

19 - FUEL SYSTEM

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Tdi

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DESCRIPTION

Air intake

The air cleaner is positioned to the right of the engine and connected by hoses to a cold air intake duct and the turbocharger inlet. A crankcase breather hose is fitted between the air cleaner and the separator.

A single stage turbocharger, fitted between the exhaust manifold and exhaust pipe, is connected by hoses to the air cleaner and to an intercooler mounted on the right of the radiator. The intercooler is connected by a hose to the inlet manifold.

Fuel system

A 89 litre fuel tank is mounted at the rear of the vehicle beneath the load space floor. The tank is vented by a 2 way valve in the filler cap.

A mechanical lift pump, driven by the camshaft, is mounted on the side of the engine.

A fuel filter, fitted with a replaceable element and incorporating a water separator, is positioned on the LH side of the bulkhead.

A Bosch Type injection pump, incorporating a cold start advance unit and a high idle setting is mounted on the LH side of the engine and is directly driven by gears from the crankshaft. The pump meters and distributes fuel to 4 pintle type injectors located in pre-combustion chambers in the cylinder heads.

A return line passes excess fuel from the injection pump and injectors back to the fuel tank.

Glow plugs

Four glow plugs are located in the cylinder head, directly below each injector.

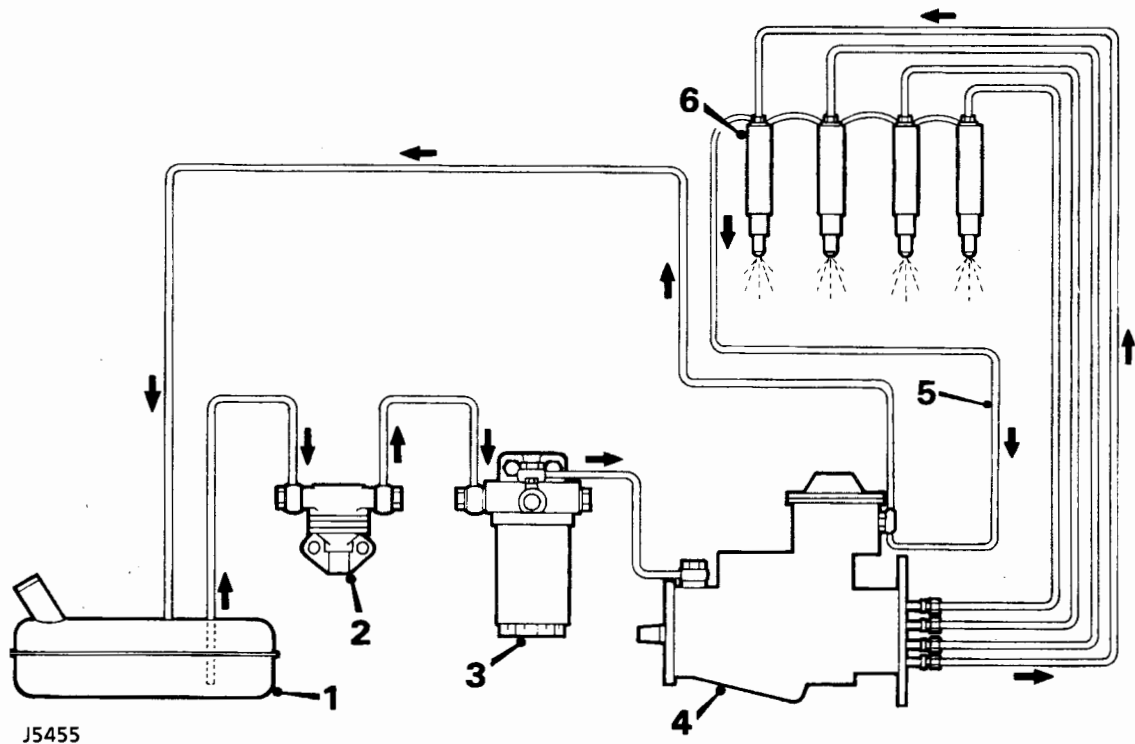
Exhaust gas recirculation (EGR)

Exhaust gas recirculation is controlled by the EGR control unit mounted in the passenger compartment on the RH 'A' post behind the fascia and receives the following inputs:

- a. Engine temperature from coolant temperature transmitter in No. 4 cylinder head;
- b. Throttle position from the potentiometer on the injection pump;
- c. Engine speed from the tachometer.
- d. EGR valve lift position.

When all correct signals are received, the EGR solenoid allows vacuum to open the EGR valve and recirculate a portion of the exhaust gas.

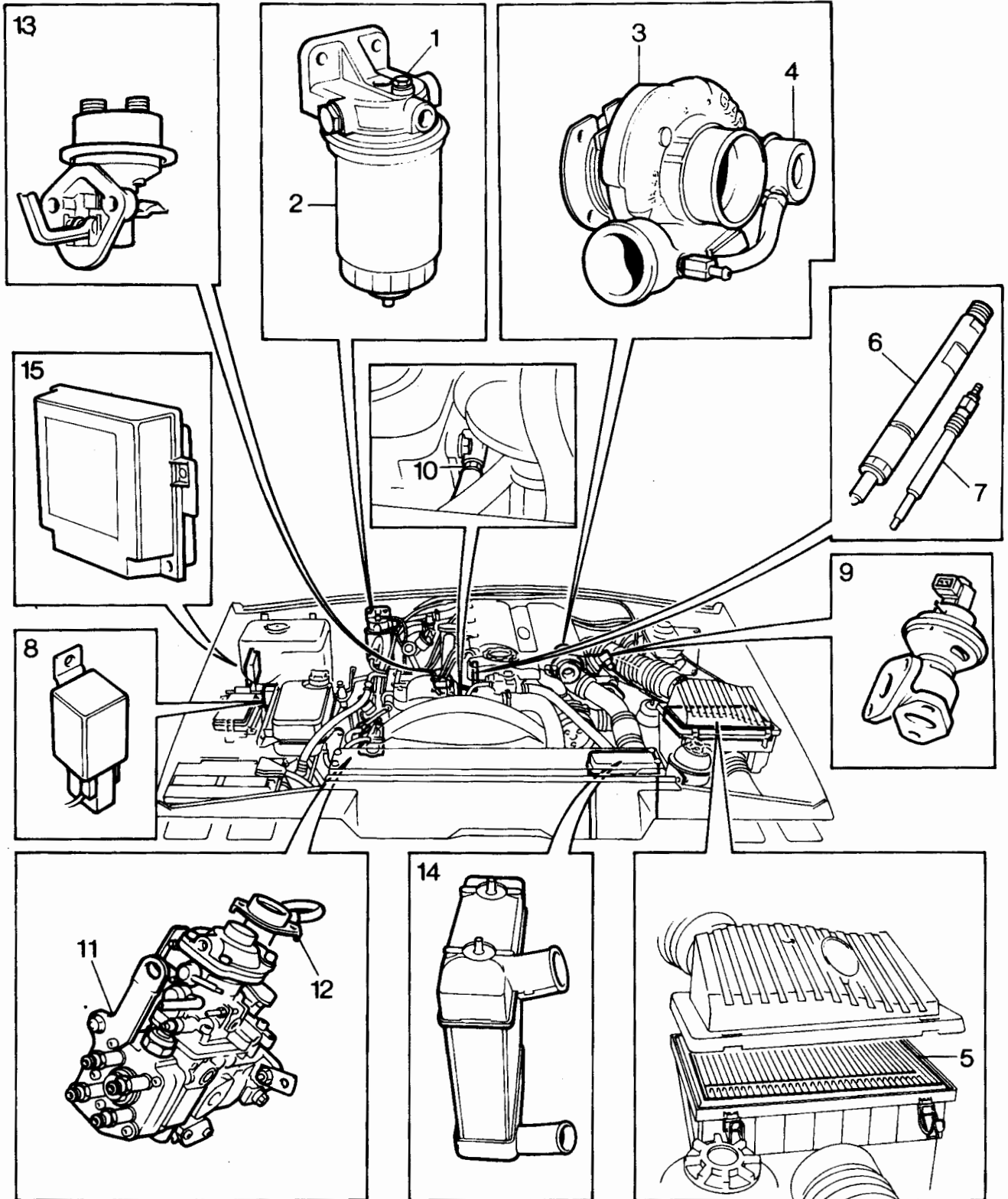
FUEL SYSTEM LAYOUT



1. Fuel tank
2. Fuel lift pump
3. Fuel filter
4. Fuel injection pump
5. Spill return line
6. Fuel injectors

FUEL SYSTEM COMPONENT LOCATION

1. Fuel filter bleed screw
2. Fuel filter
3. Turbocharger
4. Wastegate
5. Air cleaner
6. Fuel injector
7. Glow plug
8. Glow plug controller
9. EGR valve and valve lift potentiometer
10. Coolant temperature transmitter - EGR and instruments
11. Fuel injection pump
12. EGR throttle potentiometer
13. Fuel lift pump
14. Intercooler
15. EGR Control unit



J5456

OPERATION

Diesel engines operate by compression ignition. The rapid compression of air in the cylinder during the compression cycle heats the injected fuel, causing it to self ignite. During cold starting, automatically controlled glow plugs assist in raising the temperature of the compressed air to ignition point.

A cold start advance unit advances the injection timing to further assist starting. Idle quality is improved by the high idle setting.

The engine is supplied with pre-compressed air by a single stage turbocharger.

Exhaust gases passing over a turbine cause it to rotate, driving a compressor mounted on the turbine shaft. Air drawn from the cold air intake passes, via the air cleaner, to the turbocharger where it is compressed. The compressed air passes to the cylinders via an intercooler, which reduces the temperature of the compressed air, increasing its density.

Fuel is drawn from the tank by a mechanical lift pump and passes to the injection pump via a filter. In addition to removing particle contamination from the fuel, the filter incorporates a water separator, which removes and stores both bound and unbound water.

The injection pump meters a precisely timed, exact quantity of fuel to the injectors in response to throttle variations, injection timing varying with engine speed. Any excess fuel delivered to the injection pump is not injected, passing back to the tank via the fuel return line.

Fuel is injected in a finely atomised form into a pre-combustion chamber in the cylinder head where it ignites. The burning fuel expands rapidly into the main combustion chamber, creating extreme turbulence which mixes the burning fuel thoroughly with the compressed air, providing complete combustion.

Cold Starting is assisted by glow plugs, a cold start advance unit and a high idle setting.

Glow plugs

Glow plug operation is controlled by a timer unit, start relay and resistor. When the ignition is turned on the timer unit is energised, the glow plugs start to operate and a warning light on the dashboard illuminates, remaining illuminated until the glow plugs are automatically switched off.

The length of time the glow plugs will operate is dependent on under bonnet temperature, which is monitored by a sensor located in the timer unit.

Starting the engine results in the power supply to the glow plugs passing through the resistor, which reduces their operating temperature. The glow plugs are cut out either by the temperature sensor in the timer, or by a microswitch on the injection pump which operates when the throttle is depressed.

Cold start advance

The cold start advance unit is connected to the engine cooling system via hoses. It contains a temperature sensitive element which is retracted when cold and pulls the advance lever, via cable, towards the rear of the pump against spring pressure. As coolant temperature rises, the cold start element expands releasing tension on the cable and allowing spring pressure to move the advance lever forwards.



Exhaust Gas Recirculation (EGR)

Operation of the EGR system is dependent on the following:

- a. Engine temperature - must be between 20 ° C and 100 ° C approx.
- b. Engine speed - must be between 630 and 2850 rev/min.
- c. Engine load - calculated by throttle potentiometer position.
- d. EGR valve lift position.
- e. Duration of engine idling.

Under varying engine speed and load conditions the control unit sends a signal to open the vacuum modulator which allows a vacuum to be applied above the EGR valve diaphragm, the vacuum supply being taken from a 'T' connector in the brake servo hose. This process is controlled by an engine speed/load map stored in the EGR control unit memory.

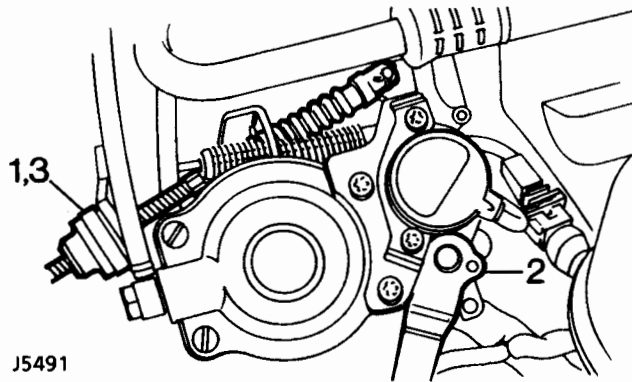
Engine speed is measured by monitoring the waveform present on one phase of the generator. Throttle position is measured via a potentiometer mounted on the fuel injection pump throttle lever. Closed loop control is achieved by allowing the control unit to continually monitor EGR valve lift via a potentiometer mounted on the valve; this valve lift is compared with the actual valve lift required on the control unit map and adjusted if necessary.

With coolant temperature between 20 ° C and 100 ° C; the engine having just returned to idle, EGR will shut off after 25-30 seconds idling.



THROTTLE CABLE

Adjust

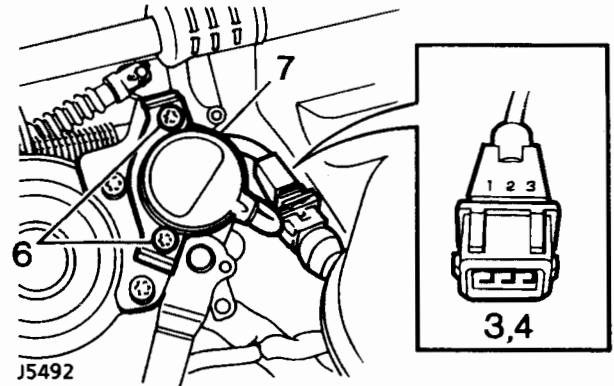


1. Loosen throttle cable adjustment ferrule.
2. Hold throttle lever in fully closed position.
3. Adjust outer cable, by rotating ferrule, to give 1.57 mm (0.062 in) of free play in the inner cable.
4. Check that throttle opens fully when the throttle is depressed.

EGR THROTTLE POSITION SENSOR

Check

1. Run engine until normal operating temperature is reached.



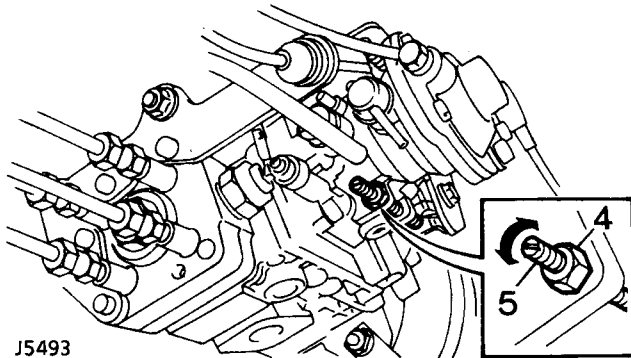
2. Switch off engine and disconnect throttle position sensor multiplug.
3. Connect an Ohmmeter across pins 1 and 3 of multiplug. Ohmmeter should read between 1K and 1.05K ohms.
4. Connect an Ohmmeter across pins 1 and 2 of multiplug. Ohmmeter should read between 850 and 900 ohms.
5. If the readings are correct, EGR position sensor is OK - reconnect multiplug.
6. Loosen 2 Torx screws securing position sensor.
7. Rotate position sensor to achieve correct Ohmmeter readings, then tighten Torx screws.
8. Re-check Ohmmeter readings, then reconnect multiplug.

LOW AND HIGH IDLE SPEED

Adjust

The high idle speed (cold start idle) is automatically set by the setting of the low idle speed and can not be adjusted individually.

1. Check and adjust throttle cable.
2. Start engine and run it until normal operating temperature is reached.
3. Using a suitable tachometer, check the engine idle speed. *See ENGINE TUNING DATA, Information, Engine - 300Tdi*



J5493

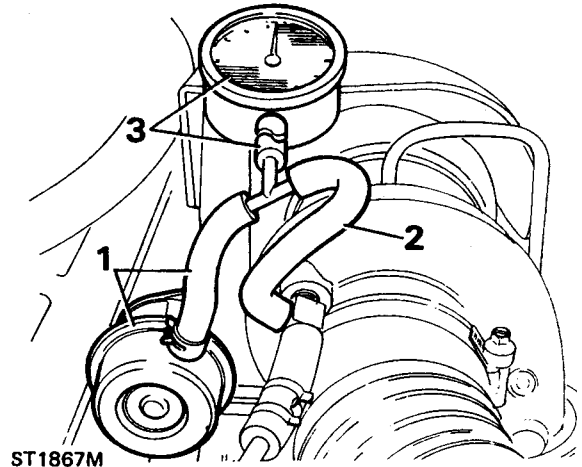
4. If adjustment is necessary, loosen the locknut on the injector pump.
5. Turn the adjustment screw either clockwise to increase the engine speed or anti-clockwise to decrease the speed. Run the engine at an increased speed for a few seconds then check the idle speed again.
6. When the correct speed has been achieved, hold the adjuster screw steady while tightening the locknut.



NOTE: The low idle speed control is the only permitted adjustment in service. Any additional adjustments required must be entrusted to authorised Bosch agents.

CHECK TURBOCHARGER BOOST PRESSURE

For boost pressure. *See ENGINE TUNING DATA, Information, Turbocharger*



ST1867M

1. Disconnect, from turbocharger, hose to actuator. Insert into a suitable "T" piece.
2. Connect a short length of suitable hose to turbocharger and connect other end to "T" piece.
3. Connect a further length of hose to third leg of the "T" piece and other end to a pressure gauge capable of reading in excess of 61 cm Hg. The pressure gauge hose must be capable of reaching passenger compartment so that gauge may be observed.
4. To check maximum boost pressure, drive vehicle normally but in such a manner that full throttle can be maintained whilst climbing a hill with engine speed held steady between 2,500 and 3,000 rev/min.



TANK SENDER UNIT

Service repair no - 88.25.32



WARNING: Ensure that the **WARNINGS** and **FUEL HANDLING PRECAUTIONS** given in Section 01 are adhered to before carrying out the following operations.

Special tool - LST131

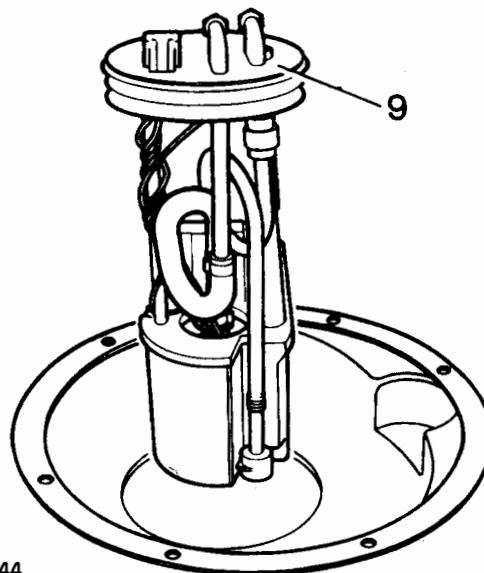
Remove

1. Disconnect battery negative lead.
2. Remove the rear carpet retainer.
3. Ease the carpet from under the lower trim panels at the rear of the fold down seats.
4. Raise the carpet to expose the sound insulation.
5. Fold back the sound insulation to reveal the access panel.
6. Remove the securing screws and detach the access panel from the floor.
7. Disconnect the multi-plug from sender unit.

8. Disconnect the fuel pipes from the sender unit.
9. Using special tool LST131 remove the locking ring and withdraw the sender unit from the fuel tank.

Refit

10. Fit the sender unit to the fuel tank and secure with the locking ring. Tighten to **45 to 50 Nm**.
11. Connect the fuel pipes to the sender unit.
12. Connect multi-plug to sender unit.
13. Inspect the access panel seal to ensure that it is satisfactory for further use, renew as necessary.
14. Fit the access panel to the aperture in the floor and secure with the screws.
15. Reverse removal procedure. 1 to 5. Refit the sound insulation and carpet.



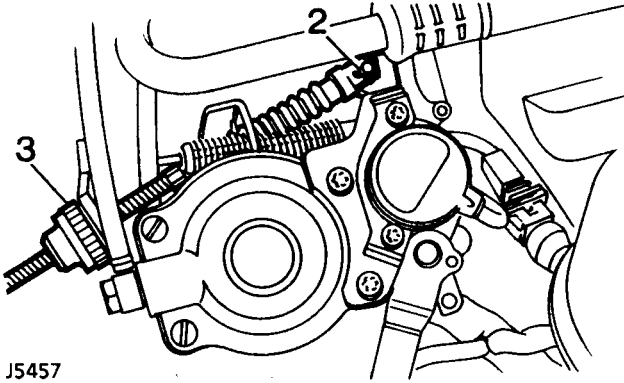
J5444

THROTTLE CABLE

Service repair no - 19.20.06

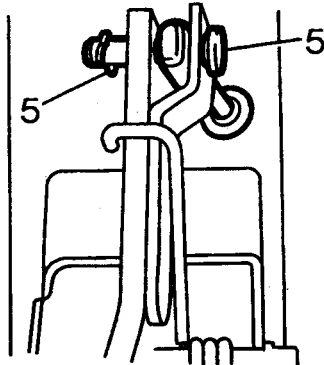
Remove

1. Disconnect battery negative lead.



J5457

2. Remove pin and clevis pin securing throttle cable to throttle lever.
3. Pull ferrule from abutment bracket and withdraw throttle cable.
4. Release throttle cable from clip on bulkhead.



J5458

5. Remove pin and clevis pin securing throttle cable to throttle lever.
6. Release grommet from bulkhead.
7. Withdraw throttle cable from engine compartment.

Refit

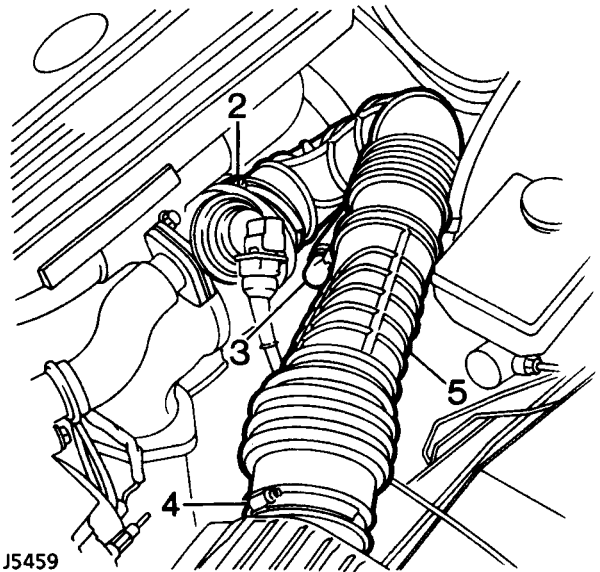
8. Reverse removal procedure. Use new pins to secure clevis pins.
9. Adjust throttle cable. **See Adjustment, Throttle Cable Adjustment**

INTAKE HOSE TURBOCHARGER

Service repair no - 19.42.11

Remove

1. Disconnect battery negative lead.



J5459

2. Loosen clip and disconnect intake hose from turbocharger.
3. Loosen clip and disconnect breather hose from intake hose.
4. Remove clip and disconnect hose from air cleaner, discard clip.
5. Remove intake hose

Refit

6. Reverse removal procedure. Use a new clip to secure intake hose to air cleaner.

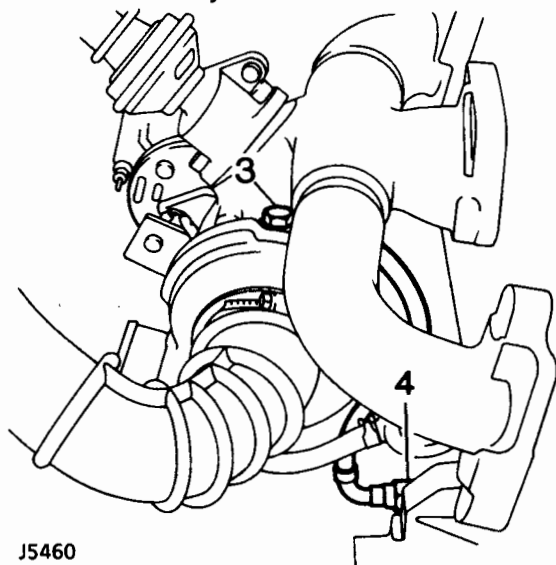


TURBOCHARGER OIL FEED PIPE

Service repair no - 19.42.14

Remove

1. Disconnect battery negative lead.
2. Remove exhaust front pipe. *See MANIFOLD AND EXHAUST SYSTEM, Repair, Manifold and Exhaust System - Tdi*



J5460

3. Remove banjo bolt securing oil feed pipe to turbocharger, discard 2 sealing washers.
4. Unscrew union, disconnect oil feed pipe from cylinder block.



