



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.



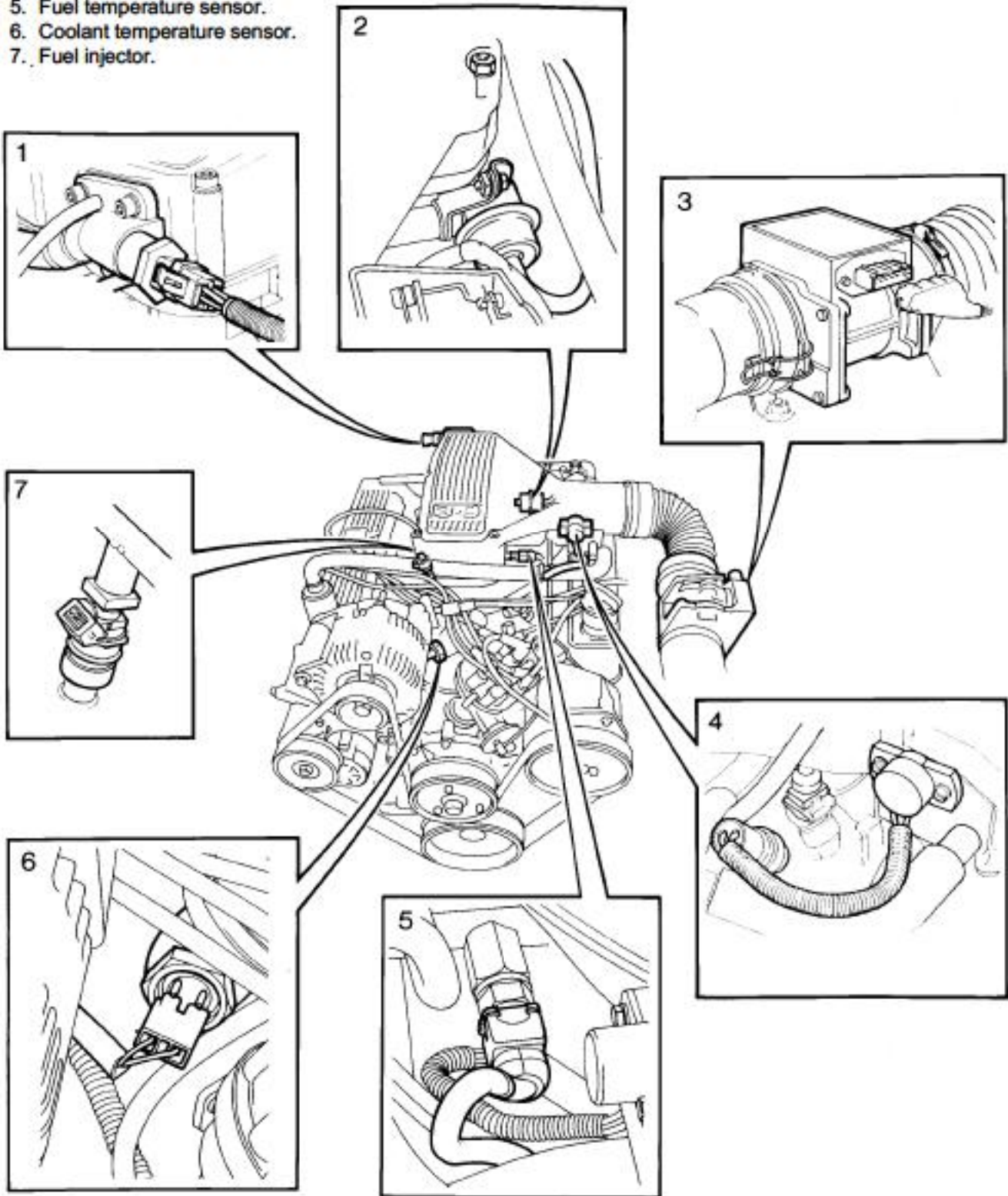
WARNING: Check the integrity of the fuel system before the inertia switch is reset.

Relay modules

The two multiport fuel injection relays 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 multiport 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 potentiometer.
5. Fuel temperature sensor.
6. Coolant temperature sensor.
7. Fuel injector.

