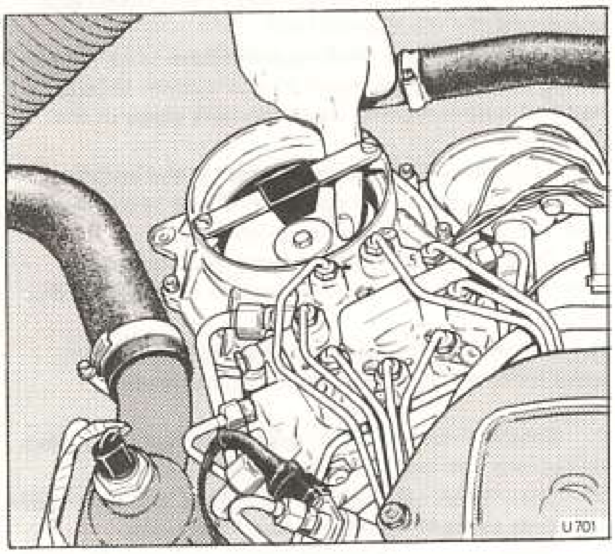


Fig. U2-29 Checking the movement of the air flow sensor plate

Procedure 2 Induction system air leaks

Visually check all vacuum hoses, pipes, and clips for damage or looseness that may allow an air leak into the induction system (see fig. U2-6).

Check the entire induction system for air leaks with the engine running. Use a suitable length of rubber hose as a listening tube. One end of the hose should be placed near to the operator's ear and the other end moved over the areas where a leak is suspected. The leak will often be heard as a high pitched hiss or whistle.

Procedure 3 Metering control unit lever sticking

1. Ensure that the engine temperature is above 20°C (68°F).
2. Remove the air intake duct from the inlet to the control unit.
3. Bridge the engine running sensor (refer to page U2-43).
4. Switch on the ignition for approximately ten seconds, then **switch off.** This will ensure that control system pressure is applied to the control piston.
5. Press the air sensor plate slowly downwards (see fig. U2-29) to its maximum open position. The resistance to this movement should be uniform over the whole range of travel. Allow the air sensor plate to return to its rest position and repeat the operation.

If the resistance to the air sensor plate movement is uniform over the whole range of travel the metering unit is not sticking.

6. Should the resistance to air sensor plate movement be greater in the rest position, it could be due to the plate being either out of position or bent.
7. If the condition described in Operation 6 is confirmed, press the air sensor plate downward several times to exhaust the control pressure. Then, press the plate fully downwards and allow it to spring back to the rest position. It should return freely and bounce downwards slightly from the spring loaded stop at least once.
8. Should a resistance be confirmed in Operation 7 remove the air sensor plate and repeat the operation. If this alleviates the resistance, the air sensor plate is fouling the sides of the air funnel and should be centralized (refer to Procedure 4) or the air funnel may be deformed in some way.
9. If there is still a resistance to the movement of the lever it could be due to contamination within the fuel distributor barrel or occasional binding in the lever mechanism.
10. Contamination within the fuel distributor can be checked by separating the fuel distributor from the control unit and withdrawing the control piston for inspection.

Use a screwdriver to remove the three retaining screws situated on top of the fuel distributor around the connection to the warm-up regulator. Lift off the fuel distributor (resistance will be felt due to the rubber sealing ring), bend back the piston retaining tabs and withdraw the piston.

Handle the control piston with care, if it is knocked or dropped it may become damaged.

Do not handle the control piston on its working surfaces.

11. Thoroughly clean the control piston in clean unleaded fuel.

12. Fit the control piston to the fuel distributor. Ensure that the spring is fitted above the piston.

Bend the retaining tabs so that the piston cannot fall out. Ensure that the rubber sealing ring situated between the fuel distributor and the mixture control unit, is in good condition. Lubricate the rubber sealing ring with approved grease and fit the distributor ensuring that the three retaining screws are evenly tightened.

If a resistance is still noticeable a new fuel distributor assembly should be fitted to the mixture control unit.

13. After fitting the fuel distributor check the idle mixture strength.

Procedure 4 Positioning the air flow sensor plate

1. Remove the air inlet ducting from above the air sensor plate.

2. Check that the sensor plate is flat (i.e. not bent) and that it will pass through the narrowest part of the air funnel without fouling.

3. If necessary, loosen the plate securing screw.

4. Insert the guide ring RH 9609 whilst retaining the sensor plate in the zero movement position (see fig. U2-30). This will prevent the sensor plate from being forced downwards as the centring guide ring is being installed.

5. With the centring guide ring in position tighten the retaining screw to the torque figure given in Section U10. Carefully remove the centring guide ring.

6. Bridge the engine running sensor and switch on the ignition for ten seconds to apply control pressure to the control piston in the fuel distributor.

7. The upper edge of the sensor plate adjacent to the fuel distributor, should be flush with the beginning of the upper cone as shown in figure U2-31.

Note

It is permissable to leave the top edge of the air sensor plate adjacent to the fuel distributor, protruding into the upper cone by a maximum of 0,5 mm (0.020 in). The lower edge of the sensor plate which is chamfered, must not project upwards outside the short cylindrical part of the air funnel at any point on its circumference.

8. If the air sensor plate is positioned too high, remove the fuel distributor and carefully tap the guide pin lower (see fig. U2-32) using a mandrel and a small hammer.

Note

This adjustment must be made very carefully, ensuring that the guide pin is not driven too low. Repeated adjustment in both directions can loosen the guide pin. Serious damage to the engine could result if the pin should fall out.

Procedure 5 Checking the operation of the auxiliary air valve

1. Ensure that the engine is cold.

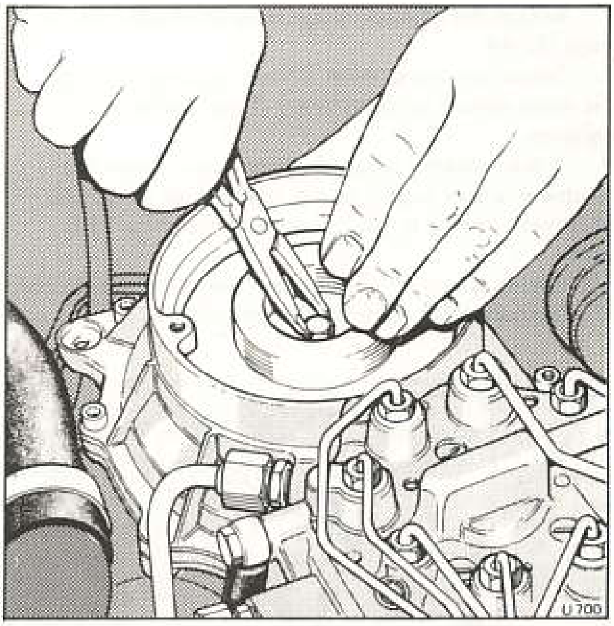


Fig. U2-30 Installing the centring guide ring

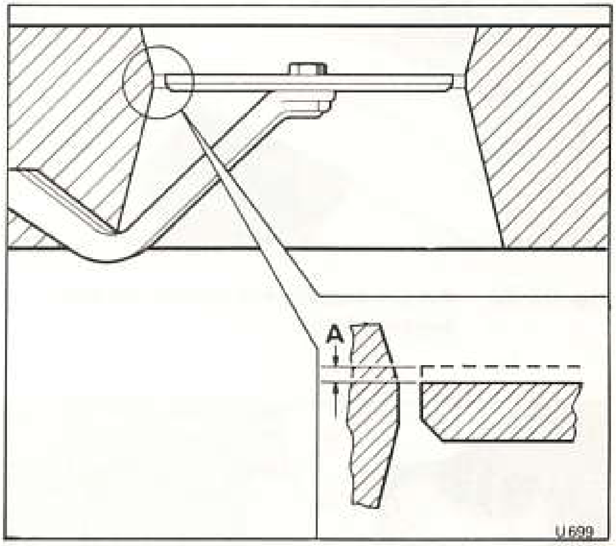


Fig. U2-31 Checking the height of the air flow sensor plate
A 0,5 mm (0.020 in)

2. Disconnect the electrical plug at the auxiliary air valve.

3. Disconnect the inlet and outlet rubber hoses from the auxiliary air valve.

4. Using a flashlight and a small mirror observe the position of the hole in the blocking plate. It should be partially uncovered (see fig. U2-33). If the blocking plate completely closes the air passage, fit a new auxiliary air valve.

5. If the air passage way is open, bridge the engine running sensor (refer to page U2-43).

6. Connect the electrical plug to the auxiliary air valve.

7. Bridge the heaters inhibit relay (if fitted) refer to page U2-44.
8. Switch on the ignition. The air passage through the valve should be completely closed within four minutes.
9. If the blocking plate does not close; check the electrical power supply to the auxiliary air valve. The minimum voltage at the connector should be 11.5 volts.
10. Finally, using an ohmmeter, check the heating coil in the auxiliary air valve for an open circuit.

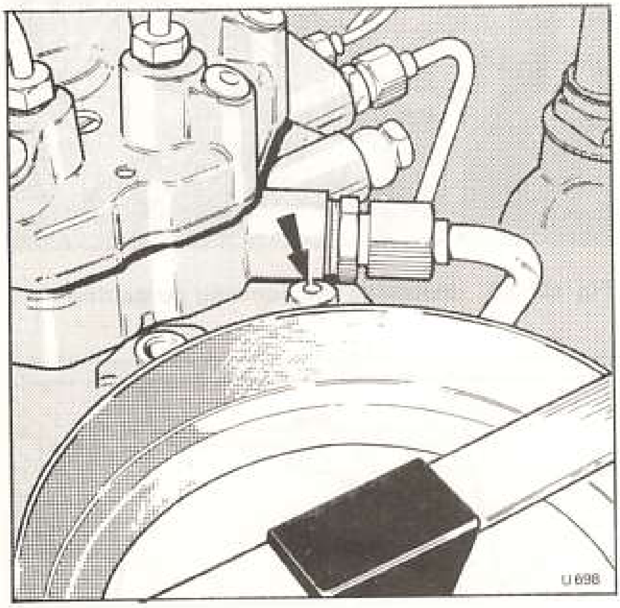


Fig. U2-32 Height adjustment for the air flow sensor plate

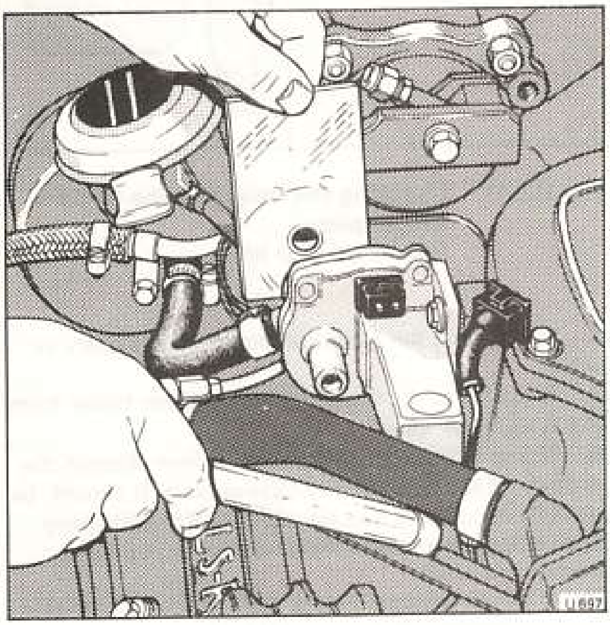


Fig. U2-33 Checking the auxiliary air valve (E.G.R. valve heatshield removed)

Should the heating coil prove faulty fit a new air valve.

Procedure 6 Checking the operation of the primary fuel circuit

Fuel delivery

1. Fit the pressure tester RH 9612 (Bosch No. KDEP 1034), adapter, and hose. Refer to page U2-42.
2. Open both valve screws on the pressure tester valve block.
3. Disconnect the fuel return line to the fuel tank, at the fuel distributor (see fig. U2-4). Using a 'firtree' type nipple and nut (SPM 1390/1) connect one end of an auxiliary fuel return hose to the connection. Hold the other end of the hose in a graduated measuring container capable of holding at least 2 litres (3.5 Imp pt, 4.25 US pt).
4. Disconnect the electrical plug from the warm-up regulator and the auxiliary air valve.
5. Bridge the engine running sensor (refer to page U2-43) and switch on the ignition for 30 seconds. At least 1000 ml of fuel should be delivered into the measuring container.
6. If the delivery quantity is satisfactory check the primary system pressure. However, if the delivery quantity is below the prescribed amount proceed as follows, checking the fuel pump delivery after each operation.
7. Check the voltage at the fuel pump. When the pump is operating this should be 11.5 volts.
8. Check the fuel lines for blockage.
9. Fit a new main fuel filter.
10. Fit a new fuel pump.

After establishing that the fuel delivery is correct remove the test equipment. Connect the fuel return pipe to the fuel distributor.

Primary system pressure

To carry out this test, fit the pressure tester RH 9612 (Bosch No. KDEP 1034), adapter, and hose. Refer to page U2-42.

The temperature of the engine is not important for this test.

1. Close the valve screw on the pressure tester three-way block adjacent to the connection to the warm-up regulator (see fig. U2-35).
2. Bridge the engine running sensor (refer to page U2-43) and switch on the ignition. The pressure gauge will now show primary system pressure which should be between 5,2 bar and 5,8 bar (75.4 lbf/in² and 84.1 lbf/in²).
3. If the primary system pressure is too **low**.
a. check the fuel supply.
b. check the setting of the pressure regulator and service if necessary (see Primary system pressure regulator – To service).
4. If the primary system pressure is too **high**.
a. check for a restriction in the return line to the fuel tank.
b. check the setting of the pressure regulator and service if necessary (see Primary system pressure regulator – To service).

Procedure 7 Checking the control pressure

Control pressure is determined by the warm-up regulator and governs the basic mixture strength.

The warm-up regulator contains two temperature sensitive bi-metals and an aneroid capsule (see fig. U2-24) which responds to atmospheric pressure. Therefore, the control pressure depends upon the warm-up regulator bi-metal temperature and the atmospheric pressure (which is reduced with increasing altitude).

Fit the pressure tester RH 9612 (Bosch No. KDEP 1034), adapter, and hose. Refer to page U2-42.

Cold control pressure

The engine must be cold to enable this test to be properly carried out. The engine must not have been run for at least four hours or **preferably**, left overnight.

The ambient temperature at the time of the test must also be known.

1. Disconnect the electrical plug situated on the warm-up regulator.
2. Bridge the engine running sensor (refer to page U2-43).
3. Open both valves on the pressure tester valve block.
4. Switch on the ignition, noting that the pressure tester gauge will show cold control pressure.
5. Refer to figure U2-35 for the correct cold control pressure.

If the test site is at sea level the correct control pressure should be within ± 0,2 bar (3 lbf/in²) of the heavy line (corresponding to an atmospheric pressure of 984 millibars).

Example

With an atmospheric pressure of 984 millibars or above and an ambient air temperature of 20°C (68°F), the **cold control pressure** should be between 2,0 bar and 2,4 bar (29 lbf/in² and 34.8 lbf/in²).

If the test site is at altitude [i.e. above 600 m (1968.5 ft)], determine the atmospheric pressure at the time of the test. This should be obtained from a local weather station or airport that is at the same altitude, or from a reliable mercury barometer reading taken at the test site.

The control pressure should be within ± 0,25 bar 3.6 lbf/in²) of the value corresponding to the atmospheric pressure.

Example

With an atmospheric pressure of 838 milibars and an ambient air temperature of 20°C (68°F), the **cold control pressure** should be between 2,45 bar and 2,95 bar (35.5 lbf/in² and 42.8 lbf/in²).

6. To carry out a basic functional test on the altitude compensation device at sea level, connect a suitable hand operated vacuum pump to the breather connection on the warm-up regulator and evacuate the body (see fig. U2-36). Ensure that the control pressure rises as the pressure within the warm-up regulator decreases.

If the cold control pressure is incorrect fit a new warm-up regulator.

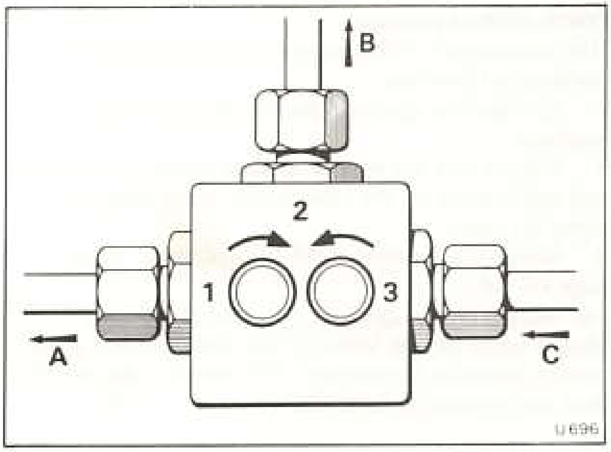


Fig. U2-34 **Three-way valve block (primary system pressure)**

A To the warm-up regulator

B To the pressure gauge

C From the fuel distributor

Note A single flow direction controller in place of the two knurled screws may be encountered. However, the valve's basic principle of operation remains unchanged.

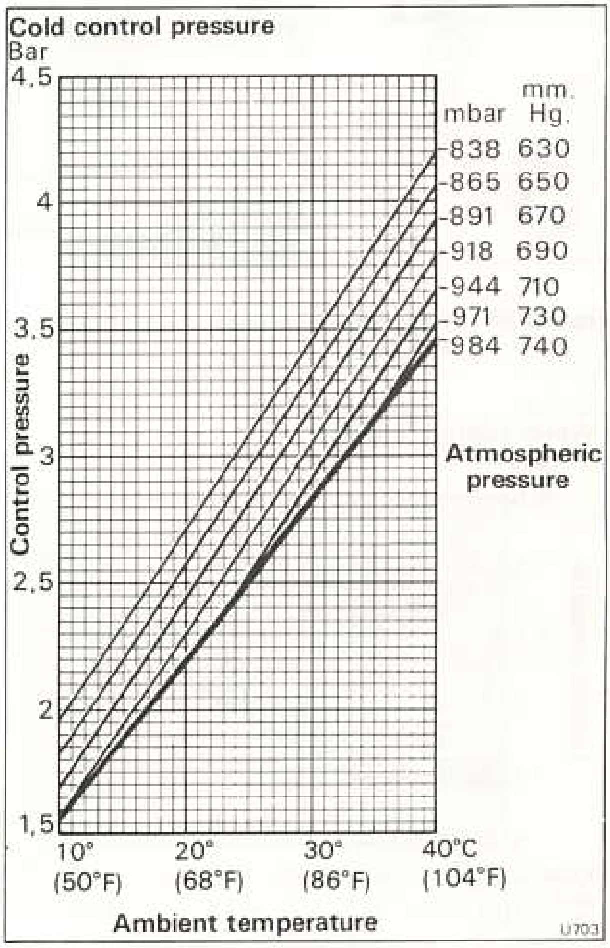


Fig. U2-35 **Control pressure (cold)**

Warm control pressure

The temperature of the engine is not important when carrying out this test.

7. Connect the electrical plug to the warm-up regulator.

8. Ensure that the engine running sensor is bridged and both valves on the valve block of the pressure tester are open.

9. Bridge the heaters inhibit relay (if fitted). Refer to page U2-44.

10. Switch on the ignition. The control pressure should begin to rise. When it has stabilized the warm control pressure is indicated. This should take no more than one minute at 20°C (68°F).

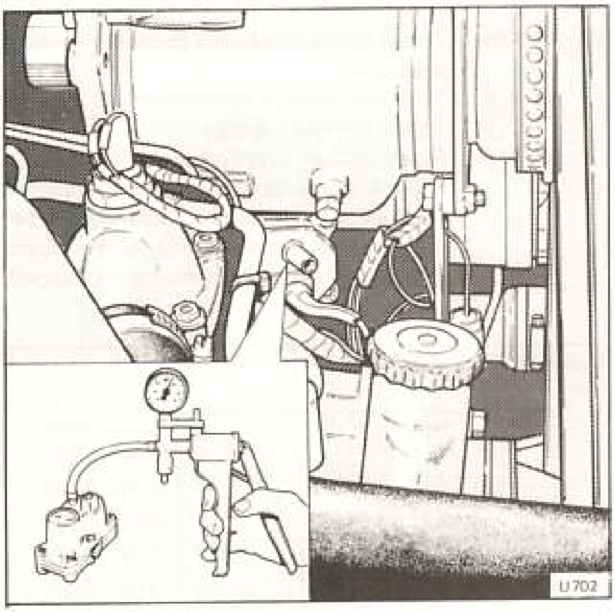


Fig. U2-36 Evacuating the body of the warm-up regulator

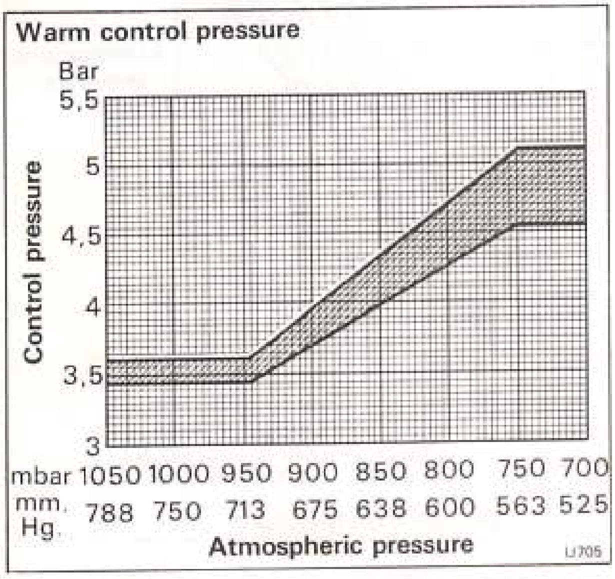


Fig. U2-37 Control pressure (warm)

11. Refer to figure U2-37 for the correct warm control pressure at the corresponding test site altitude.

12. If the warm control pressure is incorrect, check that there is an electrical supply to the warm-up regulator. If the supply is correct the warm-up regulator is defective and a new assembly should be fitted.

Procedure 8 Checking the fuel system for leaks

1. Fit the pressure tester RH 9612 (Bosch No. KDEP 1034), adapter, and hose. Refer to page U2-42. Ensure that both valves on the pressure tester valve block are open.

2. Ensure that the engine temperature is between 30°C and 50°C (86°F and 122°F).

3. Bridge the engine running sensor (refer to page U2-43).

4. Switch on the ignition and allow one minute for warm control pressure to be registered on the gauge of the pressure tester.

5. Switch off the ignition noting the time taken for the pressure to fall to zero and compare this time with the data given in figure U2-38.

6. If the pressure drops too quickly repeat the test with the control pressure circuit disconnected. To carry out this test, close the valve on the pressure tester valve block adjacent to the warm-up regulator connection (see fig. U2-34) and repeat the test given in Operations 2 to 5 inclusive.

Should the pressure loss now be acceptable, there is a leak either.

a. externally from the control circuit pipes and/or pipe connections.

b. at the push valve situated within the primary system pressure regulator. This indicates that the rubber sealing rings are defective and should be changed (refer to Primary system pressure regulator – To service).

Should the pressure loss remain outside the acceptable limits, the leak is in the primary fuel circuit and may be due to.

a. the sealing ring in the primary system pressure regulator being defective and indicating that the rubber sealing rings in the assembly should be changed (refer to Primary system pressure regulator – To service).

b. the cold start injector leaking.

c. a faulty non-return valve in the fuel pump outlet union.

d. leaking accumulator diaphragm.

e. an external leak from one of the fuel system pipes.

f. one or more of the injectors leaking.

If an injector leak is suspected, switch on the ignition to restore the system pressure then slightly depress the air sensor plate. If the pressure reading drops continuously with the sensor plate depressed an injector is leaking. Remove the sparking plugs for inspection, the plug removed from the cylinder having the sticking injector will often be found in a sooty condition.

Procedure 9 Checking the injectors

1. Remove the injectors from the engine.

2. Connect one injector to the test equipment RH 9414 (Bosch No. KDJE 7452). Refer to figure U2-39.

Opening pressure

3. Bleed the discharge tube by moving the operating lever several times with the union slackened. Tighten the union.

4. Check the injector for dirt by operating the lever slowly at approximately one stroke per two seconds, with the valve on the pressure gauge open.

If the pressure does not rise to between 1,0 bar and 1,5 bar (14.5 lbf/in² and 21.75 lbf/in²) the valve of the injector has a bad leak, possibly caused by dirt. Attempt to flush the valve by operating the lever rapidly several times. If the injector valve does not clear the injector should be discarded.

5. Check the opening pressure of the injector by closing the valve of the test equipment and bleeding the injector by operating the test equipment lever rapidly several times. Open the valve and move the lever slowly at approximately one stroke per two seconds, note the pressure at which the injector begins to spray.

The correct pressure for the injector to commence spraying is between 3,5 bar and 4,1 bar (50.75 lbf/in² and 59.45 lbf/in²). If this is not correct fit a new injector.

Leakage test

6. Open the valve on the test equipment and slowly operate the lever until the pressure reading is 0,5 bar (7.25 lbf/in²) below the previously determined opening pressure.

7. Hold this pressure constant by moving the lever.

8. No drops should appear from the injector for the next 15 seconds.

Evaluation of spray and 'chatter' test

9. Operate the lever of the test equipment at one stroke per second, as this is done the valve in the end of the injector should be heard to 'chatter'.

10. The injector should also produce an even spray with an approximate spray angle of 35°. If drops form at the mouth of the injector valve or if the spray is excessively one-sided, the injector should be discarded.

The various spray formations and angles are shown in figure U2-40.

Repeat Operations 1 to 10 inclusive on the remaining injectors noting that only new test fluid must be used to replenish the reservoir of the test equipment.

Procedure 10 Checking the delivery balance of the fuel distributor

1. Fit the delivery quantity comparison tester RH 9613 (Bosch No. KDJE 7455). Refer to page U2-42.

2. Remove the air intake ducting to reveal the air sensor plate.

3. Bridge the engine running sensor (see page U2-43) and switch on the ignition.

4. Bleed the test equipment.

5. This test is carried out under simulated idle, part load, and full load conditions as follows.

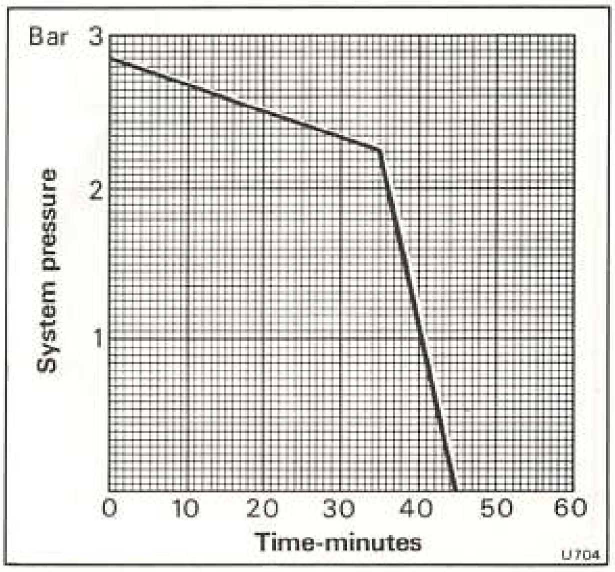


Fig. U2-38 Fuel system 'leak down'

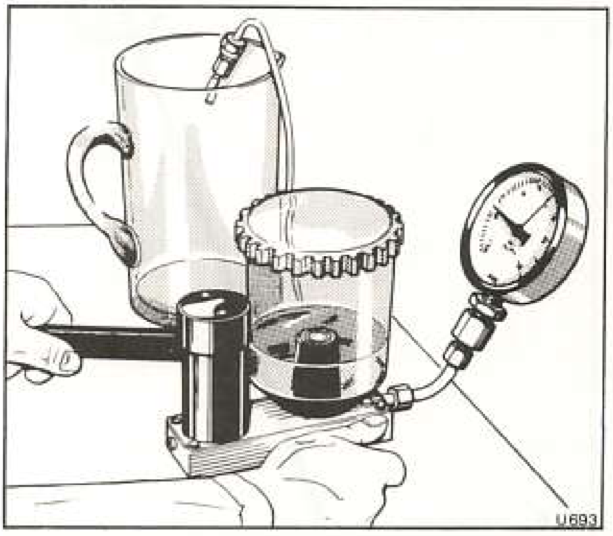


Fig. U2-39 Testing an injector

Idle conditions

6. Press switch number one on the test equipment and move the air flow sensor plate downwards (using the adjusting device shown in figure U2-41), until the reading on the small rotameter indicates a flow of approximately 6,7 ml/min.

7. Test the remaining outlets and determine which one has the lowest fuel delivery.

8. Press the switch of the outlet with the lowest fuel delivery and using the adjusting device, adjust the height of the air flow sensor plate until the reading on the rotameter is 6,7 ml/min.

