

FUEL INJECTION - Circuit Diagram

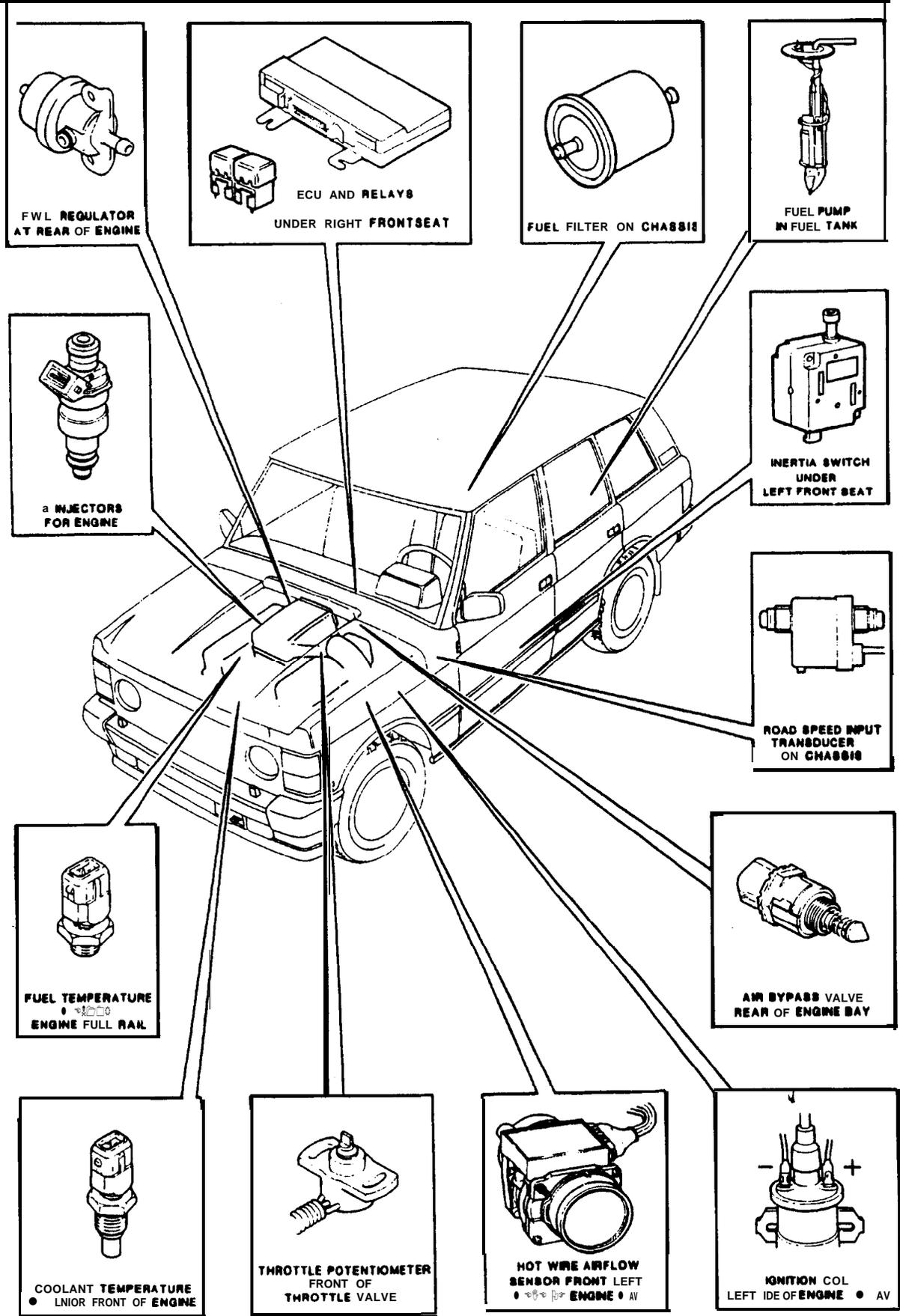
- | | |
|---|--|
| <ul style="list-style-type: none"> 1. 40 way connector to Electronic Control Unit (ECU). 2. Lambda sensor (left side - bank A). 3. Lambda sensor (right side - bank B). 4. By-pass air valve (stepper motor) (fast idle). 5. Lambda sensor screened ground. 6. Fuse 18 - main fuse panel. 7. Inertia switch. 8. Fuel pump. 9. Ignition switch. 10. Speed transducer (road speed input). 11. Neutral switch (automatic gearbox) (load input). 12. Pick-up point-air conditioning circuit (load input). | <ul style="list-style-type: none"> 13. Battery. 14. Diagnostic plug. 15. In-line resistor. 16. Coil/-ve (engine RPM input). 17. Coolant temperature thermistor (sensor) (input). 18. Fuel temperature thermistor (sensor) (input). 19. Throttle potentiometer. 20. Air flow sensor. 21. Fuel pump relay. 22. Main relay. 23. Injectors-I to 8. 24. Pick-up point E.F.I. warning symbol (instrument binnacle). <p>== = Denotes screened ground.</p> |
|---|--|

NOTE: Reference to left and right side is made when viewing vehicle from rear.

Cable colour code

B	Black	C	Green	R	Red	S	Grey
U	Blue	O	Orange	W	White	K	Pink
N	Brown	P	Purple	Y	Yellow	LG	Light green

The last letter of a colour code denotes the tracer.



RR2178E

INTRODUCTION

The Electronic Fuel injection system provides a reliable and efficient microprocessor controlled fuel management system.

The function of the system is to supply the exact amount of fuel directly into the inlet 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 Electronic Control Unit (E.C.U.), the E.C.U. will then determine the exact amount of fuel required at any condition.

The E.C.U. 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.

DESCRIPTION

ELECTRONIC CONTROL UNIT-ECU

The Electronic Fuel Injection system is controlled by the E.C.U. which is located under the front right hand seat. The control unit is a microprocessor with integrated circuits and components mounted on printed circuit boards. The E.C.U. 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 THERMISTOR (SENSOR)

The coolant thermistor (sensor) is located by the front left hand branch of the intake manifold. The thermistor provides engine coolant information to the E.C.U. The E.C.U. on receiving the signal from the thermistor will lengthen slightly the time that the injectors are open, and reducing this time as the engine reaches normal operating temperature.

FUEL TEMPERATURE THERMISTOR (SENSOR)

The fuel temperature thermistor (sensor) is located in the fuel rail forward of the ram housing. The thermistor sends fuel temperature data to the E.C.U, the E.C.U on receiving the data will adjust the injector open time accordingly to produce good hot starting in high ambient temperatures.

BYPASS AIR VALVE (STEPPER MOTOR)

The bypass valve is screwed into a housing attached to the rear of the plenum chamber, between the plenum chamber and bulkhead. The bypass 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 E.C.U.