CAUTION: Plug the connections.

5. Move oil feed pipe from behind turbocharger and remove.

Refit

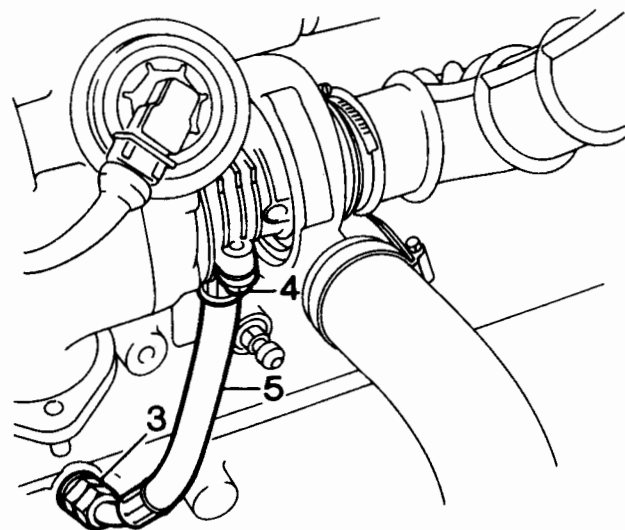
6. Reverse removal procedure. use new sealing washers.
7. Tighten banjo bolt to **20 Nm**.
8. Check/top-up engine oil level.

TURBOCHARGER OIL DRAIN PIPE

Service repair no - 19.42.12

Remove

1. Disconnect battery negative lead.
2. Remove exhaust front pipe. *See MANIFOLD AND EXHAUST SYSTEM, Repair, Manifold and Exhaust System - Tdi*



J5461

3. Unscrew union and disconnect oil drain pipe from cylinder lock.
4. Remove 2 bolts securing oil drain pipe to turbocharger.
5. Remove oil drain pipe, remove and discard gasket.



CAUTION: Plug the connection.

Refit

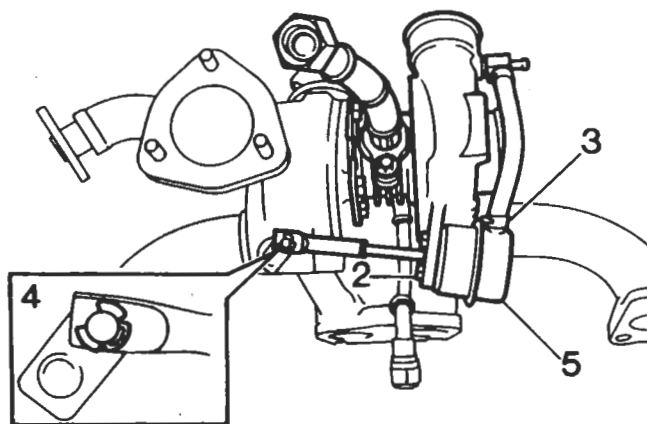
6. Ensure mating surfaces of oil pipe, turbocharger and engine block are clean.
7. Reverse removal procedure. Use a new gasket.
8. Tighten oil drain pipe to turbocharger bolts to **25 Nm**.
9. Check/top-up engine oil level.

TURBOCHARGER ACTUATOR

Service repair no - 19.42.31

Remove

1. Remove exhaust manifold and turbocharger. **See MANIFOLD AND EXHAUST SYSTEM, Repair, Exhaust Manifold - Tdi**



J5488

2. Remove 2 nuts securing the actuator to the turbocharger bracket.
3. Release clip and disconnect hose from actuator.
4. Remove and discard clip securing control lever to wastegate spindle.
5. Remove turbocharger actuator.

Refit

6. Fit the replacement actuator and secure with nuts.
7. Push the control lever as far as possible towards the actuator and apply pressure to keep the lever in this position.
8. Pressurise the actuator to 57 - 62 cm Hg and hold this pressure.



CAUTION: Use only the threaded end of the lever to make adjustments. Forcing the complete lever in or out will change the calibration with the possibility of damaging engine boost.

9. Screw the lever in either direction until the eye on the end will locate easily over the wastegate spindle and secure with a new clip.
10. Release the pressure and tighten the locknut.
11. Refit exhaust manifold and turbocharger. **See MANIFOLD AND EXHAUST SYSTEM, Repair, Exhaust Manifold - Tdi**

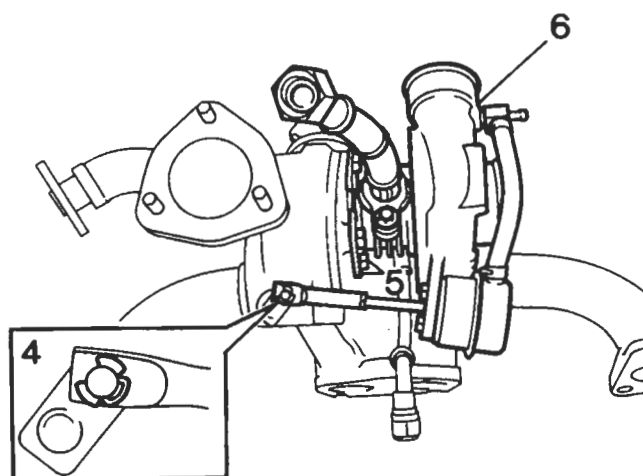
TURBOCHARGER AND GASKET

Service repair no - Turbocharger - 19.42.01

Service repair no - Gasket - 19.42.25

Remove

1. Disconnect battery negative lead.
2. Remove air cleaner assembly. **See Air Cleaner**
3. Remove exhaust manifold assembly. **See MANIFOLD AND EXHAUST SYSTEM, Repair, Exhaust Manifold - Tdi**



J5469

4. Remove and discard clip securing control lever to wastegate spindle.
5. Remove 4 bolts and 2 clamp plates securing turbocharger to exhaust manifold.
6. Remove turbocharger and discard gaskets.

Refit

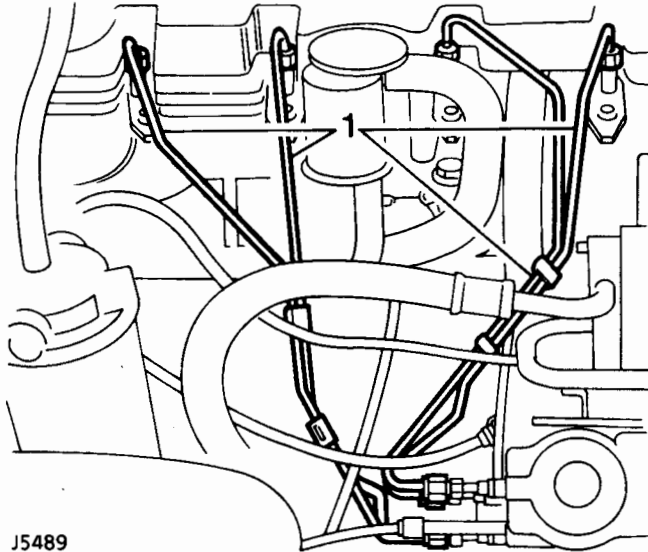
7. Clean mating faces of turbocharger and exhaust manifold.
8. Reverse removal procedure. Use new clip to secure control lever to wastegate spindle. Tighten to **45 Nm**.
9. Check/top-up engine oil level.



FUEL LIFT PUMP

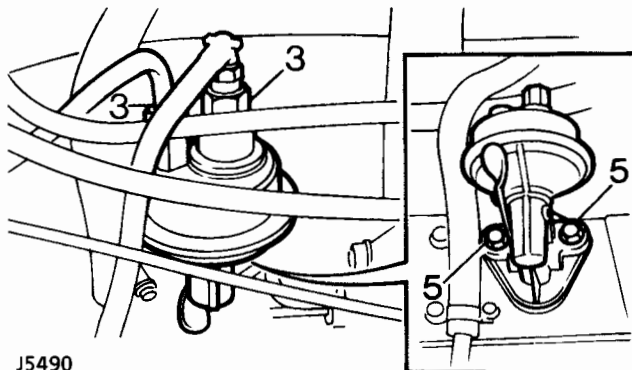
Service repair no - 19.45.09

Remove



J5489

1. Loosen unions securing fuel injection pipes to injectors and injector pump. Remove injection pipes.
2. Plug the connections to prevent the ingress of foreign material.



J5490

3. Loosen unions and disconnect fuel supply and feed hoses from fuel lift pump.
4. Plug the connections to prevent the ingress of foreign material.
5. Remove 2 bolts securing lift pump to engine block.
6. Remove fuel lift pump and discard gasket.

Refit

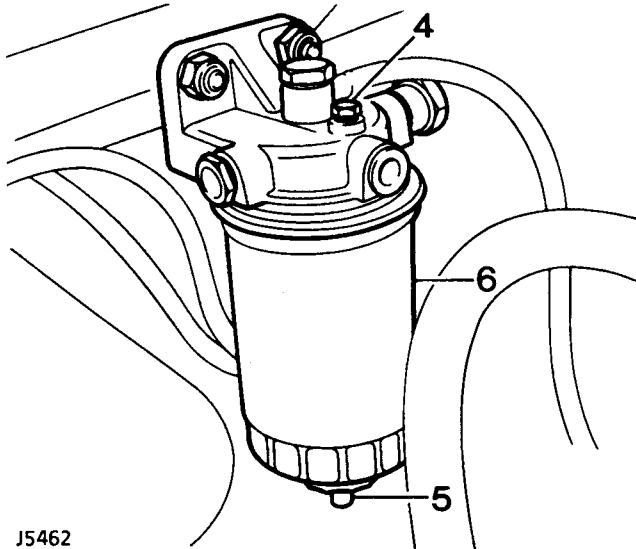
7. Clean mating faces of fuel lift pump and engine block.
8. Using a new gasket, fit fuel pump, ensure correct location of lever with camshaft. Fit securing bolts. Tighten to **25 Nm**.
9. Connect fuel hoses to pump and secure unions. Tighten to **33 Nm**.
10. Fit injector pipes to injectors and injection pump, and secure unions. Tighten to **28 Nm**.

FUEL FILTER ELEMENT

Service repair no - 19.25.07

Remove

1. Disconnect battery negative lead.
2. Clean area around filter head.
3. Place a suitable container beneath filter bowl to collect any spillage.



J5462

4. Loosen bleed screw.
5. Loosen drain tap, allow fuel to drain into container.
6. Unscrew filter element, discard element.

Refit

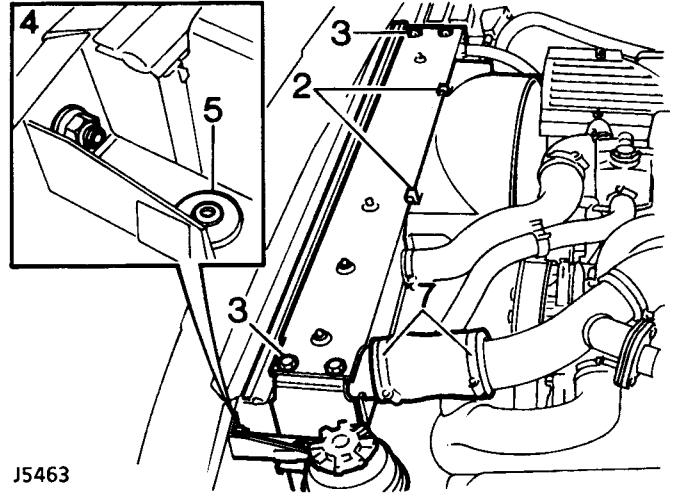
7. Clean seal and seating in filter head.
8. Lubricate filter element seal with fuel.
9. Position filter element to filter head and hand tighten.
10. Reconnect battery negative lead.
11. Crank engine until fuel is drawn through the system and starts.

INTERCOOLER

Service repair no - 19.42.15

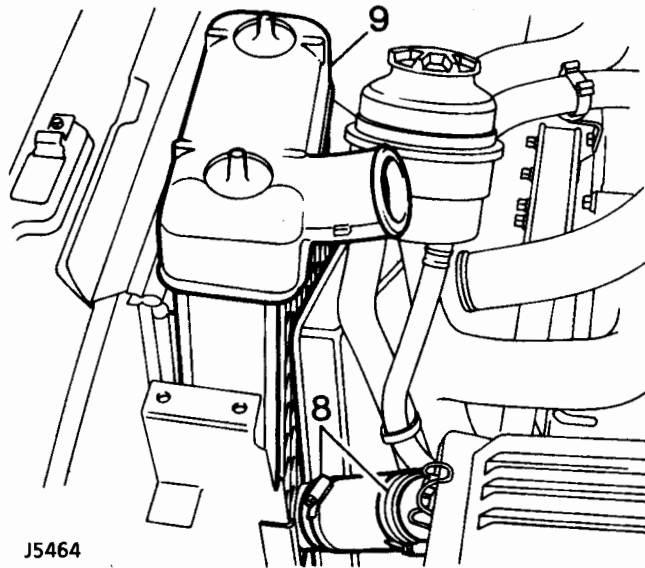
Remove

1. Disconnect battery negative lead.



J5463

2. Release 2 clips securing fan cowl to radiator top cover.
3. Remove 4 bolts securing radiator top cover, remove top cover.
4. Remove nut, bolt and washers securing intercooler side cover bracket to bonnet [hood] platform.
5. Release bracket from side cover lug, position bracket and power steering reservoir aside.
6. Position side cover away from intercooler.
7. Loosen 2 clips and disconnect top hose from intercooler.
8. Loosen 2 clips and disconnect bottom hose from intercooler.



J5464

9. Move intercooler upwards and clear of fan cowl.

Refit

10. Ensure locating lug grommets are fitted and in good condition.
11. Ensure foam pad is in good condition and attached to intercooler.
12. Move intercooler into position.
13. Reverse removal procedure.

GLOW PLUGS

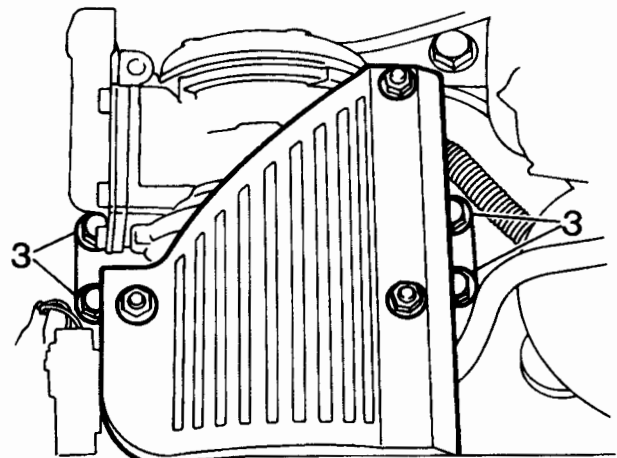
Service repair no - 19.60.31

Remove

1. Disconnect battery negative lead.

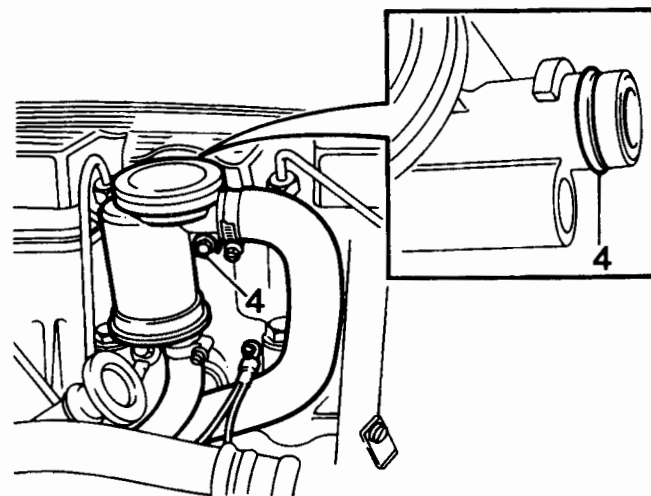
No.1 glow plug - air conditioning models

2. Release drive belt from compressor pulley. See **ENGINE, Repair, Drive Belt Renew**



J5465

3. Remove 4 bolts securing compressor to front cover, move compressor aside.

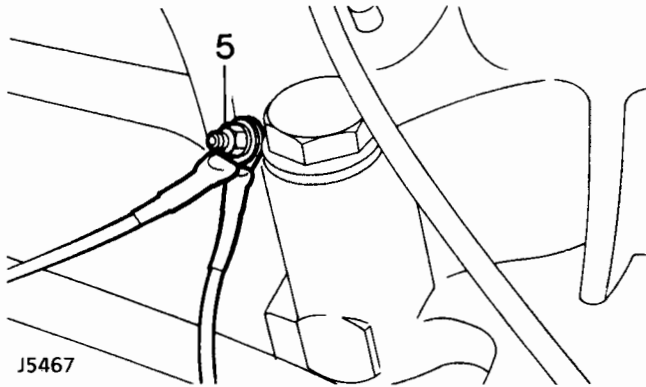


J5466

No.3 glow plug

4. Remove bolt securing Hummel valve, withdraw valve, remove and discard 'O' ring.

All glow plugs



J5467

5. Remove terminal nut from glow plug, disconnect wire from glow plug terminal.
6. Remove glow plug.

Refit

7. Clean glow plug and seating.
8. Coat threads of glow plug with suitable anti-seize compound operational to a temperature of 1000° C.
9. Fit glow plug. Tighten to **23 Nm**.
10. Connect wire to glow plug terminal and secure with nut.



NOTE: Feed wire must be connected to No. 4 glow plug terminal.

11. *No. 3 glow plug:* Lubricate new 'O' ring with engine oil and fit to Hummel valve. Fit valve and secure with bolt. Tighten to **15 Nm**.

No. 1 glow plug - air conditioning models

12. Position compressor to front cover, fit bolts. Tighten to **25 Nm**.
13. Fit drive belt to compressor pulley and adjust tension. **See ENGINE, Repair, Drive Belt Renew**

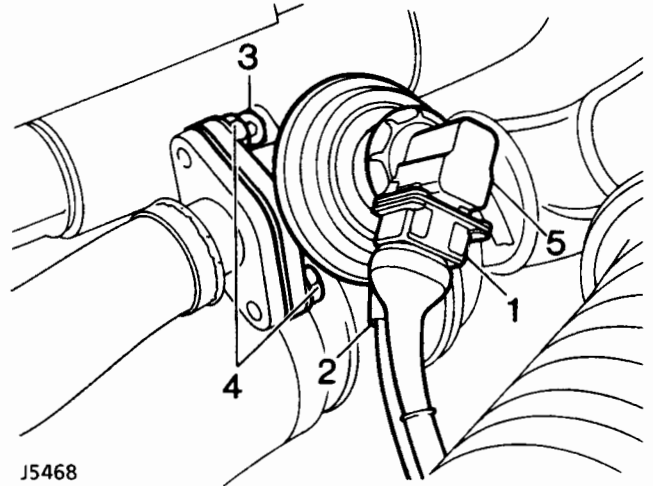
All models

14. Reconnect battery negative lead.

EGR VALVE

Service repair no - 19.45.01

Remove



J5468

1. Disconnect multiplug from EGR valve.
2. Disconnect vacuum pipe from EGR valve.
3. Remove 2 Allen screws securing EGR valve to exhaust manifold.
4. Remove 2 bolts securing hose to EGR valve.
5. Remove EGR valve and discard gaskets.

Refit

6. Clean mating faces of EGR valve and exhaust manifold.
7. Reverse removal procedure. Tighten bolts to **25 Nm**.

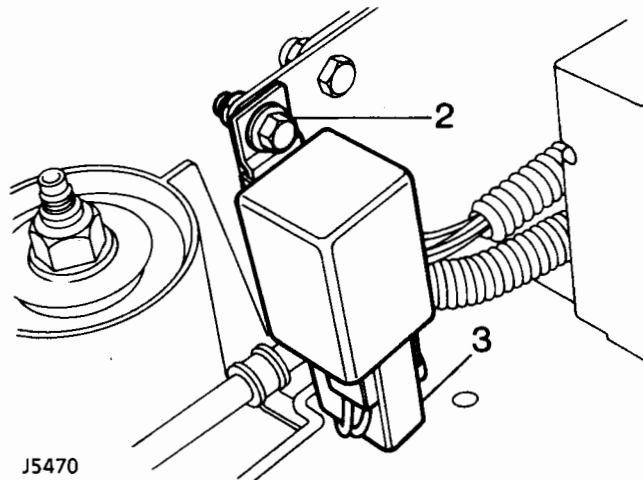


GLOW PLUG CONTROL UNIT

Service repair no - 19.60.33

Remove

1. Disconnect battery negative lead.



J5470

2. Remove nut and bolt securing control unit to mounting bracket.
3. Disconnect multiplug and remove control unit.

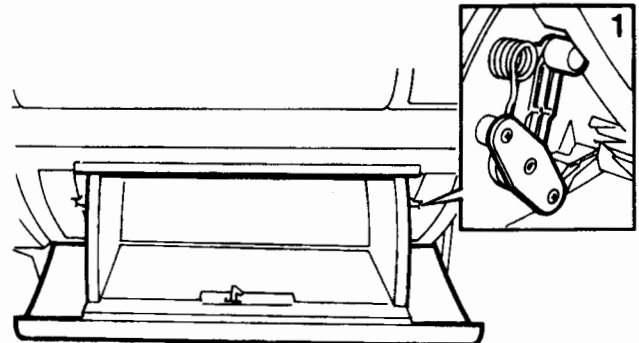
Refit

4. Reverse removal procedure.

EGR CONTROL UNIT

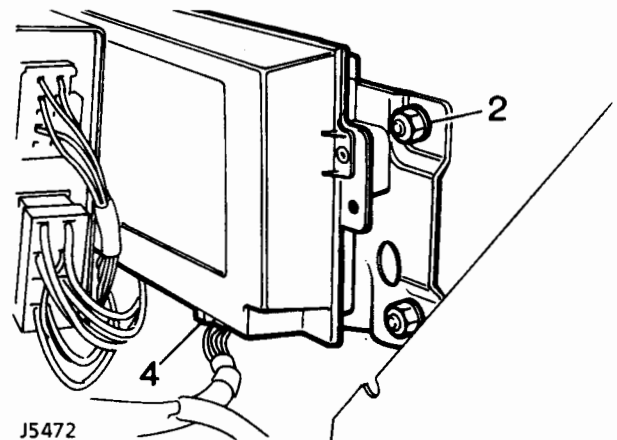
Service repair no - 19.45.06

Remove



J5471

1. Release 2 glovebox stays from fascia and pivot glovebox fully downwards.



J5472

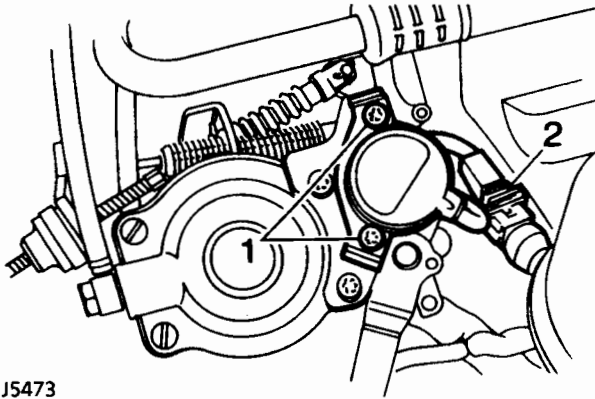
2. Remove 2 plastic nuts securing control unit to body.
3. Release control unit from fixings.
4. Disconnect multiplug and remove control unit.