9. Measure the fuel delivery from each outlet, noting that none of them should exceed 7,7 ml/min.

Part load conditions

10. Repeat Operations 6 to 9 inclusive, moving the air flow sensor plate downwards, until a fuel delivery of

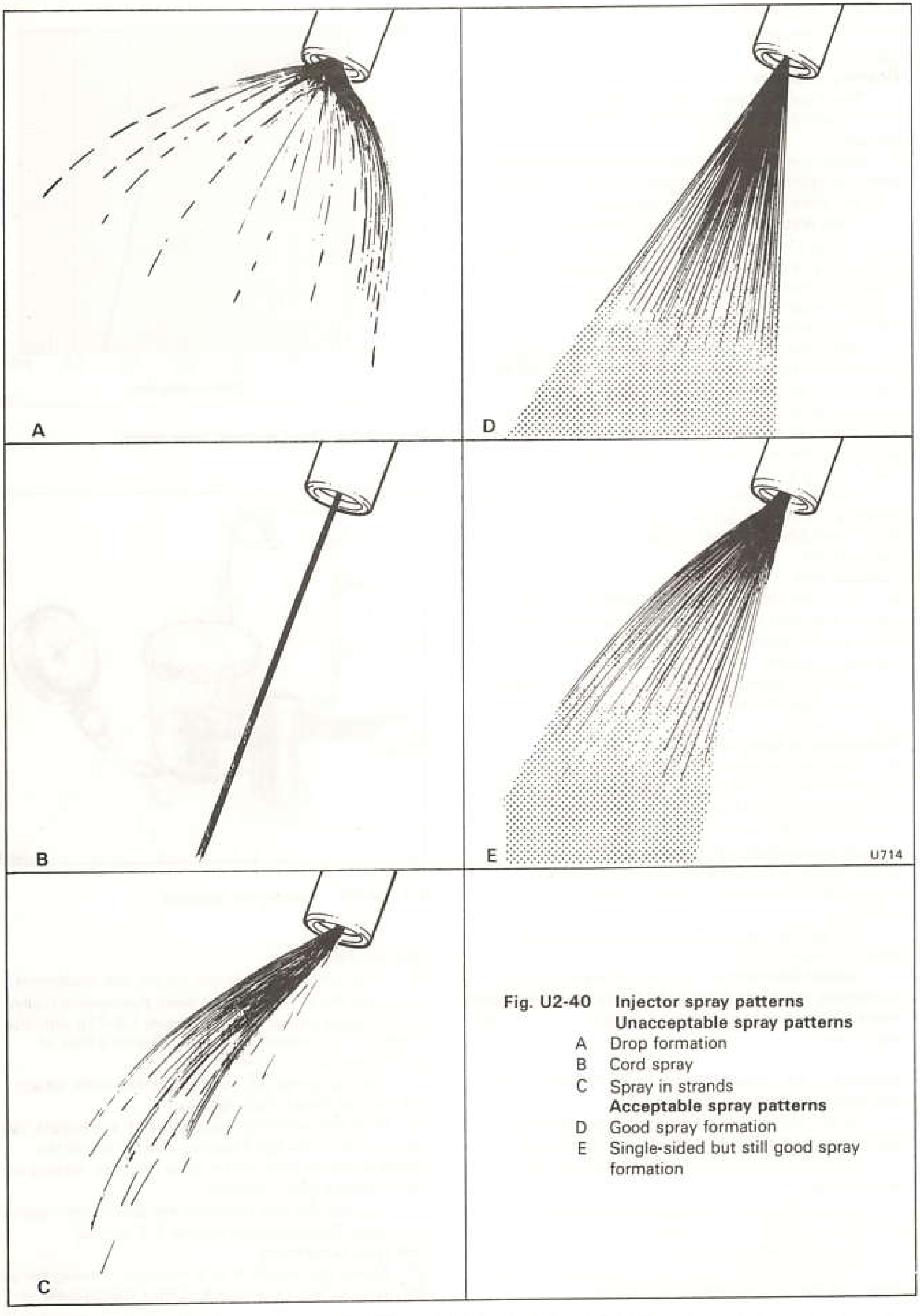


Fig. U2-40 Injector spray patterns
Unacceptable spray patterns

- A Drop formation
- B Cord spray
- C Spray in strands

Acceptable spray patterns

- D Good spray formation
- E Single-sided but still good spray formation

20,8 ml/min is measured (on the large rotameter) from the fuel outlet with the lowest delivery.

11. Measure the fuel delivery from each outlet, noting that it should not exceed 22,4 ml/min.

Full load conditions

12. Repeat Operations 6 to 9 inclusive, moving the air flow sensor plate further downwards, until a fuel delivery of 94 ml/min is measured from the fuel outlet with the lowest delivery.

13. Measure the fuel delivery from each outlet, noting that it should not exceed 99 ml/min.

14. Switch off the ignition and remove the test equipment.

If the fuel delivery exceeds the limits quoted a new fuel distributor should be fitted.

Procedure 11 Checking the engine idle speed

For details relating to the checking and setting of the idle speed, refer to Idle speed – To set, in the service adjustments section.

Procedure 12 Checking the idle mixture strength

The idle mixture strength should be checked and adjusted in accordance with the instructions given under the heading Idle mixture strength – To set, in the service adjustments section.

The idle mixture strength should always be checked if either a new warm-up regulator or fuel distributor have been fitted.

Procedure 13 Checking the opening of the throttle

1. Unscrew the worm drive clips securing the air intake hose to the throttle body and the mixture control unit.
2. Free the joints and withdraw the hose.
3. Depress the accelerator pedal fully and observe the position of the throttle plate. The plate should be in the fully open position.
4. Ensure that the throttle plate and linkage operate smoothly throughout the test.
5. If the throttle plate does not open fully, or if the linkage does not operate smoothly, investigate and correct the problem, ensuring that the linkage is correctly adjusted (refer to Section U9, Throttle linkage).

Procedure 14 Checking the 'wide open' throttle mixture enrichment

1. Start and run the engine until normal operating temperature is attained.
2. Stop the engine.
3. Fit the 'closed loop' system test meter RH 9615* (Bosch No. KDJE P600). Refer to page U2-43.
4. Bridge the engine running sensor (see page U2-43).
5. Ensure that the ignition is switched on.
6. The test meter should read between 45% and 55%, if not refer to the 'Closed loop' system fault finding flow chart.
7. Operate the 'wide open' throttle micro-switch. The test meter reading should increase by 7%. If the test

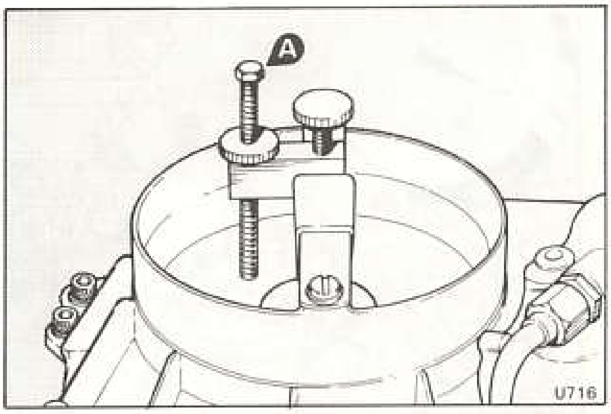
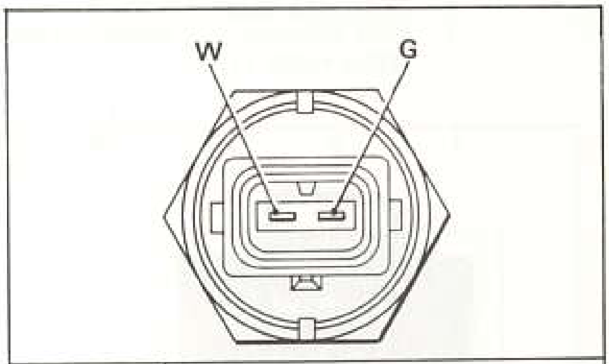


Fig. U2-41 Air flow sensor plate movement (adjustment device)
A Adjustment screw



Switch temperature	Resistance - Ohms (meter reading)		
	Between terminal G and earth	Between terminal W and earth	Between terminals G and W
Less than 10°C (50°F)	50 - 70	0	50 - 70
More than 20°C (68°F)	50 - 70	∞	∞

U715

Fig. U2-42 Thermal time switch

meter reading does not increase, continue to trace the fault using the 'Closed loop' system flow chart.

Procedure 15 Checking the air intake filter and ducting for blockage

1. Remove the air filter element (refer to Air intake filter element – To remove and fit, in the Removal and fitting of components section).
2. Examine the condition of the element and fit a new one if necessary.
3. Inspect the filter housing assembly. Particular attention should be given to the intake 'scoop' that diverts air from behind the front bumper into the filter housing, ensure that this is not obstructed.
4. Slacken the worm drive clip that secures the

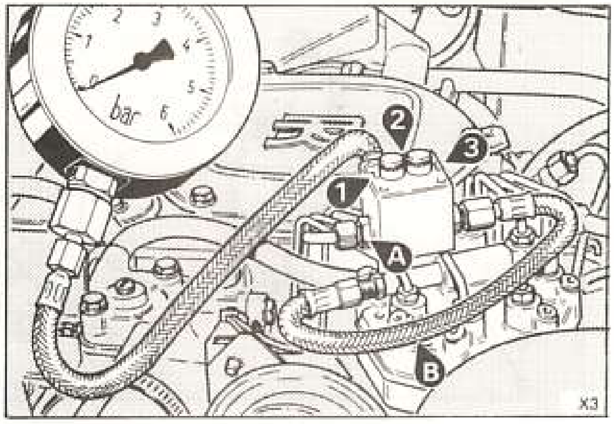


Fig. U2-43 Pressure tester and adapter
1 To warm-up regulator
2 To the pressure gauge
3 From the fuel distributor
A Valve block adapter RH 9607
B Hose and valve block adapter RH 9645 (KDJE P100/11)

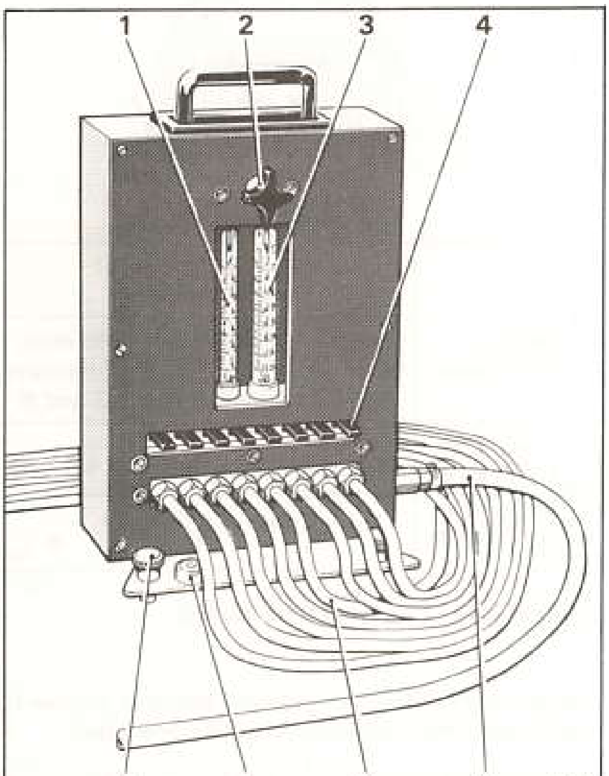


Fig. U2-44 Fuel delivery quantity comparison tester
1 Small rotameter
2 Three-way valve
3 Large rotameter
4 Fuel delivery key
5 Fuel return line
6 Fuel delivery line
7 Spirit level
8 Level adjusting screw

flexible ducting to the mixture control unit, ensure that the ducting is not blocked and is in good condition.

5. Slacken the worm drive clips that secure both ends of the rubber hose connecting the mixture control unit to the throttle body. Ensure that this hose is not blocked and is in good condition.

6. Carry out the tests given in the Workshop procedures 3 and 13.

7. Fit all hoses, clips, and the filter element upon satisfactory completion of the tests.

Procedure 16 Checking the cold start system
When checking the cold start system it is essential that the information given in the Workshop safety precautions on page U2-23 is observed.

Thermal time switch

1. Withdraw the electrical plug from the thermal time switch.

2. Connect a test lamp between one of the two plug terminals and earth.

3. Switch on the ignition and crank the engine. The bulb of the test lamp should illuminate. Repeat the check on the other plug terminal. If the bulb does not illuminate in either test, the electrical connections and wiring of the respective circuit are suspect.

4. Produce a test lead using a Bosch electrical plug and two lengths of wire each approximately 500 mm (19.6 in) long.

5. Connect the test wires to the thermal time switch via the plug.

6. Refer to figure U2-42 and measure the resistance between.

a. terminals W and G

b. each terminal and the brass body of the switch.

Depending upon the temperature of the switch the resistance measured should be within the values given in figure U2-42.

7. If the values do not correspond with those given in the illustration fit a new switch (refer to Thermal time switch – To remove and fit).

8. After the test has been satisfactorily carried out remove the test lead assembly and connect the electrical loom plug.

Cold start injector

9. Detach the electrical plug from the cold start injector.

10. Produce a test lead using a Bosch electrical plug, two lengths of wire and a micro-switch.

11. Unscrew the three setscrews, securing the plenum chamber cover in position, withdraw the setscrews and collect the washers. Remove the cover so that the operation of the cold start injector can be observed.

12. Connect the electrical plug to the cold start injector and the two wires, one to an auxiliary electrical feed and the other to an earth point.

Note
Exercise care to eliminate the possibility of an electrical spark (use the micro-switch to make and break the circuit).

13. Bridge the engine running sensor (see page U2-43).

14. Switch on the ignition.
15. Operate the micro-switch to complete the auxiliary electrical circuit. The cold start injector should spray fuel as the contacts in the micro-switch complete the electrical circuit, if it does not spray fuel fit a new injector.

Note
Release the micro-switch immediately the cold start injector sprays fuel, otherwise the engine will be filled with fuel.

16. Switch off the ignition and remove the auxiliary test lead from the injector.
17. Dry the nozzle of the cold start injector.
18. Switch on the ignition, noting that no drops of fuel should form on or drip from the injector nozzle. If the injector is defective a new one should be fitted.
19. Switch off the ignition, connect the electrical plug and fit the plenum chamber cover, ensuring that the cover sealing ring is in good condition.

Procedure 17 Checking the exhaust gas recirculation (E.G.R.) system

Details for checking the exhaust gas recirculation system are given in Section U4, Exhaust emission control system.

Procedure 18 Checking the engine running sensor

1. Switch on the ignition; the fuel pump should not operate.
2. Switch off the ignition.
3. Disconnect the engine running sensor electrical plug and socket situated approximately 150 mm (6 in) along the loom from the sensor.
4. Produce a test lead with an appropriate Lucar connection on either end and bridge terminals 5 (white/pink) and 7 (pink) on the vehicle loom socket.
5. Switch on the ignition; the fuel pump should operate.

This test isolates the engine running sensor from the circuit. If the fuel pump does not operate check for a fault in.

a. the white/pink cable from the socket terminal 5 to the fuel pump.
b. the feed to the socket terminal 7.
c. the fuel pump.

6. Switch off the ignition and remove the bridging cable.
7. Connect the engine running sensor loom plug and socket.
8. Bridge the engine running sensor (see page U2-43).
9. Switch on the ignition; the fuel pump should operate.

This test proves that the engine cranking by-pass, situated inside the engine running sensor is operating.

If the fuel pump does not operate check for a fault in.

a. the auxiliary white cable on the starter relay (check for 12 volts).
b. the white/red cable from the starter relay to the loom socket.

10. Check for continuity of the white/black cable from the ignition system ballast resistors (if fitted) to the loom socket.

Normally, a symptom of a fault in this supply is that the engine will start when cranked by the starter motor but stop immediately the ignition key is released.

If the fault diagnosis indicates that the loom and ancilliary components are satisfactory, fit a new engine running sensor.

Procedure 19 Checking the fuel accumulator diaphragm for a leak

1. Locate the flexible hose connecting the accumulator to the fuel tank return pipe.
2. Suitably clamp the hose to prevent unpressurized fuel from flowing out during the test.
3. Unscrew the worm drive clip securing the flexible hose to the connection on the fuel accumulator
4. Withdraw the hose from the connection.
5. Bridge the engine running sensor (see page U2-43).
6. Switch on the ignition to operate the fuel pump and pressurize the fuel accumulator.
7. Ensure that no fuel flows from the open connection on the fuel accumulator during the test.
8. If fuel does flow from the open connection, the accumulator diaphragm is leaking and a new fuel accumulator must be fitted.
9. Switch off the ignition, connect the fuel pipe and remove the clamp.

Procedure 20 Checking for a faulty overrun valve

1. Unscrew the worm drive clips securing both the inlet and outlet air connections.
2. Withdraw the diaphragm vacuum hose.
3. Unscrew and remove the setscrews retaining the overrun valve to the mounting bracket.
4. Withdraw the overrun valve.
5. Connect a hand operated vacuum pump to the vacuum connection.
6. Ensure that both inlet and outlet connections to the valve are clean and blow down the connection that is offset (see fig. U2-13). Air should not pass through the valve.
7. Operate the vacuum pump and continue blowing into the valve.
8. When the reading on the gauge of the vacuum pump approaches 495 mm Hg (19.5 in Hg), the diaphragm should lift the sealing valve from its seat. It should now be possible to blow through the valve, the air coming out through the centre outlet.
9. If the overrun valve does not operate as stated, fit a new assembly, reversing the procedure given for removal.

Fault diagnosis test equipment and special procedures

This section contains information relating to the fitting procedures for the test equipment used when diagnosing a fault. Also included are the special procedures associated with the fuel injection system.

Pressure tester RH 9612 (Bosch No. KDEP 1034), hose and valve block adapter RH 9645 (KDJE P100/11), and valve block adapter RH 9607 – To fit

The pressure tester and adapter are fitted into the control pressure line of the system (see fig. U2-43), with this equipment the system can be checked for.

a. cold and warm control pressure.
b. primary system fuel pressure.
c. fuel system leakage (internal or external).

To fit the test equipment proceed as follows.

1. Disconnect the battery.
2. Depressurize the fuel system (see page U2-44).
3. Unscrew the pipe union that connects the adapter on top of the fuel distributor to the pipe feeding the warm-up regulator.
4. Ensure that the special adapter RH 9607 is fitted into the valve block connection number 1.
5. Connect the warm-up regulator feed pipe union to connection number 1 on the change-over valve block of the test equipment.
6. Attach the open connection on the fuel distributor to connection number 3 on the change-over valve block, using the flexible hose and valve block adapter RH 9645 (Bosch No. KDJE P100/11).
7. Ensure that the pressure gauge is connected to connection number 2 on the change-over valve block, using the second flexible hose.
8. Bridge the engine running sensor (see page U2-43).
9. Connect the battery.
10. Disconnect the electric plugs at the warm-up regulator and auxiliary air valve.
11. Let the pressure gauge hang down under its own weight with the flexible hose fully extended.
12. Ensure that both valves on the pressure tester valve block are open and switch on the ignition. The fuel pump should now build-up pressure in the system.
13. Open and close valve screw number 1 on the valve block six or seven times in a ten second rhythm.
14. After the equipment has been satisfactorily bled lift up the gauge and suspend it from a bonnet catch.
15. Switch off the ignition noting that the pressure gauge and adapter are now ready for use.
16. To remove the test equipment, depressurize the system (refer to page U2-44) and reverse the procedure.

Note

The valve block of the pressure tester should always be stored with the valve screws open, to relieve any pressure on the sealing rings.

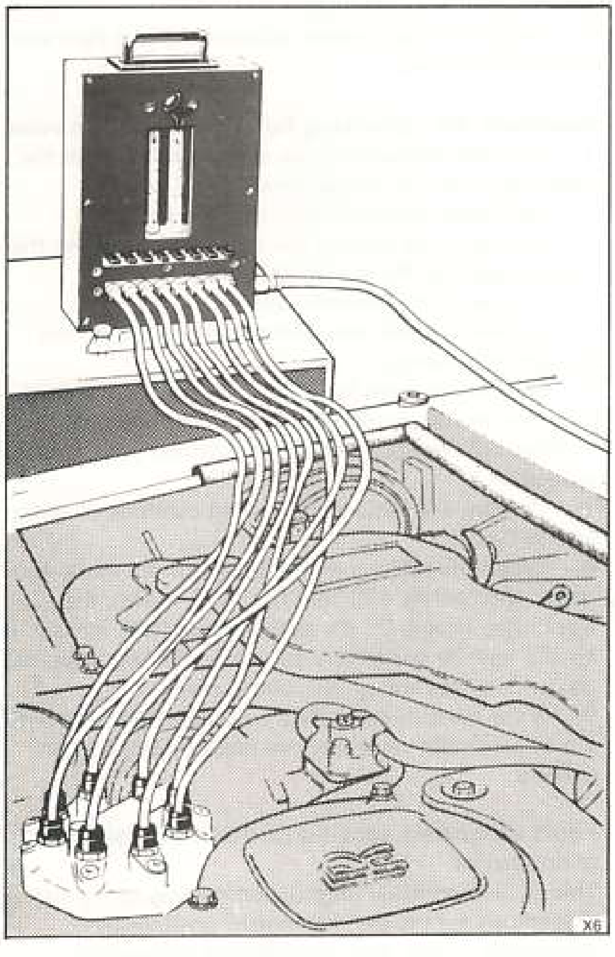


Fig. U2-45 Installation of comparison tester

Fuel delivery quantity comparison tester RH 9613, Bosch No. KDJE 7455)

If there is any discrepancy in the quantity of fuel delivered by the individual fuel distributor outlets, it can be measured by a comparison test, using the test equipment RH 9613 (Bosch No. KDJE 7455). This equipment is illustrated in figure U2-44.

The test equipment is designed in such a way that the tests can be carried out without removing the fuel distributor from the engine.

Ideally, the tester should be set permanently on a mobile trolley, so that once it is levelled-up only the trolley needs to be manoeuvred to the test site. However, the tester can be set up on a table close to the test vehicle and the test equipment levelled-up for each test using the levelling screws and spirit level (see fig. U2-44).

The test equipment should be fitted to the vehicle as follows.

1. Disconnect the battery.
2. Unscrew the unions securing the fuel injector lines to the fuel distributor outlets.
3. Screw the special adapters supplied with the test equipment, into the fuel distributor outlets.
4. Fit the automatic couplings fastened on the ends of the test equipment, to the special adapters in the fuel distributor outlets (see fig. U2-45).

Note

Outlet one from the fuel distributor should always be nearest to the fuel inlet connection. Figure U2-46 indicates which test line and switch of the test equipment are connected to which engine cylinder.

5. Route the fuel return pipe across the engine, along the side of the car and into the filler for the fuel tank.
6. Bridge the engine running sensor (see page U2-43).

7. Disconnect the electrical plug from the warm-up regulator and the auxiliary air valve.
8. Connect the battery and switch on the ignition. The fuel pump should operate to build-up pressure in the system.
9. To bleed the test equipment, remove the air intake ducting from the mixture control unit and push the air flow sensor plate downwards to its fully opened position. Press each key on the flowmeter one after the other, whilst simultaneously operating the three-way tap. Continue this operation until there are no bubbles in the two rotameters.
10. Allow the air flow sensor plate to return to the zero position and switch off the ignition. The test equipment is now ready for use.
11. To remove the test equipment, depressurize the system (refer to page U2-44) and reverse the procedure.

'Closed loop' system test meter RH 9615 (Bosch No. KDJE – P600)

1. Ensure that the test meter is positioned on the car floor beneath the main fuseboard.
2. Locate the black/slate test cable situated above the side scuttle trim pad on the right-hand side of the vehicle, attach the test connection to the Lucar connector.
3. Connect the brown (feed) cable to a known 12 volt supply and the green/yellow cable to a good earth point. For convenience, it is suggested that the cables be fitted to an adapter that will fit into the cigar lighter socket.
4. Switch on the ignition.
5. The test meter is now ready to be used.
6. When carrying out the tests, it will be necessary to fit a cable between the 2 volts supply connection on the testmeter and the disconnected blue cable for the oxygen sensor signal.

Details of all the tests are given in the appropriate fault diagnosis flow chart.

Bridging the engine running sensor

It is necessary to bridge the engine running sensor so that the fuel pump can be operated without running the engine.

The method used to carry out this exercise is described in the following sequence of operations. However, extreme care must be used when deciding the type of relays arrangement fitted to a particular car, especially the Corniche.

The layout for the Corniche will be either that shown in figure U2-48 (late Corniche) or U2-49 (early Corniche).

Silver Spirit, Silver Spur, Mulsanne, late Corniche, and all Continental

1. Ensure that the ignition is switched off.
2. Disconnect the electrical feed to the cold start injector.
3. Withdraw the starter relay and bridge the brown and the white/red cables at the relay socket (see fig. U2-48).
4. Check that the fuel pump now operates when the ignition is switched on.

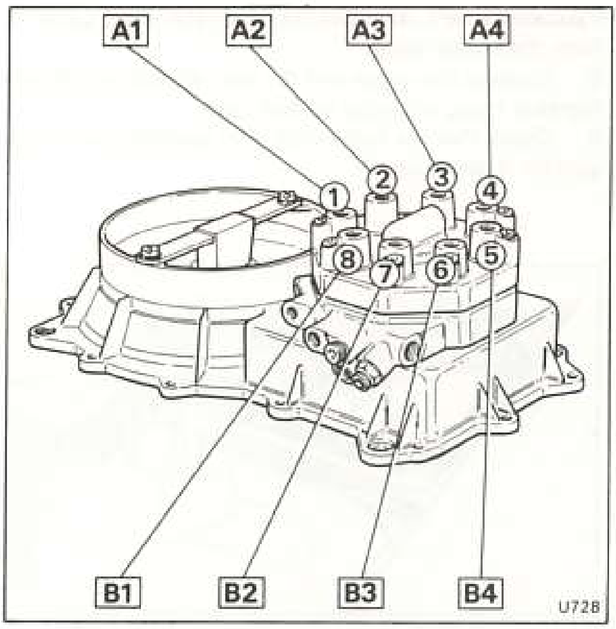


Fig. U2-46 Fuel distributor connections
○ Key number on test equipment (left to right)
□ Engine cylinder

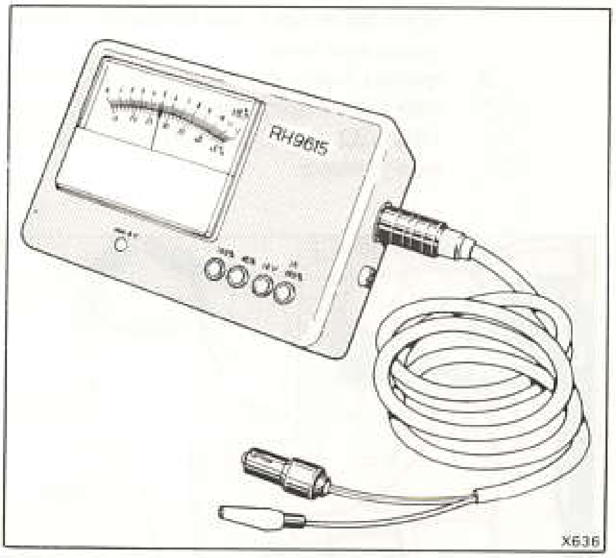


Fig. U2-47 'Closed loop' system tester

Always unbridge the engine running sensor immediately the tests are complete.

Early Corniche and all Camargue

1. Ensure that the ignition is switched off.
2. Disconnect the electrical feed to the cold start injector.
3. Locate the starter relay and the fuel injection system relay situated adjacent to the transmission dipstick (see fig. U2-49).
4. Withdraw the white cable Lucar from the fuel

injection system relay and the twin white/red Lucar from the starter relay.
5. Connect the white and the twin white/red cables together using a double bladed Lucar.
6. Check that the fuel pump now operates when the ignition is switched on.

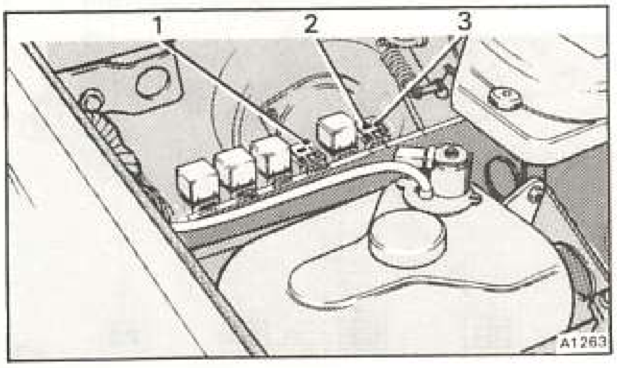


Fig. U2-48 Bridging the engine running sensor and the heaters inhibit relay

1 Bridging the engine running sensor (Silver Spirit, Silver Spur, Mulsanne, late Corniche and all Continental)
2 Bridging the heater inhibit relay (Silver Spirit, Silver Spur, and Mulsanne 1986 model year cars)
3 Ignition distributor vacuum retard cut-off relay (Silver Spirit, Silver Spur, Mulsanne 1981/82 model year cars only – may been deleted)

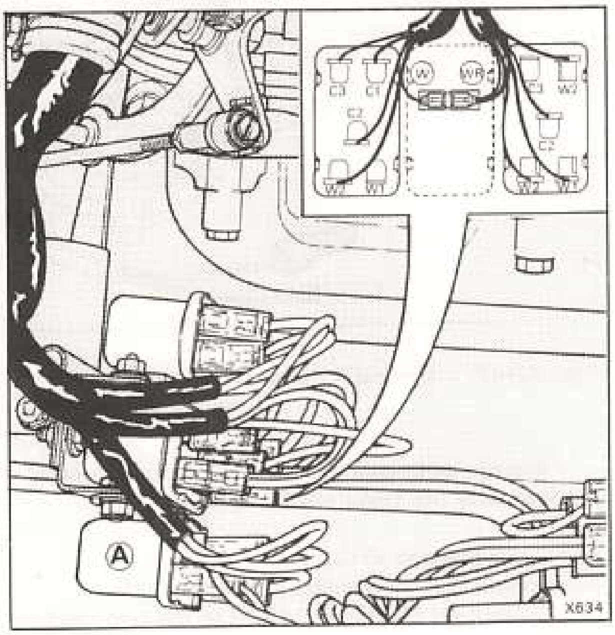


Fig. U2-49 Bridging the engine running sensor (early Corniche and all Camargue)

A Ignition distributor vacuum retard cut-off relay – May not be fitted

Always unbridge the engine running sensor immediately the tests are complete.

Bridging the heaters inhibit relay

1986 model year Silver Spirit, Silver Spur, and Mulsanne cars, are fitted with a heater inhibit relay (see fig. U2-48). The purpose of this relay is to prevent premature weakening of the mixture during extended cranking.

The relay inhibits the electrical feed to the heaters in the auxiliary air valve and the warm-up regulator until the engine has started.

Bridge the relay as follows.

1. Ensure that the ignition is switched off.
2. Identify the relay (see fig. U2-48).
3. Withdraw the relay from its socket.
4. Using a suitable length of addition cable bridge the white/pink and white/yellow cables in the relay socket.
5. Tests can now be carried out to check the operation of the auxiliary air valve and the warm--up regulator.

Always unbridge the relay immediately the tests are complete.

Depressurizing the fuel system

The fuel in the system may be pressurized (except for the fuel tank and return lines), therefore, unless the engine has been stationary for a minimum of two hours, it is recommended that the fuel system be depressurized before dismantling any parts of the system.

To depressurize the system proceed as follows.

1. Clean the inlet connection to the fuel filter (see fig. U2-23).
2. Wrap an absorbent cloth around the joint and carefully slacken the pipe nut to release any pressurized fuel from the system.
3. Tighten the pipe nut.
4. It should be noted that the system will still contain unpressurized fuel.
5. After working on the system, run the engine and check to ensure that there are no leaks.

Water contamination of the fuel

If the fuel system becomes contaminated, it is recommended that the following procedure is adopted to remove the water.

1. Unscrew the union connecting the fuel return line to the fuel distributor.
2. Blow compressed air into the fuel return line to force any fuel in the line into the tank.
3. Slightly jack-up the car on the right-hand side and siphon the fuel from the fuel tank. Lower the jack.
4. Pour one gallon of Exxonvarsol or Shell Mineral spirit 135 into the fuel tank and rock the car from side to side, to throughly mix the spirit with any water remaining in the tank.
5. Slightly jack-up the car on the right-hand side and siphon the fuel tank. Lower the jack.
6. Repeat Operations 4 and 5 until all the water has been removed from the fuel tank.