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

LAMBDA SENSORS (O₂ SENSORS)

The two Lambda 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 E.C.U. Each sensor is heated by an electrical element to improve its response time when the ignition is switched on.

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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 E.C.U.

THROTTLE POTENTIOMETER

The throttle potentiometer is mounted on the side of the plenum chamber inlet neck and is directly coupled to the throttle valve shaft.

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

In addition the E.C.U. will weaken the mixture when it detects the potentiometer output voltage is decreasing under deceleration and will shorten the length of time the injectors are open.

When the throttle is fully open, the E.C.U. will detect the corresponding throttle potentiometer 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 E.C.U.

ROAD SPEED TRANSDUCER

The road speed transducer is fitted between the upper and lower speedometer cables. It is mounted on a bracket located on the left hand chassis side member adjacent to the rear engine mounting. The transducer provides road speed data to the ECU. The ECU in turn detects vehicle movement from the road speed input and ensures that idle speed control mode is disengaged. Should the speed transducer fail in service the ECU idle speed control would become erratic.

INERTIA SWITCH

The inertia switch is a mechanically operated switch located under the left hand front seat attached to the seat base rear cross-member.

The switch is normally closed and is in the ignition feed (fuse to 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.

RELAYS

The two electronic fuel injection relays are located under the front right hand seat mounted forward of the E.C.U. The main relay is energized via the E.C.U when the ignition is switched on and supplies current to the fuel injection system. The fuel pump relay is energized by the E.C.U. which in turn operates the fuel pump to pressurize the fuel system.

E.F.I. WARNING SYMBOL (Instrument binnacle)

An E.F.I. warning symbol incorporated into the instrument binnacle will illuminate when the E.C.U. detects that it cannot maintain correct air/fuel ratio due to a fault in one of the following fuel injection system components.

Air flow sensor.

Lambda sensor.

Water temperature thermistor. (sensor)

Throttle potentiometer.

The symbol will illuminate on initial turn of the ignition key as part of the bulb check feature, and will go out after a few seconds.

If the symbol illuminates when the engine is idling or the vehicle is being driven it indicates a failure of one of the four functions, the vehicle should be driven with care, and the cause rectified, refer to test procedure for the particular functions. Should one of the functions fail, the vehicle can still be driven due to a limp home feature incorporated into the fuel injection system.

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 on the fuel injection/engine system, the following check and adjustments must be carried out before attempting to start the engine.

- A. Throttle potentiometer setting - see 'Throttle potentiometer' setting procedure.
- B. Spark plug gaps - see 'Section 05 Engine tuning data'.
- C. Throttle levers - see 'Throttle lever setting procedure'.
- D. Ignition timing - static - see 'Section 86 Electrical'.

CAUTION: 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 **circuitry** must be checked using the appropriate recommended equipment.

Recommended Equipment -

Lucas 'Electronic Ignition Analyser'
Lucas Part Number - YWB 119.

Lucas Diagnostic Equipment
Lucas Part Number - 60600965 (complete kit)

Individual part numbers for the above kit are as follows:

Hand held test unit - Model 2HHT
Lucas Part Number - 84772

Interface unit - Model 21U
Lucas Part Number - 84773

Serial link lead
Lucas Part Number - 54744753

Memory card
Lucas Part Number - 54744754

Operating manual
Lucas Part Number - XXB825

Plastic case
Lucas Part Number - 54744755

NOTE: The Lucas diagnostic equipment can be connected to the diagnostic plug located by the E.C.U.

Use in conjunction with the Lucas Operating Instruction Manuals.

If the above equipment is unavailable the tests can be carried out using a multi-meter, following the instructions given in the charts.

CAUTION: Ensure the multi-meter is correctly set to volts or ohms, dependent upon which test is being undertaken.

Carry out the following static checks before undertaking the continuity procedure:-

- A. Fuse 18 - in main fuse panel - is intact.
- B. Inertia switch - not tripped.
- C. Fuel - ample fuel in fuel tank.
- D. Battery Condition - state of charge.
- E. Air Leaks - no unmetered air entering engine system.
- F. Electrical Connections - dry, clean and secure.

CONTINUITY TEST PROCEDURE

The continuity procedure and instructions on the following pages must be followed precisely to prevent damage occurring to any of the fuel system components.

To enable the tests to be carried out when the 40 way multi-plug is connected to the E.C.U., it is necessary to remove the two screws securing the shroud to the plug to enable the multi-meter probes to be inserted into the back of the appropriate pin.

CAUTION: Tests that require the plug to be removed from the E.C.U., must also have the meter probes inserted into the back of the plug. If the probes are inserted into the plug sockets, damage will occur to the sockets resulting in poor connections when the plug is reconnected.

TESTING

1. Remove the E.C.U., and harness plug from beneath the front right hand seat, access is gained through the rear opening of the seat base.
2. Remove the plug shroud and maneuver it along the harness until there is enough clearance enabling meter probes to be inserted into the back of the plug.
3. There are 4 pin numbers, 1, 13, 28, 40 moulded onto the rear of the plug for pin position identification as shown in the illustration below, (for clarity the electrical leads have been omitted).

Pins 1 to 13 top row.

Pins 14 to 27 centre row (Pin 14 is below pin 13 but is not identified on the rear of the plug).

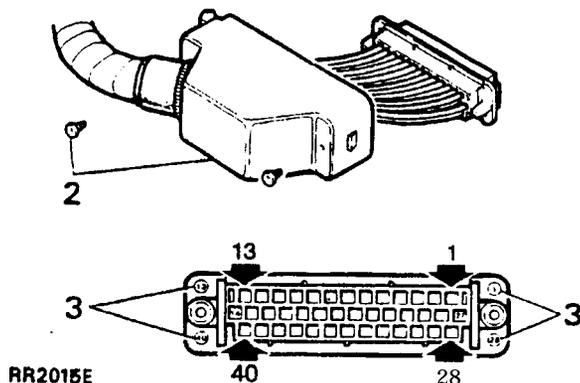
Pins 28 to 40 bottom row.