Refit

5. Reverse removal procedure.

EGR THROTTLE POSITION SENSOR

Service repair no - 19.30.14

Remove

J5473

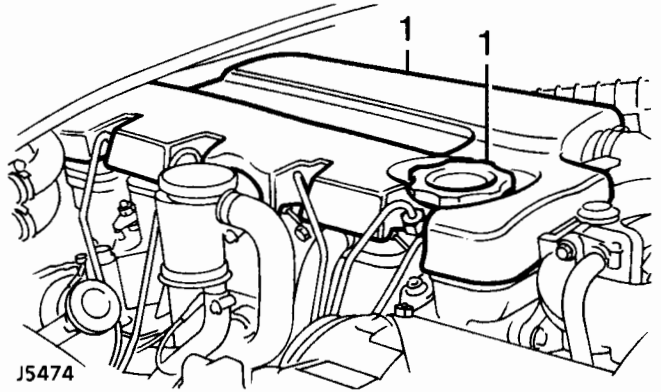
1. Remove 2 screws securing throttle position sensor mounting plate to injection pump.
2. Disconnect throttle position sensor multiplug from harness.
3. Remove throttle position sensor assembly.

Refit

4. Locate throttle position sensor assembly on injection pump and fit and tighten screws.
5. Connect multiplug.
6. Adjust throttle position sensor. **See Adjustment, EGR Throttle Position sensor**

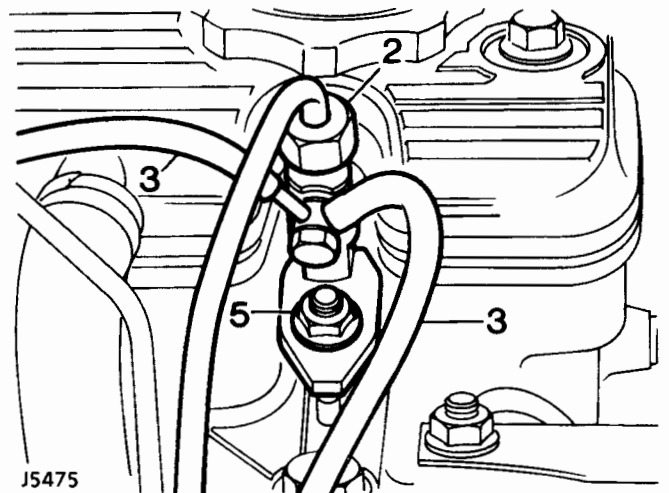
INJECTORS

Service repair no - 19.60.10

Remove

J5474

1. Remove oil filler cap and remove sound deadening pad from top of engine.
2. Remove high pressure pipe from relevant injector and injection pump.
3. Disconnect spill return hose(s) from injector.
4. Plug pipes and injector connections to prevent the ingress of dirt and foreign matter.
5. Remove nut securing injector clamp plate to cylinder head.
6. Remove injector.



J5475

Refit

7. Reverse removal procedure. Renew copper washer on injector. Tighten injector clamp plate nut to **25 Nm**.



FUEL INJECTION PUMP AND TIMING

Service repair no - 19.30.07

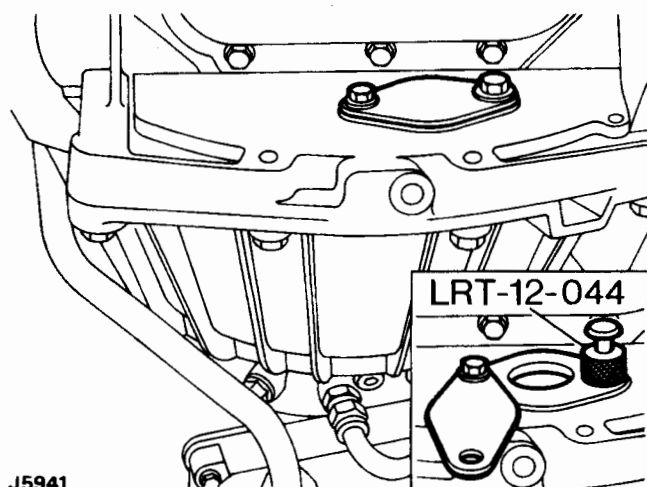


NOTE: The following text refers to a Tdi vehicle with a manual gearbox without electronic diesel control. Where reference is made to the timing tool substitute the following information for automatic and EDC variants.

If manual gearbox: Timing tool LRT-12-044 fits into the base of the flywheel housing

If manual gearbox with EDC: Timing tool LRT-12-085 must be used and also fits into the base of the flywheel housing.

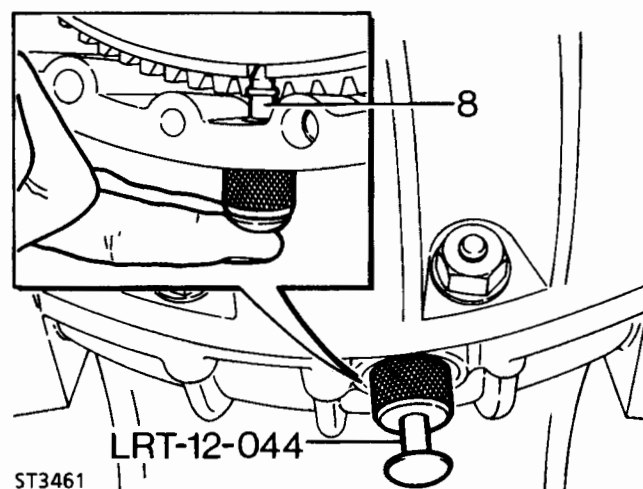
If automatic gearbox: Timing tool LRT-12-044 fits into the larger bolt hole of coverplate on engine backplate, sited near to the rear of sump. Pin locates in ring gear.



J5941

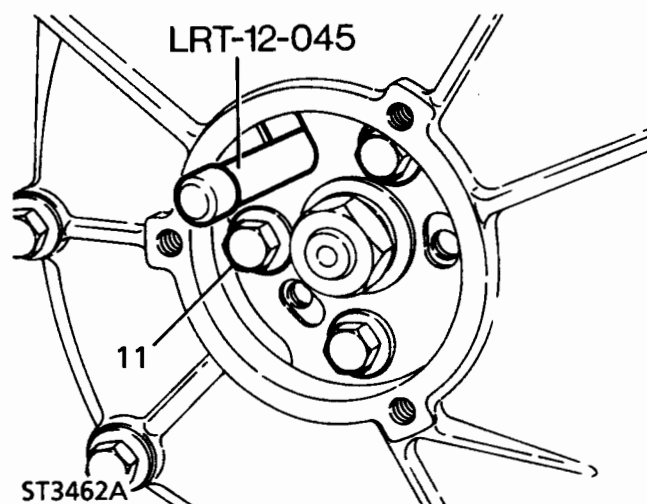
Remove

1. Disconnect battery negative lead.
2. Remove injection pipes, pump to injector.
3. Remove oil filler cap from rocker cover.
4. Viewing valve mechanism through filler aperture, turn crankshaft clockwise until No. 1 cylinder is just before TDC.
5. Refit oil filler cap.
6. Remove blanking plug from flywheel housing.
7. Fit timing tool LRT-12-044 to flywheel housing, do not engage centre pin.



ST3461

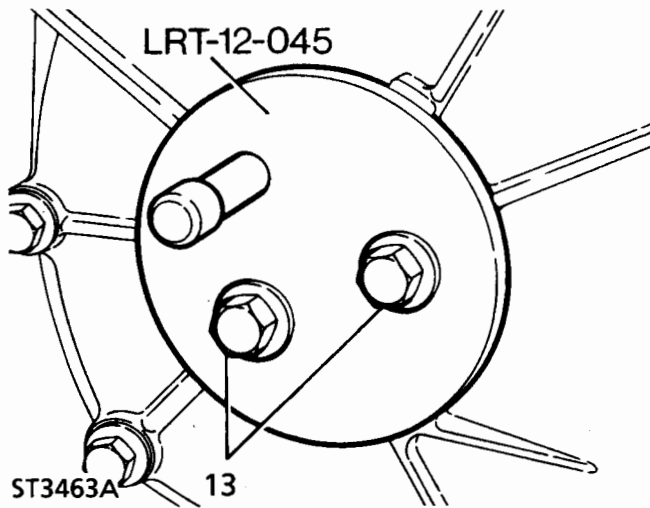
8. Continue rotating crankshaft clockwise until centre pin engages with timing slot in flywheel.
9. Remove injection pump access plate, complete with gasket, from front cover plate.
10. Fit pin from LRT-12-045 to injection pump gear.



ST3462A

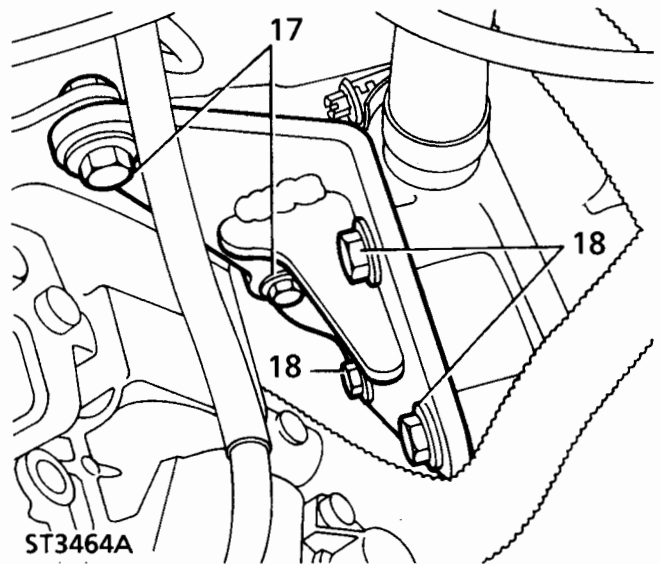
19 FUEL SYSTEM

11. Remove drive gear to pump hub fixing bolts and plate.
12. Remove pin from pump gear.



13. Fit gear retaining tool LRT-12-045 with an 8 mm washer, 1.5 to 2 mm thick, under each bolt head in addition to the existing washer.
14. Remove throttle cable and hand throttle cable if fitted.

15. Disconnect stop control solenoid connector.
16. Remove banjo bolts securing spill return, main fuel and boost signal pipes, refit banjo bolts after disconnecting pipes.

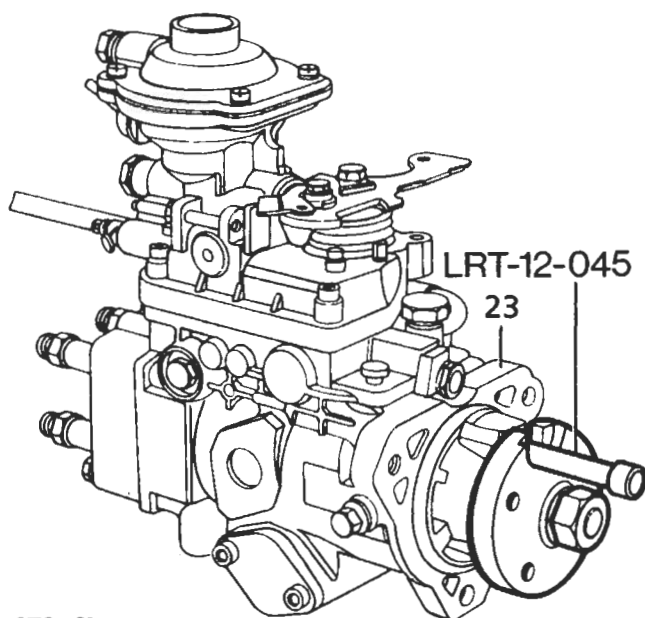


17. Remove pump mounting bracket bolts 2 off.
18. Loosen pump support bracket bolts to block, sufficient for bracket to just move.
19. Remove pump securing nuts at flange and withdraw pump and gasket.
20. Fit blanks to pipe connections.



Refit

21. Remove blanks from pump.



ST3467A

22. Remove special tool pin from pump.
 23. Clean mating faces of pump and front cover.
 24. Fit pump to cover with a new gasket and secure with nuts. Tighten to **25 Nm**.
 25. Attach pump to bracket and finger tighten nuts and bolts
 26. First tighten bolts securing bracket to block and then bolts securing pump to bracket.
 27. Connect spill return, main fuel pipes. Tighten to **25 Nm**.

28. Connect boost signal pipe and secure with banjo bolts. Tighten to **10 Nm**.
 29. Connect stop control solenoid lead.
 30. Connect throttle cable and where applicable hand throttle cable.
 31. Remove special tool LRT-12-045.
 32. Fit gear lock plate.
 33. Fit pin from special tool LRT-12-045.
 34. Secure gear with bolts.
 35. Remove special tool pin.
 36. Turn crankshaft two complete revolutions, check timing pin from LRT-12-045 can be fully and easily inserted into the pump. At the same time check flywheel timing pin LST-12-044 can also be inserted in the flywheel slot.
 37. If, with the flywheel timing pin located, the timing pin cannot be inserted cleanly into the injection pump, carry out the following:
 - Ensure flywheel timing pin is disengaged from slot in flywheel.
 - Turn the crankshaft the small amount necessary to enable the timing pin to be inserted into the pump.
 - Loosen the three pump gear retaining bolts.
 - Turn the crankshaft to T.D.C..
 - Check that the timing pin is an easy fit in the pump and that the flywheel timing pin locates.
 - Tighten the pump gear retaining bolts to the correct torque.
 - Remove the timing pin from the pump and the timing tool from the flywheel housing.
38. Using antisieze compound, fit the blanking plug to flywheel housing. Tighten to **12 Nm**.
 39. Fit access plate with gasket to front cover plate. Tighten to **25 Nm**.
 40. Refit injector pipes. Tighten to **29 Nm**.

VEHICLE SPEED SENSOR

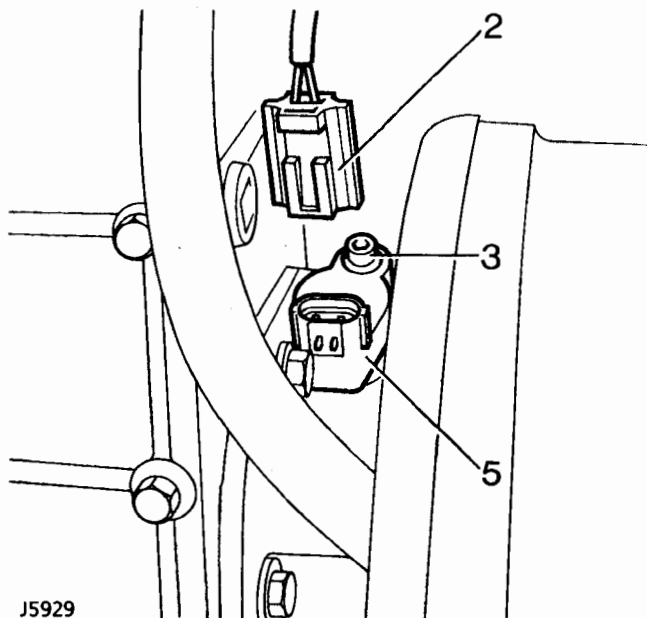
Service repair no - 18.30.22

Remove



NOTE: The following procedure is carried out with the ramp still raised.

1. Disconnect battery negative lead.



2. Disconnect sensor multi-plug.
3. Remove sensor retaining screw.
4. Remove sensor retaining plate.
5. Remove sensor from transfer box.

Refit

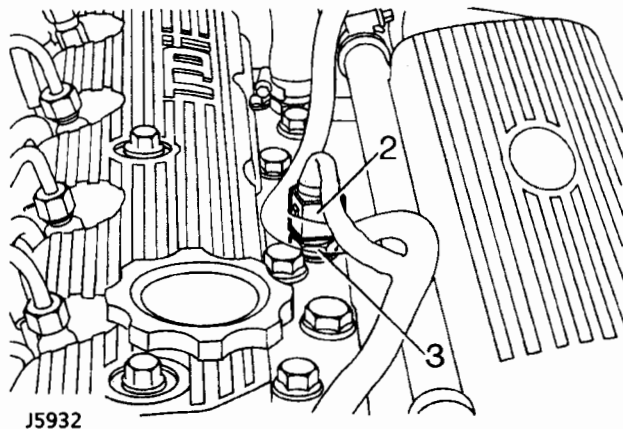
6. Reverse removal procedure.

COOLANT TEMPERATURE SENSOR

Service repair no - 18.30.68

Remove

1. Disconnect battery negative lead.



2. Disconnect sensor multi-plug.
3. Remove sensor.
4. Clean off water spillage from sensor area.

Refit

5. Fit a new copper washer.
6. Fit sensor and tighten securely.
7. Refill cooling system.
8. Run engine, check for water leaks around sensor.

19 - FUEL SYSTEM

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MFI

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DESCRIPTION

Hot Wire Multiport Fuel Injection

The 'Hot Wire' Multiport fuel injection system derives its name from the mass air flow sensor which uses one cold wire and one electrically heated wire to measure the volume of air entering the engine.

The function of the system is to supply the exact amount of fuel directly into the intake manifold according to the prevailing engine operating conditions.

To monitor these conditions, various sensors are fitted to the engine to measure engine parameters. Data from the sensors is received by the Engine control module (ECM), the ECM will then determine the exact amount of fuel required at any condition.

The ECM having received data from the sensors produces pulses, the length of which will determine the simultaneous open time of each bank of injectors in turn, which will govern the amount of fuel injected.

Engine control module - ECM

The Multiport fuel injection system is controlled by the 14 CUX Engine Control Module comprising of a microprocessor with integrated circuits and components mounted on printed circuit boards. The ECM is connected to the main harness by a 40 pin plug.

Injectors

The eight fuel injectors are fitted between the pressurized fuel rail and inlet manifold. Each injector comprises a solenoid operated needle valve with a movable plunger rigidly attached to the nozzle valve. When the solenoid is energized the plunger is attracted off its seat and allows pressurized fuel into the intake manifold.

Engine coolant temperature sensor

The engine coolant temperature sensor is located in the front of the thermostat housing. The sensor provides engine coolant information to the ECM. The ECM increases the injector opening time when cold to provide improved driveability, and reduces the opening time as the engine reaches normal operating temperature.

Engine fuel temperature sensor

The engine fuel temperature sensor is located in the rail on the RH side of the ram housing. The sensor sends fuel temperature data to the ECM, the ECM on receiving the data will adjust the injector open time accordingly to produce good hot starting in high ambient temperatures.

Idle air control valve

The idle air control valve is screwed into a housing attached to the rear of the plenum chamber, between the plenum chamber and bulkhead. The idle air control valve has two windings which enable the motor to be energised in both directions thus opening or closing the air valve as required by the ECM.

The idle air control valve will open and allow extra air into the plenum chamber to maintain engine idle speed when the engine is under increased (Electrical and Mechanical) loads.

The idle air control valve will control engine idle speed when the vehicle is stationary.

Heated oxygen sensors (O₂ sensors) - Catalyst vehicles

The two heated oxygen sensors are located forward of the catalysts mounted in the exhaust downpipes.

The sensors monitor the oxygen content of the exhaust gases and provide feedback information of the air/fuel ratio to the ECM. Each sensor is heated by an electrical element to improve its response time when the ignition is switched on.

Fuel pressure regulator

The fuel pressure regulator is mounted in the fuel rail at the rear of the plenum chamber. The regulator is a mechanical device controlled by plenum chamber vacuum, it ensures that fuel rail pressure is maintained at a constant pressure difference of 2.5 bar above that of the manifold.

When pressure exceeds the regulator setting excess fuel is returned to the fuel tank.

Fuel pump

The electric fuel pump is located in the fuel tank, and is a self priming 'wet' pump, the motor is immersed in the fuel within the tank.

Air flow sensor

The hot-wire air flow sensor is mounted on a bracket attached to the left hand valance, rigidly connected to the air cleaner and by hose to the plenum chamber inlet neck.

The air flow sensor consists of a cast alloy body through which air flows. A proportion of this air flows through a bypass in which two wire elements are situated: one is a sensing wire and the other is a compensating wire. Under the control of an electronic module which is mounted on the air flow sensor body, a small current is passed through the sensing wire to produce a heating effect. The compensating wire is also connected to the module but is not heated, but reacts to the temperature of the air taken in, as engine intake air passes over the wires a cooling effect takes place.

The electronic module monitors the reaction of the wires in proportion to the air stream and provides output signals in proportion to the air mass flow rate which are compatible with the requirements of the ECM.

Throttle position sensor

The throttle position sensor is mounted on the side of the plenum chamber inlet neck and is directly coupled to the throttle butterfly shaft.

The throttle position sensor is a resistive device supplied with a voltage from the ECM. Movement of the accelerator pedal causes the throttle valve to open, thus rotating the wiper arm within the throttle position sensor which in turn varies the resistance in proportion to the valve position. The ECM lengthens the injector open time when it detects a change in output voltage (rising) from the throttle position sensor.

In addition the ECM will weaken the mixture when it detects the throttle position sensor output voltage is decreasing under deceleration and will shorten the length of time the injectors are open.

When the throttle is fully open, the ECM will detect the corresponding throttle position sensor voltage and will apply full load enrichment. This is a fixed percentage and is independent of temperature. Full load enrichment is also achieved by adjusting the length of the injector open time.

When the throttle is closed, overrun fuel cut off or idle speed control may be facilitated dependant on other inputs to the ECM.

The throttle position sensor is 'self adaptive', which means that adjustment is not possible. It also means the throttle position sensor setting is not lost, for example, when throttle stop wear occurs.



CAUTION: Do not attempt to adjust throttle position sensor.



Tune select resistor -

To suit individual market requirements a tune select resistor is connected across pins 5 and 27 of the ECM.

It is located adjacent to the ECM, and strapped to the MFI cable assembly. The value of the resistor is dependent on the market application:

Red wire, 180 ohms, Australia, Rest of world.

Green wire, 470 Ohms, UK and Europe - non catalyst.

Yellow wire 910 Ohms, Saudi non catalyst.

White wire, 3K9 Ohms, European catalyst

Condenser fans

It should be noted that under high coolant temperatures, when the engine is switched off, the condenser fans will be activated and will run for approximately ten minutes.

Vehicle speed sensor

The vehicle speed sensor is located on the side of the Transfer box adjacent to the parking brake. The sensor provides road speed data to the ECM. The ECM in turn detects vehicle movement from the road speed input and ensures that idle air control mode is disengaged. Should the vehicle speed sensor fail in service the ECM idle air control would become erratic.

The sensor also provides road speed data to the electric speedometer and cruise control ECU.

Inertia fuel shutoff switch

The inertia fuel shutoff switch is a mechanically operated switch, located on the bulkhead adjacent to the washer reservoir under bonnet [hood]. The switch is normally closed and is in line with the fuel pump. In the event of a sudden impact the switch opens, and disconnects the electrical feed to the fuel pump. The switch is reset by pressing down the button.