7. Locate the fuel tank outlet connection. Unscrew the worm drive clip securing the fuel feed hose and detach the hose.
8. Remove the circlip from the base of the fuel tank outlet connection and withdraw the tank strainer assembly. Collect the rubber sealing ring.
9. Clean the strainer by blowing compressed air through the screen from the inside.
10. Ensure that the rubber sealing ring is in good condition and fit the strainer assembly to the fuel tank, securing it with the circlip.
11. Unscrew the worm drive clip securing the fuel pump feed hose to the inlet connection. Connect approximately 1,82 m (6 ft) in length of 11,11 mm (7/16 in) internal diameter hose to the fuel pump inlet and the other end of the hose to a suitable container.
12. Connect approximately 1,82 m (6 ft) length of hose to the fuel distributor return to fuel tank connection using a nut and nipple (SPM 3290 and SPM 3291). Place the free end of the hose into an empty container of at least 5 litres (1.1 Imp gall, 1.32 US gall).
13. Fit a new fuel filter assembly.
14. Remove the fuel injectors and fuel injection lines.
15. Unscrew the worm drive clip securing the mixture control unit air intake ducting. Remove the ducting.
16. Detach the electrical plug from the pressure control valve.
17. Connect the eight auxiliary plastic fuel lines from the fuel delivery quantity comparison tester RH 9613 (Bosch No. KDJE 7455) to the fuel injection line connections on the fuel distributor. Place the free ends of the plastic fuel lines into the empty container.
18. Pour at least 2,27 litres (4 Imp pts, 4.8 US pts) of mineral spirit into the container feeding the pump.
19. Bridge the engine running sensor (see page U2-43).
20. Switch on the ignition to operate the fuel pump. **Do not allow the fuel pump to run dry.**
21. Press the air flow sensor plate downwards to its maximum open position.
22. Continue to flush the system through until the mineral spirit collected from the plastic fuel lines connected to the fuel distributor, is clean.
23. Test the fuel injectors (see page U2-36).
24. Fit the fuel injectors and injector lines.
25. Fit a new fuel filter assembly.
26. Fit the fuel return line to the fuel distributor.
27. Fit the hose from the fuel tank to the fuel pump inlet connection.
28. Add fuel to the fuel tank and test the engine.

Removal and fitting of components

Before dismantling any connections and removing any components always depressurize the system. Always blank off any open connections to prevent the ingress of dirt.

Fuel tank (see figs. U2-52 and U2-53)

The fuel tank is fitted at the forward end of the luggage compartment behind the carpet covered sealing panel.

A small expansion tank of approximately 3,12 litres (5.5 Imp pts, 6.7 US pts) capacity is situated within the main fuel tank to inhibit complete filling and thereby, provide fuel expansion volume to cope with extreme temperature conditions.

When the car is being filled with fuel, the main fuel tank (without an expansion tank) could normally be completely filled, leaving only the filler neck and vent connector pipes to accommodate the expansion of the fuel. Therefore, an expansion tank is situated in the upper part of the main fuel tank and as the fuel level rises above the lower part of the expansion tank it flows inside through two small holes in the base. Two additional holes in the top of the expansion tank allow air to escape.

Fuel tank – To remove

1. Carry out the necessary workshop safety precautions.
2. Disconnect and remove the battery.
3. Siphon the fuel from the tank.
4. Unscrew the Pozidriv screws from the panel at the forward end of the luggage compartment and remove the knob from the battery master switch.
5. Withdraw the panel to reveal the fuel tank.
6. Disconnect the three electrical cables from the fuel tank level gauge. Remove the tape securing the loom to the fuel tank.
7. Remove the clips securing the three fuel tank vent hoses to their respective connections on top of the tank.
8. Withdraw the hoses and blank the open connections.
9. Unscrew the worm drive clip securing the filler hose to the fuel tank. Free the hose and blank off the open connection.
10. From beneath the car, detach the fuel feed and return connections at the fuel tank. Blank off the open connections.
11. Disconnect the rollover tube at the hose connection on the left-hand side of the fuel tank. Slacken the two tube retaining clips on the luggage compartment floor. Free the rollover tube from the Insulok plastic clip situated on either side of the tank.
12. Turn the rollover tube in the retaining clips so that it lies on the luggage compartment floor.
13. Unlock and unscrew the half-nut from each of the tank retaining strap bolts.
14. Unscrew the full nut from each of the two tank retaining strap bolts.
15. Withdraw the bolts and the crossmember. Collect the four bridge pieces from the ends of the retaining straps.
16. Bend the retaining straps and carefully withdraw the fuel tank assembly.

Note

The fuel tank may prove difficult to move due to the bonding effect that can take place between the rubber mountings and the tank after a period of time.

If an extra effort is required to free the tank, ensure that it will not be damaged by the force used.

Fuel tank – To fit

1. Ensure that the battery is disconnected (i.e. leads removed from the battery) and the necessary workshop safety precautions carried out.

2. Clean the forward area to the luggage compartment.

If blanking plugs, nuts, washers, etc., remain in this area when the fuel tank is fitted, they could become the cause of noise which may prove difficult to eradicate once the fuel tank is in position.

3. Fit the fuel tank cushioning pads to the rear seat panel. The two small pads situated below the main pad are only fitted on early cars.

4. Ensure that the rubber blanking grommets are fitted one into each of the forward corners of the luggage compartment floor.

5. Fit the rubber matting to the luggage compartment floor.

6. Fit the moulded rubber insulating pieces around the suspension pots and wheel arches.

7. Fit the two compriband pads around the large holes in the luggage compartment floor.

8. Fit the compriband covered wooden strip on the luggage compartment floor where it joins the rear seat panel.

Note

The position of all pads and strips are shown illustrated in figures U2-50 and U2-51. All pads and strips should be secured in position using an appropriate adhesive (see Chapter S).

9. Fit the fuel tank upper securing straps into position.

10. Fit the rollover tube, ensuring the uprights are turned to lie flat on the luggage compartment floor.

11. Ensure that the evaporative loss control hose is fitted correctly through the luggage compartment floor and that the open end is positioned high so that it can be retrieved when the fuel tank has been fitted.

12. Fit the long metal pipe and short hose across the top of the fuel tank, securing in position with clips.

13. Fit the fuel tank into position ensuring that the two bosses in the base of the assembly are positioned in the body holes.

14. Connect the vent hoses from both sides of the fuel tank to the filler assembly and tighten the retaining clips.

15. Rotate the rollover tube into the upright position and clip it to the hydraulic connector blocks on either side of the tank, using Insulok plastic clips.

16. Connect the canister hose that passes through the luggage compartment floor to the left-hand upright pipe. Connect the right-hand upright pipe via a hose to the centre vent connection on top of the fuel tank. Secure the hoses with retaining clips.

17. Fit the two lower fuel tank retaining straps, together with their panel brackets.

18. Fit the two compriband strips around the fuel tank.

19. Bend the retaining straps around the fuel tank, ensuring that they seat onto the compriband strips.

20. Fit a bridge piece to the end of each securing strap. Secure the fuel tank in position by fitting the long bolt, downwards, through the crossmember (if fitted), upper and lower securing strap bridge pieces and straps. Screw a full nut onto the bolt.

21. Repeat Operation 20 to the second set of securing straps.

22. Tighten the full nut of each set of securing straps

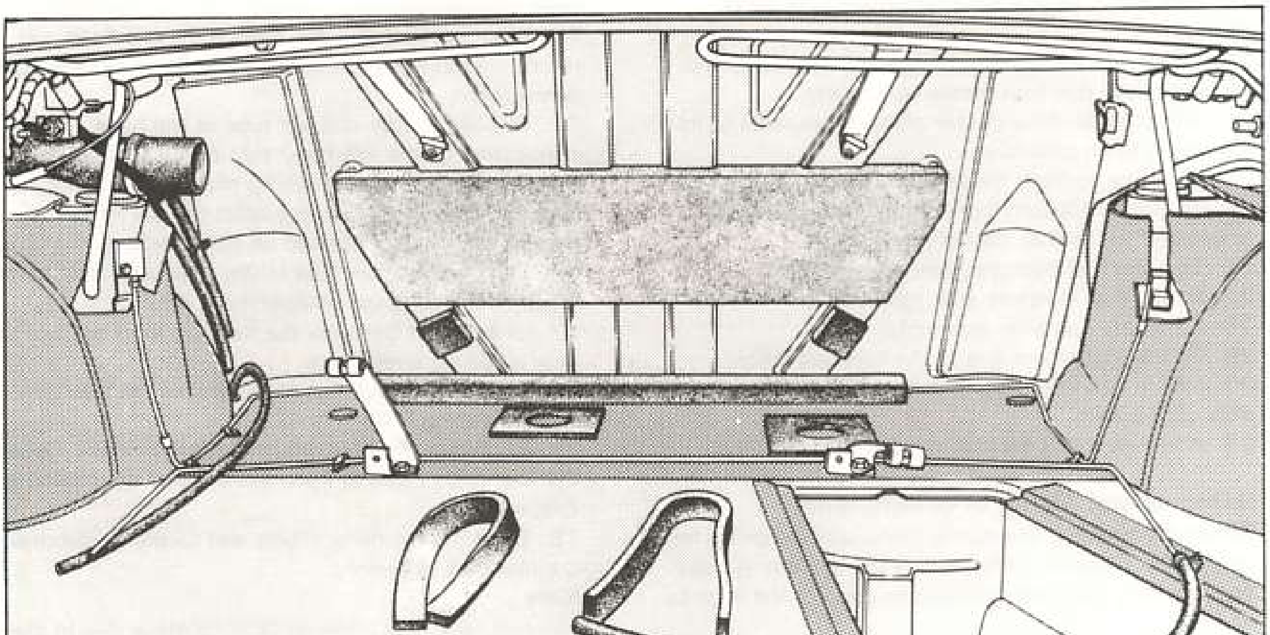


Fig. U2-50 Fuel tank mounting pads and straps (all cars other than Convertibles)

and lock in position by fitting an additional half-nut to each of the two bolts.

23. Fit the rubber intake pipe to the fuel tank neck and secure the end of the hose with a worm drive clip.

24. Connect the fuel feed hose and return pipe.

25. Locate the fuel gauge sender unit electrical loom (see figs. U2-52 and U2-53). There are three cables in the loom and these are coloured black, green/orange, and green/slate.

Tape the cables across the fuel tank until they are adjacent to the fuel sender unit.

Note

On Camargue cars the loom is situated on the right-hand side of the fuel tank.

26. Connect the cables to the fuel gauge sender unit.

27. Remove the end screw from the battery master switch and remove the knob and special ring nut.

28. Locate the base of the carpet covered panel against the two brackets and clips; secure with two screws. Secure the top of the panel with Pozidriv screws and washers to the crossmember, ensuring the panel locates over the battery master switch.

29. Fit the battery master switch special ring nut and knob. Secure the knob with the centre screw.

30. Connect the battery.

Fuel filler – To remove (Silver Spirit, Silver Spur, Mulsanne, and Corniche Saloon)

1. Disconnect the battery.
2. Unscrew and remove the Pozidriv screws securing the carpet covered sealing panel at the forward end of the luggage compartment. Remove the centre screw from the battery master switch and remove the knob. Remove the special ring nut.
3. Withdraw the carpet covered sealing panel to reveal the fuel tank assembly.
4. Unscrew and remove the self-tapping screws securing the tools stowage tray. Withdraw the stowage tray.
5. Remove the steel clips securing the two rubber hoses to the two outer vents on the top of the fuel tank and withdraw the hoses. One hose fits directly on to a vent, while the other fits to a metal pipe which extends across the width of the fuel tank.
6. Unscrew the worm drive clip securing the fuel inlet hose to the fuel tank; detach the hose and blank off the fuel tank inlet.
7. Unscrew and remove the fuel filler cap.
8. Using a screwdriver, unscrew and remove the six screws securing the fuel filler head to the body. Collect the washers from the retaining screws and withdraw the fuel filler head assembly downwards into the luggage compartment.

Fuel filler – To remove (Camargue)

1. Disconnect the battery.
2. Unscrew and remove the Pozidriv screws situated across the carpet covered sealing panel at the forward end of the luggage compartment.
3. Withdraw the carpet covered sealing panel to reveal the fuel tank assembly.
4. Remove the steel clips securing the two rubber hoses to the two outer vents on the top of the fuel tank and withdraw the hoses. One hose fits directly on to a vent while the other fits to a metal pipe which extends across the width of the fuel tank.
5. Unscrew the worm drive clip securing the fuel inlet hose to the fuel tank; detach the hose and blank off the fuel tank inlet.
6. From inside the car remove the trim panel that covers the filler assembly, this is situated adjacent to the rear window.
7. Unscrew the worm drive clip securing the fuel filler hose to the fuel filler head. Withdraw the fuel filler neck assembly downwards into the luggage compartment.
8. Open the fuel filler flap. Unscrew and remove the fuel filler cap.

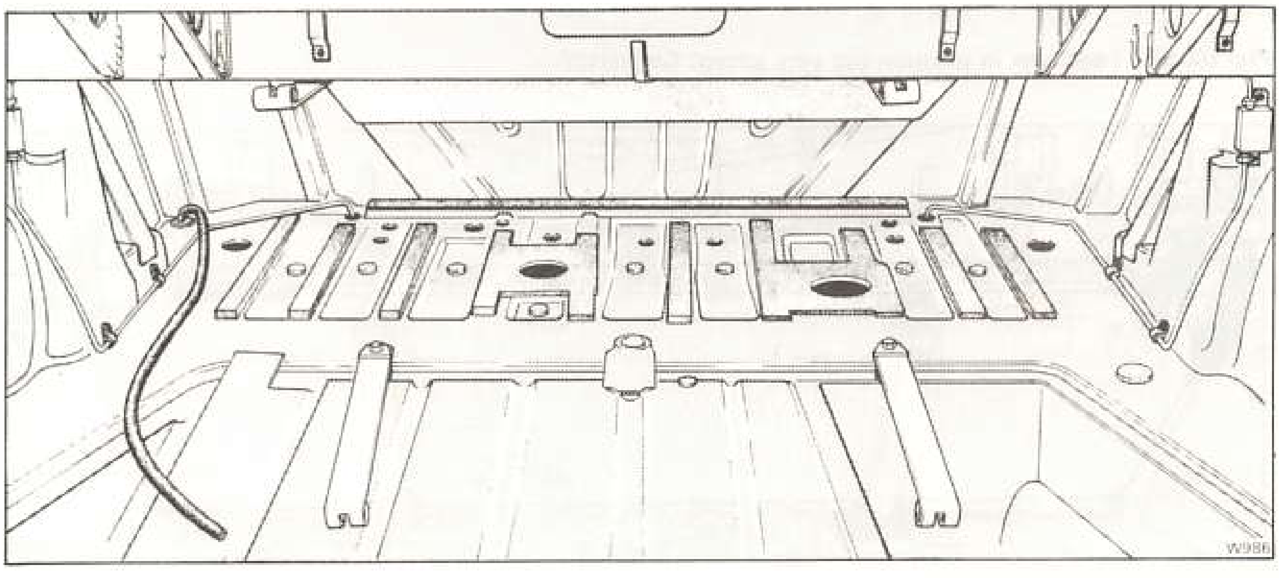


Fig. U2-51 Fuel tank mounting pads and straps (Convertible cars)

9. Using a screwdriver, unscrew and remove the six screws securing the fuel head to the body. Collect the washers from the retaining screws and withdraw the fuel head assembly.

Fuel filler – To fit (All cars except Convertibles)
Fit the fuel filler assembly by reversing the procedure given for removal, noting that when fitting the fuel filler head to the body the restrictor should be in its lowest position.

Fuel filler – To remove (Convertible cars)
1. Remove the carpet covered sealing panel from the forward end of the luggage compartment.
2. Disconnect the two rubber hoses from the outer vents on top of the fuel tank.
3. Unscrew the upper and lower worm drive clips from the fuel filler neck assembly. Withdraw the assembly and blank off the fuel tank.
4. Open the fuel filler flap. Unscrew and remove the fuel filler cap.
5. Using a screwdriver, unscrew and remove the six screws securing the fuel filler head to the body, collect the washer from beneath the head of each screw. Withdraw the assembly.

Fuel filler – To fit (Convertible cars)
Fit the fuel filler assembly by reversing the procedure given for removal.

Fuel pump – To remove and fit (see figs. U2-21 and U2-54).
1. Disconnect the battery, and depressurize the fuel system (see page U2-44).
2. Disconnect the electrical cables from the fuel pump, identify each to facilitate assembly.
3. Clamp the flexible fuel hose connecting the fuel tank to the fuel pump.

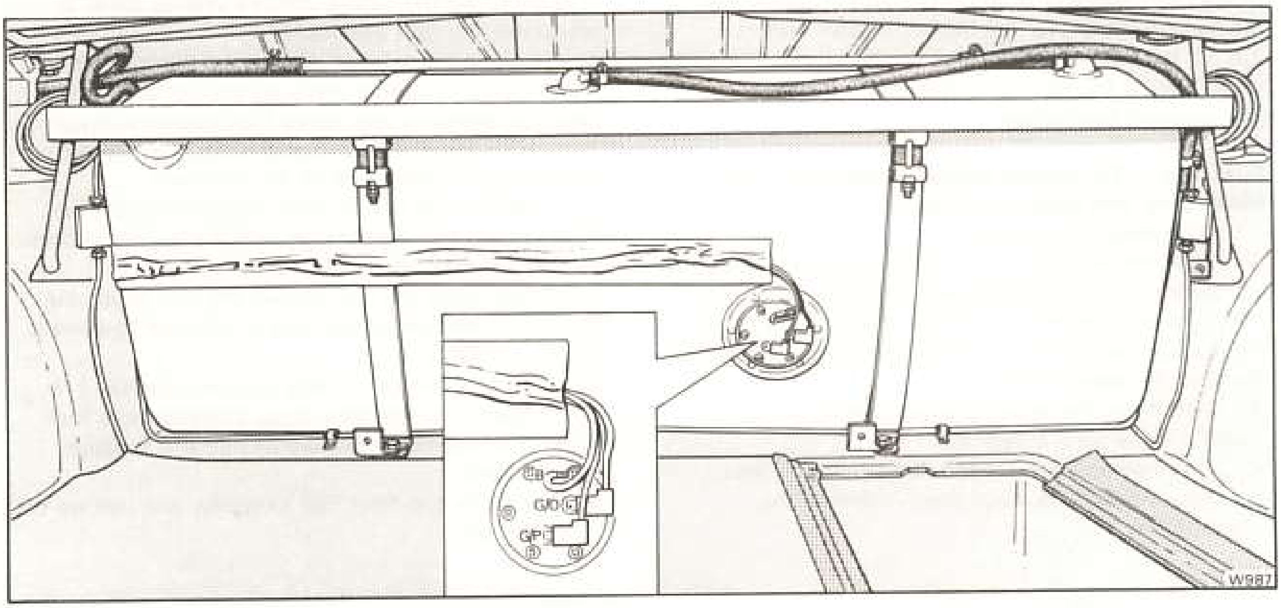


Fig. U2-52 Fuel tank in position (all cars except Convertibles)

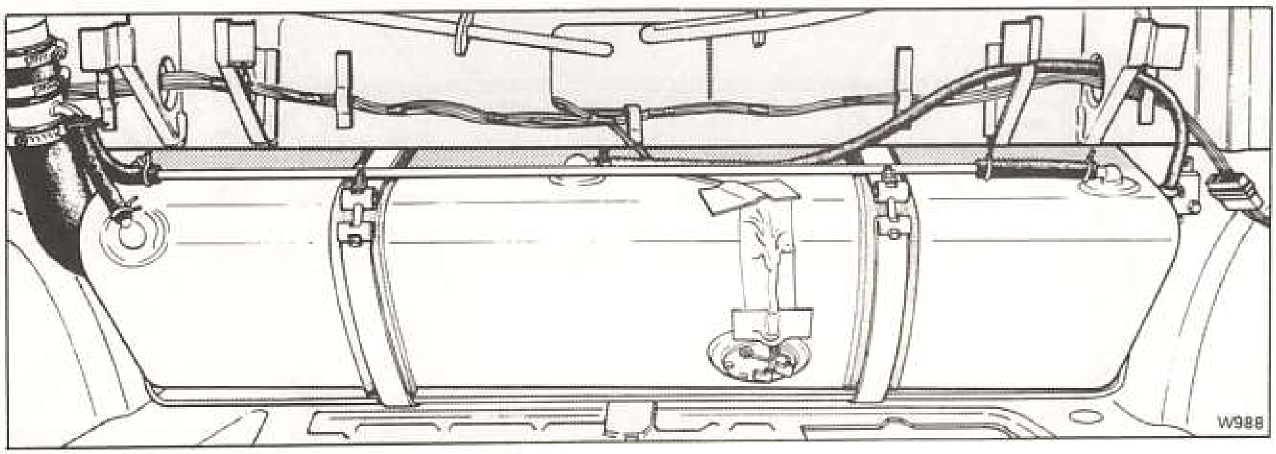


Fig. U2-53 Fuel tank in position (Convertible cars)

4. Unscrew the worm drive clip securing the fuel supply hose to the fuel pump inlet connection. Blank off the fuel pump connection.
5. Locate the fuel pump outlet connection. Using a suitable spanner, hold the hexagon of the outlet union assembly, housing the non-return valve. With a second spanner unscrew the fuel pressure damper from the end of the outlet union assembly. Collect the sealing washer and withdraw the fuel outlet pipe. Blank the open connections.
6. Unscrew the three nuts securing the fuel pump via the rubber mounting pads to the mounting brackets. Collect the washers.
7. Carefully push the fuel pump upwards to release the one mounting stud from the mount bracket and then turn the pump slightly as it is manoeuvred to free the two mounting studs on the other side of the pump.

Note
It may be necessary to slacken the two setscrews securing the mounting bracket to the car body underfloor during this operation.

8. Unscrew the nut securing the clamp bracket around the fuel pump body, collect the washer. Withdraw the clamp bracket bolt, collecting the distance piece and washer. Repeat this operation on the second clamp bracket.
9. Fit the pump by reversing the removal procedure, noting that the fuel pump body rubber insulation strips situated in each clamping bracket are in a good condition. Also, that the sealing washers situated on the pump outlet connection are in good condition.

When tightening the fuel pressure damper ensure that the pump outlet connection is held firmly with a spanner, otherwise the flexible fuel pump mounts may be strained.

Figure U2-54 gives details of the fuel pump mounting.

Fuel pressure damper – To remove and fit

1. Carry out the usual workshop safety precautions.
2. Depressurize the fuel system (refer to page U2-43).
3. Unscrew the damper from the fuel pump outlet adapter. Unscrew in an anti-clockwise direction.

Note
Before attempting to unscrew the damper assembly ensure that a second spanner is fitted to the hexagon on the fuel pump outlet adapter. This will prevent the adapter turning as the damper is unscrewed.

4. Collect the sealing washer from the recess in the damper body.
5. Withdraw the fuel pipe banjo connection and collect the sealing washer.
6. Fit the fuel pump pressure damper by reversing the removal procedure, noting that the fuel pump outlet adapter is tight in the fuel pump. Also, ensure that the sealing washers are in good condition and fitted one on each side of the outlet pipe banjo connection.

Fuel accumulator – To remove and fit (see figs. U2-22 and U2-55).

1. Disconnect the battery and depressurize the fuel system (see page U2-43).
2. Unscrew the unions on both inlet and outlet connections to the fuel accumulator, suitably blank the open connections.
3. Detach the hose from the rear of the assembly and blank the open connections.
4. Support the fuel accumulator and unscrew the two setscrews securing the mounting bracket to the car body underfloor. These setscrews are situated one on either side of the accumulator and as they are withdrawn, collect the two washers fitted under the head of each one.
5. Unscrew the nut securing the clamp bracket around the fuel accumulator body. Withdraw the clamp bolt, collecting the distance piece and washer.
6. Collect the rubber grommet and distance piece from each side of the bracket.

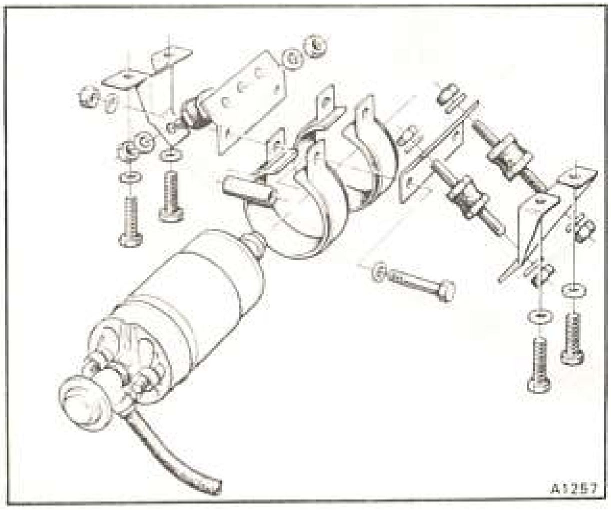


Fig. U2-54 Fuel pump mounting

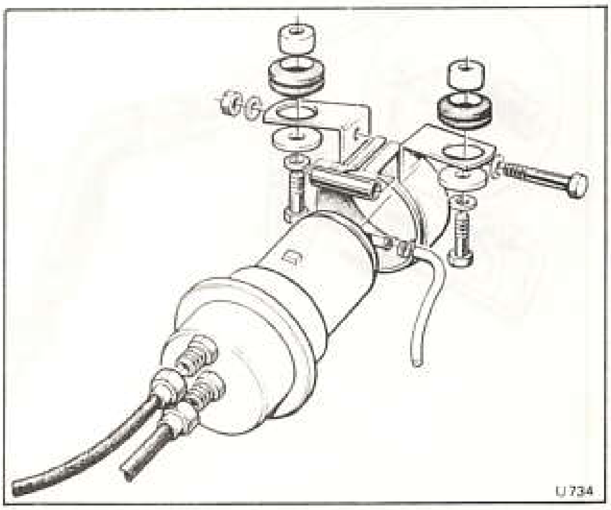


Fig. U2-55 Fuel accumulator mounting

7. Fit the fuel accumulator by reversing the removal procedure, noting that the rubber insulation strip and two rubber grommets fitted to the mounting bracket are in good condition.

Figure U2-55 gives details of the fuel accumulator mounting.

Fuel filter – To remove and fit (see figs. U2-23 and U2-56)

1. Disconnect the battery and depressurize the fuel system (see page U2-44).
2. Unscrew the filter inlet and outlet pipe unions and blank the open connections.

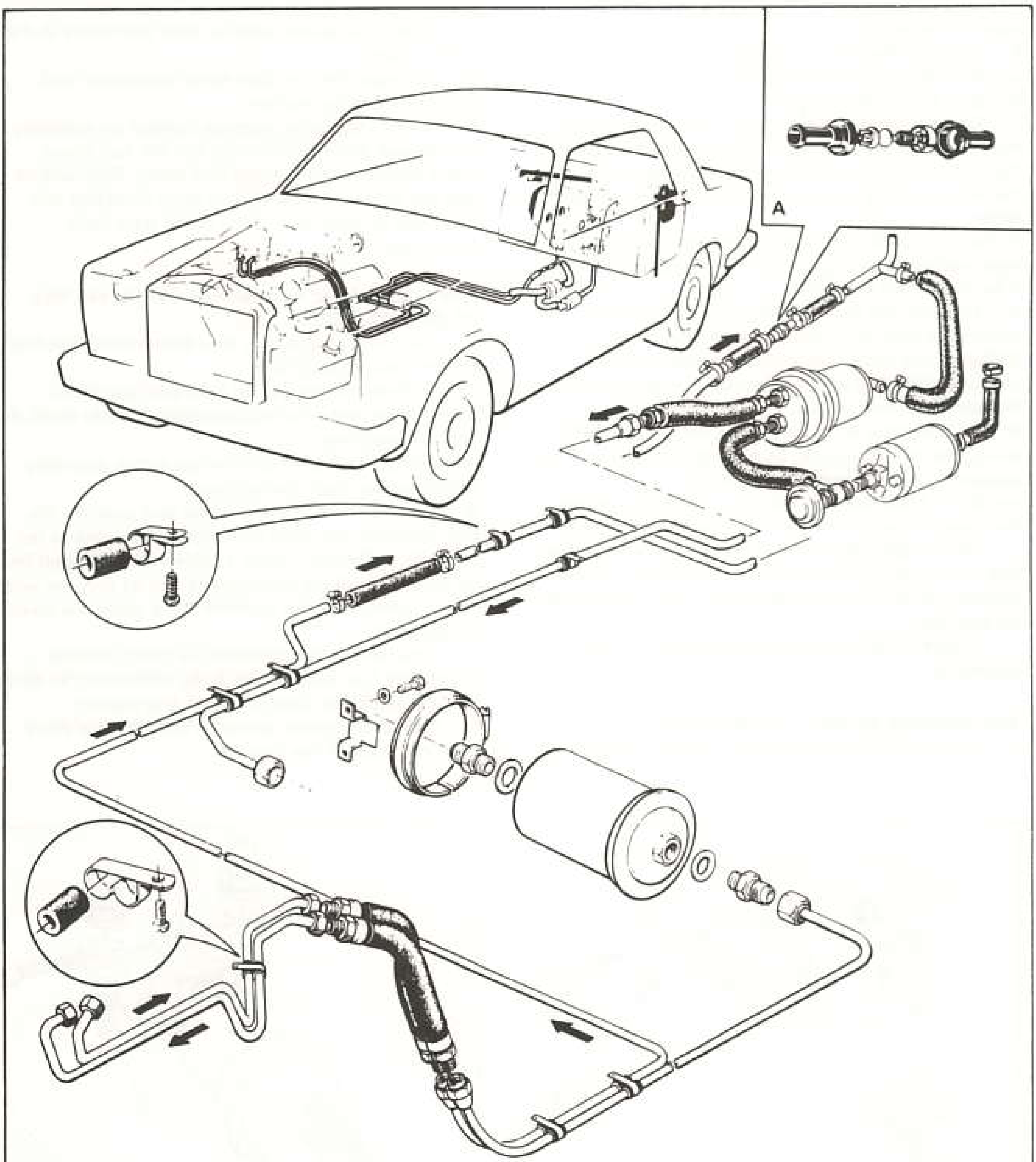


Fig. U2-56 Fuel pipes and fuel filter mounting

3. Slacken the worm drive clip securing the filter assembly to the mounting bracket; withdraw the filter assembly.
4. If a new filter is to be installed, unscrew the inlet and outlet unions from the ends of the assembly and fit them into the new assembly.