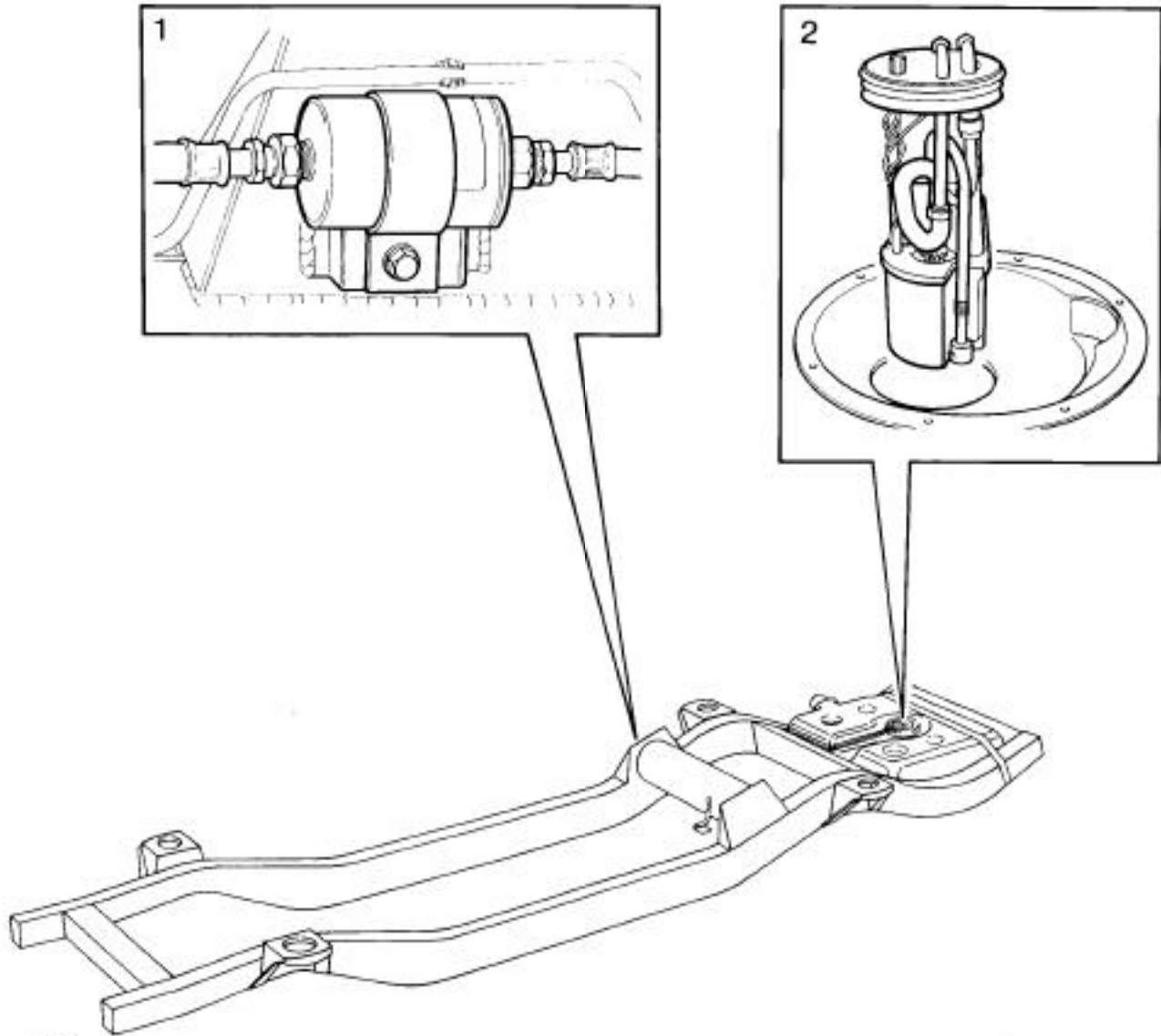


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CHASSIS MOUNTED COMPONENTS

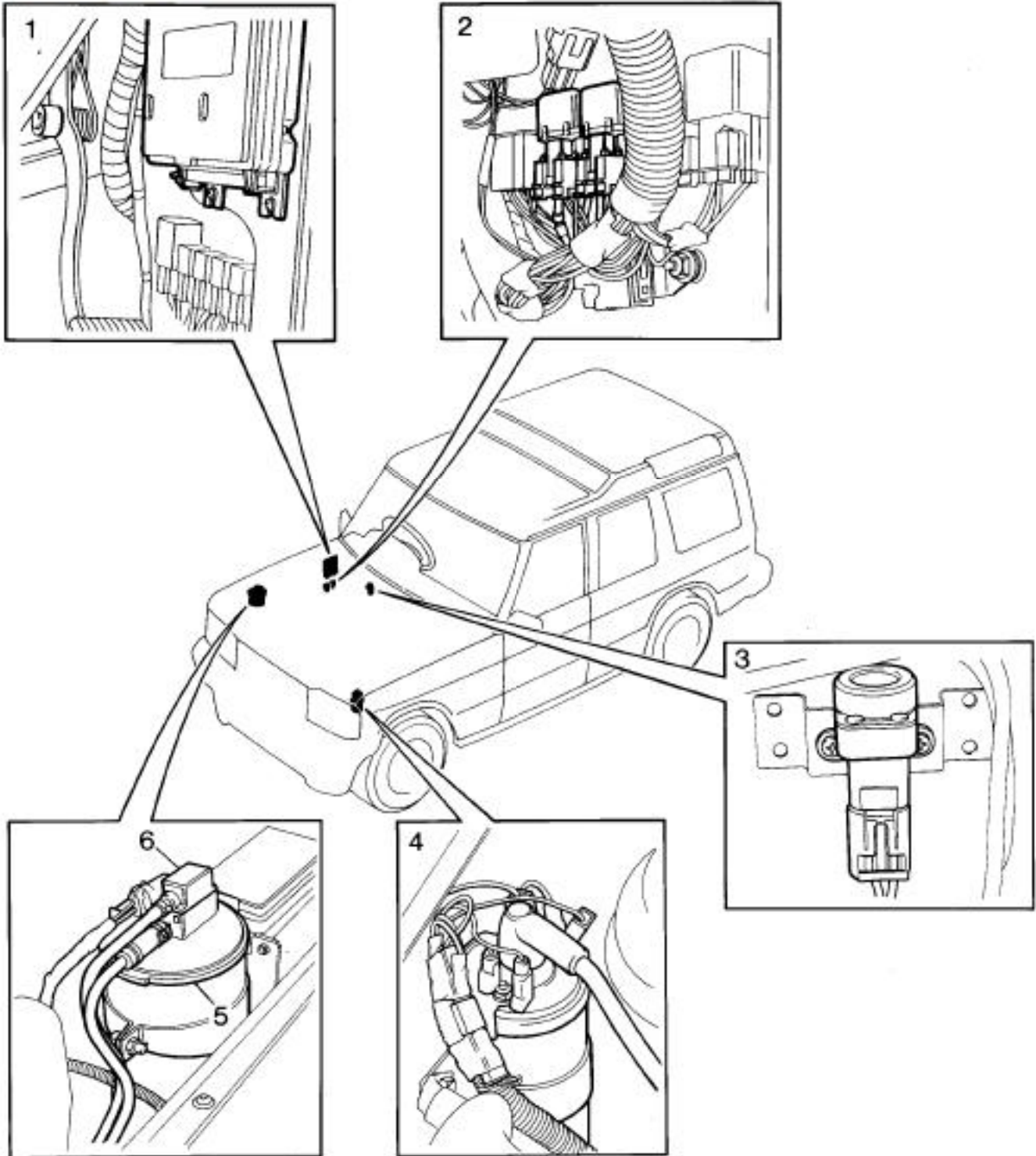
1. Fuel filter.
2. Fuel pump (in fuel tank).