PIN NOS. CABLE COLOUR

1. Red/green
2. Brown/orange
3. Yellow
4. Black
5. Brown/purple
6. Yellow
7. Green/blue
8. Not used
9. White/light green
10. Black/Yellow
11. Yellow/white
12. Blue/red
13. Yellow/blue
14. Black
15. Brown
16. Blue/purple
17. Not used
18. White/pink
19. White/grey
20. Red
21. Yellow/blue
22. Blue/red
23. Blue
24. Blue
25. Red/black
26. Green/white
27. Black/grey
28. Blue/grey
29. Orange
30. Not used
31. Not used
32. Grey/white
33. Not used
34. Black/orange
35. Blue/green
36. Not used
37. White/yellow
38. Not used
39. White/black
40. Black

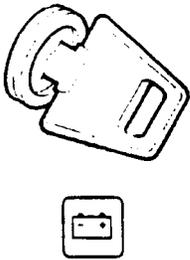
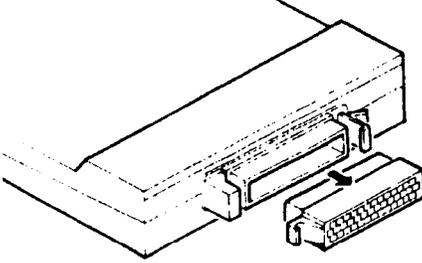
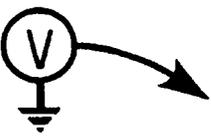
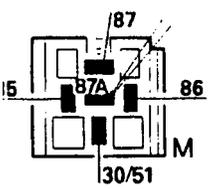
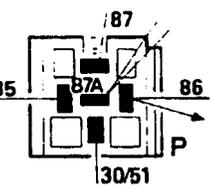
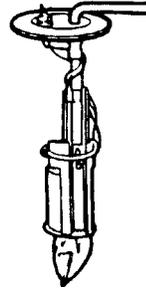
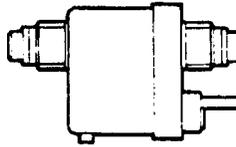
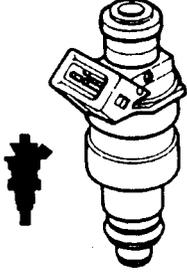
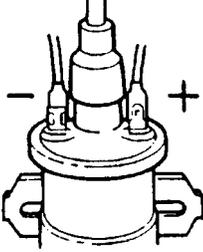
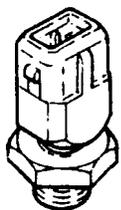
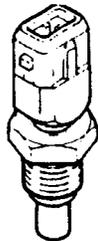
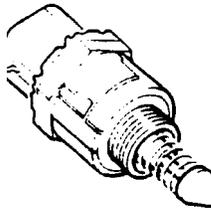
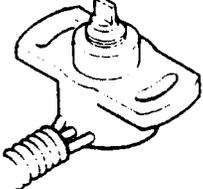
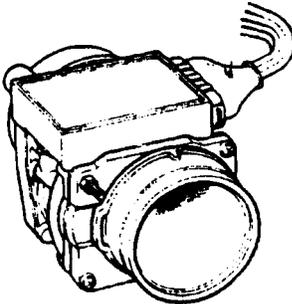
The last colour denotes the wire tracer colour.

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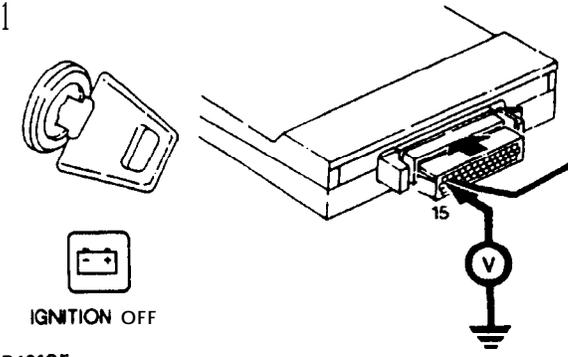
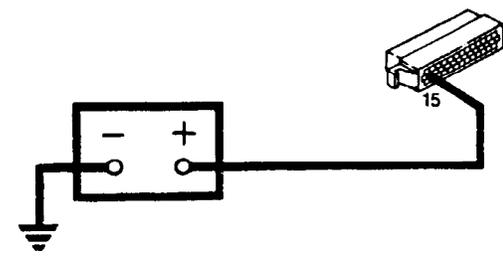
TESTS - Using a Multi-Meter

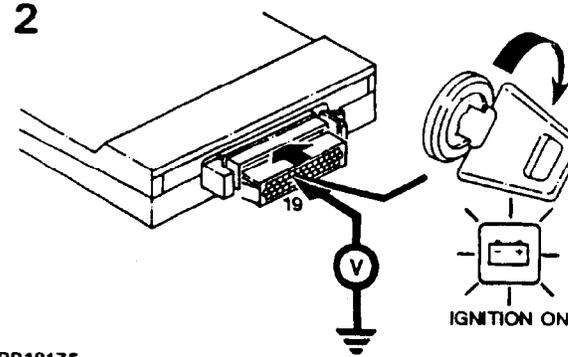
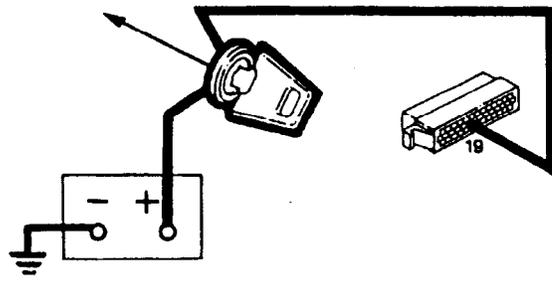
The following continuity tests are intended as a guide to identifying where a fault may be within a circuit; reference should be made to the fuel injection circuit diagram for full circuit information.

<p>KEY TO SYMBOLS</p>	 <p>IGNITION SWITCH</p>	 <p>ELECTRONIC CONTROL UNIT AND MULTIPLUG</p>		 <p>TEMPORARY CONNECTION</p>
 <p>OHMMETER CONNECTIONS</p>	 <p>VOLTMETER CONNECTIONS</p>	 <p>MAIN RELAY</p>	 <p>PUMP RELAY</p>	 <p>FUEL PUMP</p>
 <p>ROAD SPEED INPUT (SPEED TRANSDUCER)</p>	 <p>GEAR INPUT SWITCH (INHIBITOR) SWITCH</p>	 <p>INJECTOR</p>	 <p>IGNITION COIL</p>	 <p>FUEL TEMPERATURE SENSOR</p>
 <p>COOLANT TEMPERATURE SENSOR</p>	 <p>AIR BYPASS VALVE</p>	 <p>THROTTLE POTENTIOMETER</p>	 <p>HOT WIRE AIRFLOW SENSOR</p>	