Ensure that the sealing washers are in good condition.

5. Fit the fuel filter by reversing the removal procedure. Note that the rubber insulating strip fitted around the body of the filter is in good condition and the arrows on the side of the filter are pointing in the direction of flow.

Fuel lines (see fig. U2-56)

The fuel lines consist of metal bundy tubing and reinforced fuel resistant rubber hoses.

Metal piping is used where possible and is attached to the body and inner longeron by metal clips (with rubber inserts) and self-tapping screws.

Rubber hoses are used where there is a joint or flexibility is required.

Joints in the fuel line on the pressurized (feed) side of the system are usually made by a threaded adapter and union, however, on the unpressurized (return) side of the system a joint is usually effected by a worm drive clip.

Removing or fitting any of the fuel lines is relatively straightforward and reference should be made to figure U2-56.

Always depressurize the fuel system before removing any parts connected into the fuel feed lines.

A non-return valve (see fig. U2-56 – Inset A) is situated in the fuel return line in the vicinity of the final drive unit. This valve is fitted to prevent the back-flow of fuel. The valve is a non-serviceable unit and if its operation is suspect a new assembly should be fitted.

Fuel return line non-return valve – To remove and fit

1. Clamp the rubber fuel pipe before and after the valve.
2. Slacken the worm drive clips on either side of the valve and withdraw the pipes.
3. Blank off the open pipe connections if the new valve is not fitted immediately.
4. Fit the valve by reversing the removal procedure noting that the valve is fitted into the fuel line the correct way around; flow directional arrows are situated on the valve body.

Mixture control unit (see figs. U2-4 and U2-60)

The mixture control unit comprises the air meter, the fuel distributor, and the primary system pressure regulator.

The fuel distributor and/or the primary system pressure regulator can be removed separately from the assembly, however, in the process of general dismantling the components would be removed as one assembly.

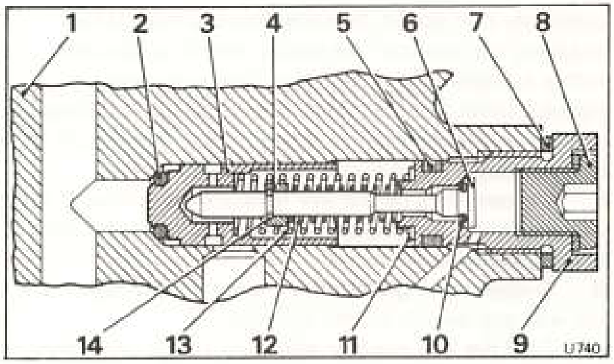


Fig. U2-57 Primary system pressure regulator valve

1 Fuel distributor housing
2 Sealing ring
3 Regulating plunger
4 Retaining ring
5 Sealing ring
6 Push valve
7 Sealing washer
8 Inner locking screw
9 Outer locking screw
10 Sealing ring
11 Shim washers
12 Push valve spring
13 Regulator spring
14 Circlip

Fuel distributor – To remove and fit

1. Disconnect the battery and depressurize the fuel system (see page U2-44).
2. Unscrew and remove the following connections on the fuel distributor.

a. the union securing the warm-up regulator feed pipe to the adapter on the top of the fuel distributor.
b. fuel supply to the fuel distributor.
c. connection to the pressure control valve via the pressure damper.
d. fuel supply to the cold start injector.
e. fuel return to the fuel tank.
f. fuel return from the warm-up regulator.

3. Unscrew the unions from both ends of the eight injector pipes and carefully withdraw the pipes, 'B' bank injector pipes are supported in a bracket situated adjacent to the pressure damper, this bracket is retained by a setscrew which should be unscrewed.
4. Using a screwdriver, unscrew the three securing screws situated on top of the distributor.
5. Lift the fuel distributor from the mixture control unit and discard the rubber sealing ring (resistance will be encountered due to the rubber sealing ring).
6. If the control piston is to be removed, carefully bend the retaining tabs away from the bore of the fuel distributor barrel and withdraw the piston. Clean the control piston in solvent cleaner and lubricate with white spirit.
7. Fit the fuel distributor and control piston by reversing the removal procedure, noting that the rubber sealing ring fitted in between the fuel distributor and mixture control unit must be in good

condition, if in doubt, fit a new sealing ring. When installing the sealing ring ensure that it is lubricated with a suitable grease and that it does not become trapped when the fuel distributor is fitted. This could cause a subsequent air leak which may be difficult to detect. Check the idle mixture strength.

8. If a **new** fuel distributor is fitted, leave one of the injector lines disconnected so that the following basic setting can be carried out.

9. Bridge the engine running sensor (see page U2-43) and switch on the ignition.

10. Turn the idle mixture adjusting screw clockwise using the special 'Tee' spanner RH 9608, until the fuel just starts to be delivered at the open outlet on the fuel distributor, then, turn the adjusting screw anti-clockwise one half turn.

The basic setting is now correct and assembly can be continued.

Primary system pressure regulator (see figs. U2-7, U2-57, and U2-58)

The pressure regulator can be removed and serviced separately from the fuel distributor. A service kit is available containing a new system pressure regulator seal, push valve assembly and system pressure adjusting shims.

1. Disconnect the battery and depressurize the fuel system (see page U2-44).
2. Unscrew the large hexagonal locking screw situated in the side of the fuel distributor (see figs. U2-7 and U2-57).
3. Withdraw the complete pressure regulator and push valve assembly (take care not to lose the shim washer(s) if the regulator plunger and spring become dislodged).
4. Lift off the regulator plunger and spring, collect the shim washer(s).
5. Examine the rubber 'O' ring situated on the end of the regulator plunger. A new 'O' ring can be fitted but the control plunger must remain with the fuel distributor.
6. To fit a new 'O' ring (see fig. U2-58) commence by cutting off the old ring with a very sharp blade.

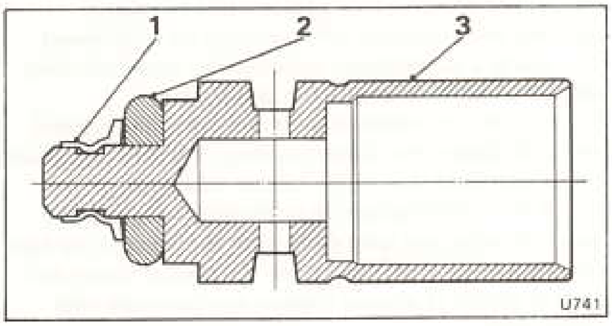


Fig. U2-58 Regulating plunger sealing ring
1 Crimped retaining ring
2 Sealing ring
3 Regulating plunger

Do not attempt to remove the crimped retaining ring.

7. Draw the new rubber 'O' ring over the crimped retaining ring, using a blunt tool. **Take care not to over stretch the new rubber 'O' ring.**
8. To check that the 'O' ring is correctly fitted and has not been damaged, ensure that it can be turned by hand and that there is a clearance of approximately 0,2 mm (0.008 in) between the retaining ring and the sealing ring.
9. To assemble and fit the regulator valve reverse the dismantling procedure using the new push valve assembly and existing shims.
10. Upon the completion of the work, fit the assembly into the fuel distributor and torque tighten the large hexagonal locking screw.
11. Carry out the workshop procedure for checking the primary system pressure and adjust if necessary using the shims supplied in the service kit, noting that 0,1 mm (0.004 in) of shims is equivalent to 0,15 bar (2.17 lbf/in²) of system pressure.
12. Carry out the workshop procedure for checking the fuel system for leaks.

Mixture control unit assembly – To remove and fit (see figs. U2-4 and U2-59)

1. Unscrew the worm drive clip securing the air intake duct, lift the ducting clear of the assembly.
2. Carry out Operations 1 to 3 inclusive given in Fuel distributor – To remove and fit.

   Unscrew the worm drive clip securing the air intake hose to the throttle body.
3. The mixture control unit assembly is secured at three points using rubber mounts.

   One mount is situated on a stud fitted into the base of the airmeter, the retaining nut and washer for this mount is situated under a bracket, immediately above A1 cylinder sparking plug.

   The other two mounting points are at the fuel distributor end of the assembly. The retaining nut and washer for one side is located immediately below the fuel return connection from the warm-up regulator. The third mounting nut and washer is situated on the opposite side of the casing.
4. Lift the assembly clear of the mountings and slide it out of position, carefully threading it past any pipes and wires.
5. Remove the upper section of the mixture control unit from the lower half (air outlet duct) by unscrewing the cap nuts situated around the face joint.
6. Fit the assembly by reversing the procedure given for removal, noting that the face joint between the two halves of the assembly should be clean and coated with Wellseal.

Throttle body – To dismantle and assemble (see figs. U2-12, U2-62, and U2-63)

1. Unscrew the worm drive clips securing both ends of the air intake hose that connects the mixture control unit to the throttle body. Withdraw the hose.
2. Locate the throttle linkage attached to the throttle spindle. Unscrew the nut on the end of the spindle,

collect the washers and withdraw the linkage and distance piece.

3. Unscrew the worm drive clip securing the hose to the rear (upstream) connection on the auxiliary air valve (see fig. U2-62). Free the joint.

4. Unscrew the setscrew securing the metal air pipe to the rear of the plenum chamber.

5. Withdraw the vacuum signal hose from the overrun valve. Label the hose.

6. Detach the electrical cables fitted to the 'wide open' throttle micro-switch mounted on the side of the throttle housing.

7. Detach the three vacuum hoses situated on top of the throttle housing. Label each hose.

8. Unscrew the four setscrews securing the throttle housing to the plenum chamber (the pressure control valve mounting bracket is fitted to the bottom left-hand setscrew), collect the washers.

9. Withdraw the throttle body assembly and discard the gasket.

10. Unscrew the worm drive clip securing the air hose to the 'offset' connection on the overrun valve, free the joint.

11. Unscrew the two setscrews securing the metal pipe to the base of the throttle body, collect the washers, free the joint and withdraw the metal pipe. Discard the gasket.

12. Locate the air pipe fitted on the micro-switch side of the throttle body. Unscrew the two setscrews, collect the washers and discard the gasket.

13. Slacken the worm drive clip securing the rubber hose to the centre connection on the overrun valve.

14. Unscrew the two setscrews retaining the overrun valve to the mounting bracket, withdraw the valve.

15. Unscrew the two setscrews securing the mounting bracket to the throttle body, withdraw the bracket complete with the micro-switch assembly.

16. Unscrew and remove the nut and screws, collect the washers and withdraw the micro-switch from the mounting bracket.

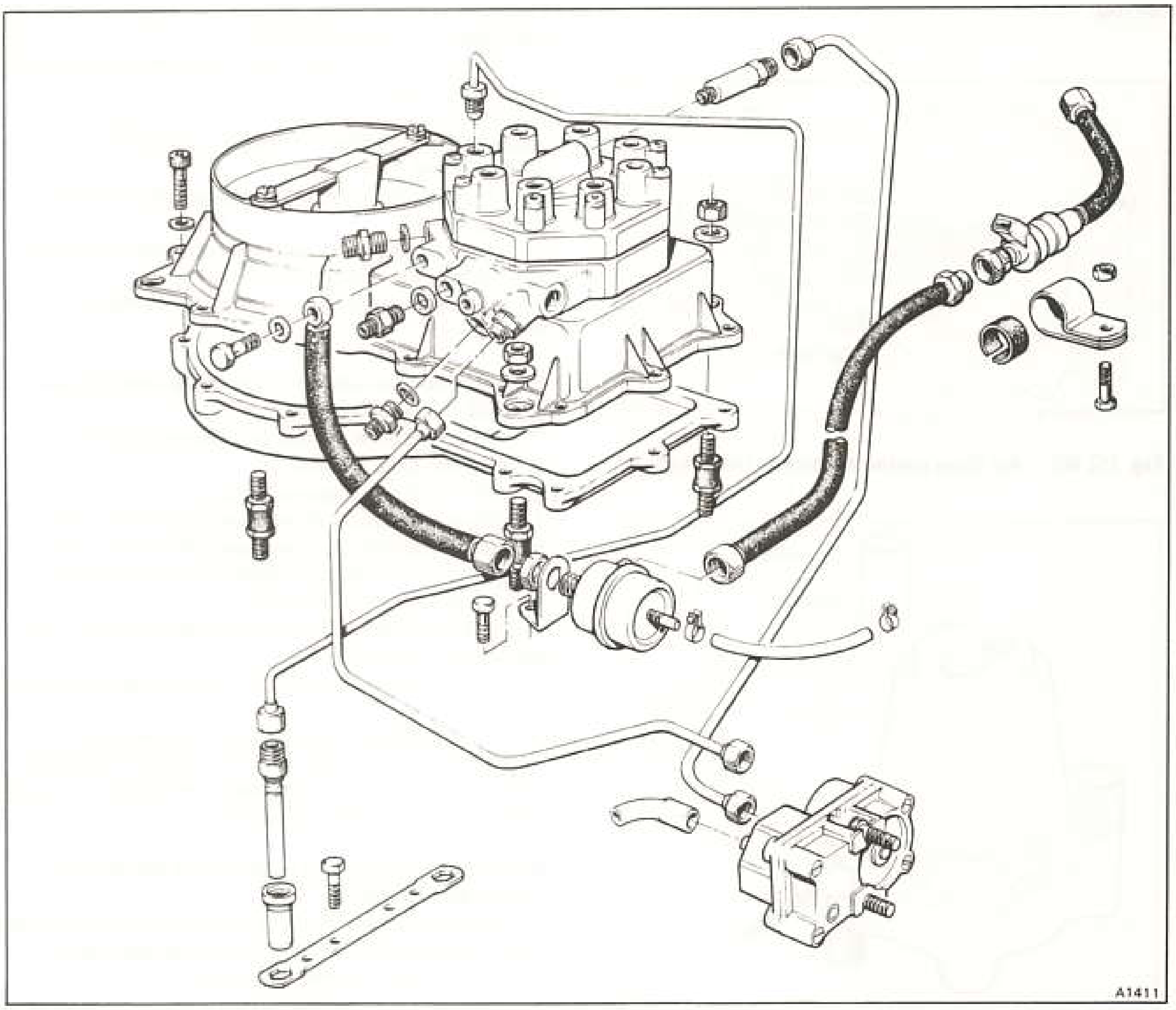


Fig. U2-59 Fuel distributor and associated components

17. Unscrew the two setscrews situated on top of the throttle body, withdraw the vacuum connection housing complete with the engine idle air bleed adjusting screw.

Discard the gasket.

18. Unscrew the nut from the throttle spindle and collect the washers and micro-switch operating cam.

19. Close the split legs of the throttle plate retaining screws and unscrew the retaining screws.

20. Open the throttle and carefully withdraw the throttle plate from the throttle spindle.

21. Withdraw the throttle spindle and remove the seals. Note the way the spindle is fitted in relation to the throttle body to ensure correct assembly.

22. Assemble the throttle body by reversing the procedure given for removal, noting the following.

a. Ensure that the throttle plate is fitted in its original position.

b. Use new throttle plate retaining screws. Ensure that the throttle plate is positioned correctly and closes completely before tightening the screws. Always spread the split ends of the screws to prevent them turning.

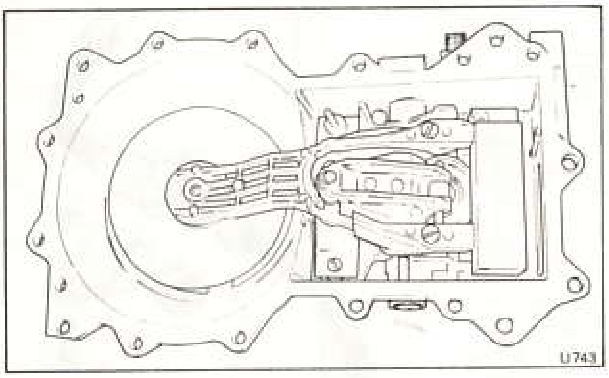


Fig. U2-60 Air flow meter assembly (inverted)

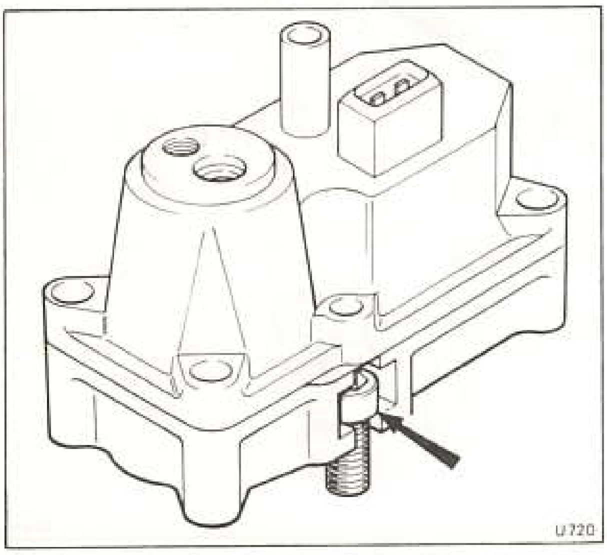


Fig. U2-61 Warm-up regulator mounting screws

c. Ensure that the throttle spindle end seals are correctly fitted and seat just below the spindle housing flange.

Warm-up regulator – To remove and fit (see figs. U2-24 and U2-61)

1. Disconnect the battery and depressurize the fuel system (see page U2-44).
2. Detach the electrical plug.
3. Unscrew the fuel feed and return pipe connections.
4. Unscrew and remove the two retaining setscrews situated one on either side of the assembly.
5. Fit the assembly by reversing the removal procedure, noting that the retaining setscrews should be positioned through the holes in the base of the unit as shown in figure U2-61 (not through the additional access holes at the top). In addition, the unions fitted to the assembly should be checked for tightness before the pipes are connected, otherwise a leak may occur.

Pressure control valve damper – To remove and fit (see figs. U2-15 and U2-59)

1. Disconnect the battery and depressurize the fuel system (see page U2-44).
2. Slacken the small worm drive clip securing the hose from the oil filter housing to the damper. Withdraw the hose.
3. Unscrew the inlet and outlet unions to detach both pipes.
4. Unscrew the large lock-nut retaining the damper assembly to the mounting bracket.
5. Fit the assembly by reversing the removal procedure.

Pressure control valve – To remove and fit (see figs. U2-16 and U2-59)

1. Disconnect the battery and depressurize the fuel system (see page U2-44).
2. Disconnect the electrical plug.
3. Disconnect the fuel return to tank hose fitted to the rear of the unit, by unscrewing the hose union situated on the 'Tee' piece approximately 150 mm (6.0 in) to the rear of the valve.
4. Unscrew the union to detach the fuel pipe from the front of the unit.
5. Slacken the clamp bracket nut and withdraw the unit.
6. Fit the pressure control valve by reversing the removal procedure, noting that the rubber insulation sleeve fitted between the bracket and valve is in good condition and correctly positioned.

Auxiliary air valve – To remove and fit (see figs. U2-25 and U2-62)

1. Remove the E.G.R. valve heatshield (this includes one of the auxiliary air valve mounting setcrews).
2. Disconnect the electrical plug.
3. Unscrew the worm drive clips securing both of the rubber hoses.
4. Unscrew the remaining mounting setscrew.

Collect the washer fitted under the head of each setscrew and the distance pieces fitted to the lower setscrew.

5. Fit the auxiliary air valve by reversing the removal procedure.

Overrun valve – To remove and fit (see figs. U2-13 and U2-62)

1. Unscrew the worm drive clips securing the rubber hoses to the pipe connections and remove the hoses.
2. Withdraw the small diameter vacuum hose.
3. Unscrew the two setscrews securing the valve to the mounting bracket.
4. Fit the valve by reversing the removal procedure.

Plenum chamber – To remove and fit (see figs. U2-1, U2-62, and U2-63)

The plenum chamber will normally require removing if certain parts of the engine are to be dismantled. Therefore, it is not advisable to attempt to remove the chamber as an individual part but as an assembly, with some of the ancillary pipes, hoses, and components remaining attached. To remove the plenum chamber assembly disconnect the battery, depressurize the fuel system and proceed as follows.

From the throttle housing side

1. Disconnect the electrical leads to the 'wide open' throttle micro-switch.
2. Disconnect the three vacuum hoses situated on top of the throttle body. Label each hose for identification purposes.
3. Unscrew the worm drive clip securing the air intake hose to the throttle body. Free the hose.
4. Unscrew the nut on the throttle spindle, collect the washers and withdraw the linkage. Replace the nut and washers.
5. Unscrew the bottom left-hand setscrew securing the throttle body to the plenum chamber. Detach the pressure control valve mounting bracket and again loosely fit the setscrew to the throttle body.

From the rear of the assembly

6. Detach the following vacuum hoses and label each to assist identification.

a. Hose from the speed control bellows.

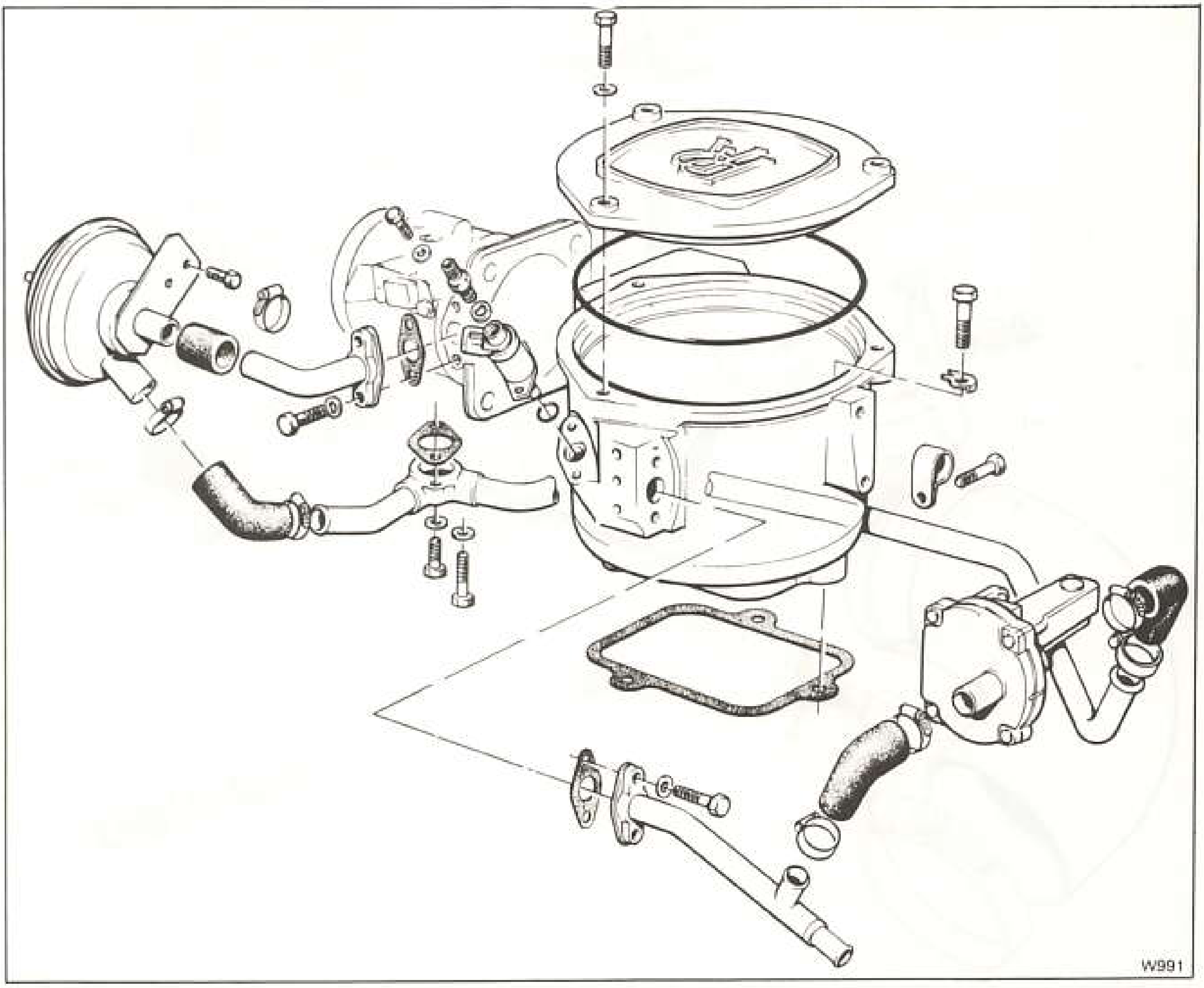


Fig. U2-62 Plenum chamber and associated components

b. Hose from the vacuum retard cut-off solenoid.

c. Hose from the E.G.R. valve.

From the auxiliary air valve side

7. Disconnect the E.G.R. valve feed pipe at the joint just below the heatshield.

6. Detach the electrical plug from the auxiliary air valve.

9. Unscrew the worm drive clip and detach the 'B' bank breather hose from the oil filler housing.

From the front of the assembly

10. Detach the electrical plug from the cold start injector.

11. Unscrew the union securing the fuel feed pipe to the cold start injector.

From on top of the assembly

12. Unscrew the three setscrews retaining the plenum chamber cover in position. Collect the washers and remove the cover carefully manoeuvring it past the E.G.R. heatshield mount.

Collect the rubber sealing ring.

13. Locate the three retaining setscrews situated in the bottom of the plenum chamber.

14. Tap the tabs on the locking washers back and unscrew the setscrews.

15. Carefully lift the plenum chamber assembly from the engine, taking care to ensure that no hoses or pipes have been left connected or have become trapped.

16. Collect the gasket fitted between the plenum chamber and the induction manifold.

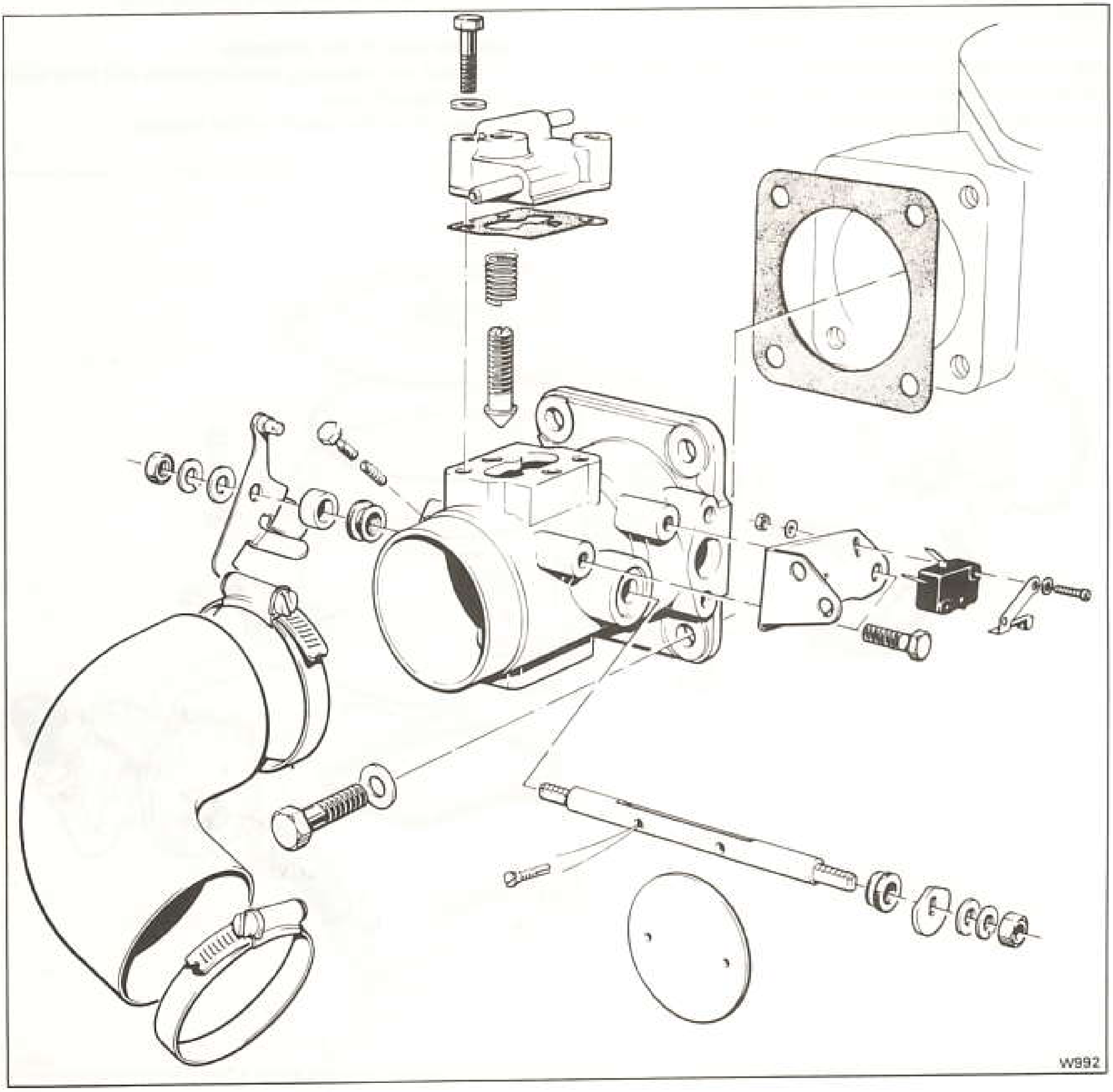


Fig. U2-63 Throttle housing and associated components

17. To fit the plenum chamber assembly reverse the procedure given for removal, noting that all gaskets, sealing rings, and hoses are in good condition.

Cold start injector – To remove and fit (see figs. U2-11 and U2-62)

1. Disconnect the battery and depressurize the fuel system (see page U2-44).
2. Detach the electrical plug from the cold start injector.
3. Unscrew the union connecting the fuel feed pipe to the injector.
4. Unscrew the two small setscrews retaining the injector in the plenum chamber. Collect the washer from the setscrew.
5. Withdraw the injector and collect the rubber sealing ring.
6. To fit the cold start injector reverse the procedure given for removal.

Thermal time switch – To remove and fit (see fig. U2-26)

1. Disconnect the battery and remove the electrical plug from the thermal time switch.
2. Drain the engine coolant (refer to Chapter L).
3. Locate the three thermal switches situated in the thermostat housing adjacent to the refrigeration compressor.
4. Detach the electrical leads and unscrew the E.G.R. cut-out thermal switch (upper) and (if fitted) the vacuum retard cut-out thermal switch (lower), note that each has an aluminium sealing washer.
5. Locate the remaining cold start injector thermal time switch (brass) and carefully unscrew it.
6. Fit the switches by reversing the procedure given for removal, noting that new aluminium sealing washers should be fitted and that care must be taken not to over tighten the switches in the thermostat housing.