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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.



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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*
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 catalysis. 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 pressurise to 2.54 Kgf/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



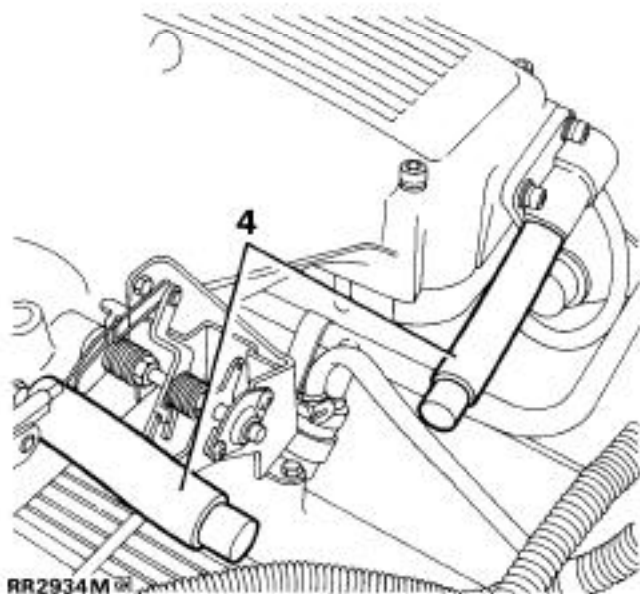
NOTE: Base idle speed is set at factory. It should not require further adjustment unless plenum chamber is changed. The adjustment screw is sealed with a plug to prevent unauthorised alteration. Check ignition timing before attempting following procedure, since this will affect idle speed.

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

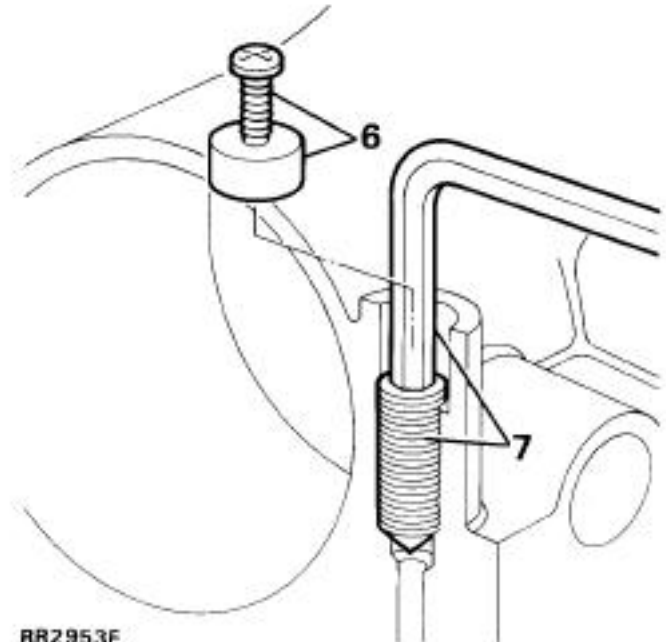
1. Drive vehicle at least two miles until engine and transmission are hot. Switch off engine.
2. Check all electrical loads are OFF, including air conditioning.
3. Remove air by-pass valve hose.



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, Engine 3.9 v8i**

Adjusting base idle speed



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 multipoint 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 multipoint 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.

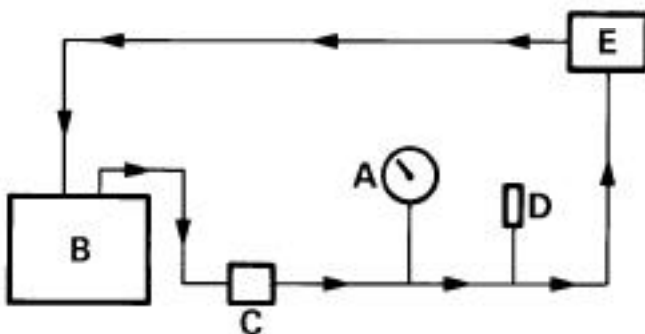
The spilling of fuel is unavoidable during this operation. Ensure that all necessary precautions are taken to prevent fire and explosion.