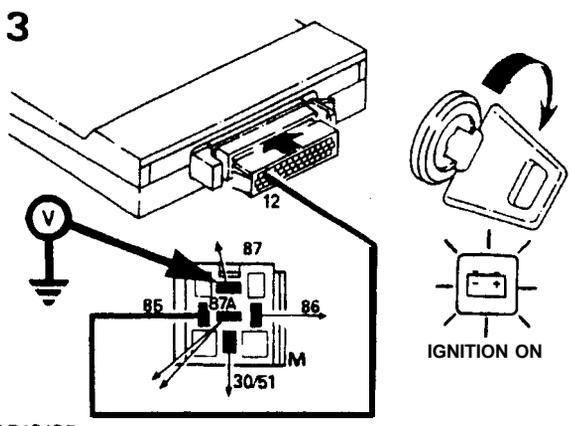
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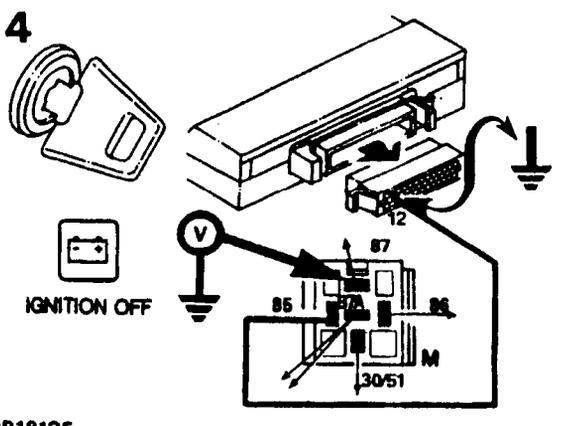
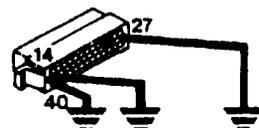
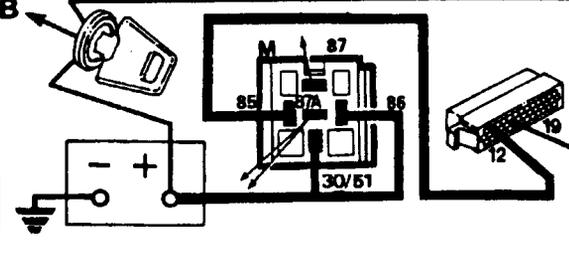
NOTE: All tests are carried out from the electronic control unit (ECU) harness multi-plug unless stated otherwise in the test procedure.

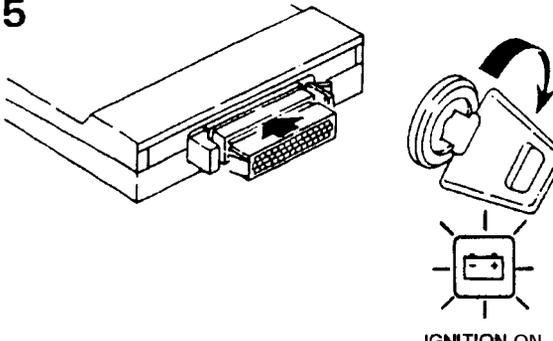
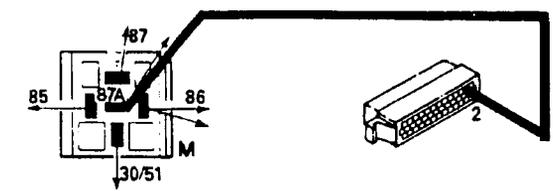
TEST PROCEDURE	RESULTS . Check cables and units shown in bold
<p>1. Check battery supply to ECU</p>	<p>Voltmeter reading of battery volts - (mimum battery voltage 10 volts) Proceed to Test 2 Voltmeter reading of zero volts Check:-</p>
<p>1</p>  <p>IGNITION OFF</p> <p>RR1816E</p>	

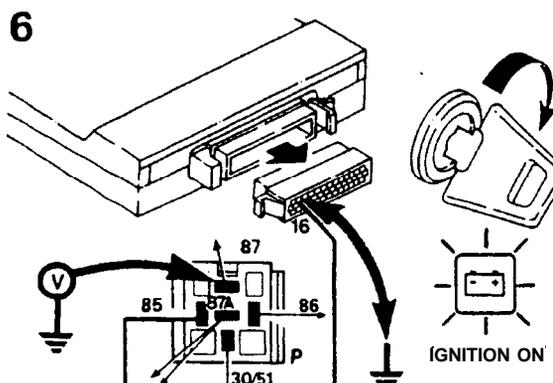
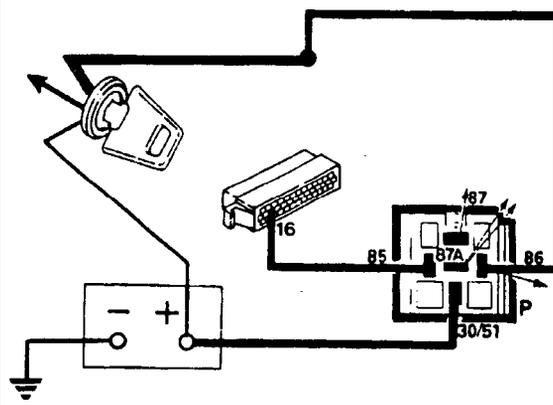
TEST PROCEDURE	RESULTS • Check cables and units shown in bold
<p>2. Check ignition supply to ECU</p>	<p>Voltmeter reading of battery volts - (minimum battery voltage 10 volts) Proceed to Test 3 Incorrect reading check:-</p>
<p>2</p>  <p>IGNITION ON</p> <p>RR1817E</p>	

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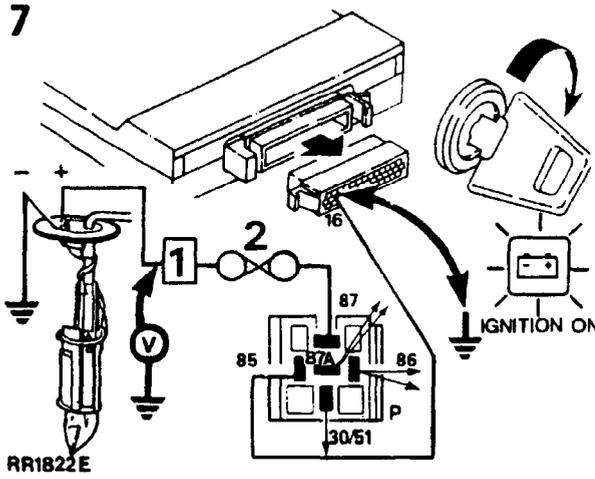
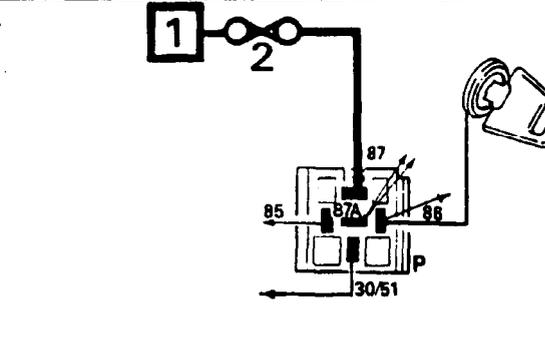
TEST PROCEDURE	RESULTS - Check cables and units shown in bold
<p>3. Check operation of Main relay</p>	<p>Voltmeter reading of battery volts - Proceed to Test 5</p> <p>Voltmeter reading of zero volts - Proceed to Test 4</p>
<p>3</p>  <p>RR1818E</p>	