Injector – To remove and fit (see figs. U2-10 and U2-59)

There are eight injectors fitted to the engine one for each cylinder. The removal and fitting procedure given below is for one injector but the instructions apply equally to all of the injectors.

1. Disconnect the battery and depressurize the fuel system (see page U2-43).
2. Unscrew the union connecting the fuel line to the injector.
3. Unscrew the two setscrews securing the injector retaining plate to the cylinder head.
4. Withdraw the retaining plate and withdraw the injector.
5. All of the injectors can be removed in this way, although if A2 cylinder injector is to be removed it will necessitate the removal of the mixture control unit.
6. Fit the injectors by reversing the procedure given for removal, noting that the rubber insulating sleeve must be in good condition.

It is essential to check the spray patterns of the injectors before they are fitted.

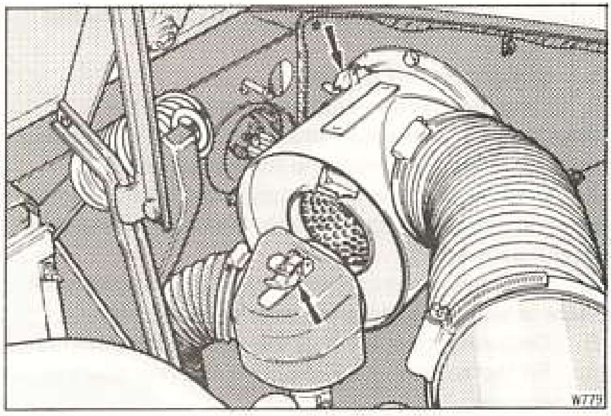


Fig. U2-64 Air filter (Silver Spirit, Silver Spur, Mulsanne, late Corniche and all Continental)

New injectors must be thoroughly flushed out before they are tested.

Electronic control unit – To remove and fit (see fig. U2-17)

1. Disconnect the battery and locate the main fuseboard.
2. Unscrew the two nuts situated at the front of the assembly on either side, collect the washers and withdraw the bolts.
3. Disconnect the multi-pin connector plug from the front of the assembly, situated below the fuseboard.
4. Remove the screws securing the rear of the assembly and carefully withdraw the unit.
5. Fit the assembly by reversing the removal procedure.

Oxygen sensor (see fig. U2-18)

1. Disconnect the battery.
2. Raise the bonnet and locate the oxygen sensor cable and connection (see Disconnecting the oxygen sensor in the appropriate flow chart). Disconnect the oxygen sensor.
3. Unscrew the oxygen sensor from the exhaust pipe.
4. Fit the oxygen sensor by reversing the removal procedure, noting that the threads of the sensor must be smeared with Never-seez assembly compound. Failure to do this will probably result in serious thread damage when subsequently removing the oxygen sensor.

It is important that Never-seez is applied only to the threads of the unit, take great care not to allow the compound to get onto the slotted shield below the threaded portion.

Torque tighten the oxygen sensor to the figures given in Section U10.

Engine running sensor/Air injection controller – To remove and fit (see fig. U2-17)

The engine running sensor/electronic timer assembly is situated adjacent to the ACU knee roll sensor, between the main fuseboard and electronic control unit.

1. Disconnect the battery.
2. Unscrew the two setscrews securing the electronic control unit in position. Carefully lower the unit and unhinge it from the front bracket.
3. Unscrew the two 2BA nuts retaining the engine running sensor/electronic timer mounting bracket to the cross bracket.
4. Slide the assembly along the cross bracket until there is sufficient room to lower the assembly.
5. Disconnect the loom at the appropriate loom plug.
6. Fit the assembly by reversing the procedure given for removal.

Air intake systems

The air filter element is situated in the air intake housing at the front right-hand side of the engine compartment (see figs. U2-64 and U2-65).

Silver Spirit, Silver Spur, Mulsanne, late Corniche, and all Continental

For details of the air filter element and cold air intake, refer to Chapter K.

Early Corniche and all Camargue

Air intake element – To remove and fit

1. Unscrew the knurled setscrew located in the centre of the air filter cover; withdraw the cover together with the trunking.
2. Remove the hexagonal nut from the centre stud; withdraw the filter element and the two end plates.
3. Fit the new element to the assembly by reversing the removal procedure. Refer to figure U2-65 for the correct assembly sequence.

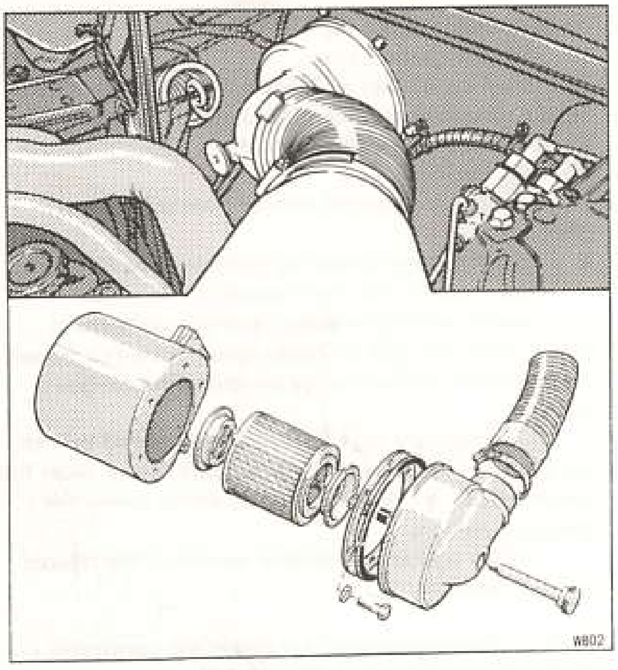


Fig. U2-65 Air filter (early Corniche and all Camargue)

Air intake – To remove and fit

1. Carry out the procedure for removing the air filter element.
2. Raise the front of the car and support the weight of the car on suitable stands.
3. Remove the right-hand front wheel (see Chapter R, Wheels and tyres).
4. Remove the front underwing sheet.
5. From inside the engine compartment, unscrew the six setscrews retaining the air intake filter element housing to the valance. From under the wing, support the weight of the assembly before the final setscrew is removed, withdraw the housing and intake scoop assembly together with the cork gasket.
6. Fit the assembly by reversing the dismantling procedure, noting that a new cork gasket should be fitted.

Service adjustments

Preliminary checks

Before carrying out any tuning, the following basic checks should be made.

a. Check the condition of the sparking plugs (see Section U7).
b. Ensure that the throttle linkage is correctly set (see Section U9).
c. Ensure that the 'wide open' throttle micro-switch is correctly set (refer to this section).
d. Check all air hose connections for tightness.
e. Start the engine and visually check the fuel system for leaks.
f. Whilst the engine is running, check the entire induction system (including the E.G.R. system) for leaks (refer to this section, Workshop procedure 2).

Before undertaking the tuning procedure the following work should be carried out.

1. Connect an impulse tachometer to the engine in accordance with the manufacturer's instructions.
2. Connect an ignition stroboscopic lamp to the engine in accordance with the manufacturer's instructions.
3. Remove the blank from the exhaust pipe adjacent to the oxygen sensor and fit the sample tapping adapter RH 9611, connect to a suitable CO meter.
4. Ensure that the engine is at normal operating temperature.

Tuning procedure

If the complete tuning procedure is to be carried out the following sequence of operations is recommended.

a. Check the ignition timing (see Section U7).
b. Check the purge flow rate (see Section U5)
c. Check the mixture strength (refer to this section).
d. Check the operation of the E.G.R. system (see Section U4).
e. Check the engine idle speed (refer to this section).

'Wide open' throttle micro-switch – To set

1. Slacken the worm drive clips securing the air intake hose to the mixture control unit and the throttle body. Withdraw the hose.
2. Open the throttle plate 60°.

3. Slacken the retaining screws sufficiently to allow the micro-switch to be moved (the micro-switch will pivot around the lower screw).
4. Move the micro-switch upwards until the operating mechanism is clear of the cam on the throttle spindle.
5. Move the micro-switch slowly downwards until the switch is heard to 'click'.
6. Tighten the securing screws, ensuring that the micro-switch does not move.
7. Operate the throttle linkage, noting that as the throttle plate passes the 60° open position the micro-switch is heard to 'click'.
8. Fit the air intake hose and tighten the worm drive clips.

Mixture strength – To test

1. Before commencing to set the mixture strength, unscrew and remove the exhaust pipe blanking plug situated adjacent to the oxygen sensor. Fit exhaust gas sampling adapter RH 9611 into the pipe.
2. Connect a suitable CO meter to the exhaust sample probe.
3. The mixture strength should be set when the ambient air temperature is between 15°C and 30°C (59°F and 86°F) and the engine temperature has stabilized at its normal operating value. The automatic air conditioning system should be switched off and the engine idle speed set at 650 rev/min.

Note

To ensure that the engine has stabilized at its normal operating temperature, it should be run for at least 15 minutes after the thermostat has opened. The opening of the thermostat can be detected by a sudden rise in the temperature of the thermostat elbow pipe.

4. Open the engine oil filler cap.
5. Disconnect the purge line at the restrictor. leave the restrictor fitted into the hose to the engine (see fig. U2-66).
6. Disconnect the oxygen sensor cable situated in the rear left-hand corner of the engine compartment.
7. Briefly accelerate the engine, allow it to return to the idle speed setting and note the reading on the meter. The CO concentration should be between 0.5% and 0.7%.
8. If the CO value is outside the limits, remove the blanking plug situated on top of the mixture control unit (see fig. U2-67) to gain access to the mixture adjusting screw.
9. Insert the mixture adjusting tool RH 9608 and locate it onto the adjusting screw. Using the adjusting tool turn the adjusting screw to either richen or weaken the mixture. Turning the adjusting screw clockwise richens the mixture and turning it anti-clockwise weakens the mixture.
10. After making an adjustment, remove the adjusting tool and temporarily fit the blanking plug, **failure to fit the blanking plug will result in an inaccurate CO measurement.**
11. Check that the engine idle speed is 650 rev/min and adjust if necessary (see Idle speed – To set, Operations 1 to 6 inclusive).

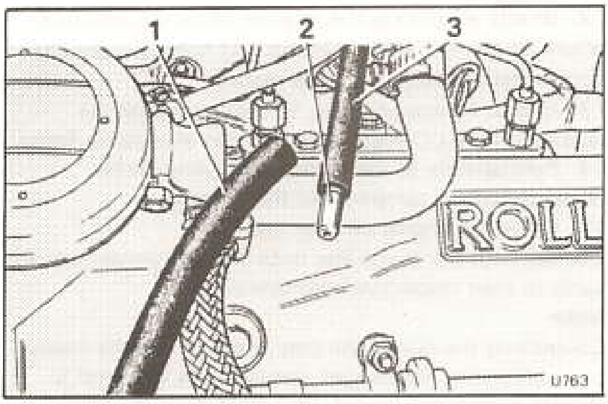


Fig. U2-66 Disconnecting the purge line
1 Hose from valance
2 Restrictor
3 Hose to throttle body

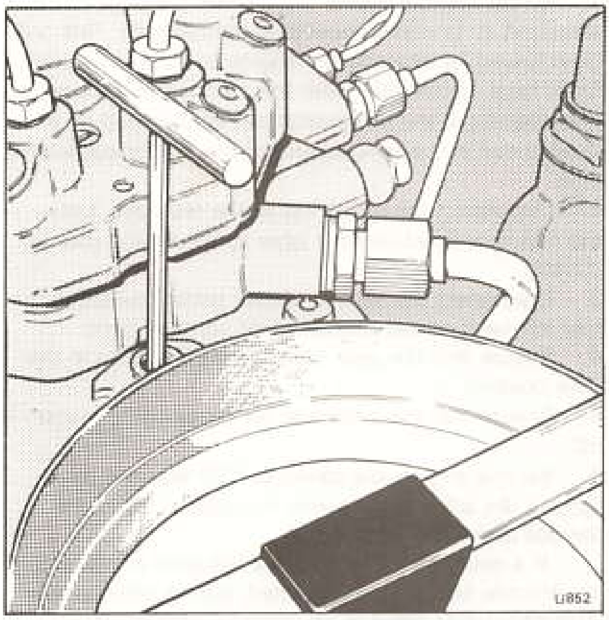


Fig. U2-67 Adjusting the mixture strength

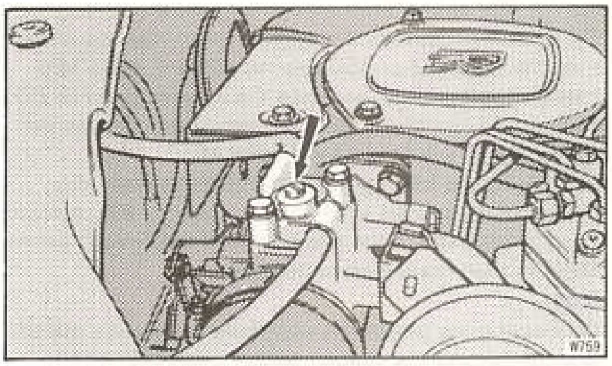


Fig. U2-68 Idle speed adjustment

12. Briefly accelerate the engine, allow the engine to return to the idle speed setting and note the idle CO concentration reading on the meter.
13. Repeat Operations 7 to 11 inclusive until the reading on the CO meter is within the acceptable limits.
14. Permanently fit the mixture adjusting screw blanking plug to tamperproof the adjuster.
15. Close the engine oil filler cap.
16. Connect the purge line hose and the oxygen sensor cable to their respective connections.

Note
Connecting the purge line may increase the idle speed and connecting the oxygen sensor cable will tend to restore normal idle speed. Do not attempt to correct these small variations in idle speed.

17. Upon successful completion of the test, stop the engine and remove the test equipment. Fit the blanking plug to the exhaust sample tapping after smearing the threads with Never-seez assembly compound.

Idle speed – To set

1. To set the idle speed, ensure that the engine has stabilized at its normal operating temperature. This can be achieved by allowing the engine to run at idle speed for at least 15 minutes after the thermostat has opened. The opening of the thermostat can be detected by a sudden rise in the temperature of the thermostat elbow pipe.
2. Disconnect the purge line at the restrictor. Leave the restrictor fitted into the hose to the engine (see fig. U2-66).
3. Disconnect the oxygen sensor cable situated in the rear left-hand corner of the engine compartment.
4. Ensure that the gear range selector lever is in the Park position.
5. Ensure that the automatic air conditioning system is off.
6. Set the engine idle speed to 650 rev/min by turning the adjustment screw situated on top of the throttle body (see fig. U2-68).

If a new throttle stop screw (situated on the side of the throttle body) has been fitted, due to either a new assembly being fitted or an overhaul of the existing assembly, a different Operation 6 is to be carried out as follows.

Ensure that the **idle adjustment screw** situated on top of the throttle body is screwed fully in. Screw out the **idle speed stop screw** situated on the side of the throttle body, until the engine speed reaches either a minimum speed or 450 rev/min. Screw in the **idle speed stop screw** to increase the engine speed by 50 rev/min. Fit the idle speed stop tamperproofing screw and tighten it until the head breaks off.

Screw the **Idle speed adjustment screw** anti-clockwise (outwards) until the idle speed is 650 rev/min.

7. Connect the purge line hose and the oxygen sensor cable to their respective connections.

Note
Connecting the purge line may increase the idle speed and connecting the oxygen sensor cable will tend to restore normal idle speed. Do not attempt to correct these small variations in idle speed.

Air injection system

The air injection system consists of a belt driven air pump that delivers air via an air switching valve to the exhaust ports, during engine warm-up. This air combines with the exhaust gases from the combustion chambers, promoting oxidation of the exhaust gases and faster warm-up of the catalytic converter.

During 'closed loop' operation of the fuel injection system, the air switching valve vents the output of the air pump into the engine air intake.

Oxygen sensor malfunction or extreme ambient conditions could delay the onset of 'closed loop' operation. However, in these instances, a time switch is fitted that ensures the air switching valve vents the injection air to the engine air intake after a nominal 2 minutes period from starting the engine.

For details of the servicing and maintenance requirements of the air injection system refer to the Service Schedules Manual TSD 4406.

Air injection pump

The rotary vane pump is mounted at the front of the engine and belt driven from the engine coolant pump pulley. Air is drawn into the pump through a centrifugal filter and exits from a connection on the rear of the pump.

Air switching valve (see fig. U3-2)

The air switching valve comprises a vacuum operated valve with integral control solenoid.

During 'open loop' operation the solenoid is energized. This applies inlet manifold vacuum to the diaphragm chamber and thereby, routes the injection air to the exhaust ports.

When the solenoid is de-energized during 'closed loop' operation, the manifold vacuum signal is inhibited and the diaphragm chamber vented to atmosphere. The internal spring returns the valve to the rest position, routing the injection air to the engine air intake system.

Pressure relief valve

A pressure relief valve is fitted between the air injection pump and the air switching valve. It consists of a spring loaded disc that opens at a set pressure to prevent excessive pressure build-up, that could damage the pump vanes under extreme pressure conditions.

Check valves

A check valve is fitted into the air injection pipe to each cylinder head. It is fitted between the air switching valve and the air injection manifold.

A check valve consists of a one-way disc valve that prevents the flow of exhaust gases back to the air switching valve when the injection air is routed away from the exhaust ports. The valve also prevents the back flow of exhaust gases during the air injection mode if either the exhaust back pressure exceeds the pump delivery pressure or in the event of pump belt failure.

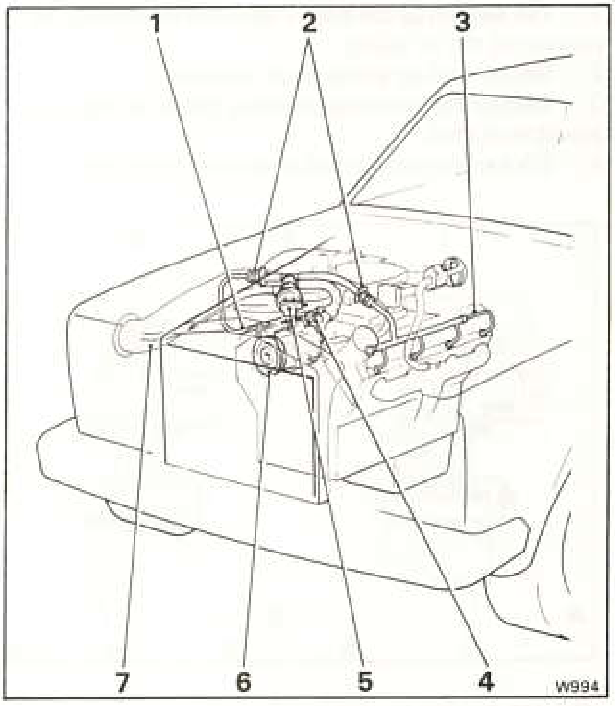


Fig. U3-1 Air injection system
1 'A' bank air injection manifold
2 Check valves
3 'B' bank air injection manifold
4 Pressure relief valve
5 Air switching valve
6 Air pump
7 Hose to air intake

Air pump drive belt

Before commencing to adjust the drive belt inspect it for signs of wear or cracking. It the belt is found unsatisfactory it should be renewed.

The belt tension must be checked at a point midway between two pulleys (see fig. U3-3) by use of a belt tension meter or by applying a spring balance to give a 9,50 mm (0.375 in) belt deflection at a specified load.

Belt dressing must not be applied to prevent belt slip.

Coolant pump to air pump
Load may be applied on either side of the belt run.

New belt and retensioning load

Belt tension meter	18,1 kgf to 22,7 kgf (40 lbf to 50 lbf)
Spring balance	3,6 kgf to 5,9 kgf (8 lbf to 13 lbf)

1. The tension of the belt is adjusted by altering the position of the air pump.
2. Slacken the air pump pivot setscrew.
3. Slacken the setscrew securing the air pump to the adjustment strut.
4. Slacken the adjustment strut pivot setscrew.

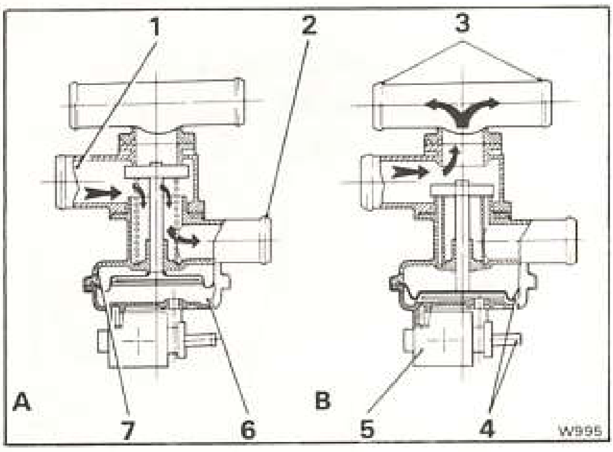


Fig. U3-2 Air switching valve
1 Inlet
2 Outlet to engine air intake
3 Outlets to exhaust ports
4 Inlet manifold vacuum
5 Solenoid valve
6 Diaphragm chamber
7 Atmospheric air bleed
A Solenoid de-energized
B Solenoid energized

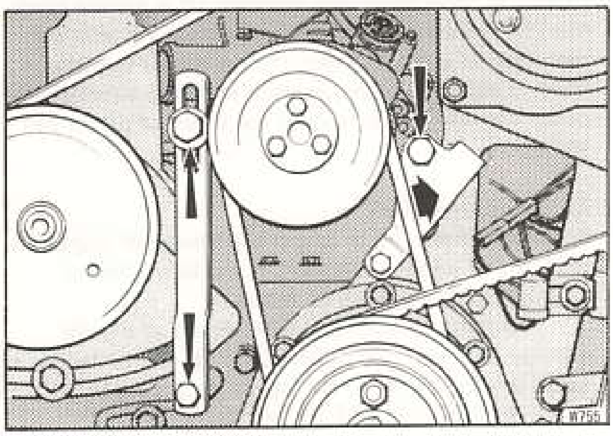


Fig. U3-3 Air pump drive belt adjustment and tension check point

5. Turn the air pump around its pivot point to adjust the belt tension and tighten the setscrew in the adjustment strut slot. Check the belt tension and repeat the adjustment operation if necessary.
6. When the belt tension is correct tighten the remaining two setscrews.

Checking the air injection system for leaks and correct operation
The air switching valve contains a built in diode. If the polarity of the electrical connections is reversed, the engine running sensor/air injection controller will be damaged.

System operation
1. Carry out the usual workshop safety precautions.
2. Disconnect the hoses from the air injection manifolds (see fig. U3-4) and suitably blank the manifold connections. It may be necessary to slacken the setscrew securing the air switching valve mounting bracket, so that the valve assembly can be swivelled to gain access to the connections.
If preferred, it is permissible to remove the short hose to the 'A' bank manifold.
3. Locate the blue oxygen sensor cable where it exits from the loom adjacent to the left-hand blower motor.
4. Ease the cable upwards until the white moulded junction piece, connecting the blue cable to the black cable is visible. Disconnect the oxygen sensor at this junction, ensuring that the black cable remains taut beneath the car.
5. Start the engine and measure the time taken from the end of the engine cranking to the switching of the air delivery from the air injection hoses. This should be between 90 seconds and 150 seconds.
6. Check both the air switching valve solenoid and the engine running sensor/electronic timer assembly if the switching of the air is outside the specified times.
If no air is delivered towards the air manifolds, the cause could be the following.
a. Vacuum signal hose not connected or blanking cap not fitted to air switching solenoid.
b. Faulty electrical wiring to the air valve solenoid or engine running sensor/air injection controller.
If the injected air is continuously directed to the air manifolds, the cause could be the following.
a. Faulty air switching solenoid or valve.
b. Faulty wiring to engine running sensor/air injection controller or air switching valve.
7. Connect the blue and the black oxygen sensor cables.
8. Continue to run the engine until normal operating temperature is attained.
9. Stop the engine.
10. Start and run the engine, ensure that the oxygen sensor warning lamp is extinguished within a few seconds and at exactly the same time the injected air is switched from the air manifolds to the air cleaner (this can be detected by a change in the sound of the air discharge).
11. If the engine is not at normal operating temperature and the oxygen sensor warning lamp

takes more than 90 seconds to extinguish, the air may be switched to the air cleaner before the warning lamp is extinguished. If this happens ensure that the engine is fully warmed-up and repeat the operation.

12. If at any time the oxygen sensor warning lamp is extinguished and the air is not switched from the manifolds to the air cleaner, there is a fualt and **serious damage to the catalytic converter could result if the engine is run in this condition.**

Possible causes of the fault are as follows.

a. Faulty electrical system.

b. Defective air switching valve.

System leak check

1. Carry out the usual workshop safety precautions.
2. Visually inspect the condition of all hoses, pipes, and joints associated with the air injection system.
3. Locate the blue oxygen sensor cable where it exits from the loom adjacent to the left-hand blower motor.
4. Ease the cable upwards until the white moulded junction piece, connecting the blue cable to the black cable is visible. Disconnect the oxygen sensor at this junction, ensuring that the black cable remains taut beneath the car.
5. Disconnect the hose from the air switching valve to the air cleaner, at the valve (see fig. U3-5).
6. Start and run the engine.
7. Listen carefully for any evidence of an air leak from the system. After 1½ minutes to 2½ minutes the air will be switched from the air manifolds towards the air cleaner. This change can be detected by the noise the air will make as it leaves the open connection of the air switching valve.
8. When the air is switched towards the air cleaner, stop the engine. Wait a few seconds, start the engine and continue the examination. Repeat this procedure until the inspection of the system is complete.
9. If an air leak is suspected it is permissible to coat the suspect component with a soap solution, soap bubbles will confirm an air leak.
10. Fit the disconnected hose to the air switching valve and secure by tightening the worm drive clip.

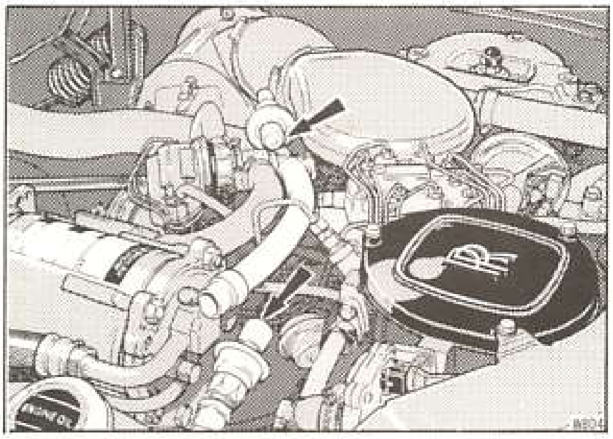


Fig. U3-4 Air injection system manifolds disconnected and blanked

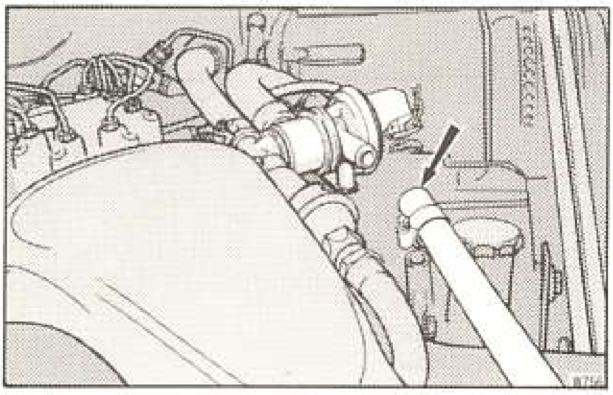


Fig. U3-5 Air injection system switching valve to air cleaner hose disconnected for leak check

Exhaust emission control system

The exhaust emission control system is designed to reduce the carbon monoxide, hydrocarbon, and oxides of nitrogen content in the exhaust gases. To comply with the exhaust emission control regulations, cars built to this specification are fitted with a three-way exhaust catalytic converter.

In order to achieve maximum efficiency the catalytic converter requires very accurate control of the engine air/fuel ratio. This has been accomplished by using a continuous fuel injection system with 'closed loop' mixture control (see Section U2).

The exhaust gases are discharged into an exhaust manifold fitted on either side of the engine. From a central take-off on each manifold the exhaust gases pass downwards via the downtake pipes.

The 'A' bank downtake pipe passes under the engine to combine with the 'B' bank downtake pipe just prior to the catalytic converter.

After the catalytic converter the exhaust system reverts back to a dual system with twin intermediate and rear silencers (see Chapter Q, Exhaust system).

Exhaust gas recirculation system (E.G.R.) (see figs. U4-1 and U4-2)

A proportion of the exhaust gas taken from a connection on top of the 'B' bank exhaust manifold is recirculated through a vacuum operated exhaust gas recirculation (E.G.R.) valve into the plenum chamber, where it mixes with the intake air. Substantially atmospheric pressure is maintained downstream of the metering valve, so that the recirculation flow is proportional to the exhaust gas flow.

The recirculation of the exhaust gas lowers the peak combustion temperature in the cylinders and thereby, reduces the level of oxides of nitorgen in the exhaust gases.

For details of the servicing and maintenance requirements of the exhaust emission control system, refer to the Service Schedules Manual TSD 4406.

E.G.R. valve (see figs. U4-3 and U4-4)

The E.G.R. valve has an integral pressure transducer. The metering orifice is incorporated in an extension of the valve seat.

A throttle gated vacuum signal is used to operate the valve. This signal is modulated by the integral transducer and applied to the control valve diaphragm, so that control valve lift is varied to maintain a constant control pressure (just above atmospheric pressure) between the metering orifice and valve seat.

When the engine load is increased, the control pressure exceeds the transducer setting and the transducer valve closes, applying the full vacuum signal to the control valve diaphragm, thus opening the control valve and increasing the E.G.R. flow.