1. Remove fuel pump relay module. *See Repair, Multipoint Fuel Injection Relay*
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*



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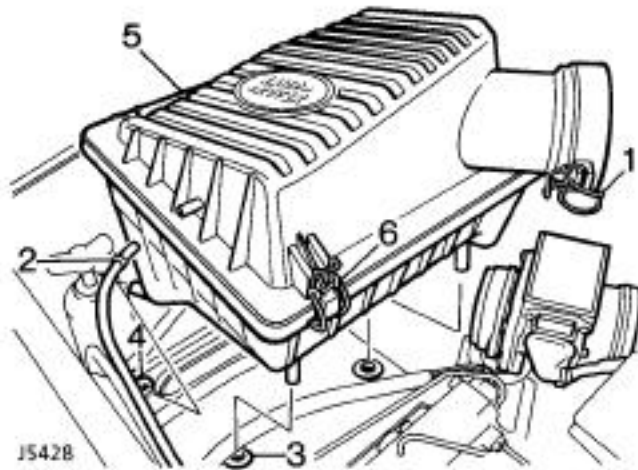
- A Pressure gauge 18G1500
- B Fuel tank and pump
- C Fuel filter
- D Fuel injectors x 8
- E Regulator



AIR CLEANER ASSEMBLY

Service repair no - 19.10.01

Remove



J5428

3.9 V8 vehicle illustrated

1. Release 2 clips securing air cleaner to air flow sensor.
2. **3.9 V8 only:** Release clip and disconnect hose from air cleaner.
4.0 V8 only: Release clip and disconnect multiplug from intake air temperature sensor. *See FUEL SYSTEM SFI, Repair, Intake Air Temperature Sensor*
3. From below wheel arch, 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.
8. **4.0 V8 only:** Remove intake air temperature sensor from cover.
9. Remove rubber mountings.

Refit

10. Fit rubber mountings to new body.
11. **4.0 V8 only:** Fit intake air temperature sensor to new cover. Tighten to **8Nm**.
12. Fit new air cleaner element and secure in position.
13. Reverse removal procedure.



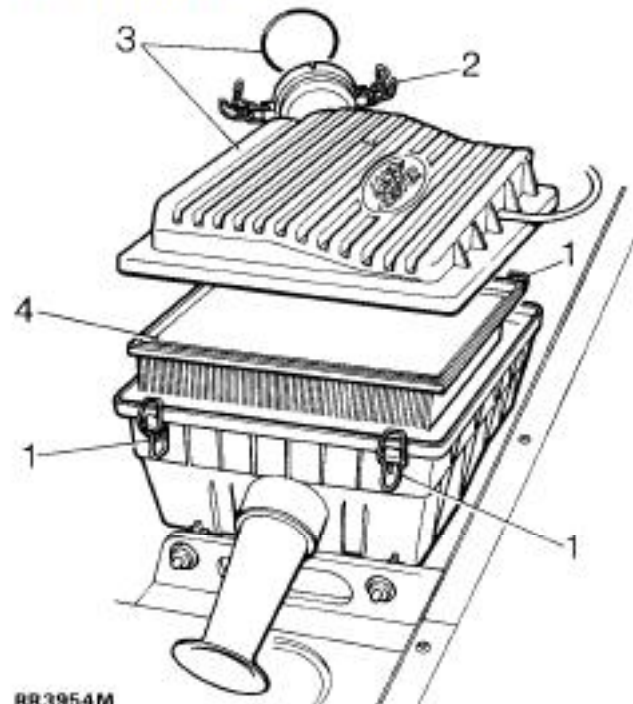
NOTE: Pull rubber mountings from below to secure unit to wheel arch.

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.



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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

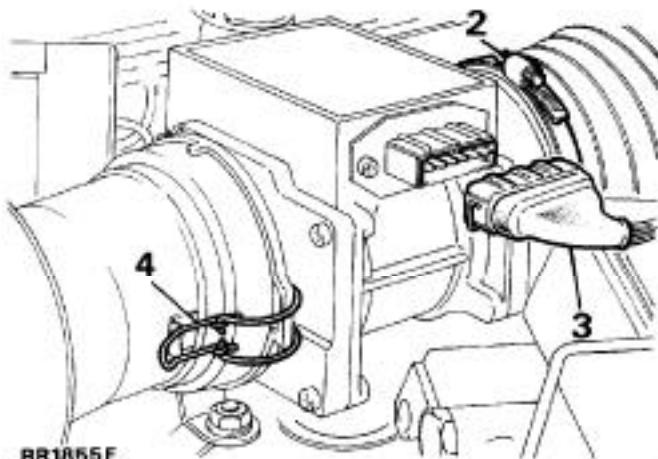
Service repair no - 19.22.25

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.