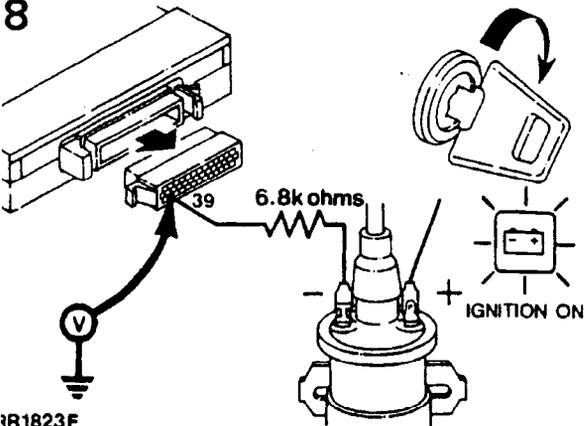
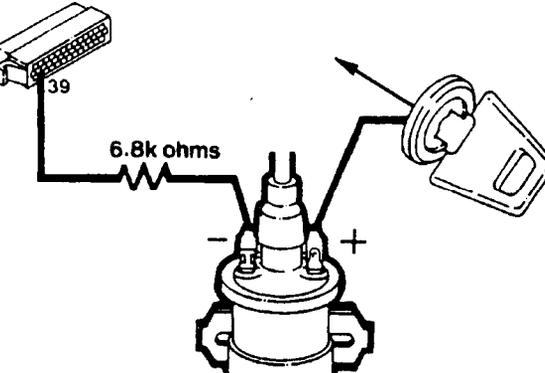
TESTPROCEDURE	RESULTS - Check cables and units shown in bold
<p>4. Fault Diagnosis Main relay circuits</p>	<p>A. Voltmeter reading of battery volts - Check:- If OK Suspect ECU</p> <p>B. Voltmeter reading of zero volts Check:-</p>
<p>4</p>  <p>RR1819E</p>	<p>A</p>  <p>B</p> 

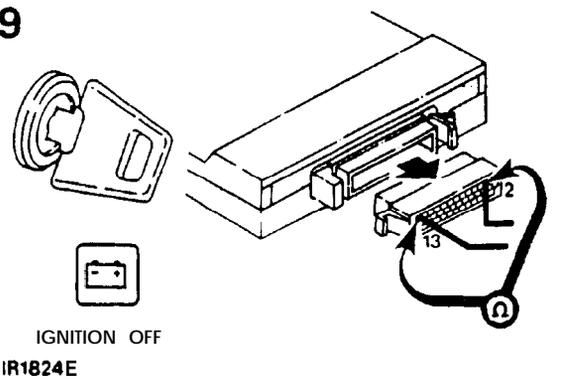
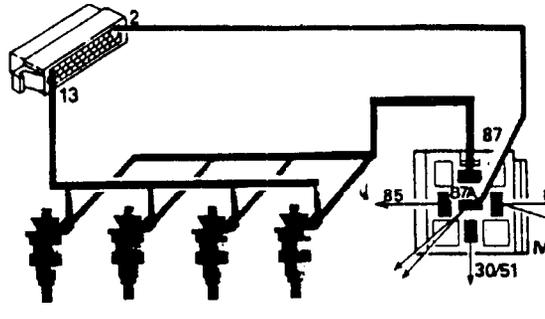
TEST PROCEDURE	RESULTS - Check cables and units shown in bold
<p>i. Check operation of pump relay</p>	<p>Listen for audible 'click' from pump relay. If O.K - Proceed to Test 7</p> <p>No audible 'click' from pump relay Check:- If OK proceed to Test 6.</p>
<p>5</p>  <p>RR1820E</p>	

TEST PROCEDURE	RESULTS - Check cables and units shown in bold
<p>i. Fault diagnosis Pump relay circuits</p>	<p>Voltmeter reading of battery volts - Suspect ECU</p> <p>Voltmeter reading of zero volts Check:-</p>
<p>6</p>  <p>RR1821E</p>	

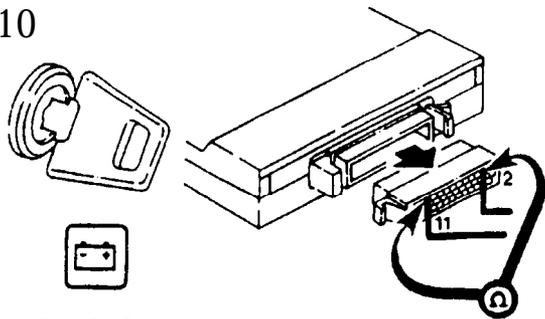
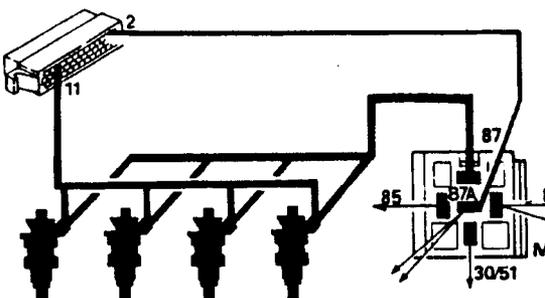
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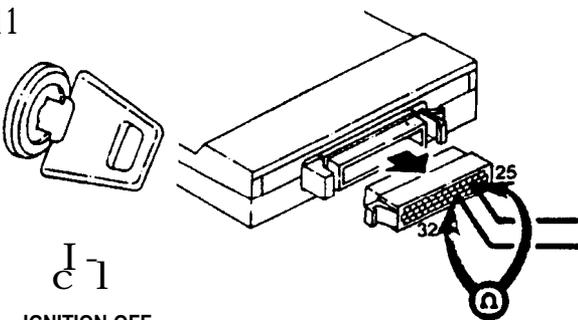
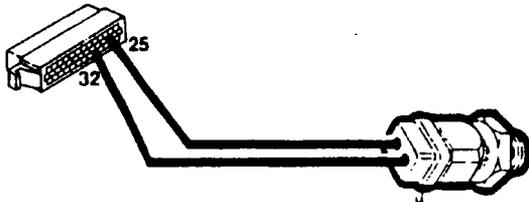
TEST PROCEDURE	RESULTS - Check cables and units shown in bold
<p>7. Check operation of Fuel pump</p> <p>NOTE: It is not possible to place the multi-meter probes directly onto the pump terminals. A link lead attached to the pump is accessible behind the rear left hand wheel located between the chassis and stowage area floor panel.</p> <p>KEY: 1. Inertia switch 2. Fuse 18</p>	<p>Voltmeter reading of battery volts - Pump operating - Proceed to Test 8</p> <p>(A) Voltmeter reading of battery volts - Pump not operating Check:-</p> <p>(B) Voltmeter reading of zero volts Check:-</p>
<p>7</p>  <p>RR1822E</p>	<p>A.</p>  <p>B.</p> 