Similarly, as the engine load is reduced, the control pressure becomes less than the transducer

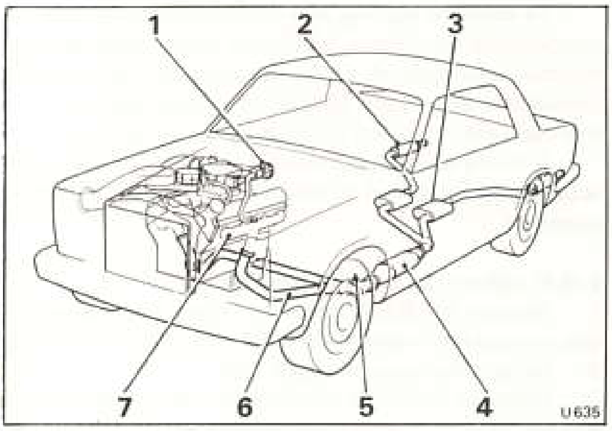


Fig. U4-1 Exhaust system
1 Exhaust gas recirculation valve
2 Rear silencer
3 Intermediate silencer
4 Catalytic converter
5 Oxygen sensor
6 'B' bank downtake pipe
7 'B' bank exhaust manifold

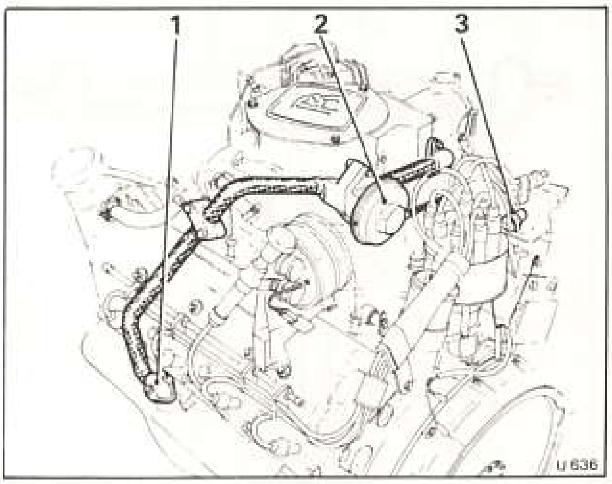


Fig. U4-2 Exhaust gas recirculation system
1 'B' bank exhaust manifold take-off point
2 Exhaust gas recirculation (E.G.R.) valve
3 E.G.R. cut-off solenoid

setting and the transducer valve opens, venting the diaphragm chamber to atmosphere and causing the control valve to close and reduce the E.G.R. flow.

The transducer valve continuously varies the control valve lift to maintain a constant control pressure under all normal operating conditions.

The use of a throttle gated vacuum signal ensures complete control valve closure at idle to maintain good idle quantity.

To improve starting and drive-away during low temperature conditions, a solenoid valve interrupts the throttle gated vacuum signal to the E.G.R. valve, until a predetermined coolant temperature is sensed by a thermal switch located in the thermostat housing.

A micro-switch operated by the kick-down switch actuates this solenoid to cut-out E.G.R. at wide throttle openings.

E.G.R. valve – To remove and fit

1. Remove the E.G.R. valve heatshield (see Exhaust gas recirculation valve heatshield – To remove and fit).
2. Detach the vacuum signal hose.
3. Unscrew the lower retaining nut and collect the washer.

Note
The upper securing nut is unscrewed to remove the heatshield in Operation 1.

4. Withdraw the valve and discard the gasket.
5. Fit the valve by reversing the procedure given for removal, noting the following points.

a. Ensure that the valve pintle is secure on the valve stem.
b. Ensure that the valve and mounting flange faces are clean and free from carbon deposits.
c. Always use a new mounting flange gasket.

E.G.R. valve – To clean

1. Remove the valve as described in E.G.R. valve – To remove.
2. Using a scraper, remove all carbon film from the valve and mounting flange faces; complete the operation with a wire brush.
3. Clean the carbon from the valve using a wire brush fitted into a portable drill. Take care not to damage the valve seating area.
4. Thoroughly blow out the valve with compressed air to ensure that all loose carbon particles are removed.
5. Upon completion of the cleaning operations, fit the valve to the engine mounting flange.

E.G.R. valve – To check

The E.G.R. system is automatically controlled by exhaust back-pressure to maintain a constant E.G.R.

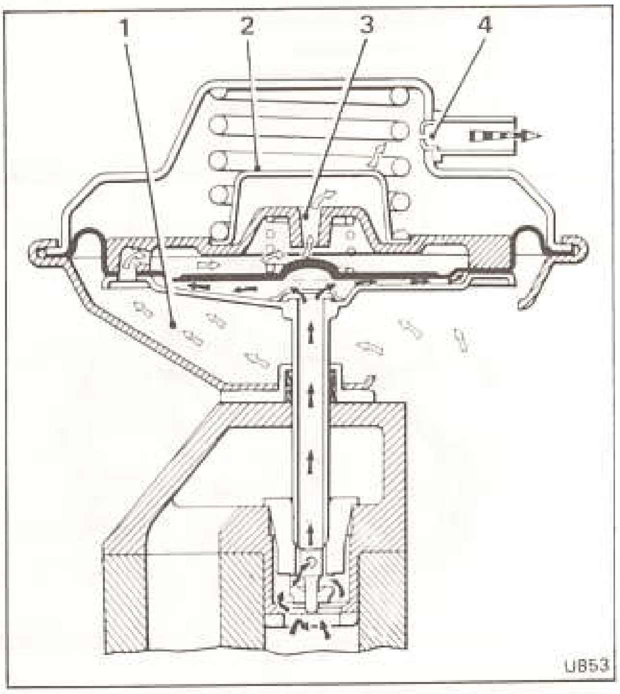


Fig. U4-3 **Exhaust gas recirculation valve Exhaust pressure below operating value**

1 Ambient air
2 Air filter
3 Air bleed
4 Restrictor
Ambient air
Exhaust gas

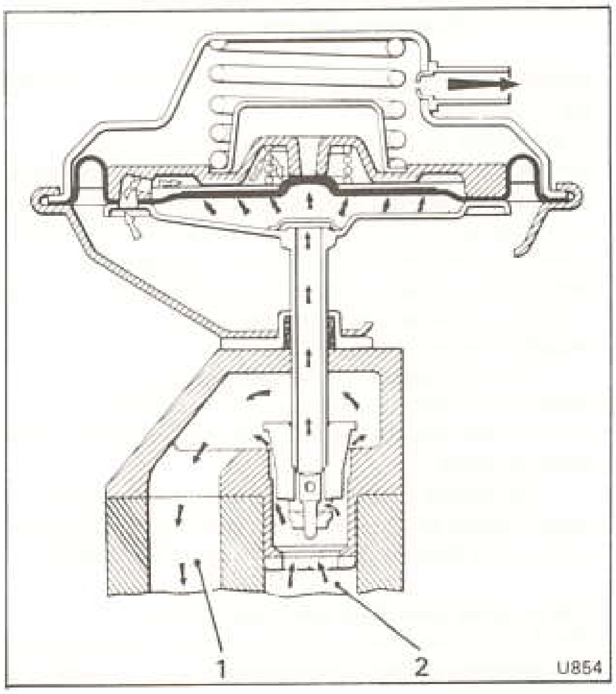


Fig. U4-4 **Exhaust gas recirculation valve Exhaust pressure above operating value**

1 Exhaust gas to plenum chamber
2 Exhaust gas from exhaust manifold
Ambient air
Exhaust gas

proportion over normal road load conditions. Checks to ensure the correct operation of the valve are only required under no load conditions as follows.

1. Connect an electric impulse tachometer to the engine in accordance with the manufacturer's instructions.
2. Ensure that the parking brake is firmly applied and that the gear range selector is in the Park position.
3. Start and run the engine until normal operating temperature is attained.
4. Ensure that the engine has run at least 15 minutes after the engine coolant thermostat has opened.
5. Allow the engine to return to the idle speed.
6. Increase the engine speed slowly noting the operation of the E.G.R. valve.
7. The E.G.R. valve should commence to open between 1550 rev/min and 1850 rev/min.

If the valve either fails to open or opens late check for the following possible causes.

a. Faulty E.G.R. cut-out temperature switch (see Section U8).
b. Faulty E.G.R. cut-off solenoid (see Section U8).
c. Faulty 'wide open' throttle micro-switch (see Section U2).
d. Faulty wiring.
e. Leak or blockage in the vacuum signal hose.
f. Excessive exhaust gas extraction for the tail-pipe (if extraction equipment is used).
g. Advanced ignition timing (see Section U7).

If the valve begins to open early check for the following possible causes.

a. Retarded ignition timing (see Section U7).
b. Excessive exhaust gas back pressure (ensure that there is no tailpipe restriction).

8. If the E.G.R. valve does not function correctly after carrying out Operations 1 to 7 inclusive fit a new valve.
9. Carry out Operations 1 to 7 inclusive with the new valve.

E.G.R. valve heatshield – To remove and fit

1. Locate the heatshield and unscrew the setscrew retaining the heatshield to the plenum chamber cover, collect the washer.
2. Unscrew the setscrew securing the heatshield to the top of the plenum chamber, collect the large diameter washer.
3. Unscrew the long setscrew that forms the lower mounting for the auxiliary air valve. Withdraw the setscrew and collect the washer and distance pieces.
4. Unscrew the nut from the E.G.R. valve top mount, collect the washer.
5. Withdraw the heatshield.
6. Fit the heatshield by reversing the procedure given for removal.

E.G.R. pipes – To remove and fit (see fig. U4-2)

There are two E.G.R. pipes joined together adjacent to the auxiliary air valve by a sealing ring and split clamp.

Lower pipe

1. Remove the E.G.R. valve heatshield (see E.G.R. heatshield – To remove and fit).

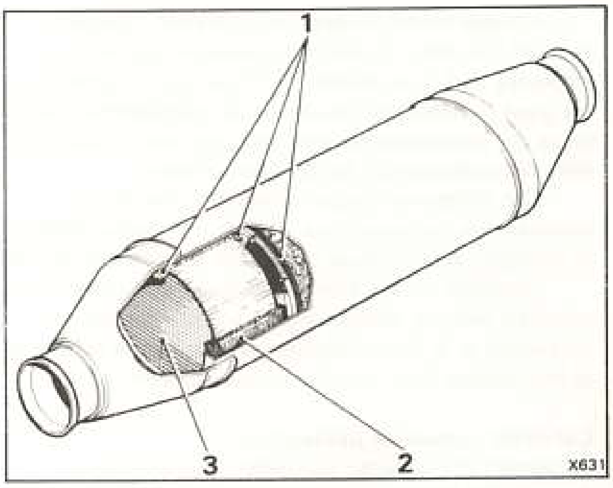


Fig. U4-5 Catalytic converter
1 Stainless steel mesh retaining rings
2 Stainless steel mesh
3 Monolithic catalyst (1 of 3 blocks)

2. Locate the joint adjacent to the auxiliary air valve, unscrew the two nuts and collect the washers. Free the clamp and withdraw the bolts together with both halves of the clamp bracket. Collect the sealing ring.
3. Unscrew the two nuts from the exhaust manifold joint. Free the joint, withdraw the pipe and discard the gasket.

Upper pipe

4. Detach the vacuum hose from the E.G.R. valve.
5. Unscrew the two setscrews securing the pipe flange to the plenum chamber, collect the washers and discard the gasket.
6. To fit the pipes reverse the procedure given for removal, noting that the joint faces should be clean and flat. Fit new gaskets.

E.G.R. pipes – To clean

1. Remove the E.G.R. valve (see E.G.R. valve – To remove and fit).
2. Remove the E.G.R. pipes (see E.G.R. pipes – To remove and fit).
3. With a pointed scraper clean as much carbon deposit as possible from inside the distribution pipes and joint faces.
4. Using a wire brush complete the cleaning operation on the pipes.
5. Using the pointed scraper carefully remove the carbon deposit from the plenum chamber.
6. Before fitting the E.G.R. pipes thoroughly blow out all the pipes and connections with compressed air.

Three-way catalyst system (see fig. U4-5)

The catalytic converter is situated in the front left-hand underfloor area, in place of a conventional front silencer. Exhaust gas from both banks of the engine is combined prior to passing through the converter. The exhaust gas then diverges into the dual exhaust system (see fig. U4-1).

A noble metal catalyst on a ceramic monolith support has been chosen for optimum conversion efficiency and rapid warm-up. Three separate blocks are used to minimise the effect of thermal shock and these are positioned to give good gas distribution and effective utilisation of the catalyst volume.

The three-way catalyst promotes reactions between the hydrocarbons, carbon monoxide, oxides of nitrogen, and residual oxygen in the exhaust gases.

Optimum conversion efficiency of the catalyst is achieved when a stoichiometric air/fuel ratio is presented to it. This condition is maintained by means of the 'closed loop' mixture control system.

Catalytic converter protection
To protect the catalytic converter from possible damage the following precautions should be taken.

Unleaded gasolene
Use unleaded gasolene only 87AKI (91 RON) Min. The use of leaded gasolene will result in a substantial reduction in the performance of the catalyst. Under no circumstances add fuel system cleaning agents to the fuel tank for induction into the engine, as these materials may have a detrimental effect on the catalytic converter.

Engine malfunction
If the engine misfires or suffers from a lack of power which could be attributed to a malfunction of either the ignition or fuel systems, operation of the vehicle should be discontinued. Driving the vehicle with a malfunction in either of these systems could cause overheating and consequent damage to the catalytic converter.

Fuel
Do not allow the vehicle to run out of fuel. A warning lamp situated on the facia illuminates to warn the driver of a low fuel level in the fuel tank. If the vehicle does run out of fuel at a high speed, possible damage to the catalytic converter could result.

Starting the engine
The vehicle must not be pushed or towed to start the engine. Failure to observe this warning could cause overheating and consequent damage to the catalytic converter.

Engine temperature warning
If, whilst driving the warning panel marked ENGINE COOLANT illuminates and/or the warning buzzer sounds, stop the car as quickly as possible in a safe and orderly manner. The engine should not be operated under any circumstances and an authorised Dealer should be consulted. Continued operation of the vehicle with the engine temperature warning buzzer sounding could cause damage to the catalytic converter.

Exhaust emission control system
It is important to keep the vehicle in proper operating condition. Failure to do so will result not only in loss of fuel economy and emission control but could also cause damage to the catalytic converter due to overheating.

Catalytic converter – To remove and fit
1. Remove the screws retaining the grass-fire shield below the catalytic converter.

Note
Take care when removing the shield as the sharp edges could cause injury to the operator's hands.

2. Locate the exhaust pipe joint situated in front of the catalytic converter.
3. Slacken the three nuts around the joint.
4. Locate the exhaust pipe joint situated to the rear of the catalytic converter.
5. Slacken the two nuts retaining the clamp bracket.
6. Support the weight of the catalytic converter.
7. Unscrew and remove the nuts from both the front and rear joints, collect the washers and withdraw the bolts.
8. Withdraw the catalytic converter assembly and collect the sealing ring of each joint. The sealing rings are not interchangeable, therefore, they should be labelled for identification.
9. Fit the catalytic converter by reversing the removal procedure, noting the following points.

a. The sealing rings and pipe flares must be thoroughly clean and free from scale. They may be lightly dressed with fine emery cloth if required.
b. Apply Never-seez anti-seize compound to the clamp bolt threads before assembly.
c. The sealing rings, pipe flares, and grooves in the spherical joint clamp bracket should be lightly smeared with either graphite lubricant or Never-seez compound. This will assist alignment of the parts upon assembly.
d. The parts should be loosely assembled and then manoeuvred to give the best alignment, before the joints are tightened.

Do not allow the assembly compound to enter the exhaust system, particularly up stream (in front) of the catalytic converter, otherwise damage to the converter assembly will result.

Oxygen sensor
For details relating to the oxygen sensor refer to Section U2.

For information relating to the remainder of the exhaust system refer to Chapter Q, Exhaust system.

Fuel evaporative emission control system

The fuel evaporative emission control system eliminates direct venting of the fuel tank, thus preventing the release of hydrocarbons into the atmosphere (see fig. U5-1).

Fuel vapours from the fuel tank are collected and stored in a charcoal filled canister situated under the left-hand front wing. This canister is purged whenever the engine is running and the stored fuel vapours are extracted from the charcoal and burnt in the engine.

The fuel tank is located at the forward end of the luggage compartment behind the carpet covered panel.

A combined pressure/vacuum relief valve is located in the fuel filler cap and a rollover tube is incorporated in the vent line from the fuel tank to the control canister, to prevent fuel from reaching the canister during harsh manoeuvres or in the event of vehicle inversion.

For details of the servicing and maintenance requirements of the fuel evaporative emission control system, refer to the Service Schedule Manual. TSD 4406.

A more detailed description of the components used in this system is as follows.

Emission control canister (see fig. U5-2)
The evaporative emission control canister is mounted under the left-hand wing. It is a cylindrical container filled with activated carbon granules.

The top of the canister incorporates a tube, open to atmosphere to admit purge intake air. In the base of the assembly is one connection for the fuel tank vent hose and another connection for the purge line. The carbon granules are retained within the canister by a system of baffles and screens as shown in figure U5-2.

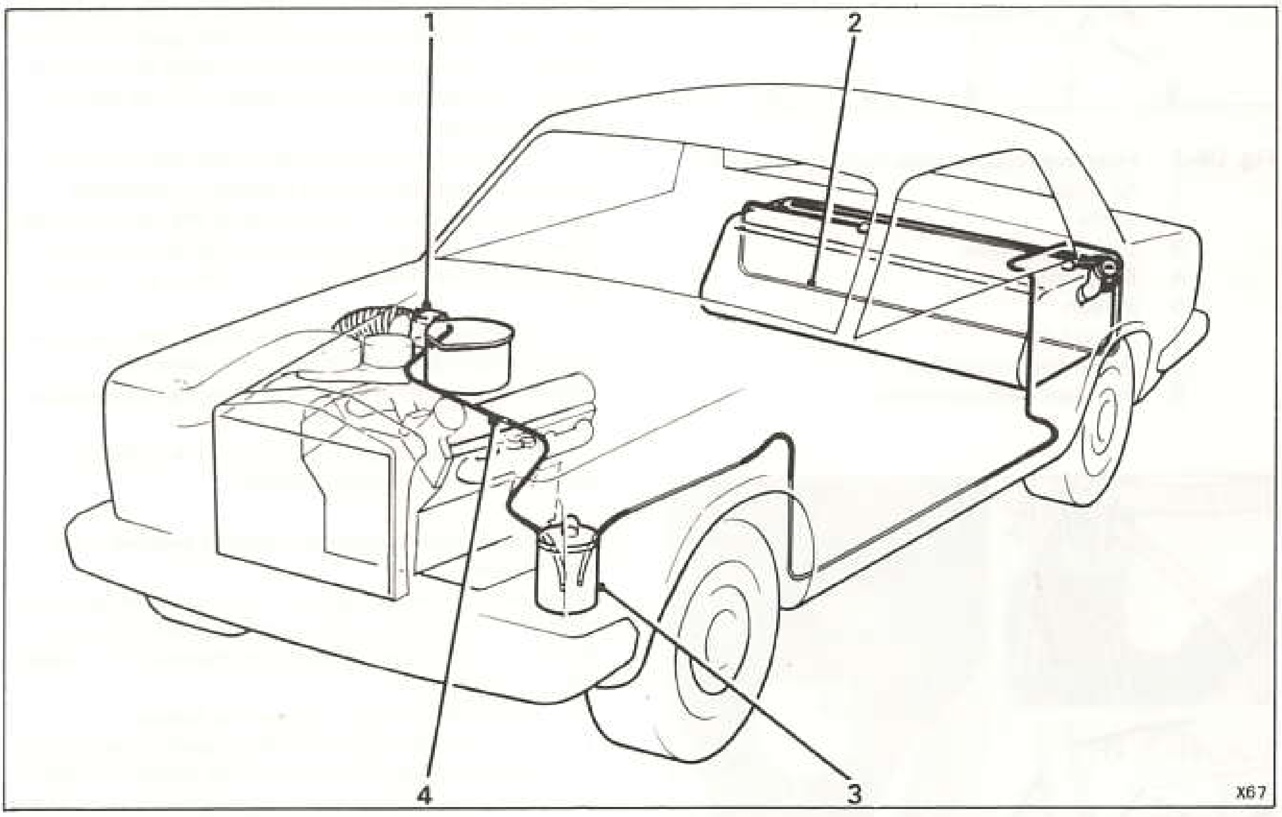


Fig. U5-1 Fuel evaporative emission control system
1 Throttle body gated purge orifice
2 Fuel tank rollover tube
3 Canister
4 Purge line restrictor

At the mileage specified in the Service Schedules remove the control canister and fit a new assembly.

Emission control canister – To remove and fit

1. Carry out the usual workshop safety precautions.
2. Locate the emission control canister under the left-hand front wing (see fig. U5-3). Using the special pliers RH 8090 remove the securing clip from the

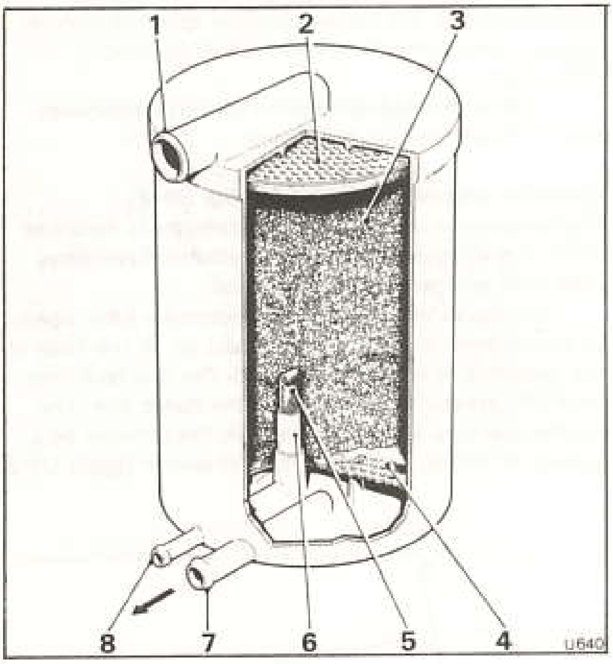


Fig. U5-2 Fuel evaporative loss control canister
1 Air intake
2 Baffle
3 Carbon granules
4 Baffle mat
5 Screen
6 Stand tube
7 Purge line connection
8 Fuel tank vent connection

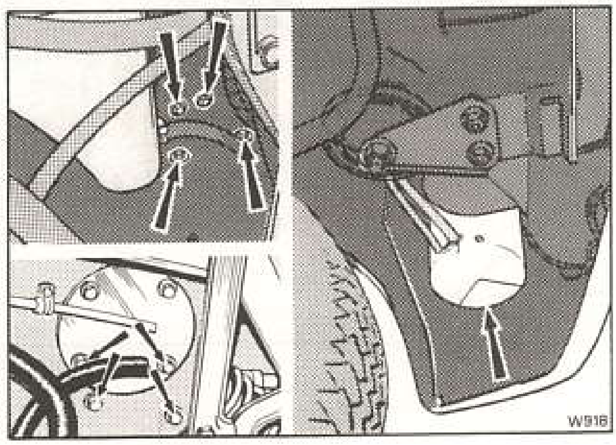


Fig. U5-3 Fuel evaporative control canister and mounting bracket setscrews

canister end of the fuel tank to canister flexible hose.

3. Withdraw both hoses fitted to the control canister. Label each one to facilitate assembly.
4. Unscrew the four setscrews retaining the control canister (see fig. U5-3) in position. Support the weight of the canister before the last setscrew is removed. Collect the washer fitted under the head of each setscrew.
5. Withdraw the control canister from under the wing.
6. Note the position of the control canister in relation to the mounting bracket and unscrew the retaining worm drive clip(s).
7. Fit the new canister to the mounting bracket and tighten the retaining worm drive clip(s).
8. Ensure that the canister is in the correct position relative to the mounting bracket.
9. Fit the assembly to the vehicle by reversing the procedure given for removal, noting that a new hose securing clip should be used.

Fuel tank vent

The fuel tank is vented via two connections to the filler neck, allowing adequate venting of the tank during filling.

A separate vapour line from the centre of the tank (the rollover tube) almost encircles the tank before passing to the evaporative loss control canister (see fig. U5-1) under the floor of the car on the left-hand side. The vent line passes around the tank to prevent liquid fuel from entering the evaporative loss control canister during harsh manoeuvres or in the event of vehicle inversion.

In the event of a blockage in the vapour line to the evaporative loss control canister, a combined pressure and vacuum relief valve in the fuel filler cap, prevents an excessive pressure build-up in the fuel tank due to fuel vaporization or vacuum as the fuel is consumed.

An expansion tank situated within the main fuel tank inhibits complete filling and provides fuel expansion volume to cope with extreme temperature conditions.

For all other details of the fuel tank refer to Section U2, Fuel injection system.

Fuel evaporative emission control system – To leak check

Whenever the various pipes, hoses, and components of the fuel evaporative emission control system are disturbed, the system should be checked for air leaks upon assembly.

To test the system proceed as follows.

1. Carry out the usual workshop safety precautions.
2. Locate the fuel evaporative loss control canister.
3. Withdraw the fuel tank evaporative hose from the canister and connect it to the test equipment shown in figure U5-4.
4. Apply air pressure to the fuel tank hose via the test equipment until a reading of 380 mm (15 in) H_2O is attained and close the pressure supply.
5. After 5 minutes again check the pressure reading,

this should not have fallen by more than 12,7 mm (0.5 in).
6. If the pressure drop is more than 12,7 mm (0.5 in), progressively treat all joints in the system with soap solution to detect air leaks.
7. Rectify any air leaks and again leak check the system.
8. During the 5 minutes leak down, visually inspect the hoses, pipes, and connections of the system that are routed under the car. Commence where the hose exits from the body at the rear and follow the system to the loss control canister.
Ensure that the hoses are secure in the mounting clips.
9. When the system is satisfactory, detach the test equipment and connect the hose to the control canister. Secure the hose with a new clip.

Purge line (see fig. U5-1)
The purge line connects the evaporative loss control canister to the engine induction system.
Air from the atmosphere is drawn down through the carbon granules in the control canister picking up the stored fuel vapours, the air then passes from a connection at the bottom of the canister, along a hose to a connection on the throttle body where the air is drawn into the induction system.

Purge line restrictor (see figs. U2-66 and U5-1)
A purge line restrictor is situated in the purge line between the control canister and the throttle housing connection. The function of the restrictor is to maintain the flow through the purge line within pre-determined limits.

Purge line restrictor – To remove and fit
1. Locate the joint in the purge line hose.
2. Hold the hose on one side of the joint and pull the other hose. This will reveal one end of the restrictor as the hose is detached.
3. Hold the restrictor and withdraw the second hose.
4. Fit the restrictor by reversing the procedure given for removal noting that it is fitted into the line the correct way around. This can be determined by comparing the diameters of the restrictor ends with those of the rubber hoses.

Purge flow rate – To check
1. Carry out the usual workshop safety precautions.
2. Remove the retaining clip from the purge line restrictor hose (if fitted).
3. Disconnect the hose at the purge line restrictor. Leave the restrictor in the hose to the engine (see fig. U2-66).
4. Connect a rotameter assembly RH 8725 into the line, between the restrictor and the open pipe to the valance connection.
5. Connect an impulse tachometer to the engine in accordance with the manufacturer's instructions.
6. Start the engine. Raise the engine speed to 2500 rev/min and note the flow reading on the rotameter, this should be between 35 ft^3/h and 55 ft^3/h.

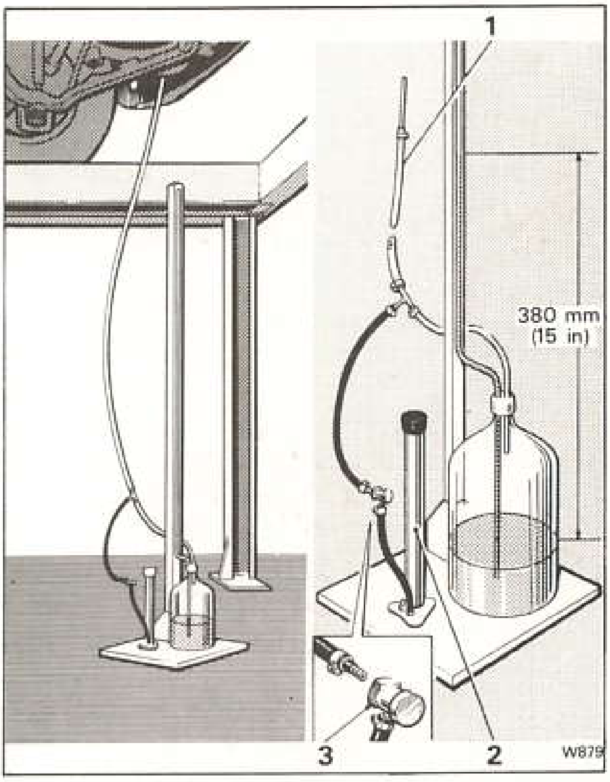


Fig. U5-4 Leak check test equipment
1 Connection to fuel tank/canister hose
2 Pump
3 One-way pressure valve

7. **If the flow is less than 35 ft^3/h,** this could be caused by.
a. An air leak in the vacuum hose connecting the restrictor to the throttle body.
b. A blockage in any of the hoses.
c. Incorrect ignition timing.
d. Incorrect drilling in the restrictor.
e. Incorrect drilling in the throttle body.
8. **If the flow is more than 55 ft^3/h,** this could be caused by.
a. Incorrect ignition timing.
b. Incorrect drilling in the restrictor.
c. Incorrect drilling in the throttle body.
d. Excessively weak mixture strength.
9. Reduce the engine speed to the idle setting.
10. Stop the engine, remove the test equipment and connect the purge line hose.

Crankcase emission control system

Crankcase emissions are controlled by two separate breather pipes.

From the rear of 'A' bank cylinder head a moulded rubber hose connects the crankcase to the air intake housing, immediately upstream of the air meter but downstream of the air cleaner/silencer assembly.

From the front of 'B' bank cylinder head a second moulded rubber tube connects the crankcase via the oil filler (which has a sealed cap) to a pipe leading to the plenum chamber. This pipe assembly incorporates a restrictor to control flow.

When fitting the flame trap assemblies, the longer assembly should be fitted to the 'B' bank oil filler connection.