Refit

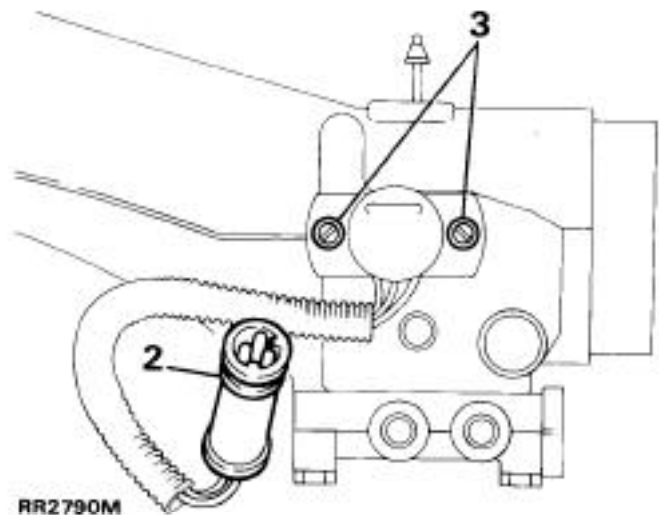
5. Reverse removal procedure. Ensure multi-plug is firmly reconnected, and hose clamp at the rear of sensor is securely tightened, to prevent unmeasured air entering engine.

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.



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.

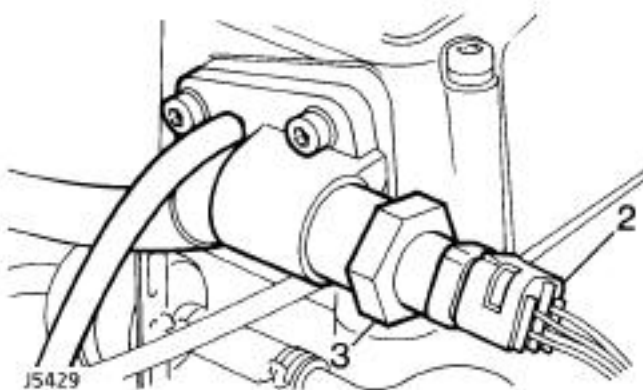


IDLE AIR CONTROL VALVE

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.

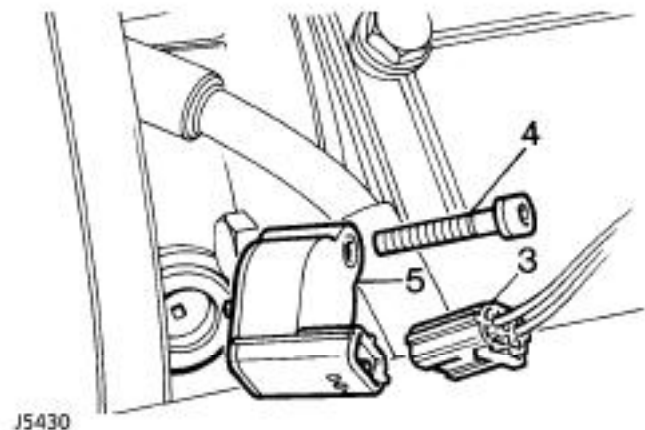
VEHICLE SPEED SENSOR

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

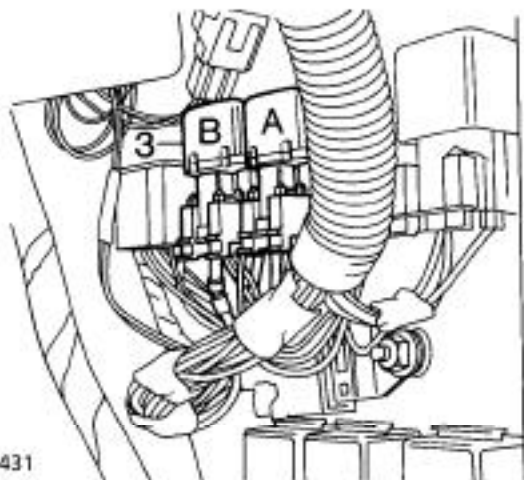
6. Reverse removal procedure.

MULTIPOINT FUEL INJECTION RELAYS

Service repair no - 19.22.08

The two Multipoint 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



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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

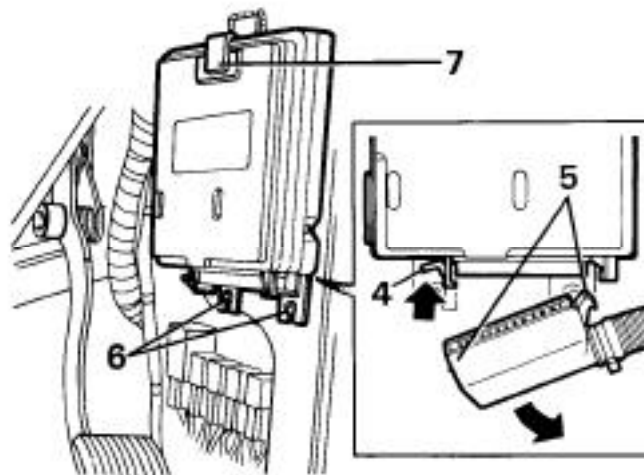
Service repair no - 19.22.34



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.