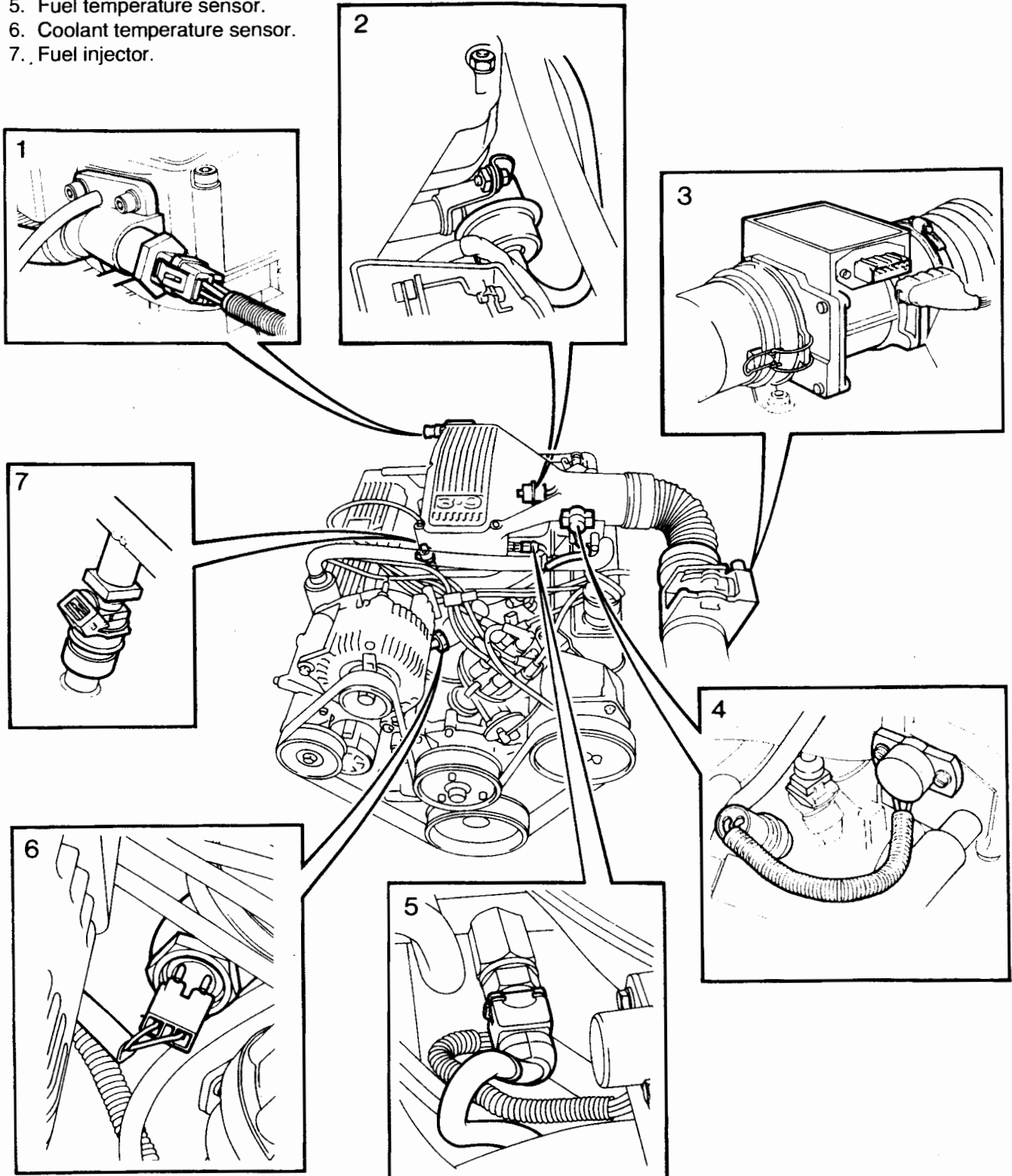
WARNING: Check the integrity of the fuel system before the inertia switch is reset.

Relay modules

The two multipoint fuel injection relay are located in the RH footwell area behind the 'A' post panel. The main relay module is energized via the ECM when the ignition is switched on and supplies current to the multipoint fuel injection system. The fuel pump relay module is energized by the ECM which in turn operates the fuel pump to pressurize the fuel system.

ENGINE MOUNTED COMPONENTS

1. By-pass air valve (stepper motor).
2. Fuel pressure regulator.
3. Air flow meter.
4. Throttle position sensor.
5. Fuel temperature sensor.
6. Coolant temperature sensor.
7. Fuel injector.

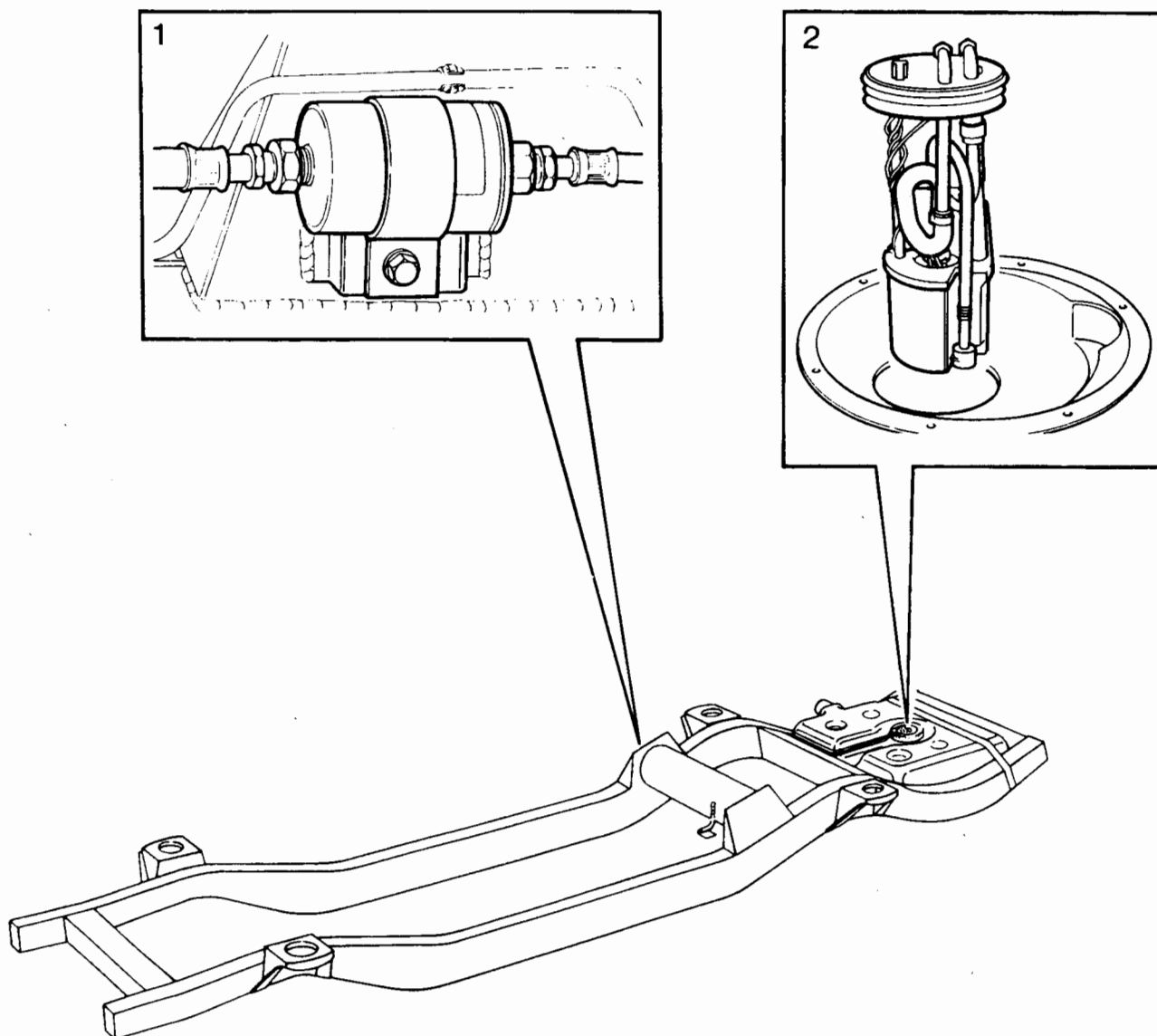


J5425



CHASSIS MOUNTED COMPONENTS

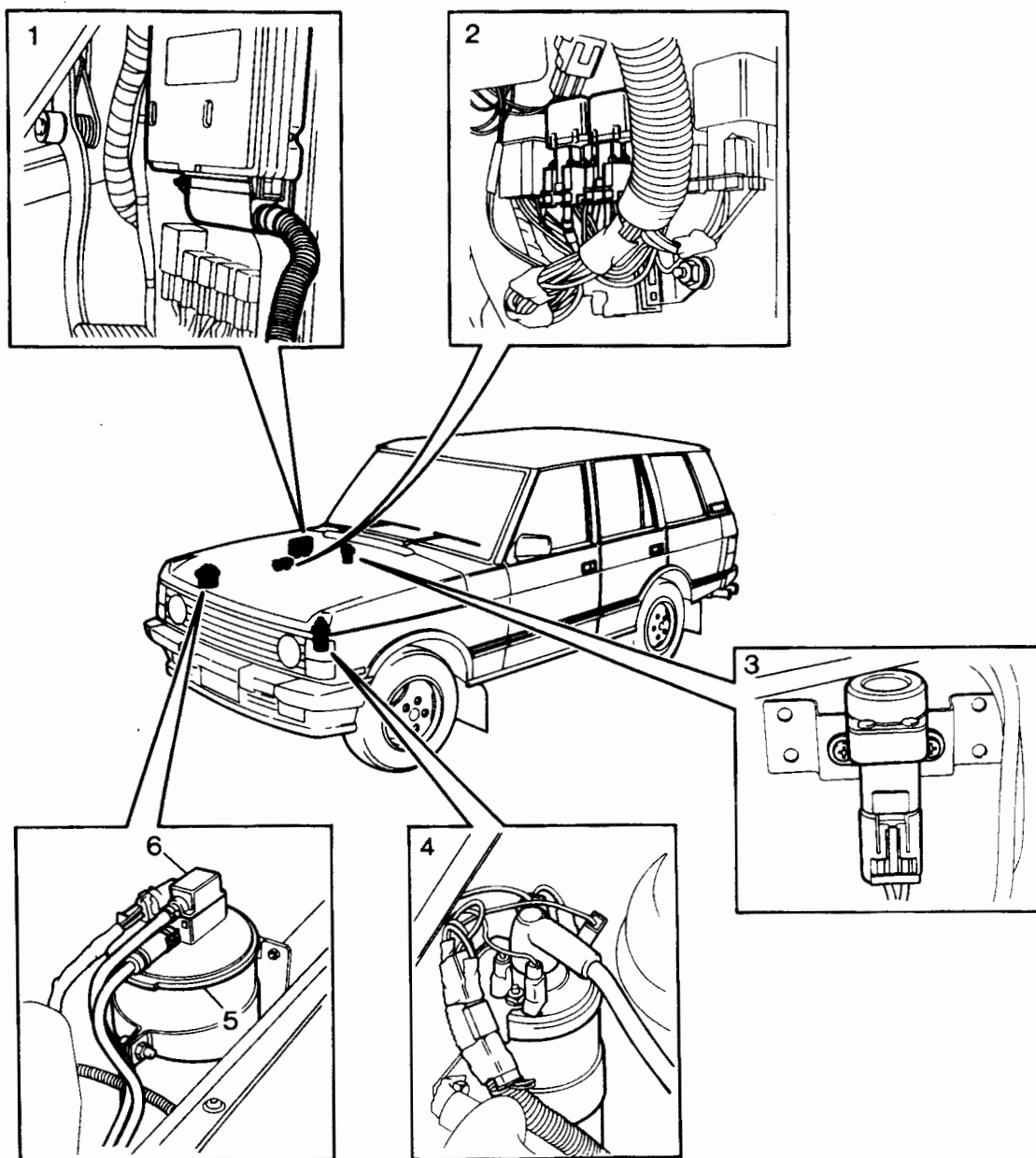
1. Fuel filter.
2. Fuel pump (in fuel tank).



J5426

BODY MOUNTED COMPONENTS

1. Engine control module (ECM).
2. Main relay and fuel pump relay.
3. Inertia switch.
4. Ignition coil.
5. Charcoal canister.
6. Purge control valve.



RR4266



MICRO PROCESSOR POWER CHECK
(Instrument binnacle - Service use only)

As part of the engine starting procedure, this symbol will illuminate momentarily.

FUEL INJECTION SYSTEM



CAUTION: The fuel system incorporates fine metering components that would be affected by any dirt in the system; therefore it is essential that working conditions are scrupulously clean. If it is necessary to disconnect any part of the fuel injection system, the system **MUST** be depressurized. All openings left open after the removal of any component from the fuel system, **MUST** be sealed off to prevent ingress of dirt.

ENGINE SETTING PROCEDURE

If a major overhaul has been undertaken of the fuel injection/engine system, the following check and adjustments must be carried out before attempting to start the engine.

1. Spark plug gaps. See *ENGINE TUNING DATA, Information, Engine 3.9 V8i* or *See ENGINE TUNING DATA, Information, Engine 4.2 V8i*
2. Ignition timing. See *ELECTRICAL, Adjustment, Ignition Timing*



CAUTION: Catalyst vehicle - if the engine is misfiring, it should be immediately shut down and the cause rectified. Failure to do so will result in irreparable damage to the catalysts.



NOTE: If the previous checks and adjustments are satisfactory but the engine will not start, the ignition and fuel injection electrical circuits must be checked using the appropriate recommended equipment.



ENGINE TUNING

Circuit fault diagnosis may be carried out on all V8i vehicles, using Testbook. Testbook will guide the operator by visual prompts through a series of diagnostic checks.

Before commencing any fault diagnosis, the following preliminary checks must be carried out.

Preliminary checks



CAUTION: Catalyst exhaust: If engine is misfiring or fails to start within 12 seconds the cause must be rectified. Failure to do so will result in irreparable damage to the catalysts. After rectification the engine must be run at 1500 rev/min (no load) for 3 minutes to purge any accumulation of fuel in the system.

1. Check that the inertia fuel shut off switch is not tripped.
2. Check fuse in main fuse panel.
3. Check for ample fuel in tank.
4. Check air inlet system for possible leaks into the intake manifold.
5. Check HT cables for correct firing order and routing.
6. Check ignition timing.

Only when the above checks have been carried out, should circuit diagnosis begin. **See *Electrical Trouble Shooting Manual*.**

INJECTOR TESTS



NOTE: Before removing any of the injectors, remove and examine the spark plugs, check for consistent colouration of plugs. A leaking injector will result in the appropriate spark plug being 'sooted up'.

The following test may only be carried out using suitable injector test equipment.

Leak Test

Leak test with the injectors closed but pressurised to 2.54 Kg/cm². No injector should leak more than 2 drops of fuel per minute.

Fuel Delivery Test

Fuel delivery test with the injector open and pressurised as above, fuel delivery from each injector should be 160-175cc per minute using white spirit, or 180-195cc per minute using petrol at 20°C ± 2°C.

BASE IDLE SPEED SETTING



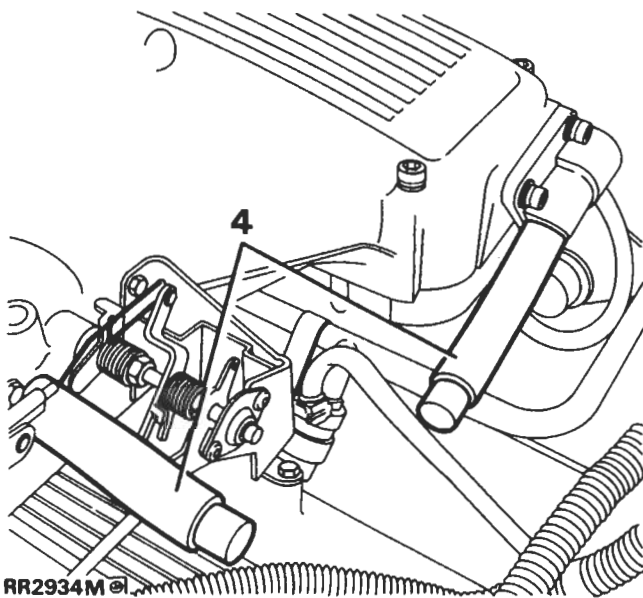
NOTE: Base idle speed is set at factory. It should not require further adjustment unless plenum chamber is changed. The adjustment screw is sealed with a plug to prevent unauthorised alteration. Check ignition timing before attempting following procedure, since this will affect idle speed.

Equipment required

Two blanking hoses. these are manufactured using a new air by-pass valve hose - Part No.ETC7874. Cut two equal pieces 90mm long from hose and seal one end of each, using 13mm diameter bar. Use a suitable clamp to ensure an air tight seal.

Checking procedure

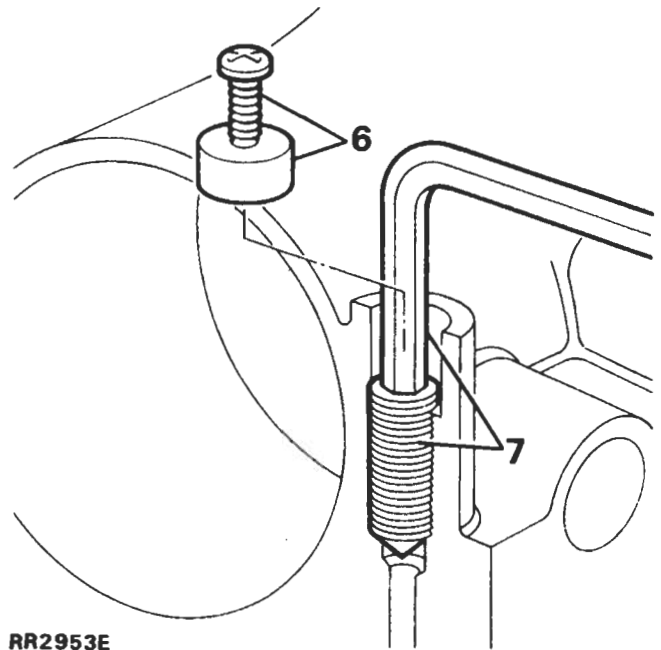
1. Drive vehicle at least two miles until engine and transmission are hot. Switch off engine.
2. Check all electrical loads are OFF, including air conditioning.
3. Remove air by-pass valve hose.



4. Fit blanking hoses to both plenum chamber and air by-pass valve. Ensure hoses are securely fitted to prevent air leaks. Note throttle cable and cruise control actuator have been omitted from illustration.

5. Start engine and check idle speed is within limits. See *ENGINE TUNING DATA, Information, Basic Idle Speed*

Adjusting base idle speed



RR2953E

6. Drill tamper proof plug and insert a self tapping screw to enable plug to be extracted.
7. Start engine, adjust idle screw clockwise to decrease or counter-clockwise to increase idle speed.
8. Stop engine, remove blanking hoses. Reconnect hose to plenum.
9. Fit new tamper proof plug.



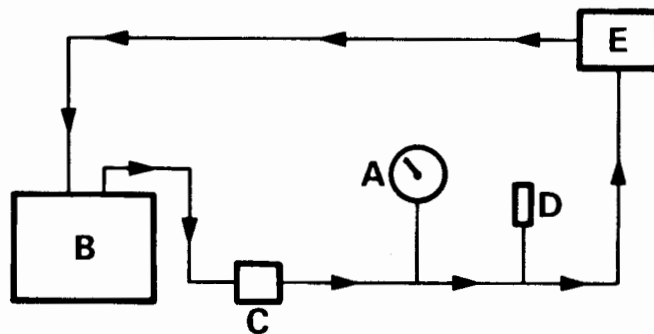
FUEL PRESSURE CHECK

In order to check the fuel pressure it is necessary to first depressurise the fuel system as follows:

WARNING: Under normal operating conditions the multiport fuel injection system is pressurised by a high pressure fuel pump, operating at up to 2.3 to 2.5 bar. When engine is stationary pressure is maintained within system. To prevent pressurised fuel escaping and to avoid personal injury it is necessary to depressurise multiport fuel injection system before any service operations are carried out.

If vehicle has not been run there will be a small amount of residual pressure in fuel line. The depressurising procedure must still be carried out before disconnecting any component within the fuel system.

The spilling of fuel is unavoidable during this operation. Ensure that all necessary precautions are taken to prevent fire and explosion.



RR3834M

- A Pressure gauge 18G1500
- B Fuel tank and pump
- C Fuel filter
- D Fuel injectors x 8
- E Regulator

1. Remove fuel pump relay module. *See Repair, Multiport Fuel Injection Relay Modules*
2. Start and run engine.
3. When sufficient fuel has been used to cause fuel line pressure to drop, injectors will become inoperative, resulting in engine stall. Switch off ignition.
4. Disconnect battery negative lead. .

NOTE: Fuel at low pressure will remain in system. To remove low pressure fuel, place absorbent cloth around fuel pipe at the filter during disconnection.

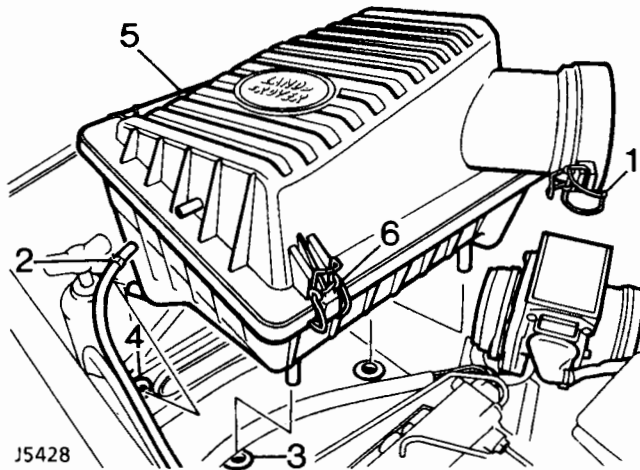
5. Connect the pressure gauge on the outlet from the filter, located on the chassis under the right rear wheel arch.
6. Reconnect the battery and turn the ignition to position II while observing the pressure gauge. Results
Expected reading 2,39-2,672 kgf/cm²
Pressure drop-max 0.7 kgf/cm² in one minute.
If pressure is low check that filter is not blocked and pump is operating satisfactorily. Then recheck pressure. If pressure is still low renew regulator. *See Repair, Fuel Pressure Regulator*



AIR CLEANER ASSEMBLY

Service repair no - 19.10.01

Remove



J5428

1. Release 2 clips securing air cleaner to air flow sensor.
2. Release clip and disconnect hose from air cleaner.
3. Release 2 rubber mountings securing bottom of air cleaner to body.
4. Slide air cleaner backwards and release from mounting bracket.
5. Remove air cleaner assembly.
Do not carry out further dismantling if component is removed for access only.
6. Release 4 clips securing top of air cleaner and remove.
7. Withdraw air cleaner element and discard.

Refit

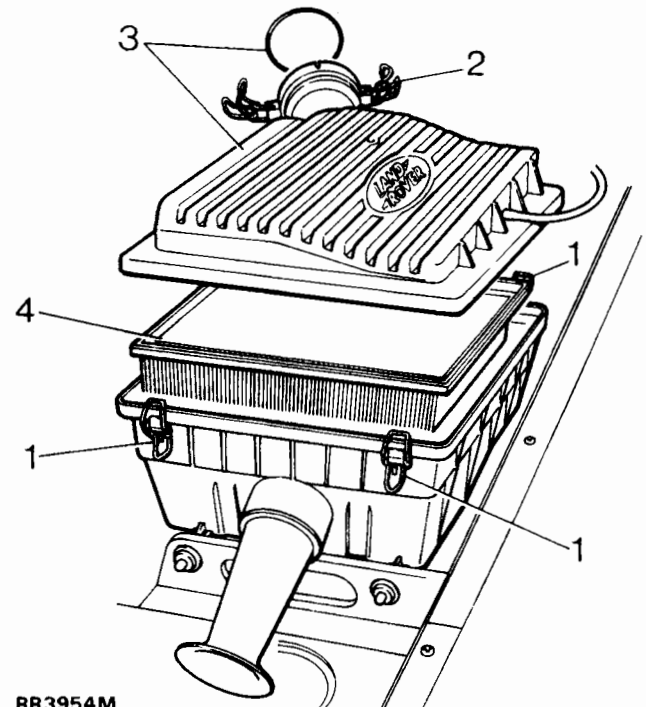
8. Fit new air cleaner element and secure in position.
9. Reverse removal procedure.

AIR CLEANER ELEMENT

Service repair no - 19.10.08

Remove

1. Release four clips retaining air cleaner cover.
2. Release two clips to air flow meter.
3. Remove air cleaner cover, retain air flow meter 'O'ring.
4. Remove element.



RR3954M

Refit

5. Fit new element.
6. Fit O ring.
7. Position air cleaner cover, secure two clips to air flow meter.
8. Secure four air cleaner cover clips.