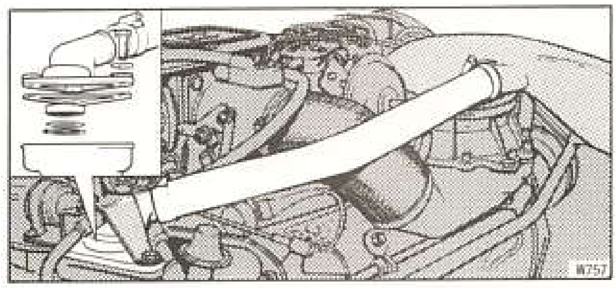


Fig. U6-1 Crankcase breather – 'A' bank

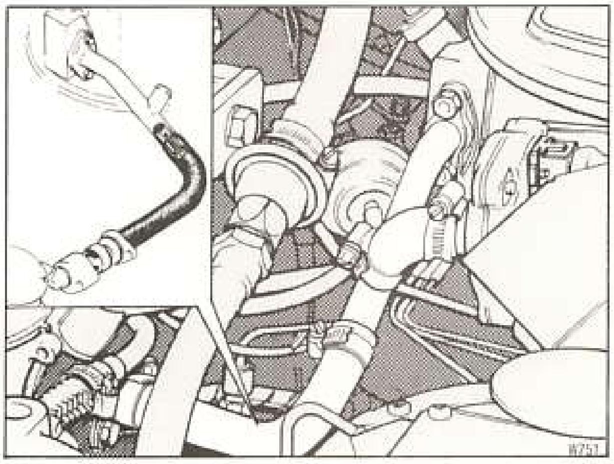


Fig. U6-2 Crankcase breather – 'B' bank

Crankcase breather 'A' bank – To service

1. Withdraw the windscreen wiper motor relay (wiper 3) situated on a bracket adjacent to the windscreen washer reservoir.
2. Remove the cover from the windscreen wiper drive mechanism to gain access to 'A' bank crankcase breather connection.
3. Locate the crankcase breather connection at the rear of 'A' bank cylinder head.
4. Slacken the worm drive clips securing the ends of the breather hose, free the joints and withdraw the hose.
5. Unscrew the three setscrews securing the breather take-off flange to the crankcase connection.
6. Withdraw the three setscrews and collect the washer fitted under the head of each one.
7. Lift the solenoid bracket from the vicinity of the connection.
8. Free the joint and lift the elbow casting from the engine. Discard the gasket.
9. Invert the casting and remove the circlip. Collect the retaining washer and withdraw the flame trap assembly.
10. Wash the flame trap in clean fuel and dry with compressed air.
11. Clean any deposits from inside the breather hose.
12. Fit the 'A' bank breather by reversing the procedure given for removal, noting that a new gasket should be fitted between the breather elbow casting and the engine.

Crankcase breather 'B' bank – To service

1. Slacken the worm drive clip securing the hose from the auxiliary air valve to the metal breather pipe. Withdraw the hose.
2. Slacken the worm drive clip securing each end of the rubber breather hose and free both hose joints.
3. Unscrew the two setscrews securing the metal breather pipe to the plenum chamber. Collect the washers, withdraw the pipe and discard the gasket.
4. Withdraw both the metal breather pipe and the rubber breather hose.
5. Unscrew the setscrew securing the adapter housing to the oil filler and collect the washer. Withdraw the housing (slight resistance may be felt due to the rubber sealing ring).
6. Remove the flame trap assembly.
7. Wash the flame trap assembly in clean fuel and dry with compressed air.
8 Clean any deposit from inside the breather pipe and hose.
9. Inspect the inside of the metal pipe to ensure that the restrictor is not blocked.
10. Assemble the 'B' bank breather by reversing the removal procedure noting that a new gasket should be fitted between the metal pipe and the plenum chamber. Ensure that the rubber 'O' ring on the oil filler connection is in good condition.

Ignition system

Data

Ignition timing 3° btdc (initial static setting)
14° – 16° btdc at 1450 rev/min (approach 1450 rev/min from a higher speed).

Ignition control system (1981/82 model year cars)

The ignition system utilises an Opus distributor (in which a magnetic pick-up and control unit replace the conventional contact breaker), a high load ignition coil and a ballast resistor.

A drum with eight ferrite rods (one per cylinder) moulded into the outer edge is mounted onto the distributor drive-shaft. As the drum rotates a voltage is created each time a ferrite rod passes the magnetic pick-up. The signal is then amplified and used to switch off the normally conducting power transistor in the primary coil circuit of the ignition coil, thus inducing a high voltage in the secondary winding which is distributed to the sparking plugs in the normal manner.

This ignition control system provides increased accuracy of timing and increased service life before maintenance is required.

The distributor has a conventional centrifugal advance mechanism.

In addition, the ignition control system employs a vacuum advance capsule.

Vacuum ignition advance is applied continuously to the capsule for part throttle economy during open road cruising.

Some 1981/82 model year cars maybe fitted with a vacuum retard system.

This ignition retard is used during engine warm-up to accelerate catalyst and oxygen sensor warm-up.

The vacuum retard signal is cut off by a solenoid valve, if the oil temperature is below 17°C (62°F) or the coolant temperature is above 55°C (131°F).

Ignition control system (1983/84/85/86/87 model year cars)

The ignition system utilises a distributor with a magnetic pick-up a separate amplifier module, a high energy coil, carbon cored resistive high tension leads, and conventional resistive type sparking plugs.

The distributor (see fig. U7-2) is mounted vertically at the rear of the engine and driven from the camshaft via a skew gear. Inside the distributor housing is a magnetic pulse generator which consists of a rotating star wheel with eight teeth (one per cylinder), a sintered magnet and coil coupled to the magnetic circuit. When the distributor shaft is rotated a pulse is generated in this coil each time a point of the star wheel passes the magnet. The pulses are fed to the amplifier module (see fig. U7-3) which controls the primary current to the ignition coil.

The ignition advance characteristic of the distributor is achieved by the use of centrifugal weights and springs in the base of the assembly, together with a vacuum advance capsule.

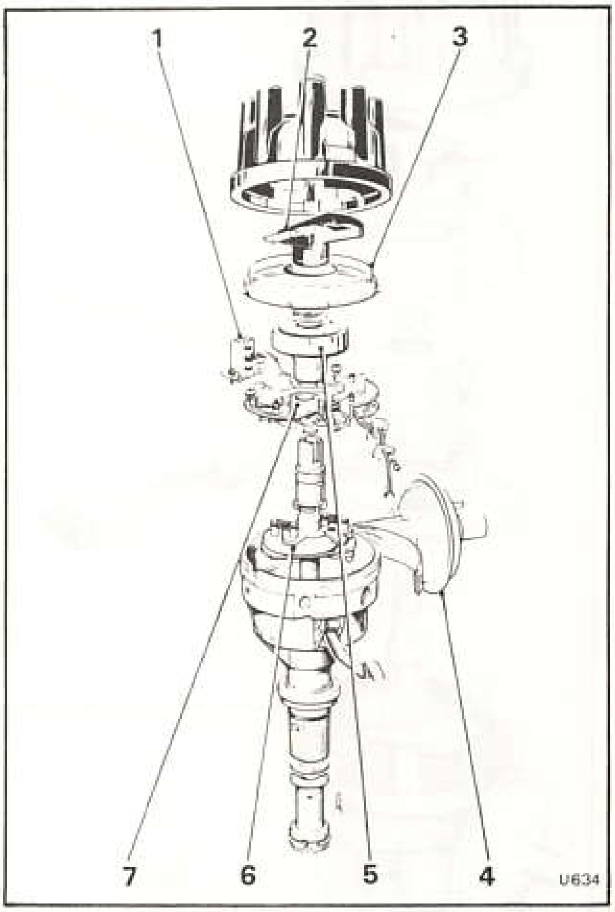


Fig. U7-1 Ignition distributor (1981/82 model year cars)

1 Magnetic pick-up
2 Rotor arm
3 Dust cover
4 Vacuum advance/retard capsule
5 Rotating drum
6 Centrifugal advance mechanism
7 Electronic module assembly

The gated orifice vacuum signal is applied to the distributor capsule at all times, this ensures good driveability and improved fuel economy.

For the removal and fitting instructions of the ignition system components refer to Chapter M.

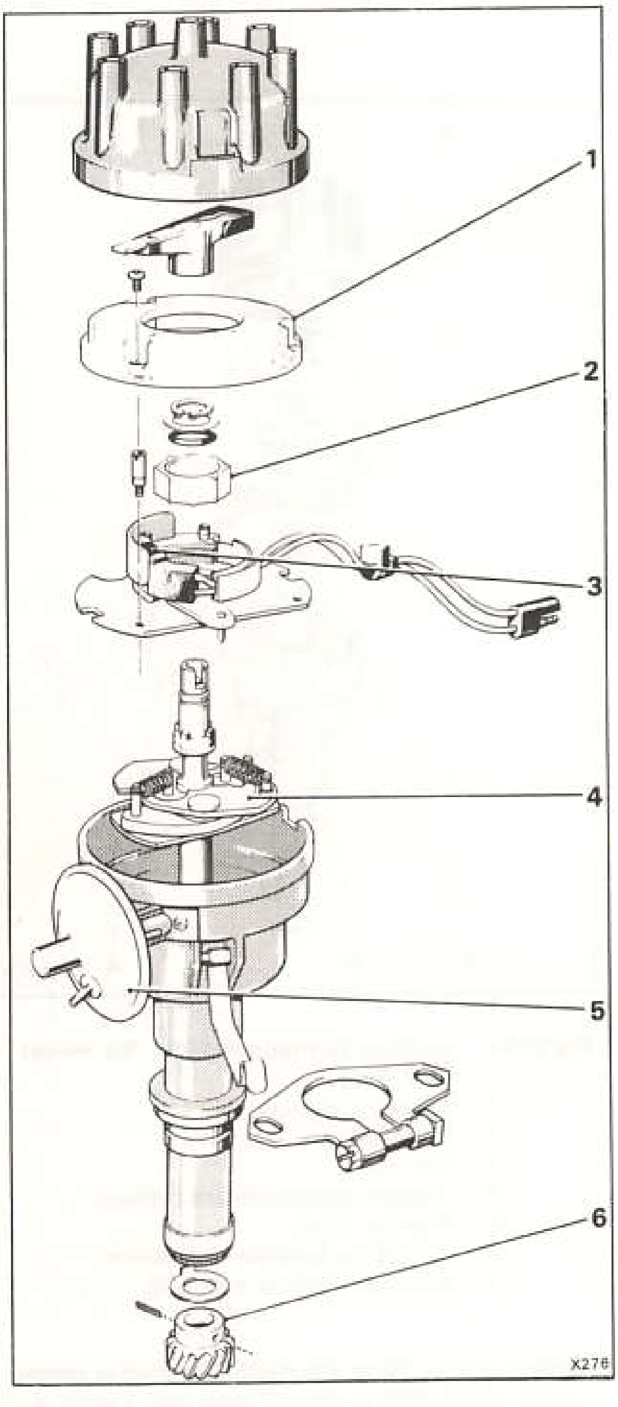


Fig. U7-2 Ignition distributor (1983/84/85/86/87 model year cars)

1 Insulating cover (dust cover)
2 Reluctor (star wheel)
3 Magnetic pick-up (trigger)
4 Centrifugal advance mechanism
5 Vacuum advance capsule
6 Driving gear

Ignition – To time (using a stroboscope)
Ignition timing is carried out an A1 cylinder and should be 15° btdc at 1450 rev/min; A1 cylinder is the front cylinder on the right-hand side of the engine when viewed from the driver's seat.

Important
If the ignition timing is to be set, ensure that the sparking plugs are in good condition before running the engine; if they require cleaning or renewal, ensure that the gaps are set correctly.

1. To check the ignition timing commence by running the engine until normal operating temperature is attained. Switch off the engine.
2. Connect a stroboscope and tachometer to the engine as described in the instructions supplied with the respective equipment.
The positive feed should be taken from a known 12 volt connection.
3. Disconnect the vacuum hose (if fitted) from the distributor side of the vacuum retard solenoid and fit a blank to the solenoid valve connection.
4. Disconnect the vacuum advance hose from on top of the throttle housing connection and blank off the throttle housing connection.
5. Start and run the engine at a speed of 1450 rev/min. When setting the engine speed reduce from a higher speed to 1450 rev/min.
6. Direct the flashing light of the stroboscope onto the crankshaft damper timing marks and timing pointer; the pointer is positioned on the left-hand side of the crankshaft damper when viewed from the driver's seat.
7. If the timing pointer does not coincide with the 15° btdc mark on the crankshaft damper adjust the ignition timing as follows.
8. Release the clamp screw on the distributor and rotate the head of the distributor in the appropriate direction until the correct timing is obtained. Clockwise rotation of the distributor head advances the ignition and conversely anti-clockwise rotation retards the ignition.
9. Tighten the clamp screw and check that the ignition timing is between 14° and 16° btdc at 1450 rev/min (again reduce from a higher speed to 1450 rev/min).

Check the operation of the ignition distributor vacuum advance/retard mechanism
After completing Operation 9 continue as follows.
Vacuum retard (if fitted) (1981/82 model year cars)
Refer to figure U7-4 to identify if the vacuum retard system is operational. If a vacuum retard system **is not fitted** proceed to Operation 14.

10. Connect a vacuum pump to the vacuum retard side of the capsule; ensuring that the hose normally connected to the capsule remains blanked off.
11. Start the engine, ensure that normal operating temperature is attained and apply a vacuum of 355,60 mm Hg (14 in Hg) to the capsule.
12. Set the engine speed to 1450 rev/min (reduce the speed to 1450 rev/min).

13. Check that the ignition timing has retarded between 10° and 14° from the setting noted upon completion of Operation 9. Remove the vacuum pump and connect the hose.

Vacuum advance (all cars)

Allow the engine to return to the idle speed and set this to 650 rev/min using the idle speed adjustment screw on top of the throttle body. Ensure that the engine speed does not dip below 650 rev/min.

15. Direct the timing light onto the timing marks on the crankshaft damper. The timing should now be between tdc and 8° btdc.

16. Connect a vacuum pump to the distributor vacuum advance side of the capsule. Apply an initial vacuum of 635 mm Hg (25 in Hg) and then reduce the vacuum to 508 mm Hg (20 in Hg) and maintain it. Adjust the idle speed to 650 rev/min.

17. Check that the ignition timing has advanced by between 10° and 14° from the setting noted previously (timing between tdc and 8° btdc).

18. Stop the engine, remove the test equipment and reconnect all hoses in their correct positions.

If the ignition timing is outside the ranges quoted, the distributor is faulty and a new unit should be fitted.

Vacuum retard (if fitted) (1981/82 model year cars)

To identify if an engine has an operational vacuum retard system reference should be made to the system cut-off solenoid (see fig. U7-4). The solenoid will be located on a bracket above the 'A' bank crankcase breather connection. If the solenoid is fitted the engine has ignition vacuum retard.

Note

When identifying the vacuum retard solenoid ensure that it is not confused with the E.G.R. cut-off solenoid that is fitted to all engines produced to the 1981/82 North American specification.

The E.G.R. cut-off solenoid is located on the lower platform of the solenoid mounting bracket, directly above the ignition distributor vacuum advance/retard capsule.

Setting the engine idle speed

To finally set the engine speed after carrying out the ignition timing sequence, refer to Idle speed – To set, in Section U2.

Distributor maintenance (1981/82 model year cars only)

The distributor requires no routine maintenance except that, at the mileage intervals specified in the Service Schedules the moulded cover and H.T. rotor arm should be removed and the spindle shaft bearings lubricated by inserting a few drops of engine oil onto the felt pad. The automatic advance mechanism should also be lubricated at this time with a few drops of engine oil inserted through apertures in the base plate.

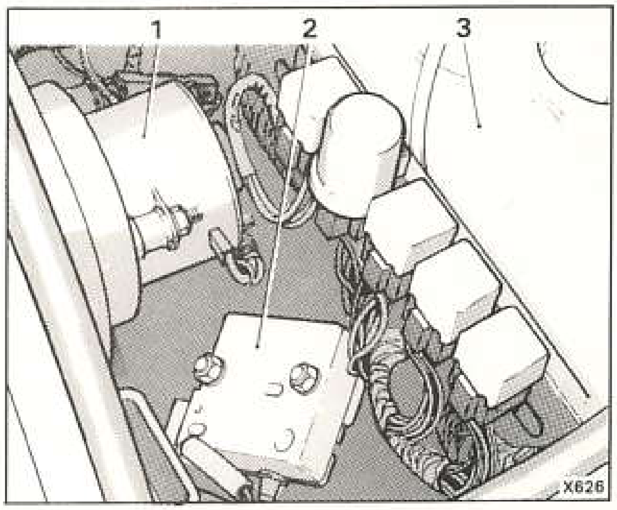


Fig. U7-3 Amplifier module
1 Fan motor
2 Ignition amplifier module
3 Windscreen washers reservoir

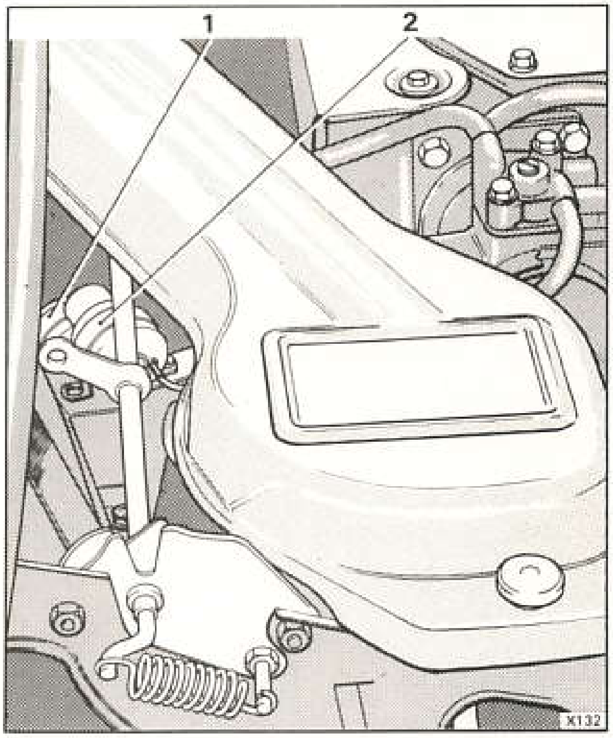


Fig. U7-4 Solenoid identification
1 E.G.R. valve cut-off solenoid
2 Ignition vacuum retard cut-off solenoid

Sparking plugs

The sparking plugs approved for this car are Champion RN 12 YC or RN 12 Y. Before fitting the plugs, set the gaps with the aid of a feeler gauge to 0,9 mm (0.035 in).

Electrical components

The electrical components described in this chapter would normally appear in Chapter M – Electrical system, however, as they are used in connection with the emission control system it is thought more practical to include the information within this chapter.

The components concerned are as follows.

Included in this section
Exhaust gas recirculation (E.G.R.) cut-off solenoid.
Ignition distributor vacuum retard cut-off solenoid and cut-out relay (if fitted) (1981/82 model year cars).
Coolant temperature switch (vacuum retard).
Coolant temperature switch (E.G.R. cut-out).
Engine oil temperature switch (vacuum retard) (if fitted to 1981/82 model year cars).
Elapsed mileage indicator.
Fuel pump relay (engine cranking).

Included in Section U2, Fuel injection system
Auxiliary air valve.
Cold start injector and thermal time switch.
Electronic control unit.
Engine running sensor/electronic timer.
Oxygen sensor and warning lamp.
Pressure control valve.
Warm-up regulator.
'Wide open' throttle micro-switch.

A theoretical wiring diagram containing details of the electrical components used in the K-Jetronic fuel injection system, is shown in Section U2, figure U2-27.

E.G.R. cut-off solenoid
The E.G.R. cut-off solenoid is located adjacent to the ignition distributor just below the ignition vacuum retard cut-off solenoid. The operation of the solenoid valve is described on page U2-20.

E.G.R. cut-off solenoid – To remove and fit
1. Detach the electrical connections, noting the positions of the connections to facilitate assembly.
2. Detach the rubber hose from both sides of the solenoid.
3. Unscrew the two screws securing the solenoid in position and withdraw the valve.
4. Fit the solenoid by reversing the removal procedure.

E.G.R. cut-off solenoid – To check
1. Withdraw the E.G.R. valve signal hose from the throttle body (see fig. U2-12) and the hose from the E.G.R. valve.
2. Ensure that the end of the hose removed from the throttle body is clean and blow down the hose. The solenoid valve should be open, allowing air to pass and come out of the hose removed from the E.G.R. valve.
3. Switch on the ignition.
4. With an engine coolant temperature below 32°C (90°F) the solenoid valve will be energized to cut-off the feed to the E.G.R. valve, therefore, it should not be possible to blow down the hose.
5. Start and run the engine. Once the coolant temperature is above 39°C (102°F) the solenoid valve will be de-energized and therefore, it should be possible to blow down the hose.
6. Stop the engine. Switch on the ignition.
7. Operate the kick-down micro-switch. The solenoid valve will be energized and it should not be possible to blow down the hose.
8. If the solenoid operates as described in Operations 2 to 7 inclusive, fit the vacuum hoses as the solenoid is operating satisfactorily.
9. If the solenoid valve does not operate satisfactorily proceed as follows.

E.G.R. cut-off solenoid circuit wiring – To check
1. Connect a test lamp across the two 'Lucar' connections to the solenoid valve. **Do not disconnect the two connections.**
2. Ensure that the engine is cold.
3. Unscrew the two setscrews securing the solenoid in that the bulb of the test lamp is illuminated.
4. Continue to run the engine, noting that as the engine warms-up (the coolant temperature reaches approximately 33°C (91°F) the test lamp bulb should extinguish.
5. Stop the engine. Switch on the ignition.
6. Operate the kick-down micro-switch noting that as the contacts make (click) the test lamp bulb again illuminates.
7. If the bulb of the test lamp operates as described the wiring is correct.
8. If the bulb of the test lamp does not operate as described.
a. Check the operation of the E.G.R. cut-out thermal switch, situated on the thermostat housing (see fig. U8-1) using the test lamp.
b. Check the operation of the kick-down micro-switch.

Ignition distributor vacuum retard cut-off solenoid and cut-out relay (if fitted) (1981/82 model year cars)
The vacuum retard cut-off solenoid is situated adjacent to the ignition distributor above the E.G.R. cut-off solenoid.

On Silver Spirit, Silver Spur, and Mulsanne cars, the cut-out relay is located on the relay bracket adjacent to the windscreen washer reservoirs and labelled ignition retard.

On Corniche and Camargue cars the cut-out relay is located with two other relays adjacent to the transmission dipstick, it is the relay shown nearest to the wing (bottom of the illustration) in figure U2-49.

Ignition distributor vacuum retard cut-off solenoid – To remove and fit (if fitted) (1981/82 model year cars)

1. Detach the electrical connections noting the positions of the connections to facilitate assembly.
2. Detach the rubber hose from both sides of the solenoid.
3. Unscrew the two screws securing the solenoid to the mounting bracket. Withdraw the solenoid valve.
4. Fit the solenoid by reversing the removal procedure.

Ignition distributor vacuum retard cut-off solenoid – To check (if fitted) (1981/82 model year cars)

1. Withdraw the two hoses from the solenoid valve. Fit an auxiliary hose to the plenum chamber side of the solenoid valve.
2. Ensure that the end of the hose is clean.
3. The solenoid valve should be closed therefore, it should not be possible to blow down the hose.
4. Ensure that the engine is cold [oil temperature below 17°C (62°F)]. If this temperature cannot be achieved, remove the oil temperature electrical connector and bridge the terminals in the loom plug.

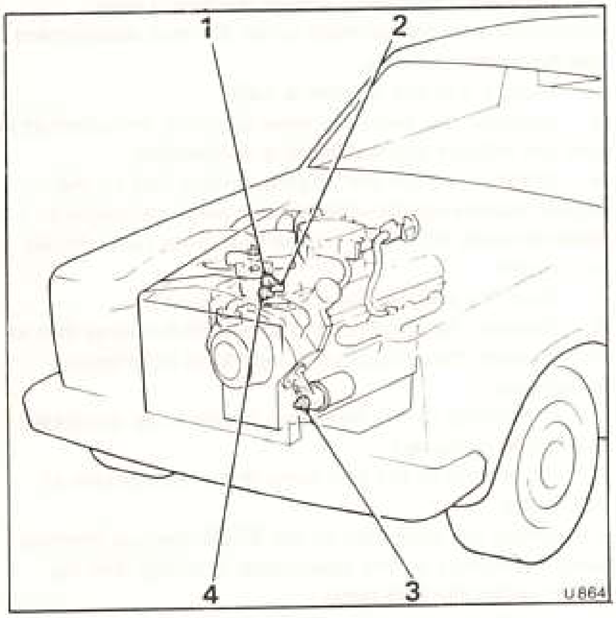


Fig. U8-1 **Thermal switches**
1 E.G.R. cut-out switch
2 Cold start injector switch
3 Ignition vacuum retard switch (oil) (if fitted) (1981/82 model year cars)
4 Ignition vacuum retard switch (coolant) (if fitted) (1981/82 model year cars)

5. Switch on the ignition, noting that it should not be possible to blow down the hose.
6. Start and run the engine. When the engine oil temperature reaches 17°C (62°F) the contacts in the oil temperature switch situated in the oil filter elbow (see fig. U8-1) will 'break' and de-energize the cut-out relay (see fig. U2-27). This will allow the solenoid to become energized via the coolant temperature switch. It should be possible to blow down the hose and through the solenoid.
7. As the engine coolant temperature rises above 55°C (131°F) the contacts of the coolant temperature switch situated in the thermostat housing (see fig. U8-1) will 'break' and de-energize the solenoid. It should not be possible to blow down the nose.
8. Stop the engine.
9. If the solenoid valve operates as described in Operations 3 to 7 inclusive, fit the vacuum hoses as the solenoid is operating satisfactorily.
10. If the solenoid valve does not operate satisfactorily, carry out a test to ensure the solenoid valve operates when 12 volts are applied and afterwards proceed as follows.

Ignition distributor vacuum retard cut-off solenoid circuit wiring – To check (if fitted) (1981/82 model year cars)

These tests will also check the operation of the cut-out relay and the oil and coolant temperature switches associated with the circuit.

1. Identify the cut-out relay (fuel injection system relay). Refer to ignition distributor vacuum retard cut-off solenoid and cut-out relay, for the location of the relay.
2. With the relay still connected (either by the original cables or link cables), connect a test lamp between the white/orange cable and the relay terminal.
3. Ensure that the engine is cold [oil temperature below 17°C (62°F)] and switch on the ignition.
4. The bulb of the test lamp should not be illuminated. If the bulb is illuminated the operation of either the relay or oil temperature switch is suspect.
5. Start and run the engine, as the engine oil temperature exceeds 17°C (62°F) the test lamp bulb should illuminate, showing that the contacts in the switch have opened and de-energized the relay, to allow the solenoid valve to be energized via the coolant temperature switch.
6. As the engine temperature rises above 55°C (131°F) the bulb of the test lamp should be extinguished as the contacts within the coolant switch open. If the bulb does not extinguish the operation of the coolant temperature switch is suspect.

From the evidence gained through carrying out these tests, the cause of a fault can be isolated so that a relatively straightforward test can be used to confirm a diagnosis.

Ignition vacuum retard thermal switches – To test (if fitted) (1981/82 model year cars)

1. Produce a test lead comprising a plug (to fit the thermal switch) and two short lengths of cable.

2. Connect a test lead to the switch and one of the cables to a known good 12 volt supply via a test lamp. The other cable should be connected to a good earth.
3. Ensure that the engine is cold (i.e. engine oil temperature below 17°C (62°F).
4. Switch on the ignition, noting that the test lamp bulb is illuminated.
5. Start and run the engine, as the engine oil temperature exceeds 17°C (62°F) the test lamp bulb will be extinguished.
6. Stop the engine, remove the test equipment and connect the plug to the switch socket.
7. Remove the plug from the coolant temperature switch (see fig. U8-1) and repeat Operation 2.
8. Switch on the ignition noting that the test lamp bulb is illuminated.
9. Start and run the engine, as the engine coolant temperature exceeds 55°C (131°F) the test lamp bulb will be extinguished.
10. Stop the engine, remove the test equipment and connect the plug to the switch socket.

Ignition vacuum retard cut-out relay – To test (if fitted) (1981/82 model year cars)

1. Locate the cut-out relay (fuel injection relay).
2. Silver Spirit, Silver Spur, and Mulsanne

The relay is situated on the relay bracket adjacent to the windscreen washer reservoir and labelled, ignition retard.

Remove the relay and withdraw the relay socket from the bracket.

Using an additional length of cable, remake the connection between the white cable and its relay contact blade.

Corniche and Camargue

The relay is located with two other relays adjacent to the transmission dipstick. It is situated nearest to the wing valance.

Label the cables to facilitate assembly and withdraw them from the relay (except the white cable).

3. Fit a known 12 volts supply to the terminal on the relay that normally contacts the white/purple cable.
4. Fit a test lamp between the terminal that normally contacts the white/orange cable and earth.
5. Switch on the ignition, noting that the bulb of the test lamp is illuminated.
6. Earth the terminal that normally contacts the brown/yellow cable, noting that each time the terminal is earthed the test lamp bulb is extinguished.
7. Fit a new relay if necessary.

Ignition vacuum retard wiring (if fitted) (1981/82 model year cars)

If all components within the vacuum retard inhibit system are serviceable, check for continuity of the cables, refer to figure U2-27.

Elapsed mileage indicator (1981/86 model year cars)

The operation of the elapsed mileage indicator is described on page U2-21. The unit is situated behind the side panel carpet on the right-hand side of the luggage compartment (see fig. U8-2).

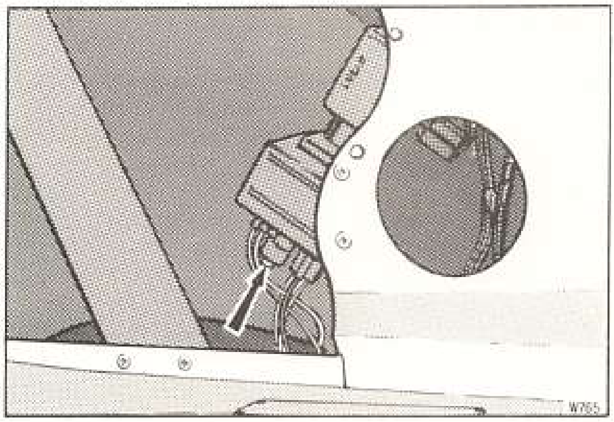


Fig U8-2 Elapsed mileage indicator

At the mileage specified in the Service Schedules, a new oxygen sensor should be fitted and at this time the elapsed mileage indicator should be reset as follows.

1. Open the luggage compartment.
2. Release the Tenax clip situated at the rear of the right-hand side carpet panel.
3. Unscrew the Pozidriv screws securing the right-hand side panel carpet in position. Unscrew sufficient screws to allow the rear of the carpet panel to be moved inwards to reveal the elapsed mileage indicator.
4. Refer to figure U8-2 and locate the reset button.
5. Firmly depress the reset button.
6. Switch on the ignition.
7. Start and run the engine, noting that as the oxygen sensor reaches its normal operating temperature the warning lamp on the facia is extinguished.
8. Stop the engine and fit the carpet panel.

Fuel pump relay (engine cranking)

The relay is the lower of two relays located to the rear of the alternator regulator on the right-hand side of the luggage compartment.

To gain access to the relay it will be necessary to remove the right-hand side carpet covered trim panel.

The purpose of the relay is to provide a maximum voltage feed to the fuel pump when the engine is being cranked with a low battery or a low ambient temperature.