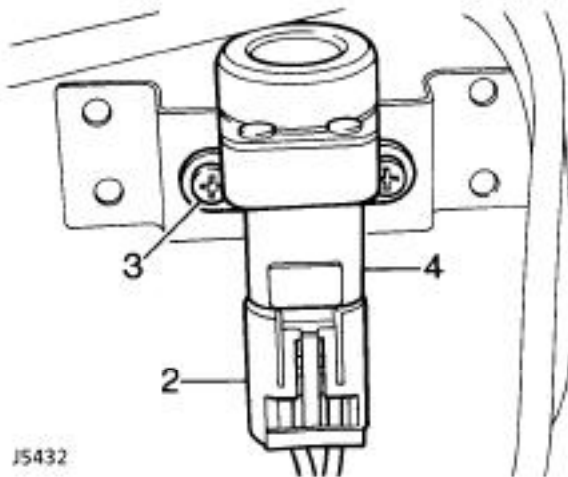
INERTIA FUEL SHUTOFF SWITCH

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

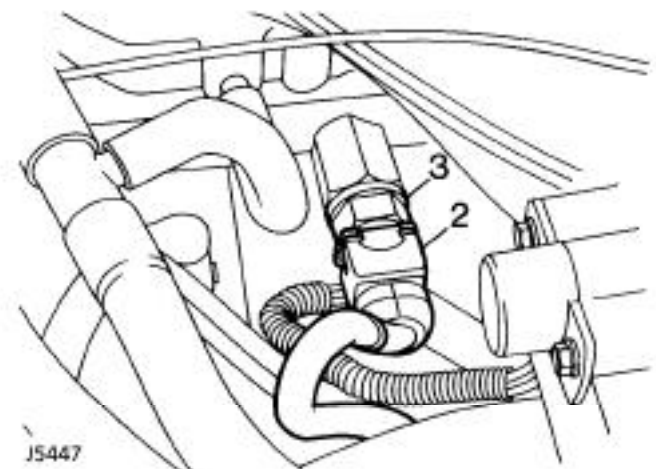
Service repair no - 19.22.08

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

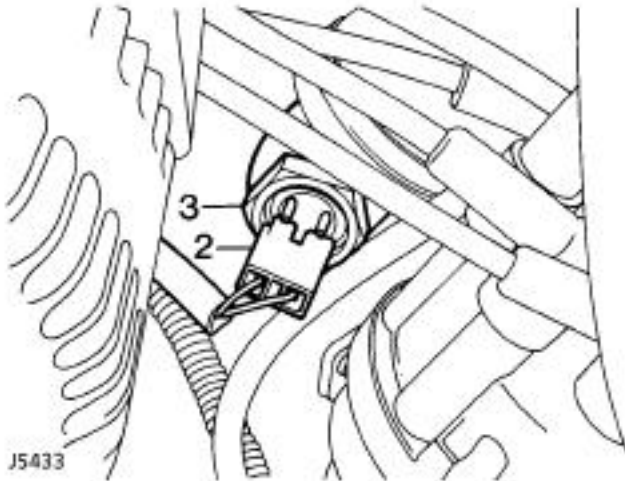
4. Reverse removal procedure. Ensure sensor is tightened securely in fuel rail.

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 railOR
 - 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).

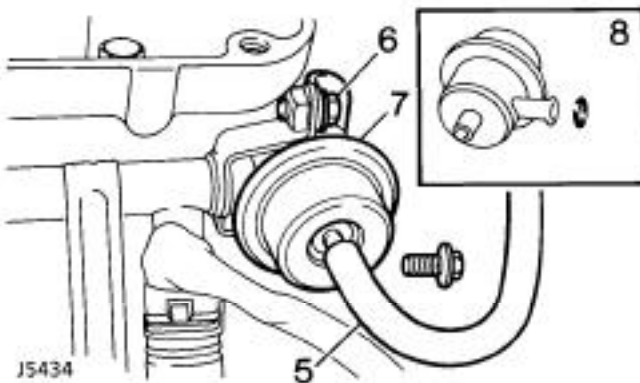


FUEL PRESSURE REGULATOR

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

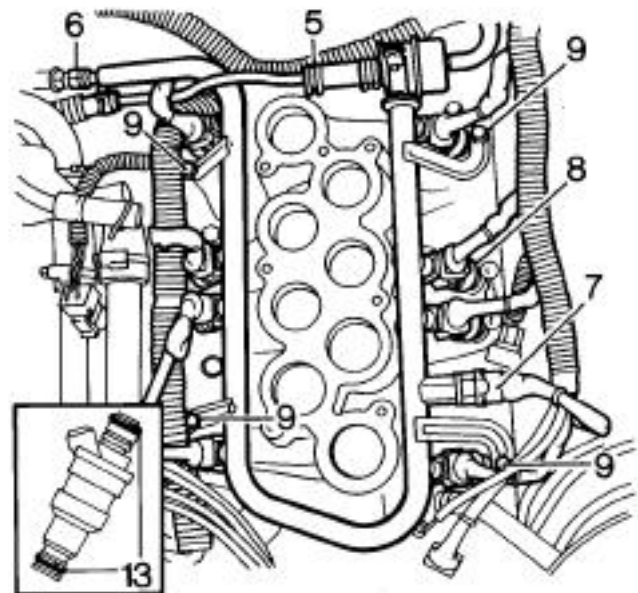
Remove

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.



J5435

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.