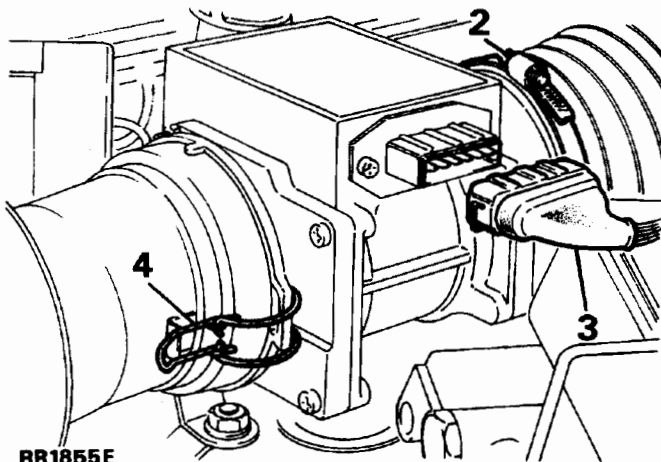
AIR FLOW SENSOR

Service repair no - 19.22.25

Remove

NOTE: The air flow sensor is not a serviceable item. In event of failure or damage the complete unit must be replaced.

1. Disconnect battery negative lead.
2. Release intake hose clamp, disconnect from sensor.
3. Disconnect multi-plug.
4. Release two clips securing air cleaner to air flow sensor. Remove sensor from engine compartment.



RR1855E

Refit

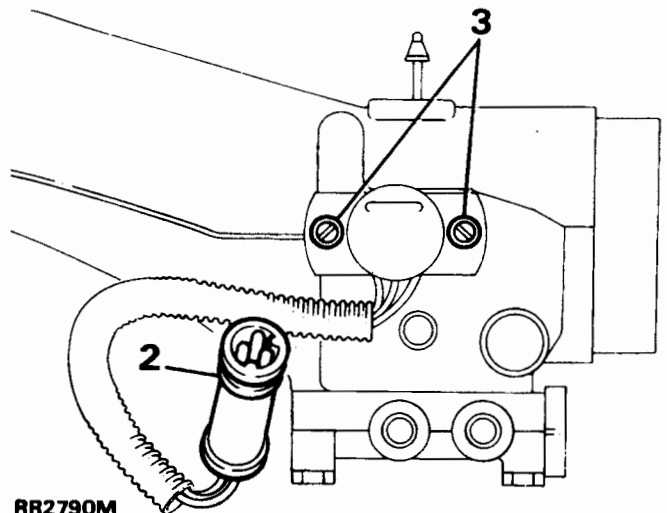
5. Reverse removal procedure. Ensure multi-plug is firmly reconnected, and hose clamp at the rear of sensor is securely tightened, to prevent unmetered air entering engine.

THROTTLE POSITION SENSOR

Service repair no - 19.22.49

Remove

1. Disconnect battery negative lead.
2. Disconnect multi-plug from harness.
3. Remove two screws securing sensor to plenum chamber and carefully pull sensor off throttle shaft.



RR2790M

4. Remove old gasket.

Refit

5. Fit new gasket.
6. Align sensor and shaft flats, slide sensor on to throttle shaft. Secure sensor to plenum chamber.



CAUTION: DO NOT operate throttle mechanism while throttle position sensor is loosely fitted, damage may be caused to throttle position sensor wiper track.

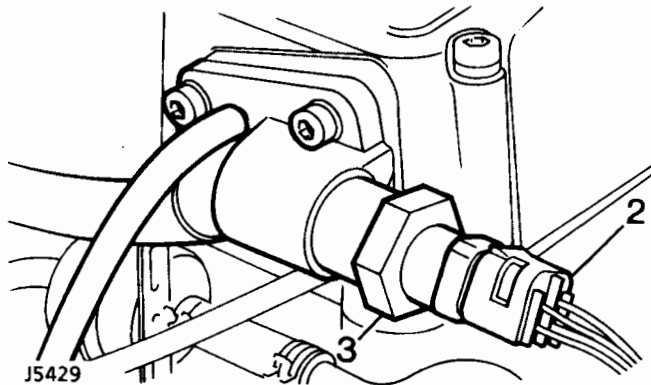


IDLE AIR CONTROL VALVE

Service repair no - 19.22.54

Remove

1. Disconnect battery negative lead.
2. Disconnect multi-plug.
3. Unscrew valve from rear plenum chamber.
4. Remove washer.



Refit

5. Fit **NEW** sealing washer.



NOTE: If same idle air control valve is being refitted clean sealing compounds from threads. Apply Loctite 241 to threads of valve before reassembly.

6. Tighten valve to **20 Nm**.
7. Reverse removal procedure.

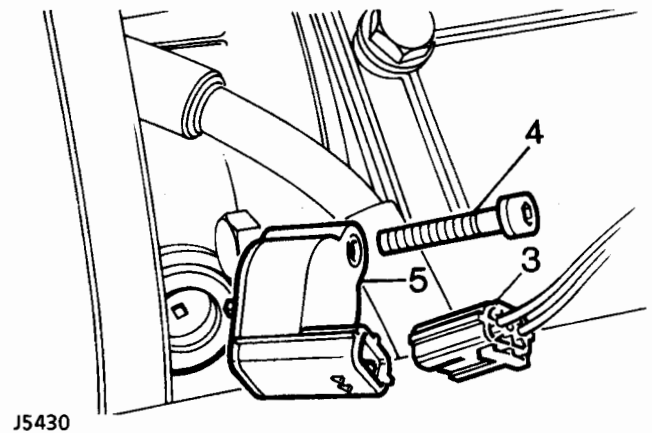
VEHICLE SPEED SENSOR

Service repair no - 88.30.14

The vehicle speed sensor is located in the LH side of the transfer box.

Remove

1. Place vehicle on lift, apply parking brake.
2. Disconnect battery negative lead.
3. Raise lift, disconnect multiplug from vehicle speed sensor.
4. Remove screw securing sensor to transfer box.
5. Remove vehicle speed sensor



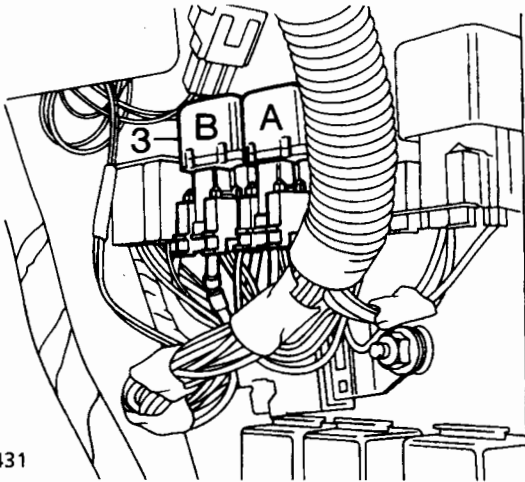
Refit

6. Reverse removal procedure.

MULTIPOINT FUEL INJECTION RELAYS

Service repair no - 19.22.08

The two Multiport fuel injection relays are located in the RH footwell area behind the 'A' post trim panel. The fuel injection relays can be identified as follows:

A. Fuel pump relay - Blue base**B. Main relay - Black base****Remove**

1. Release front door seal from 'A' post.
2. Remove lower 'A' post trim panel.
3. Pull relay from base.

Refit

4. Reverse removal procedure.

ENGINE CONTROL MODULE (ECM)-14 CUX

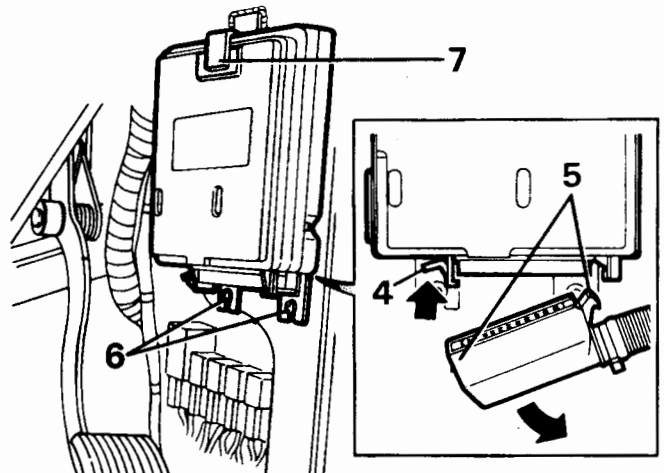
Service repair no - 19.22.34



NOTE: The ECM is not serviceable, in event of unit failure it must be replaced.

Remove

1. Remove the fascia right-hand closing panel.
2. Remove the right-hand footwell side panel trim.
3. Disconnect battery negative lead.
4. Release ECM plug retaining clip.
5. Manoeuvre the front of the plug (in the direction of the bold arrow) and detach the other end of the plug from the retaining peg.
6. Release the two screws securing the ECM to the right-hand footwell side panel.
7. Withdraw the ECM from the clip.



ST2818M

Refit

8. Refit the ECM securely in the clip and fit the two screws.
9. Reconnect the ECM harness plug. Ensure that the plug is pushed firmly into its location and that the retaining clip secures the plug in position.
10. Reverse removal procedure.



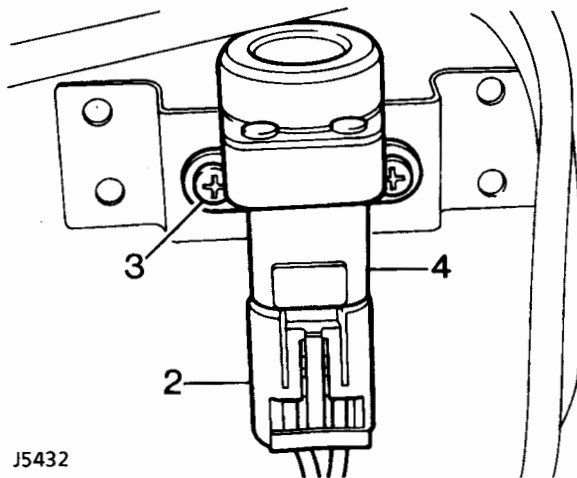
INERTIA FUEL SHUTOFF SWITCH

Service repair no - 18.30.35

The inertia fuel shutoff switch is located on the bulkhead next to the washer reservoir under bonnet [hood].

Remove

1. Disconnect battery negative lead.
2. Disconnect multiplug from inertia switch.
3. Remove 2 screws securing inertia switch to mounting bracket.
4. Remove inertia switch.



Refit

5. Position inertia switch to mounting bracket and secure with screws.
6. Connect multiplug to inertia switch.
7. Reconnect battery negative lead.

ENGINE FUEL TEMPERATURE SENSOR

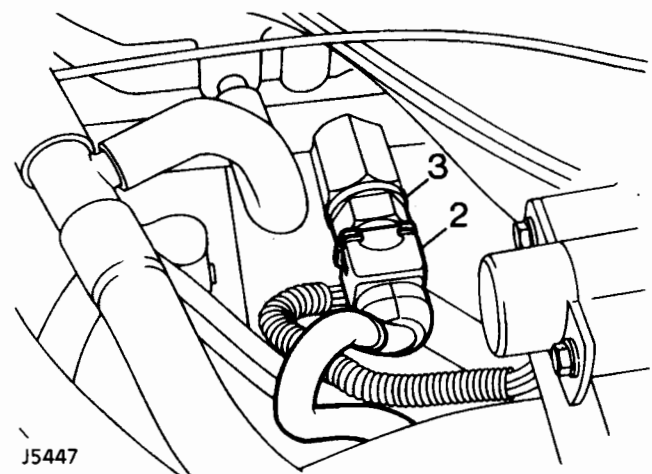
Service repair no - 19.22.08

Remove



NOTE: Fuel leakage will not occur when sensor is removed from fuel rail, therefore it is not necessary to depressurise the fuel system.

1. Disconnect battery negative lead.
2. Disconnect multi-plug from sensor.
3. Release sensor from fuel feed rail.



Refit

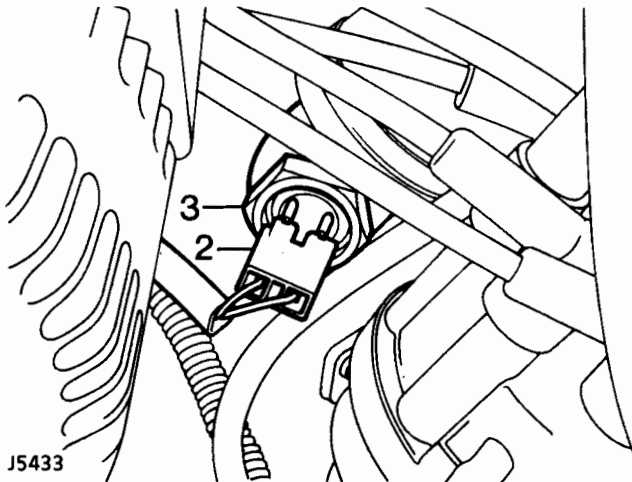
4. Reverse removal procedure. Ensure sensor is tightened securely in fuel rail.

ENGINE COOLANT TEMPERATURE SENSOR

Service repair no - 19.22.18

Remove

1. Position drain tray to collect coolant spillage.
2. Disconnect multiplug from coolant sensor.
3. Remove sensor from thermostat housing.
4. Remove and discard copper washer.



Refit

5. Fit a new copper washer.
6. Fit sensor and tighten securely.
7. Top-up cooling system.
8. Run engine, check for water leaks around sensor.

DEPRESSURISING FUEL SYSTEM



WARNING: Under normal operating conditions the Multiport fuel injection system is pressurised by a high pressure fuel pump, operating at up to 2.3 to 2.5 bar. When engine is stationary pressure is maintained within system. To prevent pressurised fuel escaping and to avoid personal injury it is necessary to depressurise multiport fuel injection system before any service operations are carried out.

If vehicle has not been run there will be a small amount of residual pressure in fuel line. The depressurising procedure must still be carried out before disconnecting any component within the fuel system.

The spilling of fuel is unavoidable during this operation. Ensure that all necessary precautions are taken to prevent fire and explosion.

1. Remove fuel pump relay module. *See Multiport Fuel Injection Relays*
2. Start and run engine.
3. When sufficient fuel has been used to cause fuel line pressure to drop, injectors will become inoperative, resulting in engine stall. Switch off ignition.
4. Disconnect battery negative lead.



NOTE: Fuel at low pressure will remain in system. To remove low pressure fuel, place absorbent cloth around fuel feed hose at fuel rail.

5. Disconnect either:
 - a) Nut and olive at fuel rail
 - OR
 - b) Hose at inlet end of fuel filter.

Refit

6. Refit fuel feed hose.
7. Refit fuel pump relay module, reconnect battery.
8. Crank engine (engine will fire in approximately 6 to 8 seconds).

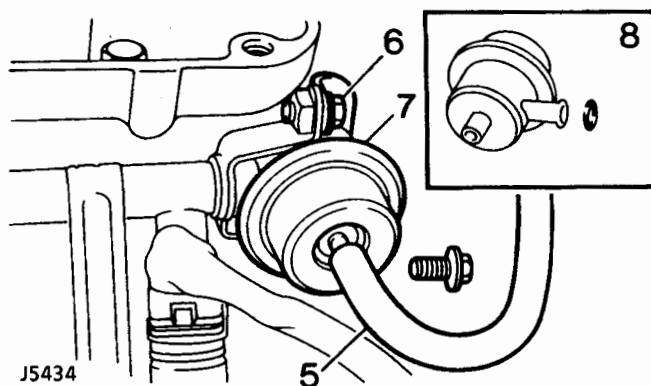


FUEL PRESSURE REGULATOR

Service repair no - 19.45.06

Remove

1. Depressurise fuel system. *See Depressurising Fuel System*
2. Disconnect battery negative lead.
3. Remove plenum chamber. *See Plenum Chamber*
4. Release clip and disconnect fuel return hose from regulator.
5. Disconnect vacuum hose from regulator.
6. Remove 2 bolts securing pressure regulator to fuel rail.
7. Release regulator from fuel rail and withdraw.
8. Remove and discard 'O' ring.



Refit

9. Lightly coat 'O' ring with silicon grease 300 and fit to regulator.
10. Reverse removal procedure.
11. Reconnect battery and pressurise fuel system. Check there are no fuel leaks around regulator connections.

FUEL RAIL-INJECTORS R/H AND L/H

Service repair no - 19.60.04 - Rail

Service repair no - 19.60.01 - Injectors

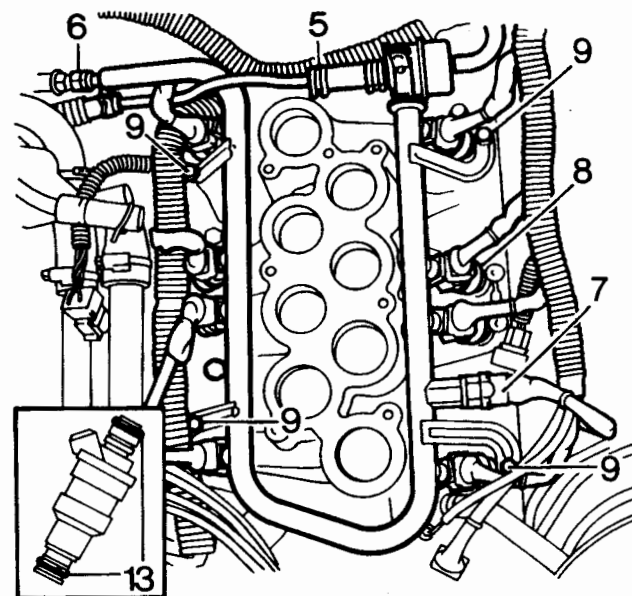
Remove

1. Depressurise fuel system. *See Depressurising Fuel System*
2. Disconnect battery negative lead.
3. Remove plenum chamber. *See Plenum Chamber*
4. Remove ram housing. *See Ram Housing*



NOTE: Place cloth over ram tube openings to prevent ingress of dirt.

5. Loosen clip and disconnect fuel return hose from regulator.
6. Loosen union and disconnect fuel supply hose from fuel rail.
7. Disconnect multi-plug from fuel temperature sensor.
8. Disconnect multi-plugs from injectors.
9. Remove four bolts securing fuel rail support brackets to intake manifold. Lay injector harnesses to one side.



10. Remove fuel rail and injectors.
11. Remove injector retaining clips, ease injectors from rail. Remove and discard 'O' rings from injectors.
12. Remove fuel pressure regulator if required.

Refit

13. Fit **NEW** 'O' rings, to injectors. Lightly coat 'O' rings with silicon grease 300. Insert injectors into fuel rail, multi-plug connections facing outwards.
14. Refit retaining clips.



CAUTION: Care must be taken when refitting the fuel rail and injectors to intake manifold to prevent damage to 'O' rings.

15. Fit a **NEW** 'O' ring to pressure regulator lightly coat 'O' ring with silicon grease 300 and secure regulator to the fuel rail.
16. Fit fuel rail and heater pipe assemblies to intake manifold. Secure rail and pipes in position with five bolts.
17. Reverse removal procedure. 2 to 7.
18. Pressurise fuel system and check for fuel leaks around injectors and pressure regulator.

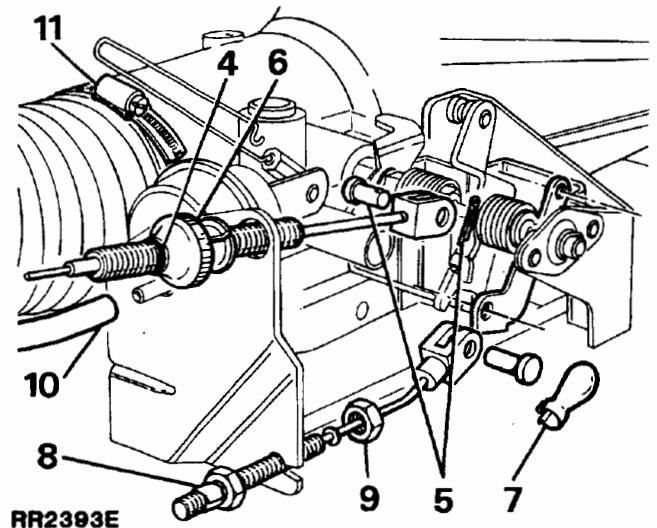
PLENUM CHAMBER

Service repair no - 19.22.46

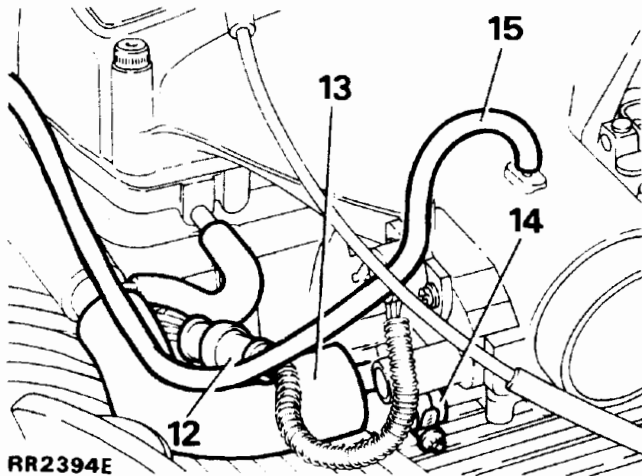
Includes throttle levers and throttle disc

Remove

1. Disconnect battery negative lead.
2. Disconnect electrical multi-plug from bypass air valve.
3. Disconnect vacuum hose adjacent to bypass air valve.
4. Mark an identification line on throttle cable outer to assist re-assembly.
5. Remove clevis pin from throttle cable.
6. Pry adjustment thumb wheel from throttle bracket. Lay cable aside.
7. Remove retaining clip and clevis pin from kick down cable (automatic vehicles).
8. Apply adhesive tape behind rear adjustment nut on kick down cable to prevent nut moving.
9. Remove front lock nut. Remove cable and lay aside.
10. Remove cruise control vacuum hose.



11. Remove intake hose from neck of plenum chamber.
12. Disconnect throttle position sensor multi-plug.
13. Remove PCV breather hose.
14. Disconnect two coolant hoses and plug each hose to prevent excessive loss of coolant. Identify each hose for re-assembly.