To test the relay proceed as follow.

1. Remove the relay.
2. Locate the two white/pink cables fitted to one connector in the relay mounting block. Free the connector and withdraw the two cables from the rear of the block.
3. Fit a test lamp from the connection in the mounting block to earth.
4. Fit the relay.
5. Ensure that the parking brake is firmly applied and the gear range selector lever in Neutral.
6. Switch on the ignition and crank the engine, noting that the bulb of the test lamp is illuminated during the cranking operation.

Throttle linkage

Throttle linkage – To assemble and set (see fig. U9-1)

1. Set the accelerator pedal off-stop screw (item 16) to give a dimension of between 32,7 mm and 33,2 mm (1.29 in and 1.31 in) from the top of the boss on the lever to the top of the adjustment screw. Tighten the lock-nut.
2. Build a sub-assembly of the accelerator pedal lever (item 17), the pivot bolt and mounting brackets (item 18). Check that the lever moves freely between the brackets.
3. Fit the accelerator pedal lever assembly to the body and check that the lever moves freely.
4. Fit the acclerator cross-shaft (item 21) and fit the cross-shaft mounting brackets (item 12) to the body longerons.
5. Adjust the cross-shaft end-float to between 0,127 mm and 0,381 mm (0.005 in and 0.015 in) by bending the brackets.
6. Check that the cross-shaft (item 21) rotates freely.
7. Using the rod (item 19) connect the pedal lever (item 17) to the cross-shaft (item 21). Use the lower of the three holes. Lock the rod with split pins and check that the rod moves freely.
8. Fit the accelerator pedal to the lever (item 17).
9. Fit the spring anchor bracket (item 22).
10. Fit the two pedal return springs (items 11 and 20) using the spring hooks.
11. Check that the brake pedal is correctly set (the accelerator pedal is set relative to the brake pedal).

    Ensure that there is a minimum clearance of 99,4 mm (3.915 in) between the seal housing and the underside of the brake pedal.

Note

Full instructions for setting the brake pedal are given in Chapter G – Hydraulic systems.

12. Check that the accelerator pedal lies between 14,27 mm and 20,62 mm (0.562 in and 0.812 in) below the brake pedal. If not, rest the off-stop screw (item 16).
13. Set the manifold levers to an angle of between 90° and 94° as shown in inset A and lock the levers to the manifold shaft.
14. Using the drive links (item 5), connect the manifold lever to the throttle lever (item 4) using the pins, washers, and split pins.
15. Fit the throttle return spring (item 2) using the spring hooks.
16. Assemble the isolator mechanism and connect the trapeze assembly to the yoke of the bracket (item 7).
17. Fit the isolator lever (item 6) to the manifold lever rod. Adjust the length of the rod to a dimension of between 151,4 mm and 152,1 mm (5.960 in and 5.990 in) between the inner faces of the lock-nuts.

    Tighten the lock-nuts.
18. Check that the mechanism moves freely by pressing downwards on the end of the lever (item 6).
19. Assemble the long rod (item 8) and adjust the rod to a preliminary length of between 519,9 mm and 520,7 mm (20.47 in and 20.50 in) between the inner faces of the lock-nuts.
20. Fit the jaw (item 14) of the long rod to the control operating lever (item 15).
21. Offer up the yoke of the ball joint on the top end of the long rod to the ball on the isolator lever (item 6).
22. Adjust the length of the long rod (item 8) until there is minimum amount of free-play in the control system.
23. Tighten the lock-nuts.
24. Check that the entire accelerator control system operates smoothly.
25. Ensure that the kick-down micro-switch and operating plunger are correctly adjusted (refer to Chapter K).
26. Check that the throttle butterfly valve is horizontal at full travel (i.e. no over travel).
27. Check that the throttles close fully when the accelerator pedal is released.
28. With the engine at normal operating temperature but not running, repeat Operations 24 and 26.

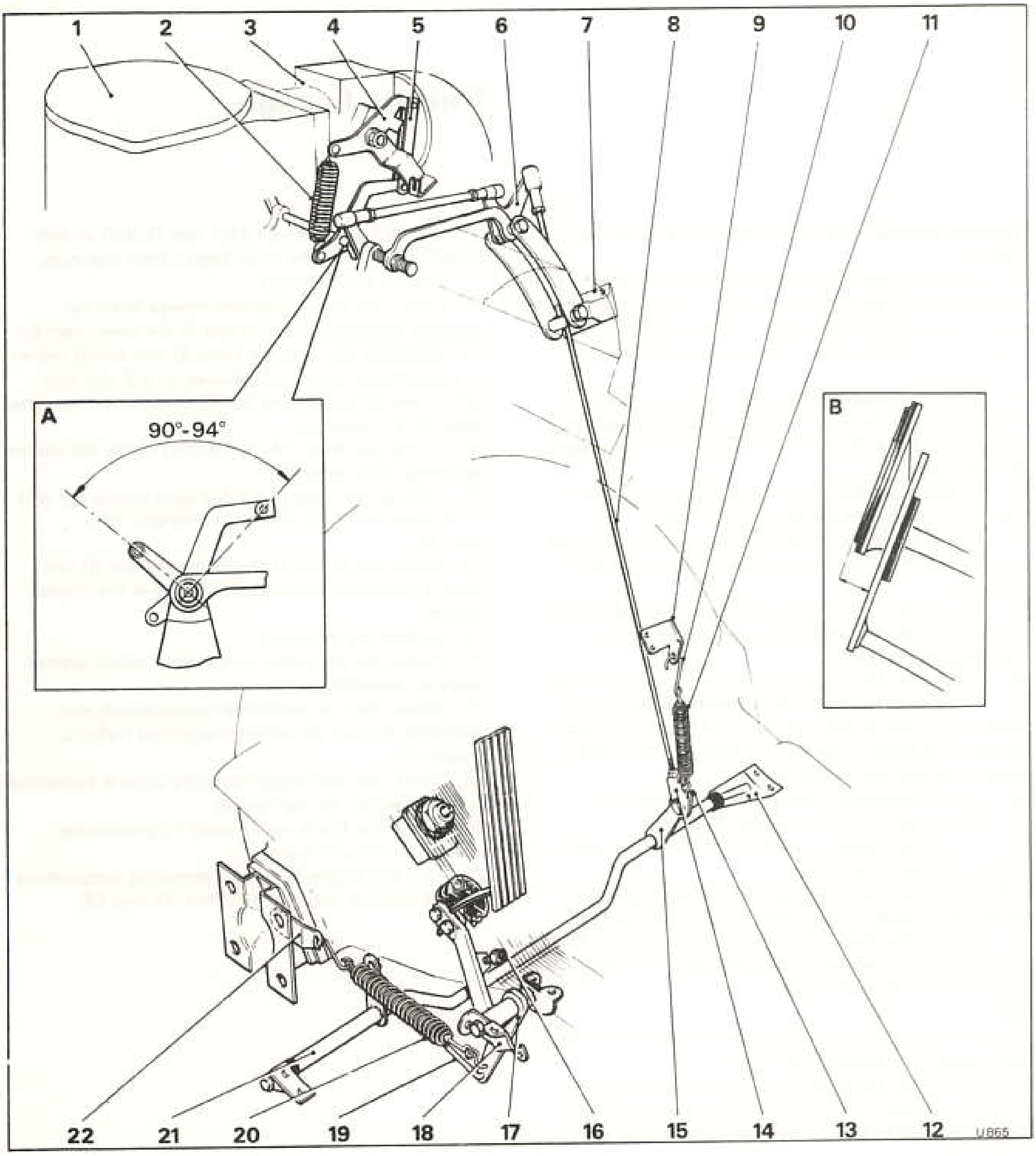


Fig. U9-1 Throttle linkage

1 Plenum chamber cover
2 Throttle return spring
3 Throttle body
4 Throttle lever
5 Drive links
6 Isolator lever
7 Body longeron bracket
8 Long rod
9 Lower return spring bracket
10 Spring hook (upper)
11 Lower return spring
12 Cross-shaft mounting bracket
13 Spring hook (lower)
14 Jaw – long rod
15 Control operating lever
16 Pedal off-stop screw
17 Pedal lever
18 Pedal lever mounting bracket
19 Connecting rod
20 Pedal return spring
21 Cross-shaft
22 Spring anchor bracket

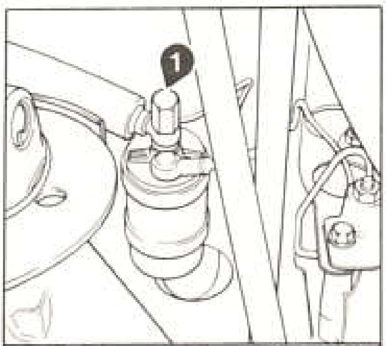
Special torque tightening figures

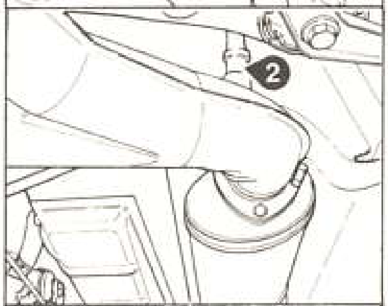
Introduction
This section contains the special torque tightening figures applicable to Chapter U – North America 1981/87 model year cars.

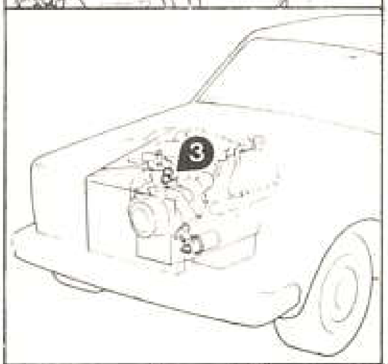
For standard torque tightening figures refer to Chapter P.

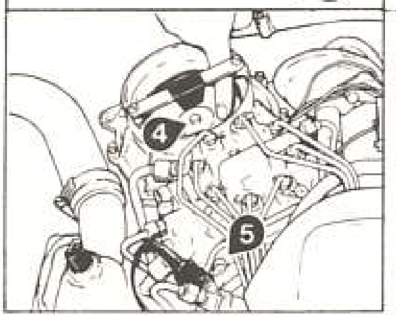
Components used during manufacture of the vehicle have different thread formations (metric, UNF, UNC, etc.). Therefore, when fitting nuts, bolts, and setscrews it is important to ensure that the correct type and size of thread formation is used.

Section U2









Ref.	Component	Nm	kgf m	lbf ft
1	Fuel pump – cap nut or fuel pressure damper When tightening the component ensure that the pump outlet is held firmly with a spanner, otherwise the flexible pump mounts may be strained	16 – 24	1,7–2,5	12 – 18
2	Oxygen sensor When fitting an oxygen sensor, always smear the threads with Never-seez assembly compound. Do not allow the assembly compound onto the slotted shield below the threaded portion	50 – 59	5,1–6,1	37 – 44
3	Thermal time switch	30	3,0	22
4	Air flow sensor plate – setscrew	5	0,50–0,55	44 – 48 lbf. in.
5	Primary system pressure regulator (large hexagon)	13 – 15	1,3–1,5	9,5 – 11

Workshop tools

RH 8090	Pliers (hose clips)
RH 8725	Flowmeter (rotameter type)
RH 9607	Adapter (for use with RH 9612)
RH 9608	Mixture adjusting tool
RH 9609	Guide ring (Air flow sensor plate)
RH 9611	Exhaust gas sampling adapter
RH 9612	Pressure tester (requires RH 9607)
RH 9613	Fuel delivery quantity comparison tester
RH 9614	Injector test equipment
RH 9615	'Closed loop' system tester
RH 9645	Hose and adapter (fuel distributor to pressure tester change-over valve)

Supplement 1
Pressure tester valve block

Service personnel may encounter two types of pressure tester valve block.

The original valve block has two valve screws and the later type has only one. Either valve block can be used to carry out the necessary workshop tests. Refer to figure U12-1 for the valve block assembly details.

Note

Whenever the pressure tester valve block is not in use, always ensure that the valve screw(s) are open to relieve the pressure on the internal sealing rings.

The pressure tester and associated parts are fitted into the control pressure line (see fig. U12-2); the line connecting the fuel distributor to the warm-up regulator. With the test equipment suitably connected at this point, the fuel injection system can be checked for

a. Cold and warm control pressure
b. Fuel system leakage (internal and external)
c. Primary system fuel circuit operation and pressure.

Installation of the test equipment

1. Carry out the usual workshop safety precautions. Switch on the ignition. Ensure that the gear range selector lever is in the Park position. Switch off the ignition and withdraw the gear range selector cut-out from the fuseboard.
2. Disconnect the battery.
3. Depressurize the fuel system (refer to the Workshop Manual).
4. Loosely assemble the test equipment as shown in figure U12-1 and then install it onto the engine as shown in figure U12-2. Ensure that all pipe nuts and unions are tight.

Bleeding the test equipment

After fitting but prior to using the test equipment, always ensure that it is properly bled as follows.

5. Bridge the engine running sensor (refer to the Workshop Manual).
6. Disconnect the electrical plugs from the warm-up regulator and the auxiliary air valve.

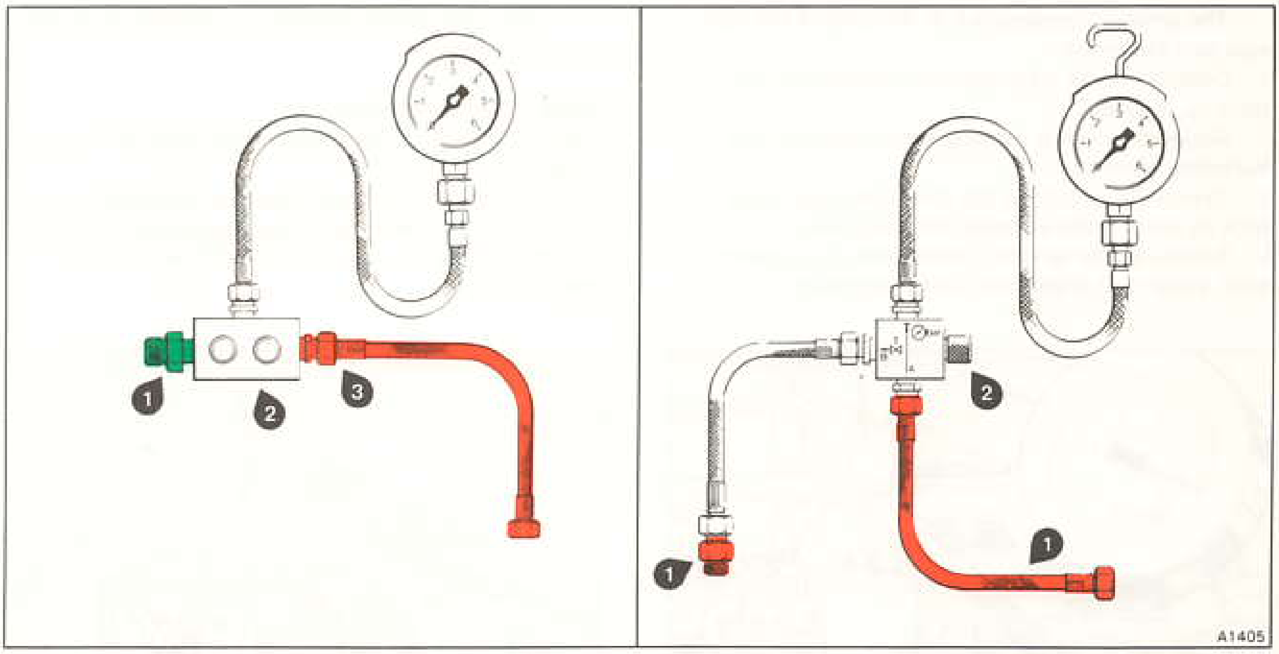


Fig. U12-1 Pressure tester valve block assembly

Original design - 2 valve screws

1 Special adapter RH 9607
2 Pressure gauge and valve block RH 9612 (Bosch No. KDEP-1034)
3 Hose and adapter RH 9645 (Bosch No. KDJE-P100/11)

Later design - 1 valve screw

1 Hose and adapter RH 9645 (Bosch No. KDJE-P100/11)
2 Pressure gauge and valve block RH 9873 (Bosch No. KDJE-P100)

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7. Connect the battery.
8. Allow the pressure gauge to hang down under its own weight with the flexible hose fully extended.
9. Ensure that the valve screw(s) on the pressure tester valve block is open.
10. Switch on the ignition. The fuel pump should now build-up pressure in the system.
11. Open and close the valve screw on the valve block (valve screw number 1 on the early type of block) six or seven times in a ten second rhythm.
12. After the equipment has been satisfactorily bled, lift the gauge up and suspend it from a bonnet catch. Finally, ensure that the valve screw(s) is open.
13. Switch off the ignition. The pressure gauge and associated parts are now ready for use.

Checking the control pressure
Control pressure is determined by the warm-up regulator and governs the basic mixture strength.

The warm-up regulator contains two temperature sensitive bi-metals and an aneroid capsule (see the Workshop Manual) which responds to atmospheric pressure. Therefore, the control pressure depends upon the warm-up regulator bi-metal temperature and the atmospheric pressure (which is reduced with increasing altitude).

Fit and bleed the test equipment.

Cold control pressure
The engine must be cold to enable this test to be properly carried out. The engine must not have been run for at least four hours or **preferably,** left overnight.

The ambient temperature at the time of the test must also be known.
1. Disconnect the electrical plug situated on the warm-up regulator.
2. Bridge the engine running sensor (refer to the Workshop Manual).
3. Open the valve(s) on the pressure tester valve block by turning the screw(s) anti-clockwise.
4. Switch on the ignition, noting that the pressure tester gauge will show cold control pressure.
5. Refer to figure U12-3 for the correct cold control pressure.

If the test site is at sea level the correct control pressure should be within ± 0,2 bar (3 lbf/in²) of the heavy line (corresponding to an atmospheric pressure of 984 millibars).

Example
With an atmospheric pressure of 984 millibars or above and an ambient air temperature of 20°C (68°F), the **cold control pressure** should be between 2,0 bar and 2,4 bar (29 lbf/in² and 34.8 lbf/in²).

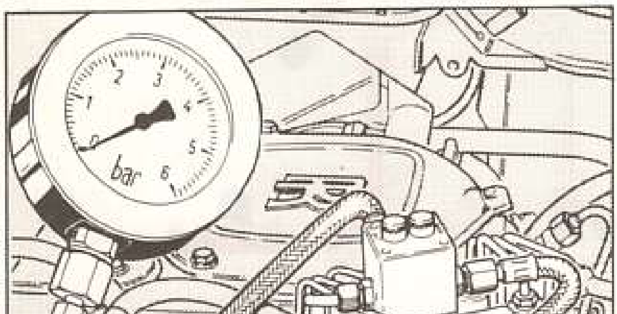
If the test site is at altitude [i.e. above 600 m (1968.5 ft)], determine the atmospheric pressure at the time of the test. This should be obtained from a local weather station or airport that is at the same altitude, or from a reliable mercury barometer reading taken at the test site.

The control pressure should be within ± 0,25 bar (3.6 lbf/in²) of the value corresponding to the atmospheric pressure.

Example
With an atmospheric pressure of 838 millibars and an ambient air temperature of 20°C (68°F), the **cold control pressure** should be between 2,45 bar and 2,95 bar (35.5 lbf/in² and 42.8 lbf/in²).
6. To carry out a basic functional test on the altitude compensation device at sea level, connect a suitable hand operated vacuum pump to the breather connection on the warm-up regulator and evacuate the body (see fig. U12-4). Ensure that the control pressure rises as the pressure within the warm-up regulator decreases.

If the cold control pressure is incorrect, fit a new warm-up regulator.

Warm control pressure
The temperature of the engine is not important when carrying out this test.
7. Connect the warm-up regulator electrical plug.
8. Ensure that the engine running sensor is bridged and the valve(s) on the valve block of the pressure tester is open.



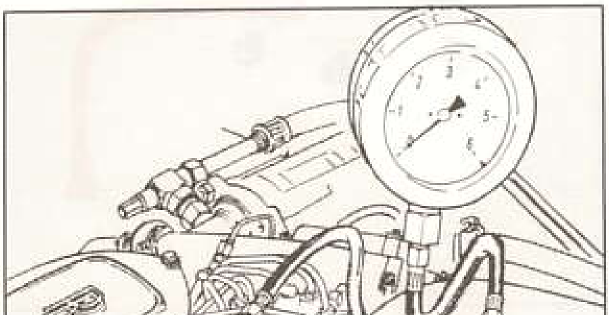


Fig. U12-2 Installation of the test equipment

9. Bridge the heaters inhibit relay, if fitted (see the Workshop Manual).
10. Switch on the ignition. The control pressure should begin to rise. When it has stabilized the warm control pressure is indicated. This should take no more than one minute at 20°C (68°F).
11. Refer to figure U12-5 for the correct warm control pressure at the corresponding test site altitude.
12. If the warm control pressure is incorrect, check that there is an electrical supply to the warm-up regulator. If the supply is correct, the warm-up regulator is defective and a new assembly should be fitted.

Checking the fuel system for leaks

1. Fit and bleed the test equipment. Open the valve on the pressure tester valve block.
2. Ensure that the engine temperature is between 30°C and 50°C (86°F and 122°F).
3. Bridge the engine running sensor (refer to the Workshop Manual).
4. Switch on the ignition and allow one minute for warm control pressure to be registered on the gauge of the pressure tester.
5. Switch off the ignition, noting the time taken for the pressure to fall to zero and compare this time with the data given in figure U12-6.
6. If the pressure drops too quickly, repeat the test with the control pressure circuit disconnected. To carry out this test, close the valve on the pressure tester valve block.

On the original design of valve block this is the screw adjacent to the connection to the warm-up regulator. Repeat the test given in Operations 2 to 5 inclusive.

Should the pressure loss now be acceptable, there is a leak either

a. externally from the control circuit pipes and/or pipe connections.

b. at the push valve situated within the primary system pressure regulator. This indicates that the rubber sealing rings are defective and should be changed (refer to Primary system pressure regulator – To service).

Should the pressure loss remain outside the acceptable limits, the leak is in the primary fuel circuit and may be due to

a. the sealing ring in the primary system pressure regulator being defective and indicating that the rubber sealing rings in the assembly should be changed (refer to Primary system pressure regulator – To service, in the Workshop Manual).

b. the cold start injector leaking.

c. a faulty non-return valve in the fuel pump outlet union.

d. leaking accumulator diaphragm.

e. an external leak from one of the fuel system pipes.

f. one or more of the injectors leaking.

If an injector leak is suspected, switch on the ignition to restore the system pressure then slightly depress the air sensor plate. If the pressure reading

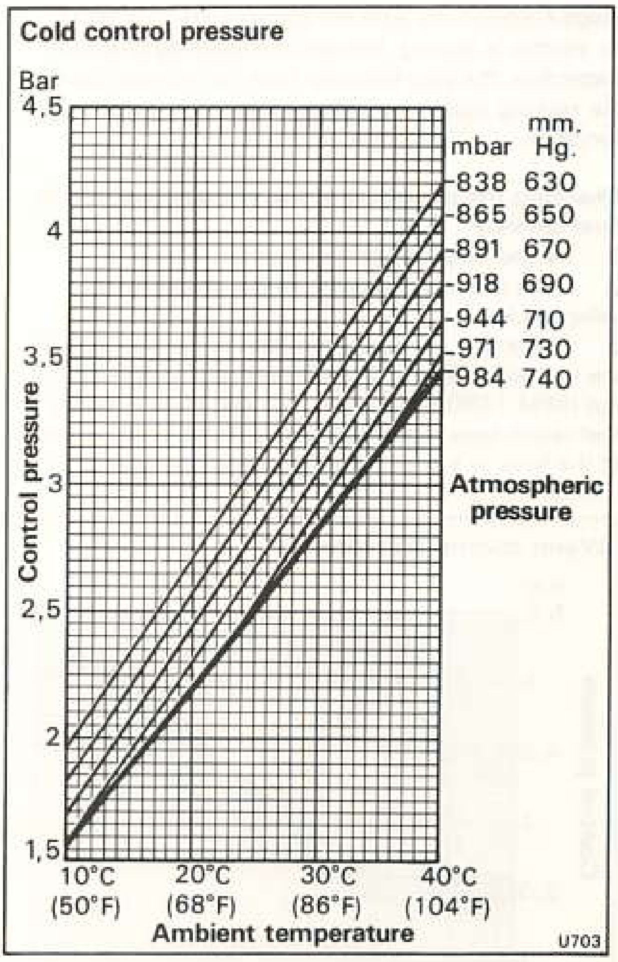


Fig. U12-3 Control pressure (cold)

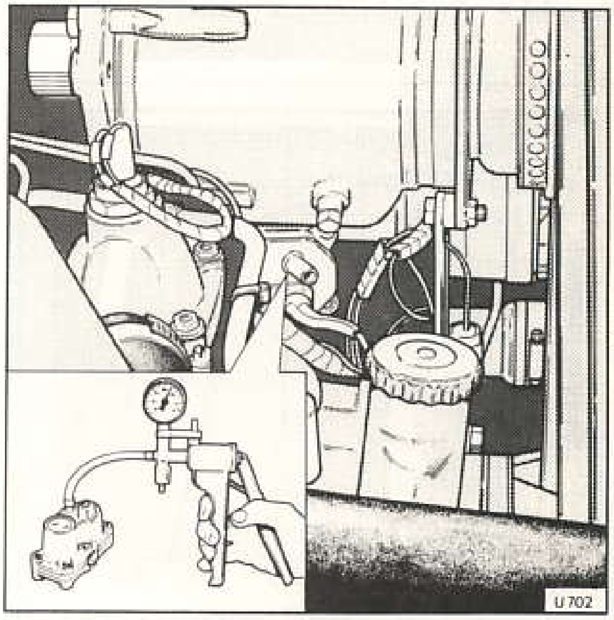


Fig. U12-4 Evacuating the body of the warm-up regulator

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drops continuously with the sensor plate depressed, an injector is leaking. Remove the sparking plugs for inspection, the plug removed from the cylinder having the sticking injector will often be found in a sooty condition.

Checking the operation of the primary fuel circuit
Fuel delivery

1. Fit and bleed the test equipment.
2. Open the valve screw(s) on the pressure tester valve block.
3. Disconnect the fuel return line to the fuel tank, at the fuel distributor. Using a 'firtree' type nipple and nut (SPM 1390/1), connect one end of an auxiliary fuel return hose to the connection. Hold the other end of the hose in a graduated measuring container

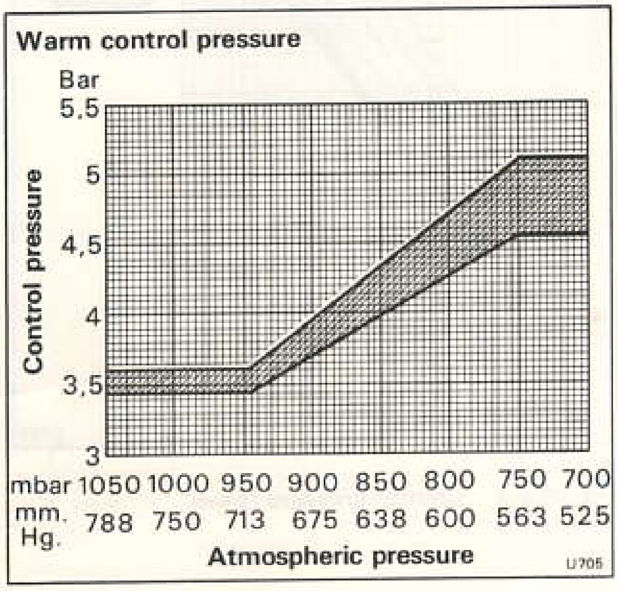

Fig. U12-5 Control pressure (warm)

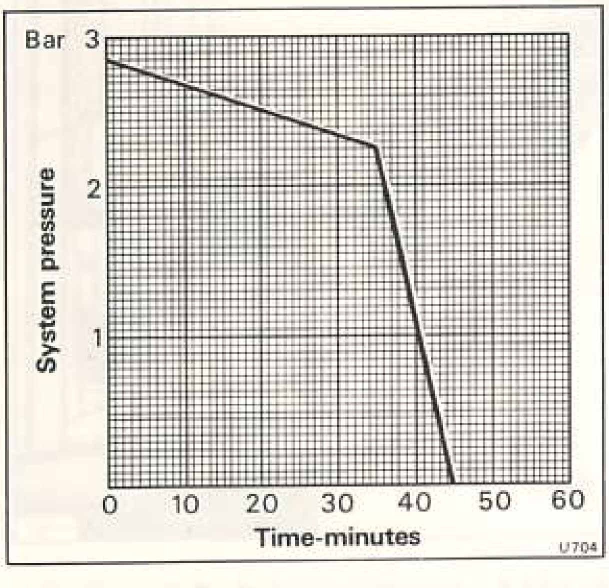

Fig. U12-6 Fuel system 'leak down'

capable of holding at least 2 litres (3.5 Imp pt, 4.25 US pt).

4. Disconnect the electrical plug from the warm-up regulator and the auxiliary air valve.
5. Bridge the engine running sensor (refer to the Workshop Manual) and switch on the ignition for 30 seconds. At least 1000 ml of fuel should be delivered into the measuring container.
6. If the delivery quantity is satisfactory check the primary system pressure. However, if the delivery quantity is below the prescribed amount, proceed as follows, checking the fuel pump delivery after each operation.
7. Check the voltage at the fuel pump. When the pump is operating, this should be 11.5 volts.
8. Check the fuel lines for blockage.
9. Fit a new main fuel filter.
10. Fit a new fuel pump.

After establishing that the fuel delivery is correct, remove the test equipment. Connect the fuel return pipe to the fuel distributor.

Primary system pressure

To carry out this test, fit and bleed the test equipment. The temperature of the engine is not important for this test.

1. Close the valve on the pressure tester block. On the original design of valve block, this is the screw adjacent to the warm-up regulator connection.
2. Bridge the engine running sensor (refer to the Workshop Manual) and switch on the ignition. The pressure gauge will now show primary system pressure which should be between 5,2 bar and 5,8 bar (75.4 lbf/in² and 84.1 lbf/in²).
3. If the primary system pressure is too low
   a. check the fuel supply
   b. check the setting of the pressure regulator and service if necessary (see Primary system pressure regulator – To service).
4. If the primary system pressure is too high
   a. check for a restriction in the return line to the fuel tank
   b. check the setting of the pressure regulator and service if necessary (see Primary system pressure regulator – To service).

At the conclusion of any of the tests always depressurize the fuel system, remove the test equipment and remake any necessary connections.

Finally, run the engine and check for leaks.