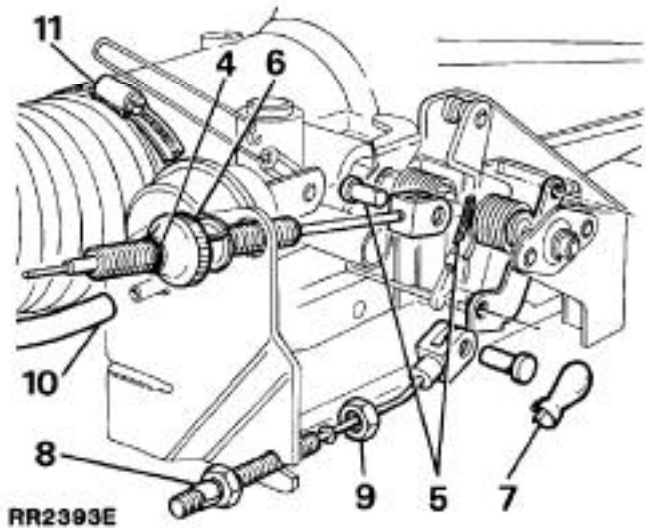
PLENUM CHAMBER

Service repair no - 19.22.46

Includes throttle levers and throttle disc

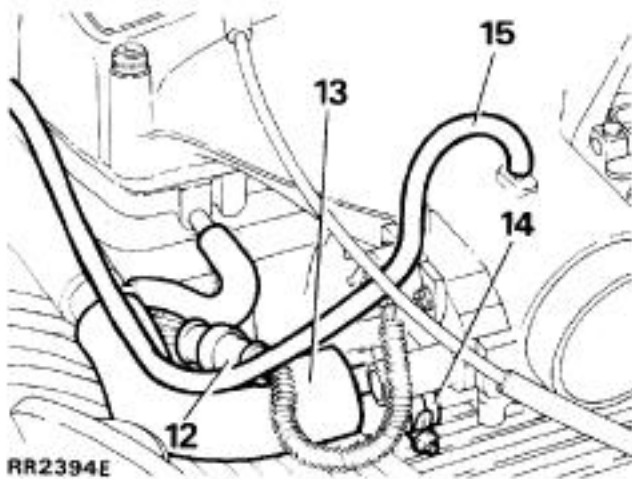
Remove

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.



RR2393E

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.

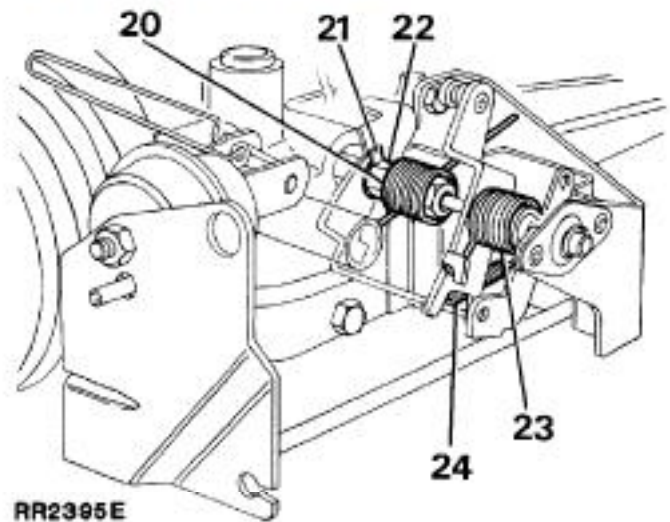


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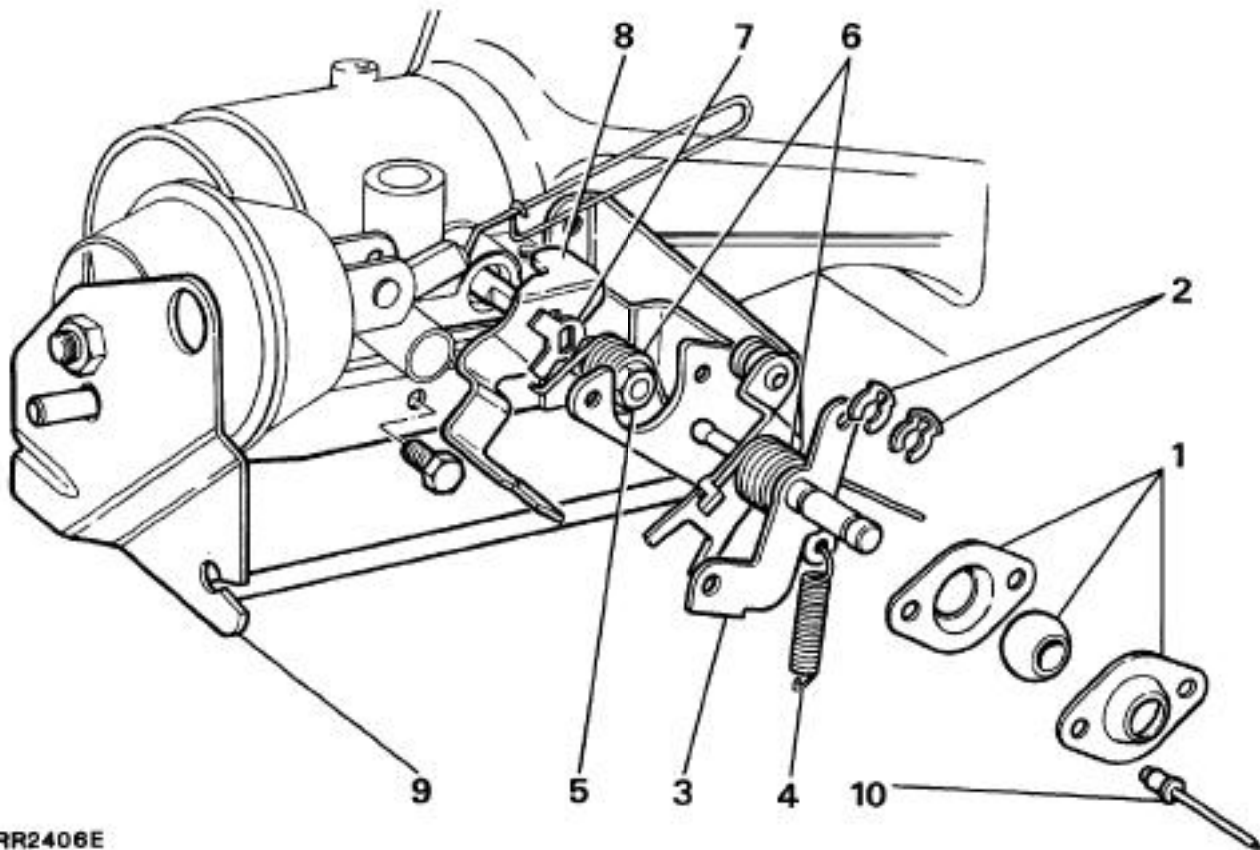
15. Remove distributor vacuum hose.
16. Release two screws and remove throttle position sensor.
17. Remove six screws securing plenum chamber. Remove plenum chamber.
18. Remove air idle air control valve hose.