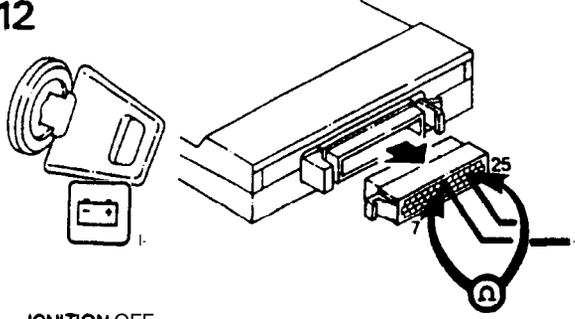
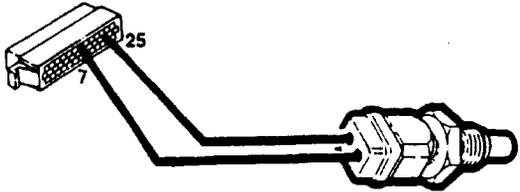
TESTPROCEDURE	RESULTS • Check cables and units shown in bold
<p>I. Check engine speed signal Cable and resistor</p>	<p>Voltmeter reading of battery volts - Proceed to Test 9</p> <p>Voltmeter reading of zero volts Check:-</p>
<p>8</p>  <p>IR1823E</p>	

TEST PROCEDURE	RESULTS • Check cables and units shown in bold
<p>9. Check injectors, Injector circuit</p> <p>(Pin 13 left bank injectors 1,3,5,7).</p>	<p>Ohm-meter reading of 4-5 Ohms - Proceed to Test 10</p> <p>Ohm-meter reading of 5-6 Ohms • Suspect 1 injector Ohm-meter reading of 8-9 Ohms • Suspect 2 injectors Ohm-meter reading of 16-17 Ohms • Suspect 3 injectors Check for open circuit injector(s) or wiring faults.</p> <p>Ohm-meter reading of Infinity Check:</p>
<p>9</p>  <p>IGNITION OFF</p> <p>IR1824E</p>	

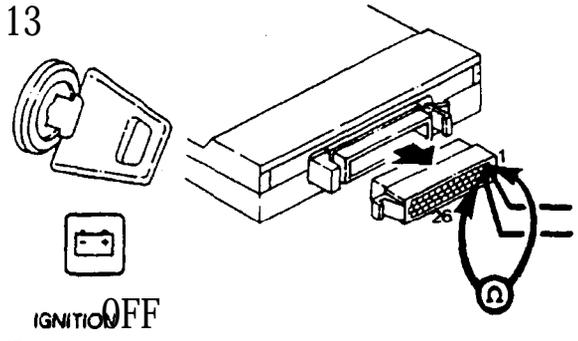
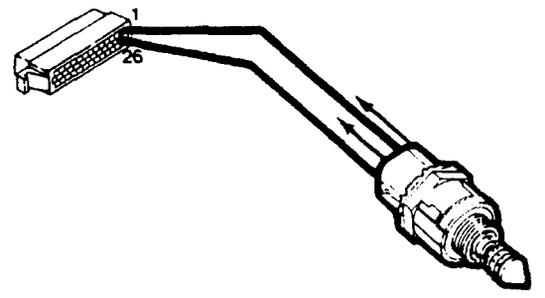
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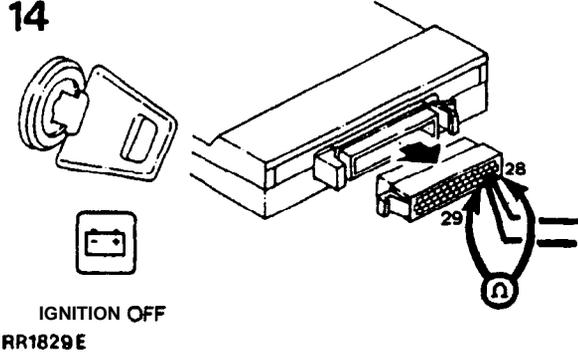
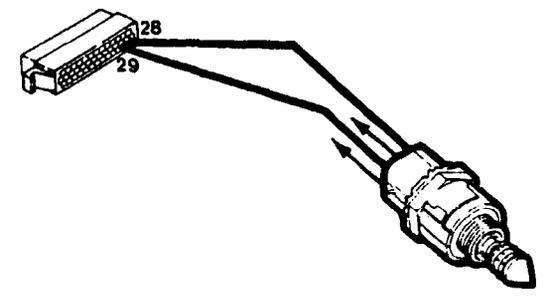
TESTPROCEDURE	RESULTS - Check cables and units shown in bold
<p>0. Check injectors Injector circuit</p> <p>pin 11 rightbank injectors 2,4,6,8)</p>	<p>Ohm-meter reading of 4-5 Ohms - Proceed to Test 11.</p> <p>Ohm-meter reading of 5-6 Ohms - Suspect 1 injector Ohm-meter reading of 8-9 Ohms - Suspect 2 injectors Ohm-meter reading of 16-17 Ohms - Suspect 3 injectors Check for open circuit injector(s) or wiring faults.</p> <p>Ohm-meter reading of Infinity Check:</p>
<p>10</p>  <p>IGNITION OFF RR1825E</p>	

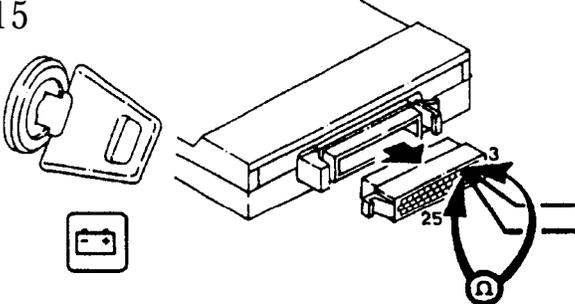
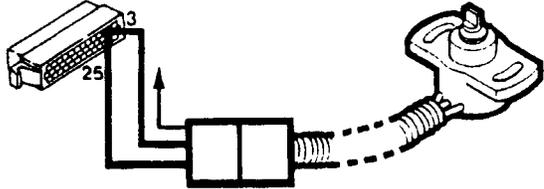
TESTPROCEDURE	RESULTS - Check cables and units shown in bold
<p>11. Check fuel temperature thermistor (sensor)</p>	<p>Correct reading-temperature to resistance - Proceed to Test 12 (Refer to Temperature Conversion Charts in Test 12)</p> <p>Incorrect Ohm-meter reading Check</p>
<p>11</p>  <p>IGNITION OFF RR1826E</p>	