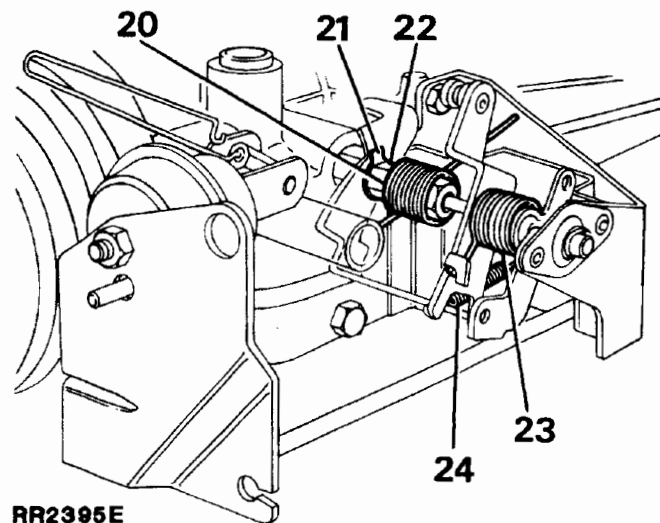


RR2394E

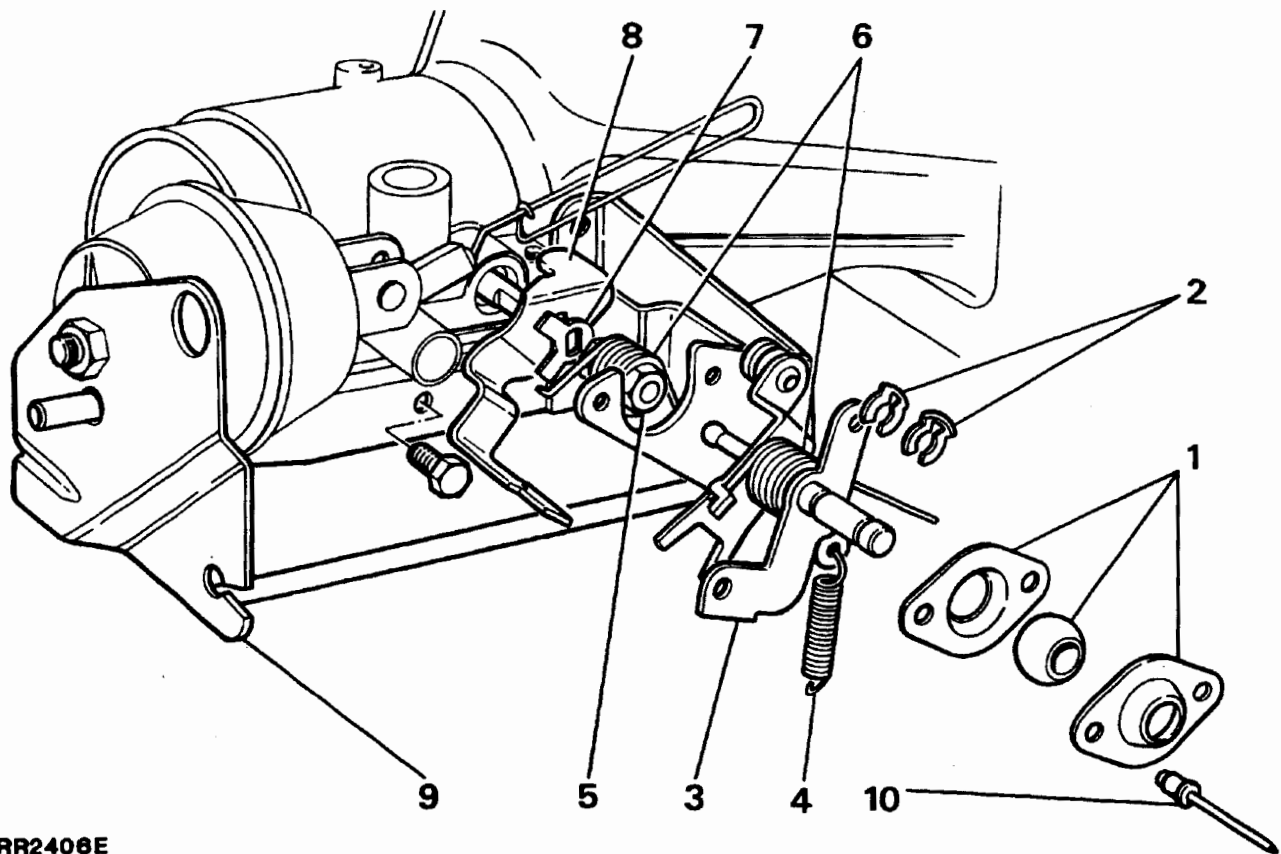
15. Remove distributor vacuum hose.
16. Release two screws and remove throttle position sensor.
17. Remove six screws securing plenum chamber. Remove plenum chamber.
18. Remove air idle air control valve hose.

Throttle lever assembly - remove

19. If fitted - unclip cruise control actuator link. Hold throttle fully open, release link from countershaft assembly. Carefully return lever assembly to close throttle.
20. Release tension on inboard throttle spring.
21. Bend back lock washer tabs.
22. Hold throttle stop lever in closed position, release nut from throttle shaft.
23. Release tension on outboard throttle spring.
24. Remove overtravel spring.



RR2395E



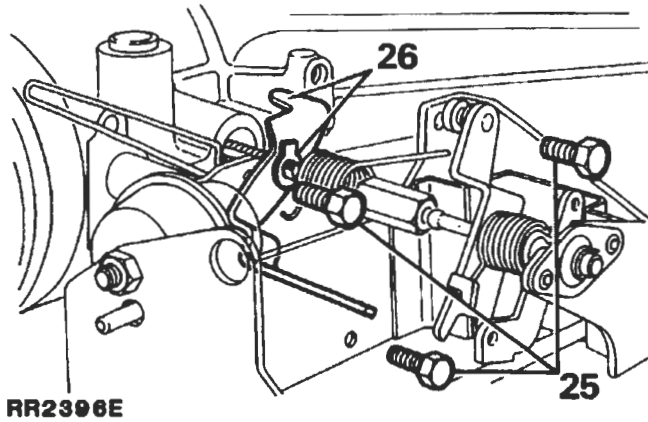
RR2408E

KEY

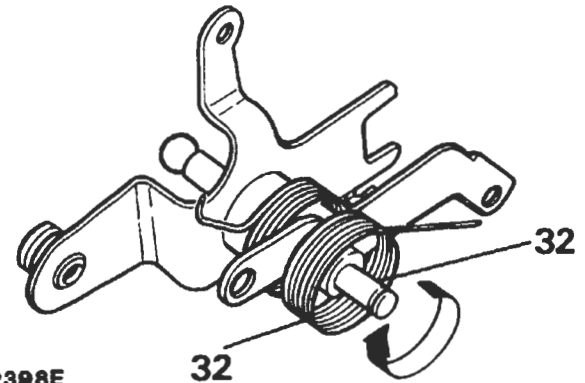
1. Spherical bush/housing
2. Retaining clips (2)
3. Countershaft assembly
4. Overtravel spring
5. Throttle shaft nut
6. Throttle return spring (2)
7. Tab washer
8. Throttle stop lever
9. Throttle bracket assembly
10. Pop rivets (2)



25. Remove three bolts securing throttle bracket to plenum chamber, withdraw bracket assembly.
26. Remove tab washer and throttle stop lever from throttle shaft.

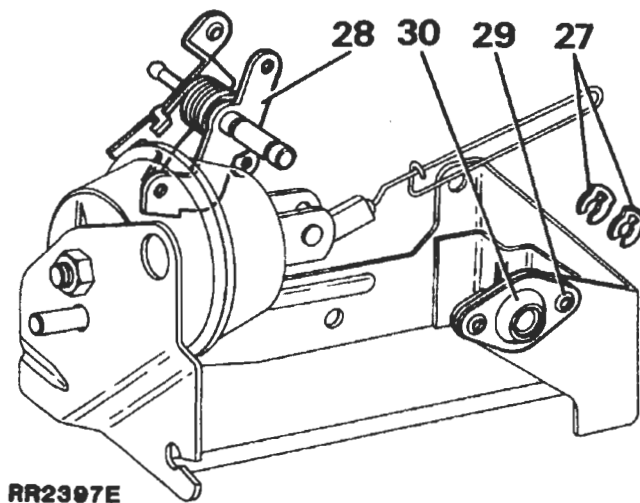


31. Grease new bush with Admax L3 or Energrease LS3. Assemble bush into housing. Assemble to throttle bracket using two 4.7 mm (3/16 in) diameter domed head rivets.
32. Examine bearing surface of countershaft assembly. If worn fit new assembly, otherwise wind throttle return spring off levers.

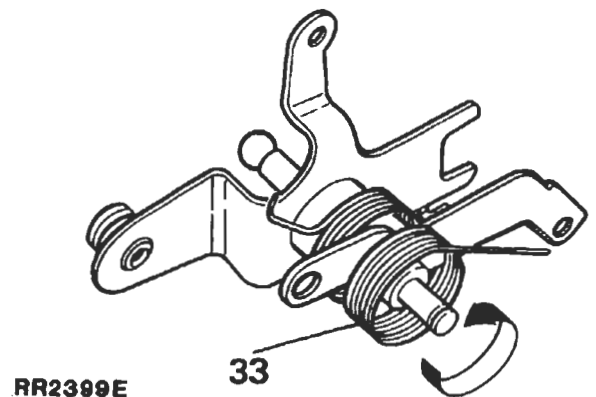


Throttle lever assembly - inspect and overhaul

27. Remove two retaining clips from spherical bush.
28. Remove the countershaft assembly.
29. If spherical bush worn, drill out two securing rivets (4,7 mm, (3/16 in) diameter drill).
30. Split assembly, discard worn bush.



33. Wind new spring onto countershaft assembly, small hooked end of spring is wound on first.



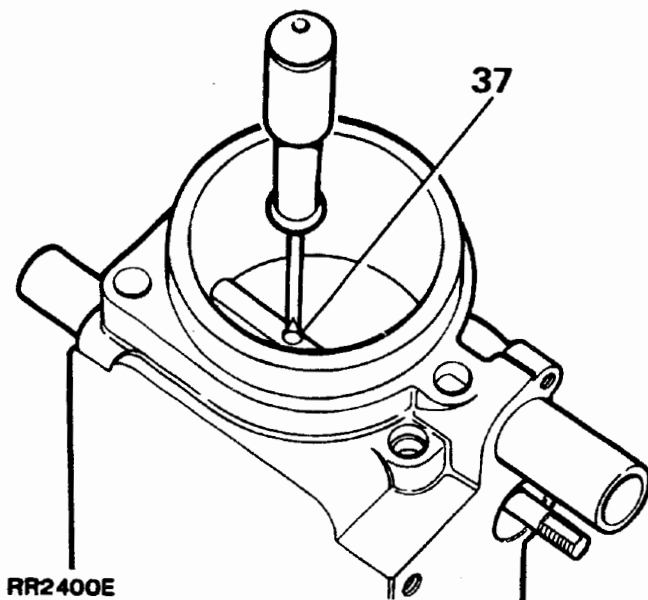
34. Grease shaft with Admax L3 or Energrease LS3, fit countershaft assembly to spherical bearing, secure with two clips.
35. Examine throttle stop lever for wear, fit a new lever if necessary.

Throttle disc - inspect and overhaul

36. Examine throttle shaft for excessive wear between bushes in plenum chamber and shaft. A small amount of clearance is permissible. If excessive wear is evident fit new shaft and bushes as follows.
37. Remove two split screws securing throttle disc and withdraw disc.

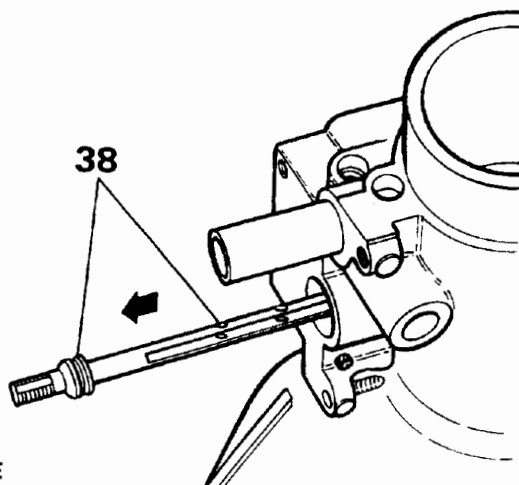


CAUTION: Take care not to damage shaft.



RR2400E

38. Remove shaft and air seal from plenum chamber.



RR2401E

39. Using suitable drift, drive out bushes.

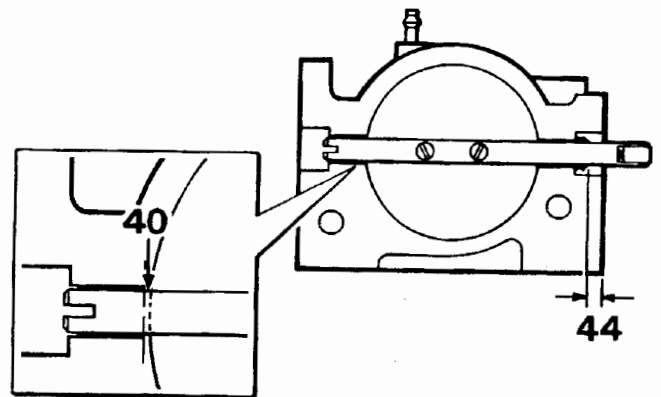


CAUTION: Take care not to damage plenum chamber bores

40. Press in new bushes until flush with throttle disc bore.

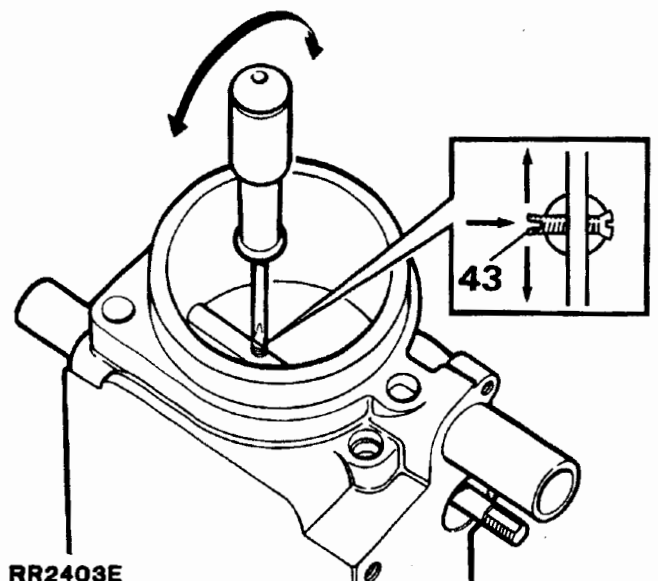


CAUTION: Ensure that bushes do not protrude into bore, as they will interfere with movement of throttle disc.



RR2402E

41. Fit throttle shaft and disc, secure with two split screws. Do not fully tighten screws.
42. Rotate throttle shaft 360° once or twice to centralise disc in bore. Tighten split screws.
43. Rotate shaft. Use screw driver to spread split.



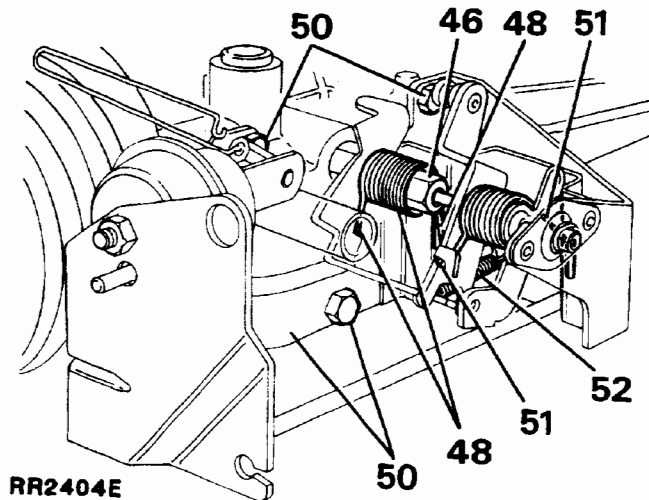
RR2403E



44. Grease new air seal with Admax L3 or Energrease LS3. Push seal down shaft, into counterbore until seal is 6.0 mm (0.236 in) below face of plenum.

Throttle levers and bracket - assemble

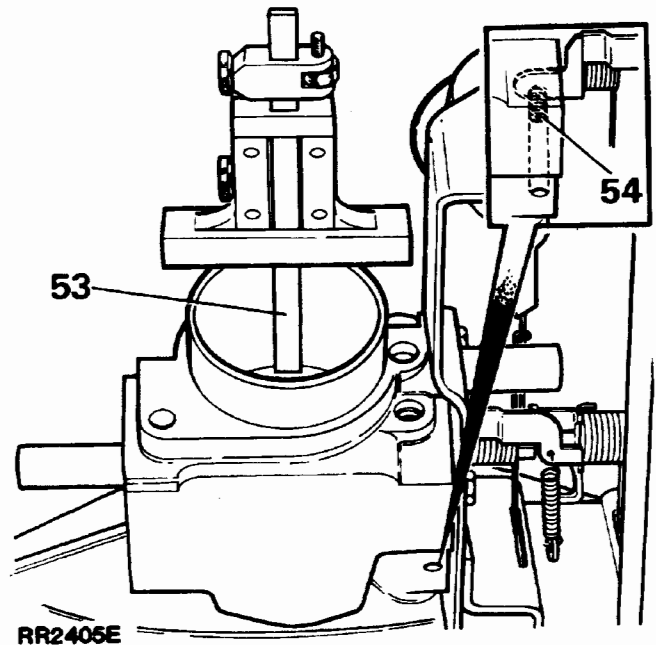
45. Fit stop lever to throttle shaft, a new tab washer and secure with throttle shaft nut.
46. Holding stop lever on stop, tighten throttle shaft nut securely, bend over tabs to lock nut in position.
47. Fit inboard throttle return spring noting that small hooked end of spring is nearest plenum.
48. Locate hooked end of inboard spring on stop lever. Wind up straight end one full turn and locate in appropriate slot.
49. Fit countershaft to interconnecting nut of throttle valve shaft.
50. Secure throttle bracket assembly to plenum. Secure with three retaining bolts.
51. Ensure hooked end of outboard spring is retained by lever, wind spring up one full turn and locate free end in appropriate slot.
52. Fit overtravel spring.
Lightly grease throttle return and overtravel springs with Admax L3 or Energrease LS3.



bore.

NOTE: If new throttle levers have been fitted, minimum throttle setting of disc must be checked to ensure it is 90° to

53. Using a depth vernier or depth micrometer, check dimension from mouth of bore to top and bottom of valve disc. Dimension must be within 0.5 mm (0.019 in) total indicator reading across diameter of disc.
54. If dimension is out of limits, adjust small set screw below stop lever.



Refit

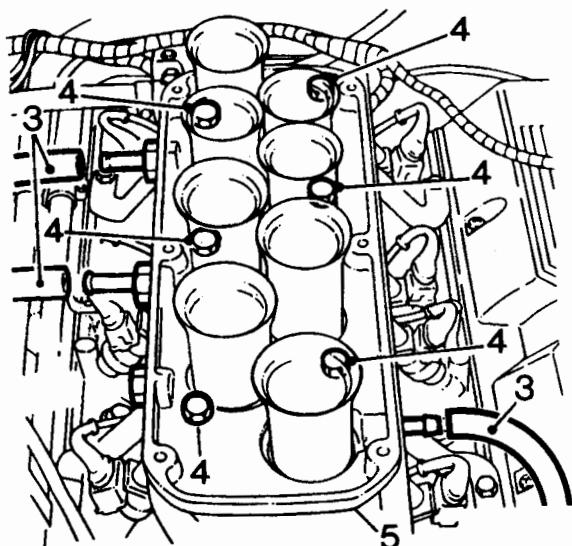
55. Reconnect and adjust cruise control actuator link. **See Actuator Link Setting**
56. Clean joint faces of plenum and ram housing. Apply 'Hylomar' sealant, refit plenum chamber. Tighten bolts to **26 Nm**.
57. Reverse removal procedure.

RAM HOUSING

Service repair no - 19.70.04

Remove

1. Disconnect battery negative lead.
2. Remove plenum chamber. *See Plenum Chamber*
3. Release hoses from ram housing.
4. Remove six through bolts (with plain washers) securing ram housing to intake manifold.



J5436

5. Remove ram housing from intake manifold.
6. Place a protective cover over inlet bores to prevent ingress of dirt.

Refit

7. Clean all mating faces.
8. Apply 'Hylomar' sealant to intake manifold face.
9. Fit ram housing. Tighten bolts, working from two centre bolts, diagonally towards outer four bolts.
10. Tighten to **26 Nm**.

INTAKE MANIFOLD

Service repair no - 30.15.08

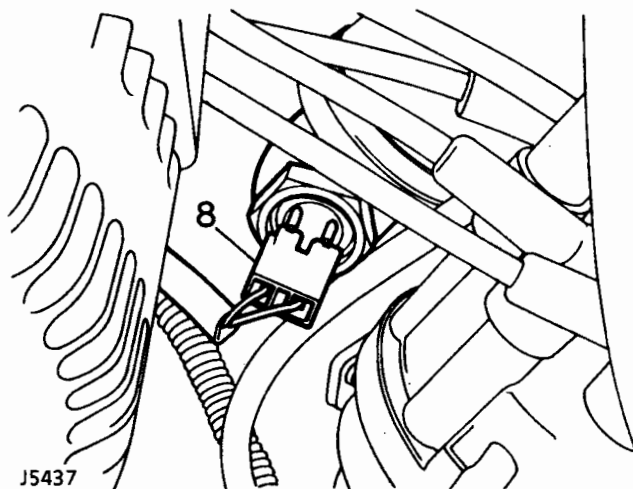
Remove

1. Depressurise fuel system. *See Depressurising Fuel System*
2. Disconnect battery negative lead.
3. Drain cooling system. *See COOLING SYSTEM, Repair, Radiator*
4. Remove plenum chamber. *See Plenum chamber*
5. Remove ram housing. *See Ram Housing*



CAUTION: Place a protective cover over intake manifold openings to prevent the ingress of dirt.

6. Disconnect the fuel temperature sensor and injector multiplugs.
7. Remove fuel pressure regulator. *See Fuel Pressure Regulator*

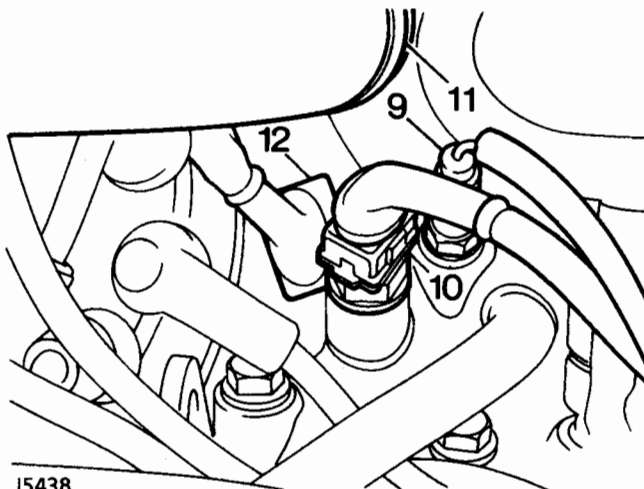


J5437

8. Disconnect multiplug from coolant temperature sensor.
9. Disconnect instrument pack temperature thermistor.
10. Disconnect coolant sensor multiplug.



11. Loosen clip and disconnect top hose from thermostat housing.
12. Disconnect multiplug from distributor amplifier module.



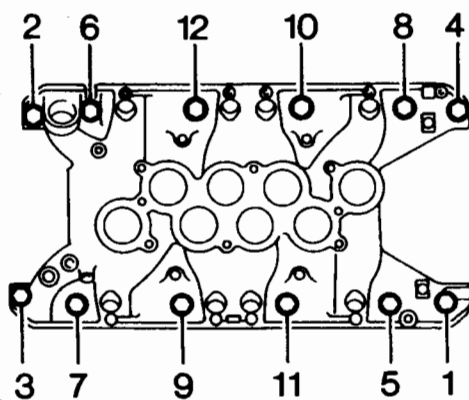
J5438

13. Loosen clip and disconnect hose from heater valve.
14. Remove injector harnesses from behind fuel rail and lay to one side.
15. Loosen union and disconnect fuel return hose from fuel rail.



NOTE: The intake manifold can be removed from the cylinder block without removing the fuel rail and injectors.

16. Using the sequence shown, remove 12 bolts securing the intake manifold to cylinder block.



J5439

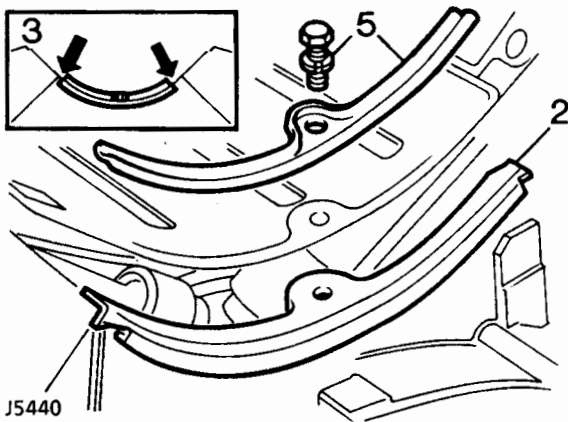
17. Remove the intake manifold.
18. Noting their fitted position, remove bolts and clamps securing intake manifold gasket to cylinder block.
19. Remove and discard gasket.
20. Remove and discard gasket seals.

Do not carry out further dismantling if component is removed for access only.