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.



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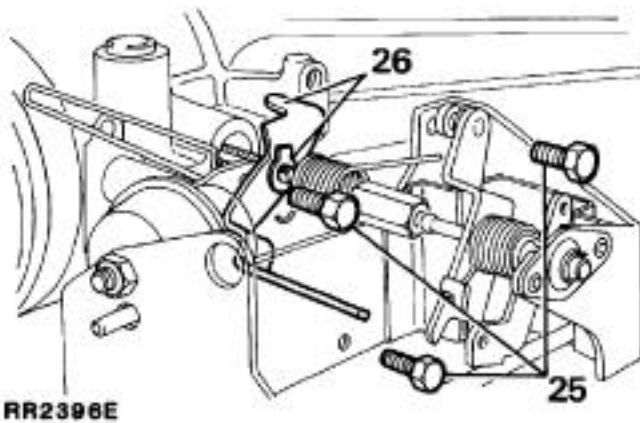
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KEY

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)

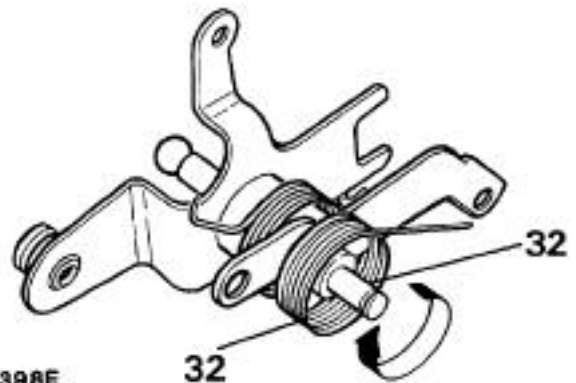


25. Remove three bolts securing throttle bracket to plenum chamber, withdraw bracket assembly.
26. Remove tab washer and throttle stop lever from throttle shaft.



RR2398E

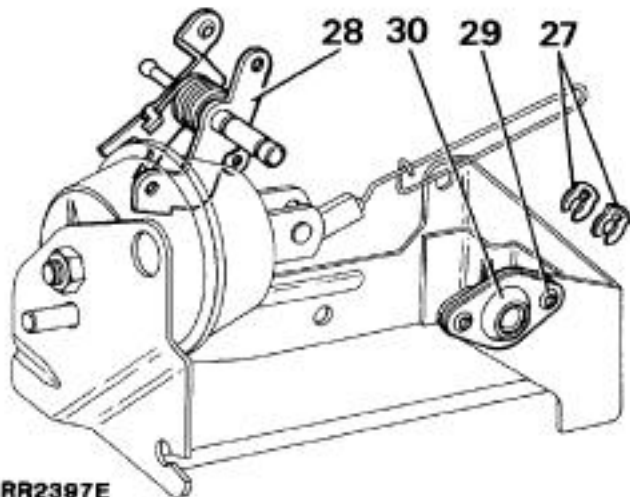
31. Grease new bush with Admax L3 or Energrease LS3. Assemble bush into housing. Assemble to throttle bracket using two 4.7 mm (3/16 in) diameter domed head rivets.
32. Examine bearing surface of countershaft assembly. If worn fit new assembly, otherwise wind throttle return spring off levers.



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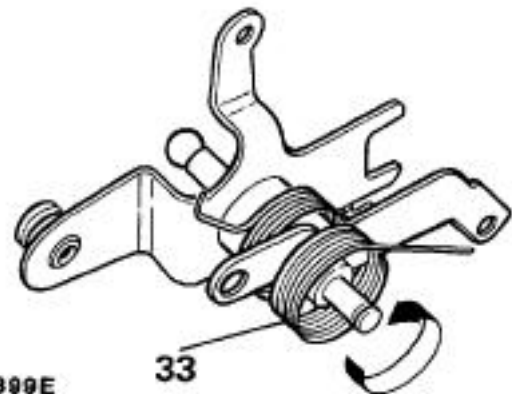
Throttle lever assembly - inspect and overhaul

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.



RR2397E

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



RR2399E

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.