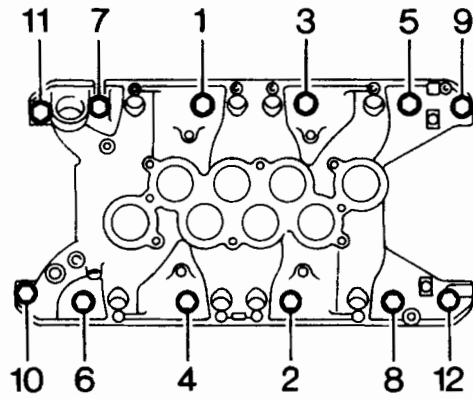
21. Remove 5 nuts securing fuel rail support brackets to intake manifold.
22. Remove fuel rail and injectors.
23. Remove 2 bolts securing thermostat housing to intake manifold.
24. Remove thermostat housing.
25. Remove bolt securing coolant pipe to intake manifold. Loosen union and remove coolant pipe. Remove and discard 'O' ring.
26. Fit new 'O' ring to coolant pipe. Position coolant pipe to intake manifold. Fit bolt securing coolant pipe support bracket to intake manifold and tighten pipe union.
27. Clean mating faces of thermostat housing and intake manifold.
28. Fit thermostat housing to intake manifold using a new gasket, fit and tighten bolts.
29. Position fuel rail to intake manifold, fit and tighten retaining bolts.

Refit

1. Clean mating faces of cylinder heads, cylinder block and intake manifold.
2. Locate NEW seals in position with ends engaged in notches formed between the cylinder heads and block.
3. Apply RTV sealant between ends of seals, cylinder head and block.
4. Fit intake manifold gasket with the word 'FRONT' to the front and open bolts hole to the front RH side.
5. Fit gasket clamps and tighten bolts finger tight.



6. Locate intake manifold onto cylinder heads, clean threads of manifold securing bolts.
7. Allow 10 minutes for RTV sealant to cure.
8. Fit manifold bolts finger tight. Working in the sequence shown tighten the bolts to **38 Nm**.



9. Tighten the gasket clamp bolts to **18 Nm**.
10. Reverse removal procedure.
11. Fill cooling system. **See COOLING SYSTEM, Repair, Radiator**
12. Start engine check for water and fuel leaks.



FUEL FILTER

Service repair no - 19.25.02

Remove

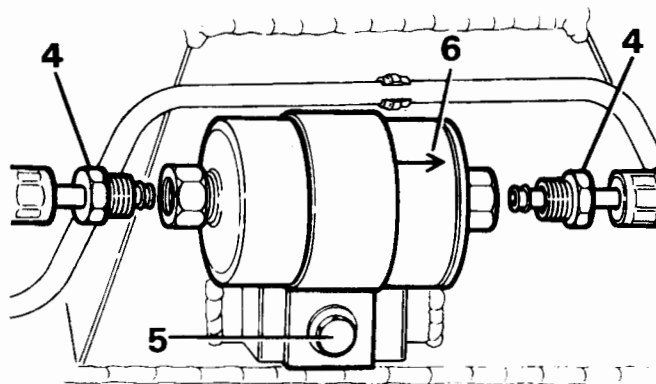


WARNING: Spilling of fuel is unavoidable during this operation. Ensure all necessary precautions are taken to prevent fire and explosion.



WARNING: Ensure fuel handling precautions given in Section 01 - Introduction are strictly adhered to when carrying out following instructions.

1. Depressurise fuel system. *See Depressurising Fuel System*
2. Access to filter is gained through right hand rear wheel arch.
3. Clean area around hose connections to prevent ingress of foreign matter into fuel system. Clamp inlet and outlet hoses to prevent fuel spillage when disconnecting hoses.
4. Loosen two fuel line unions and remove hoses. Plug ends of hoses to prevent ingress of dirt.
5. Release securing bolt and bracket and remove filter from chassis side member.



RR2966E

Refit

6. Fit a new filter observing direction of flow arrows stamped on canister.
7. Tighten securing nut and bolt.
8. Fit inlet and outlet hoses. Tighten to **30Nm**.
9. Refit fuel pump relay module, reconnect battery.
10. Start engine and inspect for fuel leaks around hose connections.

FUEL PIPES

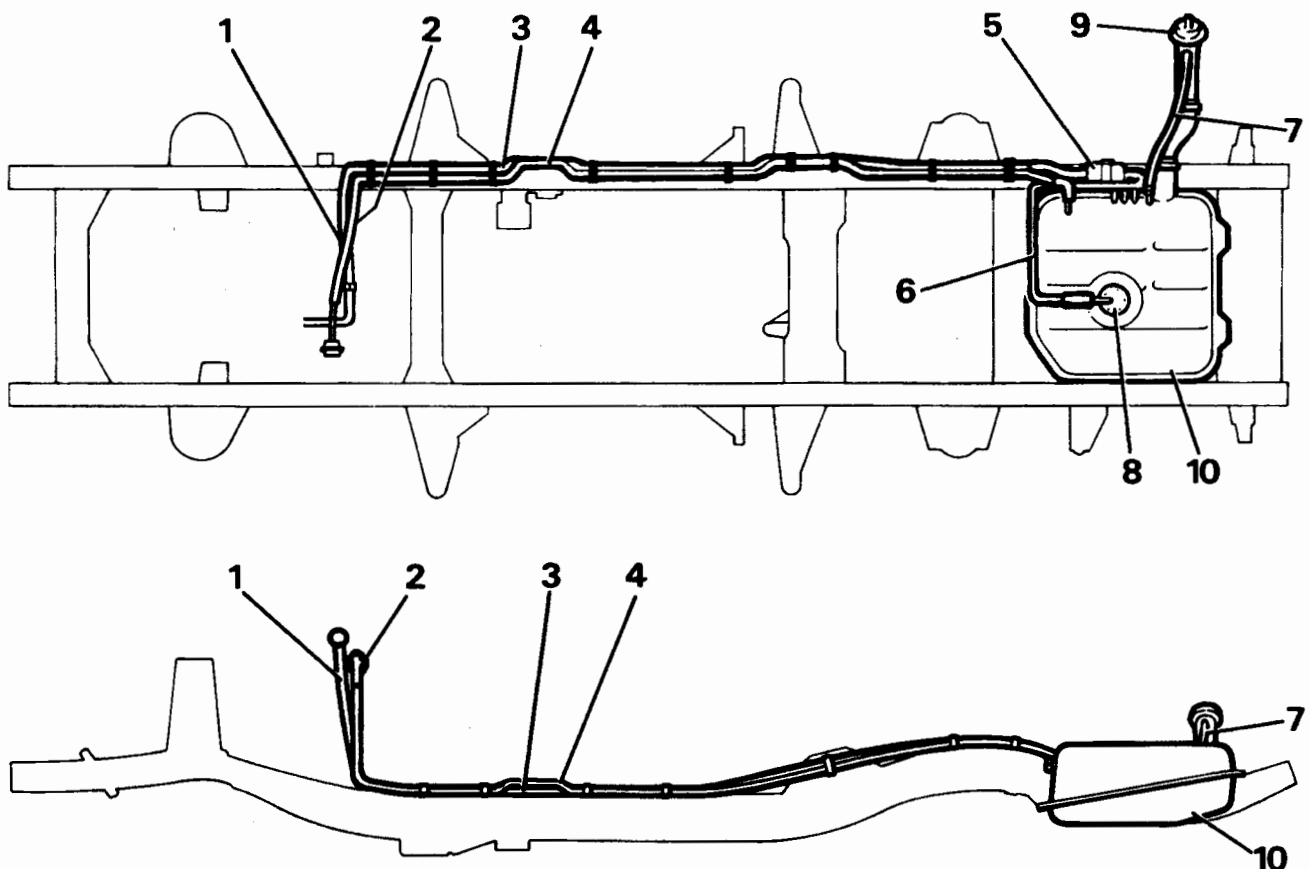
Service repair no - 19.40.92



WARNING: Depressurise fuel system. See *Depressurise Fuel System* before disconnecting any fuel pipes ensure that all necessary precautions are taken against fuel spillage



WARNING: Ensure fuel handling precautions given in Section 01 - introduction are strictly adhered to when carrying out following instructions.



J5442

KEY

- | | |
|-----------------------------------|------------------------------------|
| 1. Fuel feed hose to fuel rail. | 6. Rigid fuel feed pipe to filter. |
| 2. Fuel return hose to fuel tank. | 7. Breather hose. |
| 3. Rigid fuel feed pipe. | 8. In-tank fuel pump. |
| 4. Rigid fuel return pipe. | 9. Fuel filler neck. |
| 5. Fuel filter. | 10. Fuel tank. |

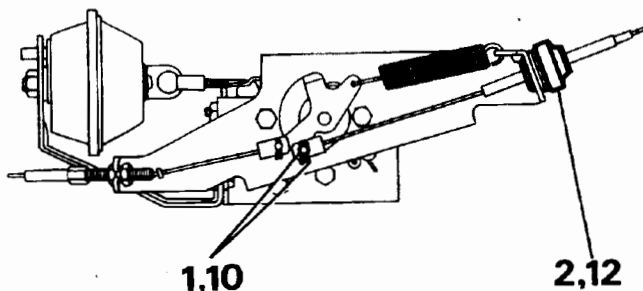


THROTTLE CABLE

Service repair no - 19.20.06

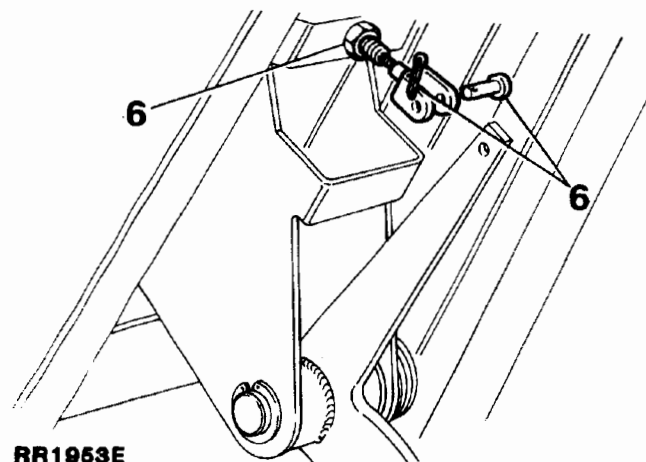
Remove

1. Remove clevis pin securing cable to lever.
2. Carefully pry throttle cable adjustment nut out of mounting bracket.
3. Remove cable from mounting bracket.



RR1954E

4. Release outer cable from retaining clips in engine compartment.
5. Remove lower dash panel.
6. Disconnect cable from accelerator pedal and release cable locknut.
7. Feed cable through bulkhead grommet into engine compartment.



RR1953E

Refit

8. Feed new cable from engine compartment through bulkhead grommet.
9. Connect cable to accelerator pedal.
10. Connect cable to throttle linkage, using a new cotter pin.
11. Clip outer cable adjustment nut into mounting bracket.
12. Adjust outer cable to give 1.57 mm free play in inner cable. Check throttle operation.

ACCELERATOR PEDAL

Service repair no - 18.30.35

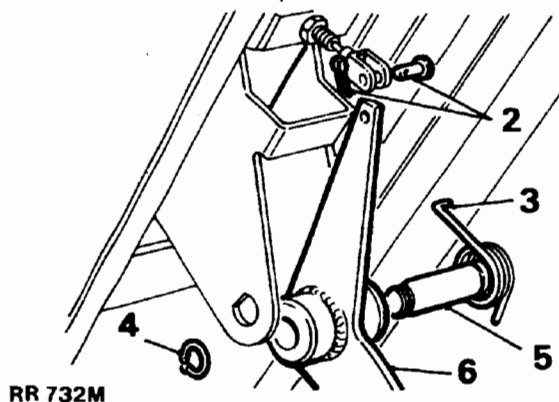
Remove

1. Remove lower dash panel.
2. Remove clevis pin securing throttle cable to accelerator pedal.
3. Release tension from pedal return spring.
4. Remove circlip from pedal pivot pin.
5. Withdraw pivot pin.



NOTE: It may be necessary to lower steering column to gain access to pivot pin circlip.

6. Remove accelerator pedal.



Refit

7. Lightly grease pivot and clevis pins.
8. Fit clevis pin using a **NEW** cotter pin.
9. Reverse removal procedure.

FUEL PUMP AND SENDER UNIT

Service repair no - 19.45.03

A plastic fuel tank with a combined fuel pump/sender unit is fitted. The fuel pump/sender unit is accessed through a panel in the load space floor.

Fuel pump/sender unit



WARNING: Ensure that fuel handling precautions given in Section 01 - Introduction are strictly adhered to when carrying out following instructions.



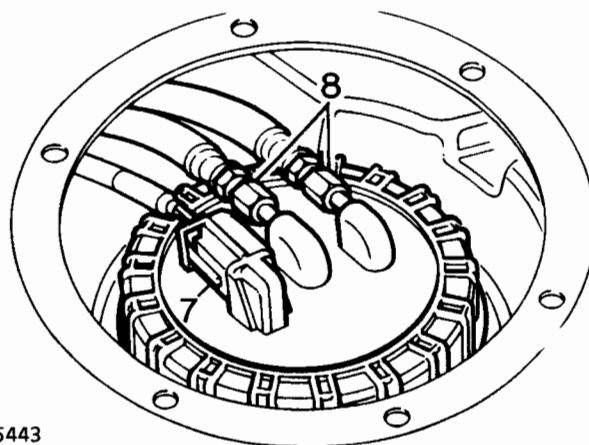
CAUTION: Before disconnecting any part of fuel system, it is imperative that all dust, dirt and debris is removed from around components to prevent ingress of foreign matter into fuel system.

Service Tools:

LRT-19-001 wrench - pump retaining ring
LRT-19-002 'Speedfit' disconnecter

Remove

1. Depressurise fuel system. *See Depressurising Fuel System*
2. Disconnect battery negative lead.
3. Syphon at least 9 litres (2 gallons) of fuel from fuel tank into a suitable container that can be sealed.
4. Remove carpet from loadspace floor and tailgate.
5. Fold back loadspace sound insulation to reveal access panel.



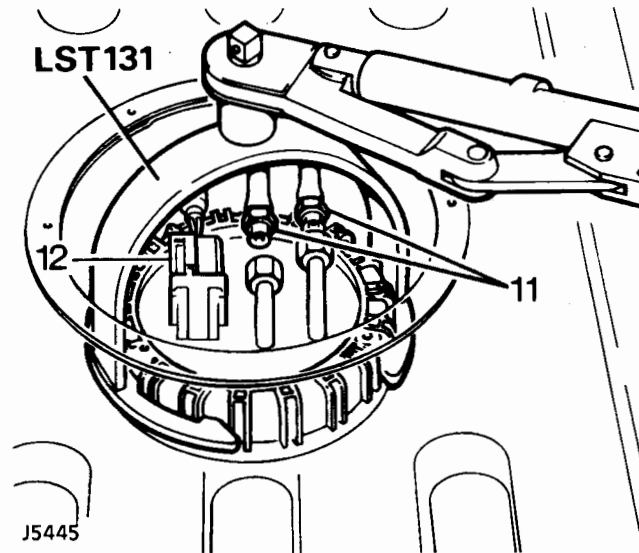
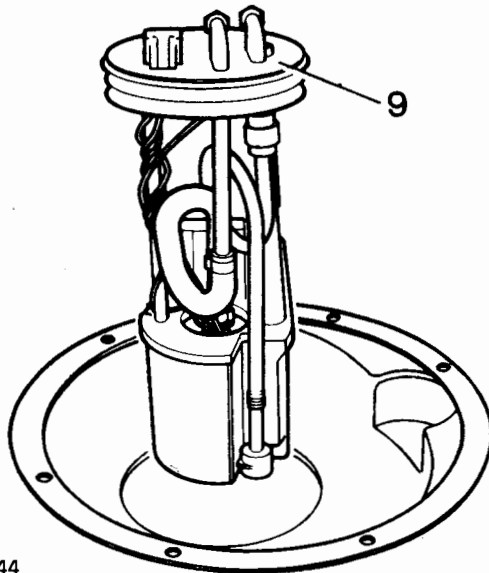
J5443



6. Remove access panel from floor.
7. Disconnect multi-plug from fuel sender unit.
8. Disconnect two fuel line unions from fuel pump.
9. Using service tool no. LRT-19-001, remove pump unit retaining ring. Withdraw unit from fuel tank.



WARNING: A quantity of fuel will be retained in body of unit, care must be taken to prevent fuel spillage when unit is removed.



Refit

10. Insert fuel pump into tank. Fit retaining ring. Tighten to **48 Nm**.
11. Connect fuel lines to pump.
12. Connect multi-plug to sender unit.
13. After assembly, check all fuel pipes, sealing rings and hose connections are secure.
14. Run engine to check for fuel leaks.
15. Inspect access panel seal, fit a new seal if necessary.
16. Fit access panel and tighten screws.
17. Reverse removal procedure. 4 - 5. Fit insulation and carpet.

FUEL TANK

Service repair no - 19.55.01



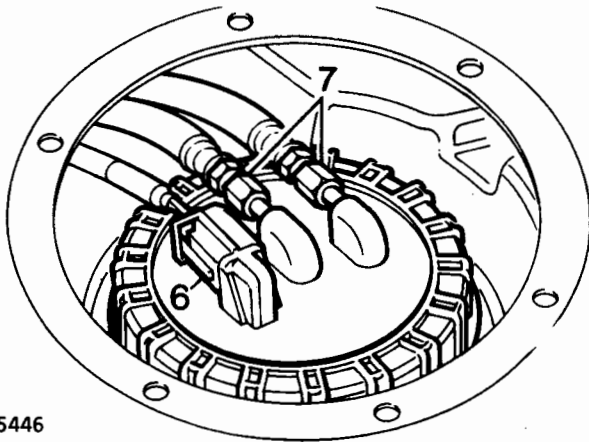
WARNING: Ensure that fuel handling precautions given in Section 01 - introduction are strictly adhered to when carrying out following instructions.



CAUTION: Before disconnecting any part of fuel system, it is imperative that all dust, dirt and debris is removed from around components to prevent ingress of foreign matter into fuel system.

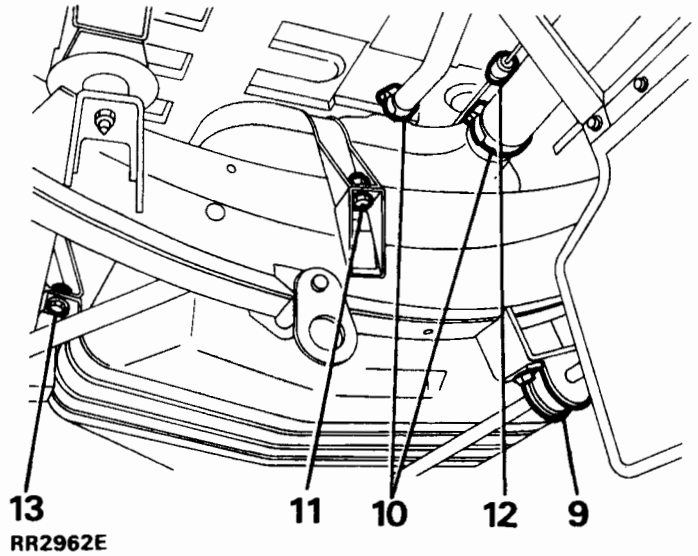
Remove

1. Depressurise fuel system. Disconnect battery negative lead.
2. Syphon fuel tank into a suitable container that can be sealed afterwards.
ENSURE TANK IS DRAINED COMPLETELY. (refer to Warning concerning fuel vapour and spillage at start of procedure).
3. Remove carpet loadspace floor and tailgate.
4. Fold back sound insulation to reveal access panel.



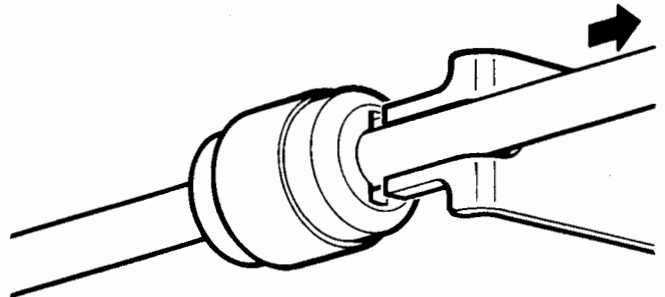
J5446

5. Remove access panel.
6. Disconnect electrical multi-plug.
7. Disconnect two fuel line unions from fuel pump.
8. Working underneath vehicle mark location of anti-roll [sway] bar straps.
9. Remove rear anti-roll [sway] bar straps, and allow bar to swing down clear of tank.



RR2962E

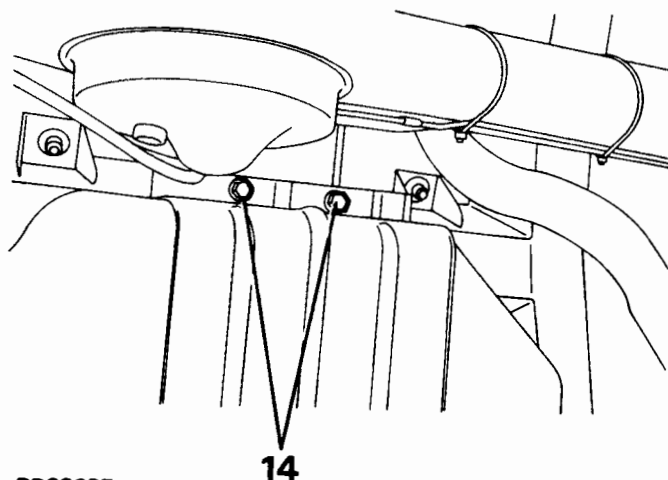
10. Remove tank filler and vent hoses at fuel tank.
11. Remove nut and bolt securing right hand side fuel tank strap.
12. Disconnect evaporative control pipe at green end of 'speedfit' connector.



ST2877M



NOTE: To disconnect 'speedfit' connector, insert forked end of LRT-19-002 into slots of connector see illustration. Press down on collet and simultaneously pull pipe from connector.



RR2963E

13. Remove back two bolts and nut plates securing fuel tank cradle.
14. Remove front nuts, bolts and washers. Remove fuel tank cradle.
15. With assistance, tilt right hand side of tank upwards and manoeuvre tank through chassis to remove.

Refit

16. Reverse removal procedure. Ensuring sealing ring, fuel pipe and hose connections are secure.
17. Run engine, check all connections for fuel leaks.

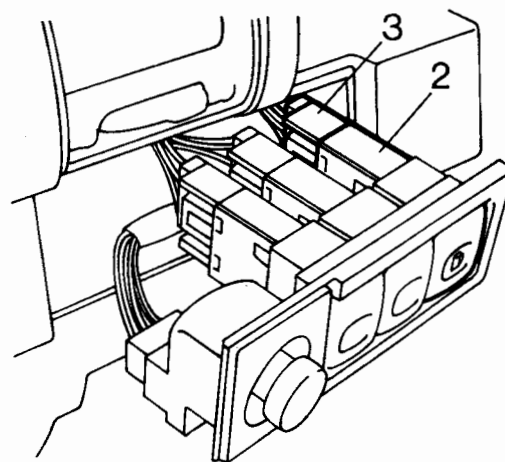
FUEL FILLER FLAP RELEASE BUTTON

Service repair no - 19.55.23

On closing, filler flap will be locked automatically. Note that release button will only work with ignition switched to OFF or AUX.

Remove

1. Disconnect the battery negative lead.
2. Carefully pry release button from mirror switch panel.



RR4270

3. Remove release button from shroud and disconnect tow wiring connectors. Ensure wires protrude through panel for reassembly.

Refit

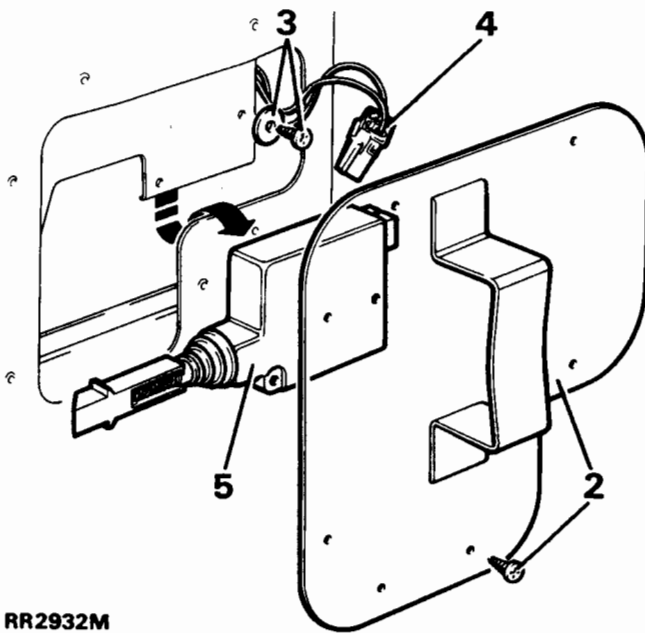
4. Reverse removal procedure.

FUEL FILLER FLAP RELEASE ACTUATOR

Service repair no - 19.55.17

Remove

1. Release fuel filler flap. Disconnect the battery negative lead.
2. Remove eight screws, with draw closure panel, in right hand side of load space.
3. Release two screws and manoeuvre actuator clear of its mounting.
4. Disconnect wiring plug.
5. Withdraw actuator.



RR2932M

Refit

6. Reverse removal procedure.



TORQUE VALUES



NOTE: Torque wrenches should be regularly checked for accuracy to ensure that all fixings are tightened to the correct torque.

	Nm
Air-Bypass valve (stepper motor)	20
All flexible hose securing clamps.....	1,3
Fuel feed pipe - hose to fuel rail	22
Fuel filter	31

EVAPORATIVE LOSS CONTROL SYSTEM

All flexible hose securing clamps.....	1,7
--	-----

METRIC	Nm
M5	6
M6	9
M8	25
M10	45
M12	90
M14	105
M16	180

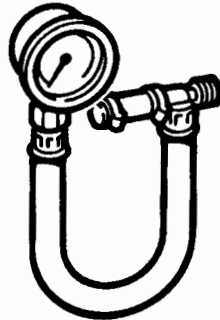
UNC / UNF	
1/4	9
5/16	24
3/8	39
7/16	78
1/2	90
5/8	136



NOTE: Torque values above are for all screws and bolts used except for those specified.



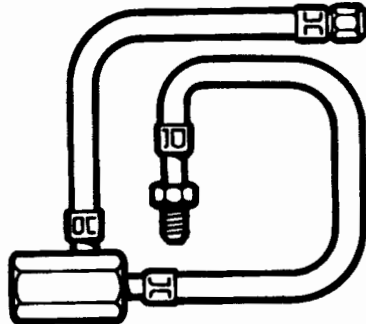
FUEL SYSTEM



18G1500

LRT-19-004
18G 500

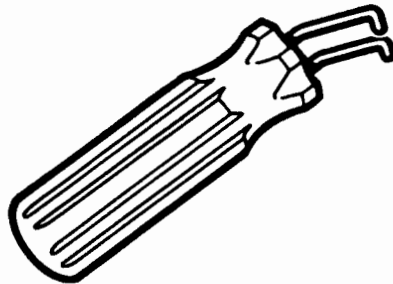
Test equipment fuel pressure



LST143

LRT-19-003
LST 143

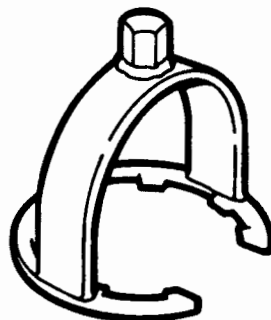
MFI pressure test adaptor



LST 144

LRT-19-002
LST 144

Connector splitter



LST131

LRT-19-001
LST 131

Fuel pump remover

19 - FUEL SYSTEM

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CRUISE CONTROL SYSTEM-HELLA GR66

Description

The cruise control system consists of electro-mechanical devices, and comprises of the following components.

ELECTRONIC CONTROL UNIT (ECU)

The engine control module is located behind the lower dash panel. The microprocessor based ECU evaluates the signals provided by the driver controls, brake pedal switch, clutch pedal switch on manual models, and the vehicle speed sensor. The ECU activates the vacuum pump as required. The ECU also has a memory function for set speed storage.

Driver operated switches

The main cruise control switch is located in the auxiliary switch panel and activates the cruise control system. The steering wheel switches provide 'set/accelerate' and 'resume/decelerate' features. These switches provide the interface between driver and cruise control system.

Brake pedal switch

The brake pedal switch is located under the lower dash attached to the brake pedal mounting bracket. The switch provides for fast disengagement of the cruise control system and rapid return of the throttle levers to the idle position when the brake pedal is applied.

Clutch pedal switch

The clutch pedal switch is located under the lower dash attached to the clutch pedal mounting bracket. The switch provides for fast disengagement of the cruise control system and rapid return of the throttle levers to the idle position when the clutch pedal is applied.

Vehicle speed sensor

The vehicle speed sensor is located on the side of the transfer box adjacent to park brake. The sensor provides road speed data to the ECU. The cruise control system cannot be engaged until the road speed exceeds 45 km/h, (28 mph) the system will automatically disengage at a road speed of 42 km/h (26 mph).

Vacuum pump

The vacuum pump is located in the engine compartment, attached to the left hand valance. The vacuum pump is energised when the main cruise control switch is operated, and is actuated by the steering wheel and brake pedal switches. The pump provides a vacuum source to the cruise control actuator at the throttle levers. A control valve in the pump provides for steady increase of road speed or purge of the system when the brake pedal is applied.

Actuator

The actuator is located in the engine compartment and is bolted to the throttle lever bracketry. The actuator provides the servo mechanism link between the cruise control system and throttle linkage and is operated by vacuum from the vacuum pump.

Neutral lockout relay module-cruise control - Automatic vehicles

The relay module is located in the right hand side footwell, accessible by removing the trim panel.

The function of the relay module is to disengage the cruise control system if neutral, or park, is selected in the main gearbox, when the system is engaged.

Engine speed trip ECU - Manual vehicles

This unit is located in the right hand side footwell, accessible by removing the trim panel.

The function of the unit is to disengage cruise control if engine speed exceeds 5000 rev/min.



ROAD TEST



CAUTION: Do not engage cruise control when vehicle is being used in low transfer gear or reverse.



WARNING: The use of cruise control is not recommended on winding, snow covered or slippery roads or in heavy traffic conditions where a constant speed cannot be maintained.

1. Start engine, depress main control switch to actuate cruise control system. Accelerate to approximately 50 km/h, (30 mph), operate 'set/acc' switch, immediately release switch, remove foot from accelerator pedal. Vehicle should maintain speed at which 'set/acc' switch was operated.
2. Operate 'set/acc' switch and hold at that position, vehicle should accelerate smoothly until switch is released. Vehicle should now maintain new speed at which 'set/acc' switch was released.
3. Momentarily touch and release 'set/acc' switch, vehicle speed should increase 1.6 km/h (1 mph) for each touch. Note that five touches will increase speed 8 km/h (5 mph).
4. Apply 'res/decel' switch while vehicle is in cruise control mode, cruise control should disengage. Slow to approximately 55 km/h, (35 mph) operate 'res/decel' switch, immediately release switch and remove foot from accelerator, vehicle should smoothly accelerate to previously set speed. Increase speed using accelerator pedal, release pedal, vehicle should return to previously set speed.
5. Operate brake pedal, cruise control system should immediately disengage returning vehicle to driver control at accelerator pedal. Operate 'res/decel' switch, vehicle should accelerate to previously set speed without driver operation of accelerator pedal.
6. Operate 'res/decel' switch and allow vehicle to decelerate to below 42 km/h, (26 mph). Operate 'res/decel' switch, cruise control system should remain disengaged.
7. Operate 'set/acc' switch below 40 km/h, (28 mph), cruise control system should remain disengaged. Accelerate, using accelerator pedal to above 45 km/h, (28 mph), operate 'res/decel' switch, and remove foot from accelerator pedal, vehicle should smoothly adjust to previously memorised speed.
8. **Automatic vehicles** - select neutral, system should disengage. **Manual vehicles** - depress clutch, system should disengage.
9. Cruise at 80 km/h (50 mph), declutch, select neutral, remove foot from clutch. Operate 'res/decel' switch. Engine should rev to 5000 rev/min, cruise control disengages, engine returns to idle.
10. Engage forward gear. Operate 'res/decel' switch. Remove foot from accelerator. Speed should accelerate to previous set speed.
11. Depress main control switch in control system should immediately disengage and erase previously set speed from ECU memory. **See *Electrical Trouble Shooting Manual*.**

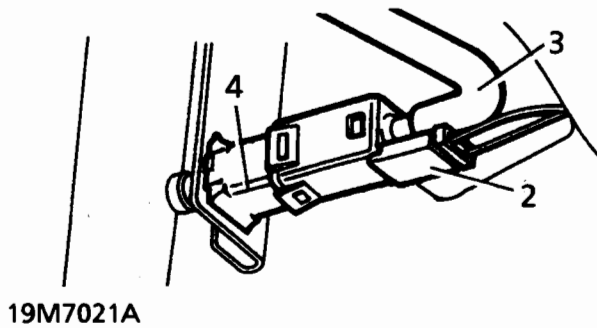


BRAKE AND CLUTCH PEDAL SWITCHES/VENT VALVES

Service repair no - 19.75.34 - Clutch Switch
 Service repair no - 19.75.35 - Brake Switch

Remove

1. Remove lower dash panel.



2. Disconnect electrical multi-plug from pedal switch.
3. Pull vent hose from switch.
4. Release switch/vent valve from bracket.

Refit

5. Reverse removal procedure.

 **NOTE: The switch/vent valve is factory set and does not require adjustment in service.**

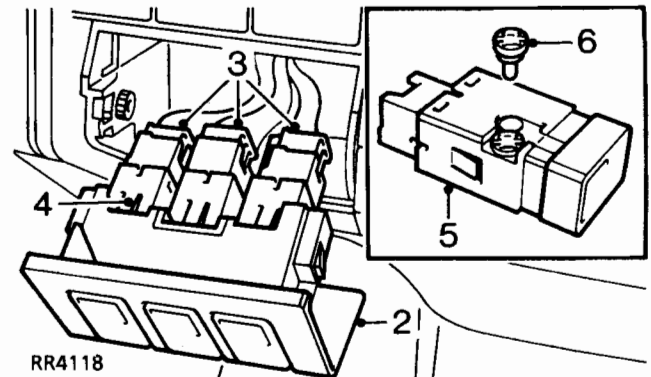
MAIN CONTROL SWITCH

Service repair no - 19.75.30

Switch Replacement

Remove

1. Disconnect battery negative lead.



2. Carefully release lower edge of panel from surround, withdraw panel.
3. Noting their fitted positions, disconnect multiplugs from switches.
4. Depress retaining lugs on switches, remove switches from panel.

Bulb replacement

5. Identify bulb to be replaced and remove appropriate switch.
6. Rotate bulb holder 90 deg. and withdraw it from switch.

Refit

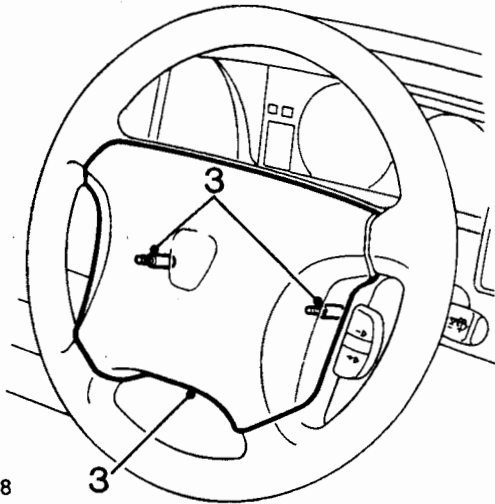
7. Reverse removal procedure.

CRUISE CONTROL SWITCH

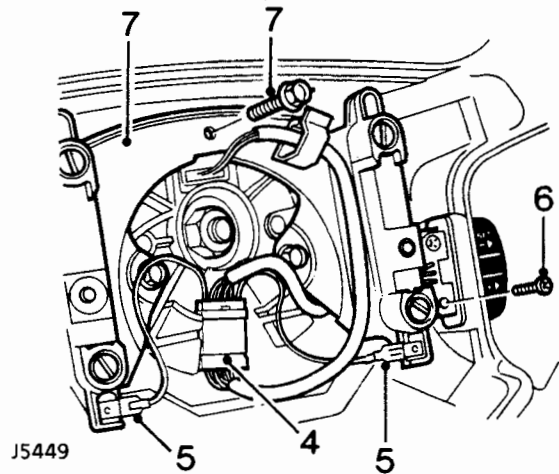
Service repair no - 19.75.36

Remove

1. Disconnect battery negative lead.
2. **Models fitted with airbags:** Remove driver's airbag module. *See SUPPLEMENTARY RESTRAINT SYSTEM, Repair, Driver's Airbag Module*



3. **Models without airbags:** Turn steering wheel through 90°. Remove 2 Torx screws securing pad to steering wheel and remove steering wheel pad.
4. Disconnect cruise control switch multiplug from main harness.



5. Disconnect 2 Lucars from horn contacts.
6. Remove 2 screws securing cruise control switch to steering wheel.
7. Remove 3 bolts securing mounting bracket to steering wheel and remove mounting bracket.
8. Remove cruise control switch from steering wheel.

Refit

9. Reverse removal procedure. Ensuring wiring harness is routed correctly.
10. **Models fitted with airbags:** Refit driver's airbag module and follow all safety precautions. *See SUPPLEMENTARY RESTRAINT SYSTEM, Repair, Driver's Airbag Module*



ROTARY COUPLER

Service repair no - 19.75.54

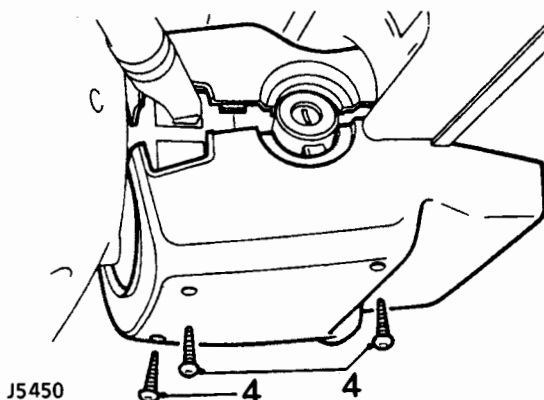
The rotary coupler is located behind the steering wheel. Access is gained by removing the steering wheel and steering column shroud.



NOTE: On vehicles fitted with airbags. See SUPPLEMENTARY RESTRAINT SYSTEM, Repair, Rotary Coupler

Remove

1. Disconnect battery negative lead.
2. Remove steering wheel. *See STEERING, Repair, Steering Wheel*
3. Release 2 turnbuckles securing lower dash closing panel and lower.
4. Remove 3 screws securing lower half of shroud to steering column.



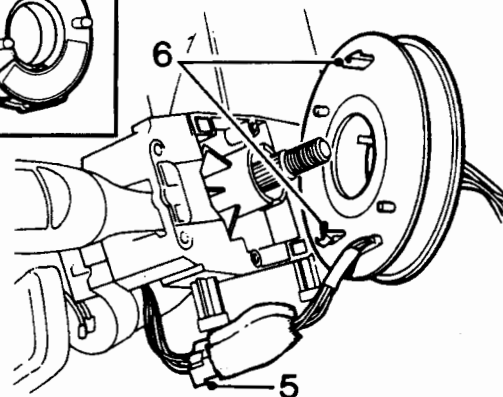
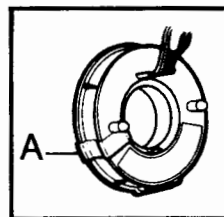
J5450

5. Disconnect rotary coupler multiplug from steering column harness.



NOTE: If rotary coupler is to be re-used a piece of adhesive tape should be placed around the moulding in position A to prevent rotation. Failure to do this may result in damage to the wires inside the coupler.

6. Release clips securing rotary coupler to column stalk assembly.
7. Remove rotary coupler from column stalk assembly.



J5451



CAUTION: Ensure front wheels are in the straight ahead position before removal and refitting. Store in a plastic bag. DO NOT rotate mechanism whilst removed.

Refit

8. Reverse removal procedure. Ensuring that the column harnesses are not trapped by the column shroud.



NOTE: If original rotary coupler is to be fitted and there is evidence of tampering, it is imperative that the coupler is centralised. See SUPPLEMENTARY RESTRAINT SYSTEM, Repair, Rotary Coupler Centralise.



NOTE: If a new rotary coupler is to be fitted and the sealing tape is broken it MUST NOT be used. Ensure rotary coupler lugs are correctly engaged in the rear of the steering wheel.

ACTUATOR

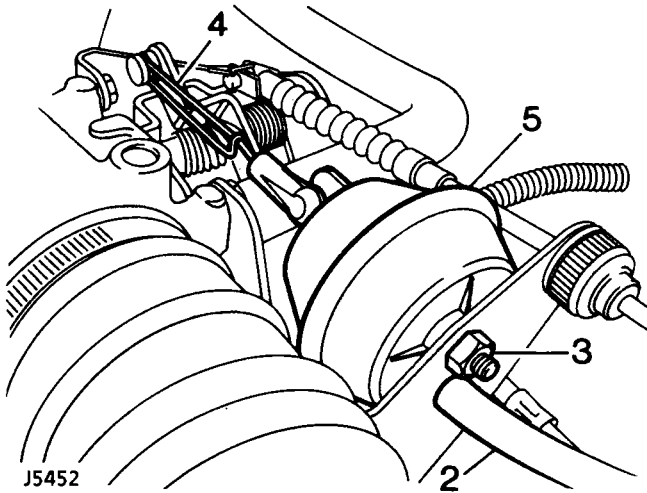
Service repair no - 19.75.12



NOTE: The actuator is non serviceable, fit a new unit if failure or damage occurs.

Remove

1. Disconnect battery negative lead.
2. Disconnect vacuum hose from actuator.
3. Remove nut securing actuator to throttle bracket.
4. Remove actuator, and manoeuvre actuator operating link off throttle lever.
5. Withdraw actuator.

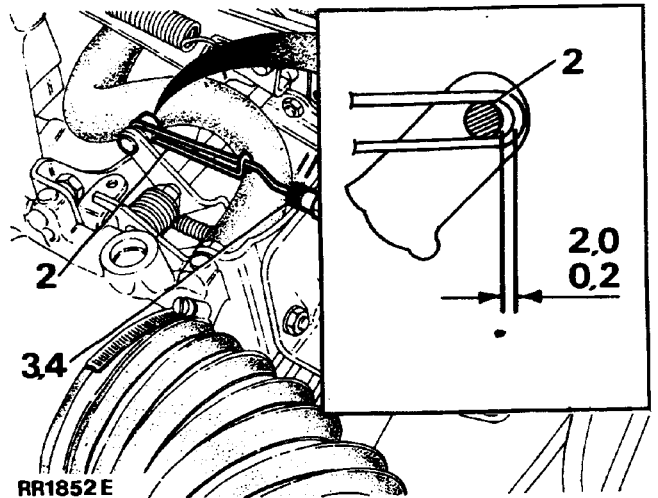
**ACTUATOR LINK-SETTING**

Service repair no - 19.75.21



NOTE: Setting procedure is carried out at minimum throttle condition only.

1. Ensure ignition is switched 'OFF'.
2. Check clearance between inside edge of actuator link and recessed diameter of throttle lever. Clearance should be 0.2 to 2.0 mm.

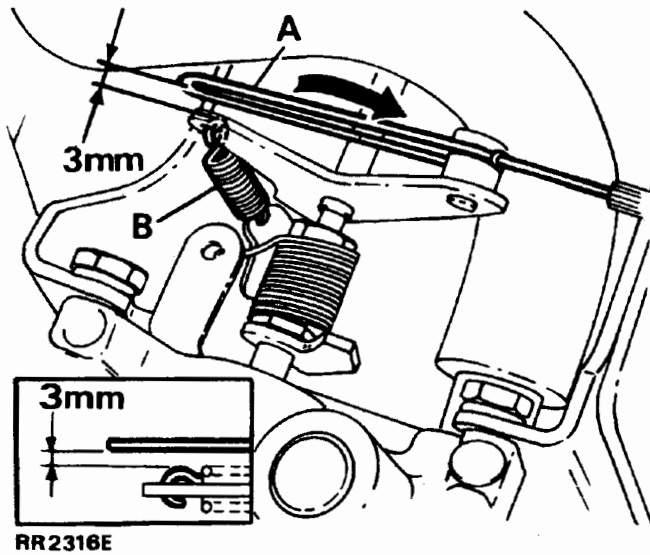
**Refit**

6. Inspect rubber diaphragm. Fit a new actuator assembly if diaphragm is damaged.
7. Reverse removal procedure. Fitting the hook uppermost.



Link - adjust

3. Remove link from actuator.
4. Rotate socket joint adjuster as necessary.
5. Refit link to actuator and recheck clearance between link and lever.
6. With throttle fully open, check a gap of at least 3mm exists between side of link ("A" in illustration) and side of small spring ("B" in illustration). Realign link by bending to achieve correct gap. Recheck clearance at closed throttle/open throttle. Check link slides smoothly in groove of throttle lever.



VACUUM PUMP

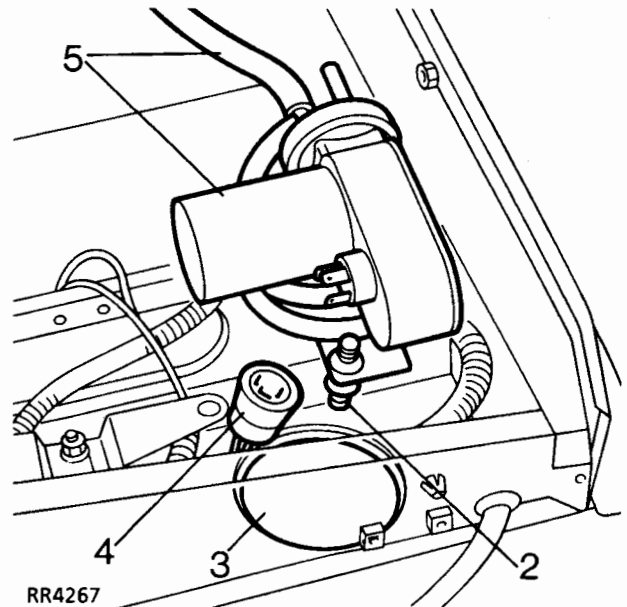
Service repair no - 19.75.06



NOTE: The vacuum pump is non serviceable, fit a new unit if failure or damage occurs.

Remove

1. Remove air cleaner. *See Air Cleaner*
2. From under the LH front wing [fender]: Press 3 rubber mountings through panel and release vacuum pump.
3. From inside engine compartment: Withdraw out of panel aperture.
4. Disconnect multiplug from vacuum pump.
5. Release vacuum pump rubber mountings from body.
6. Disconnect vacuum feed hose and remove vacuum pump.



Refit

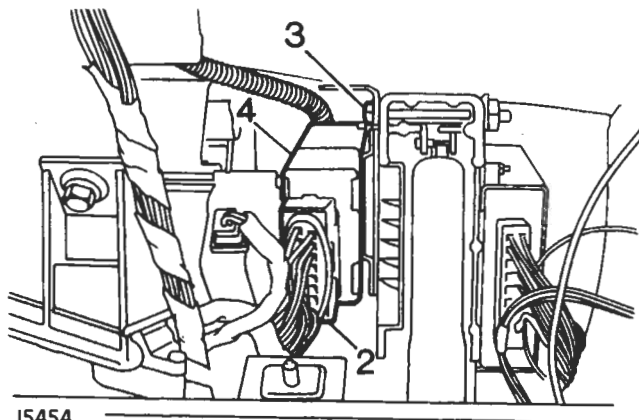
7. Reverse removal procedure. Ensuring all hose and electrical connections are secure.

CRUISE CONTROL ECU

Service repair no - 19.75.49

Remove

1. Remove lower dash panel.



J5454

2. Disconnect ECU multi-plug.
3. Remove ECU fixing.
4. Remove ECU.
5. Reverse removal procedure. Ensuring that electrical multi-plug is securely reconnected.

SPEED TRIP ECU - MANUAL



NOTE: The neutral lock out relay module/speed trip ECU is mounted in the right hand side footwell. To identify components. See *Electrical Trouble Shooting Manual*.