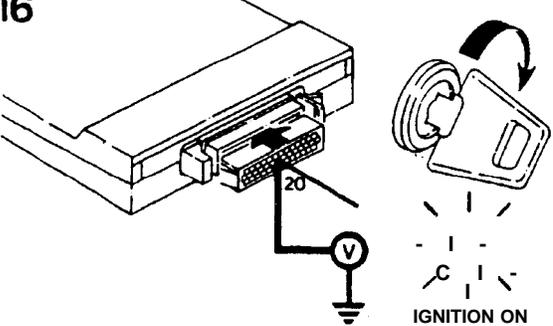
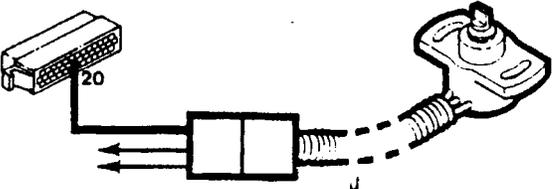
TESTPROCEDURE	RESULTS - Check cables and units shown in bold																											
<p>2. Check coolant temperature thermistor (sensor)</p>	<p>Correct reading-Temperature to resistance • Proceed to Test 13 (Refer to Temperature Conversion Chart below.</p> <table border="1" data-bbox="889 417 1416 697"> <thead> <tr> <th colspan="2">Fuel and Coolant Temperature</th> <th>Ohm-meter Reading Should be</th> </tr> <tr> <th>°C</th> <th>°F</th> <th>Ohms</th> </tr> </thead> <tbody> <tr> <td>-10°</td> <td>14°</td> <td>9100 - 9300</td> </tr> <tr> <td>0°</td> <td>32°</td> <td>5700 - 5900</td> </tr> <tr> <td>20°</td> <td>68°</td> <td>2400 - 2600</td> </tr> <tr> <td>40°</td> <td>104°</td> <td>1100 - 1300</td> </tr> <tr> <td>60°</td> <td>140°</td> <td>500 - 700</td> </tr> <tr> <td>80°</td> <td>176°</td> <td>300 - 400</td> </tr> <tr> <td>100°</td> <td>212°</td> <td>150 - 200</td> </tr> </tbody> </table> <p>Incorrect Ohm-meter reading Check:-</p>	Fuel and Coolant Temperature		Ohm-meter Reading Should be	°C	°F	Ohms	-10°	14°	9100 - 9300	0°	32°	5700 - 5900	20°	68°	2400 - 2600	40°	104°	1100 - 1300	60°	140°	500 - 700	80°	176°	300 - 400	100°	212°	150 - 200
Fuel and Coolant Temperature		Ohm-meter Reading Should be																										
°C	°F	Ohms																										
-10°	14°	9100 - 9300																										
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20°	68°	2400 - 2600																										
40°	104°	1100 - 1300																										
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80°	176°	300 - 400																										
100°	212°	150 - 200																										
<p>12</p>  <p>IGNITION OFF RR1827E</p>																												

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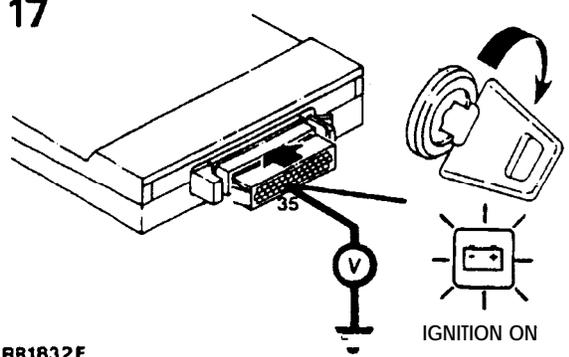
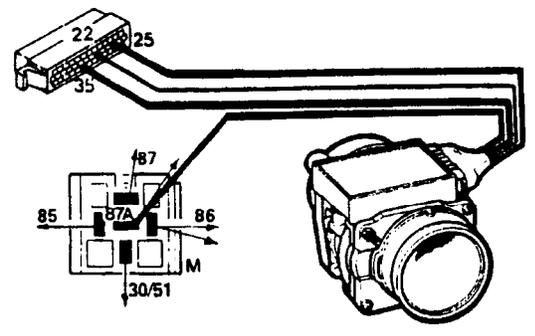
TEST PROCEDURE	RESULTS - Check cables and units shown in bold
<p>113. Check air bypass valve - Part 1</p>	<p>Ohm-meter reading of 48-58 Ohms - Proceed to Test 14</p> <p>Incorrect reading Check:-</p>
<p>13</p>  <p>IGNITION OFF RR1828E</p>	

TEST PROCEDURE	RESULTS - Check cables and units shown in bold
<p>14. Check air bypass valve - Part 2</p>	<p>Ohm-meter reading of 48-58 Ohms - Proceed to Test 15</p> <p>Incorrect reading Check:-</p>
<p>14</p>  <p>IGNITION OFF RR1829E</p>	

TEST PROCEDURE	RESULTS - Check cables and units shown in bold
15. Check throttle potentiometer - Part 1	Ohm-meter reading of 5000 Ohms - Proceed to Test 16 Incorrect reading of Infinity Check:-
<p>15</p>  <p>IGNITION OFF RR1830E</p>	

TEST PROCEDURE	RESULTS - Check cables and units shown in bold												
16. Check throttle potentiometer - Part 2	Correct voltmeter readings- Proceed to Test 17 <table border="0" style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;">Throttle closed</td> <td></td> <td style="text-align: center;">Throttle open</td> </tr> <tr> <td style="text-align: center;">0.29)</td> <td style="text-align: center;">smooth</td> <td style="text-align: center;">(4.6 Volts</td> </tr> <tr> <td style="text-align: center;">)</td> <td></td> <td style="text-align: center;">(</td> </tr> <tr> <td style="text-align: center;">0.36)</td> <td style="text-align: center;">swing</td> <td style="text-align: center;">(5.0 Volts</td> </tr> </table> Incorrect voltmeter readings Check:-	Throttle closed		Throttle open	0.29)	smooth	(4.6 Volts)		(0.36)	swing	(5.0 Volts
Throttle closed		Throttle open											
0.29)	smooth	(4.6 Volts											
)		(
0.36)	swing	(5.0 Volts											
<p>16</p>  <p>RR1831E</p>													

Continued

TEST PROCEDURE	RESULTS . Check cables and units shown in bold
<p>17. Check output of Airflow sensor</p>	<p>Voltmeter reading of 0.3-0.6 volts- Proceed to Test 18</p> <p>Incorrect voltmeter reading Check:-</p>
<p>17</p>  <p>RR1832E</p>	

PRECAUTION:

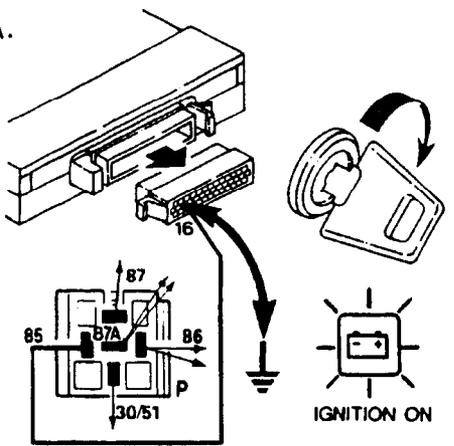
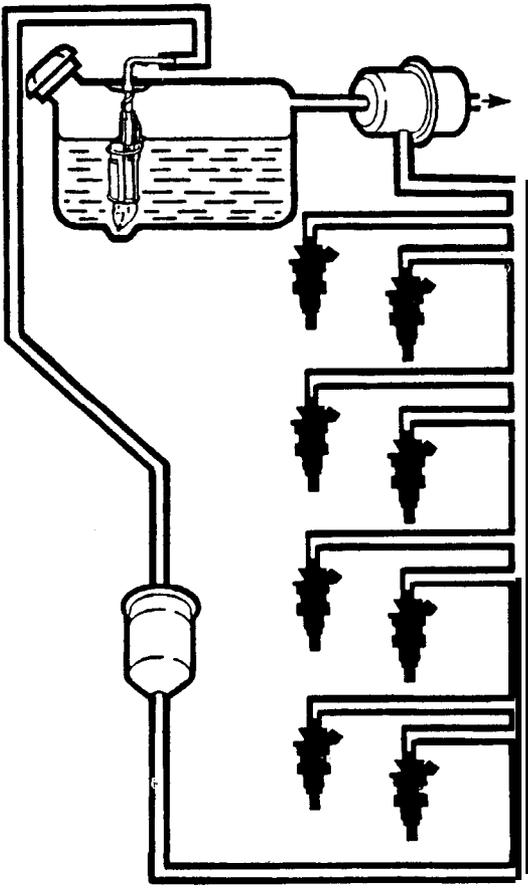
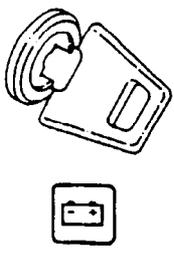
Depressurize the fuel system when fitting the fuel pressure gauge or disconnecting/replacing fuel system components.

CAUTION: Thoroughly clean the immediate area around the fuel filter and hose connections before disconnecting the fuel feed line from the filter. Failure to do so could cause foreign matter to be present in the fuel system which would be detrimental to the fuel system components.

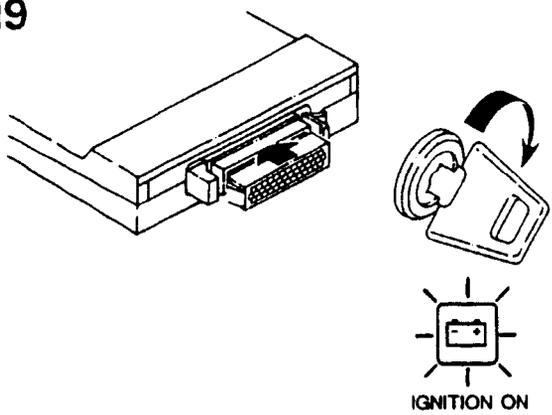
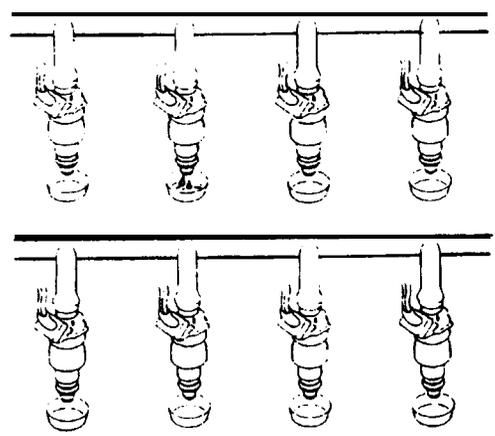
WARNING: The spillage of fuel from the fuel filter is unavoidable when disconnecting the fuel feed line, ensure that all necessary precautions are taken to prevent fire and explosion due to fuel vapour and fuel seepage.

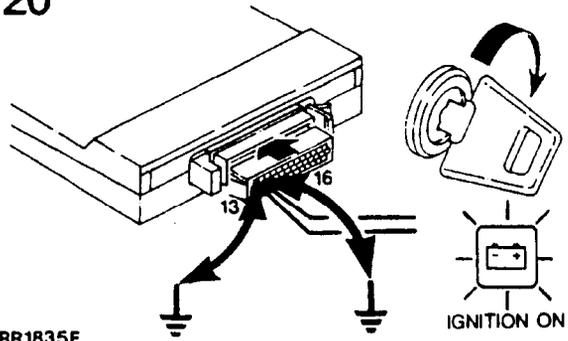
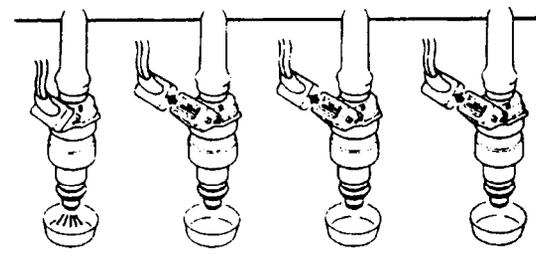
DEPRESSURIZING PROCEDURE

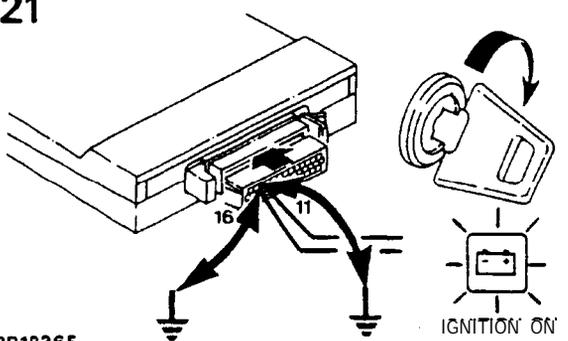
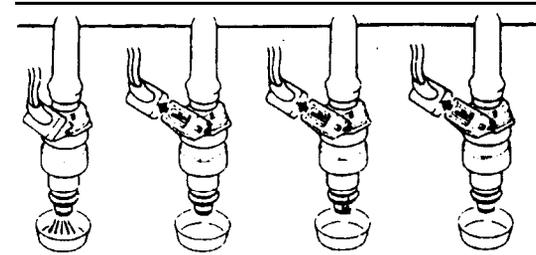
- a) Ignition off, pull pump relay off its terminal block.
- b) Crank engine for a few seconds - engine may fire and run until fuel pressure is reduced.
- c) Switch off the ignition.
- d) Connect fuel pressure gauge in the fuel supply line between the fuel rail and the fuel filter, adjacent to the filter (see Test 18).
- e) Reconnect the pump relay.

EST PROCEDURE	RESULTS - Check cables and units shown in bold
<p>18. Check fuel system pressure Service tool 18G 1500</p> <p>NOTE: Insert the pressure gauge in the fuel feed line immediately after the fuel line filter. The filter is located beneath the right hand rear wheel arch attached to the chassis</p>	<p>(A) Expected reading 2,4-2,6 kg/cm² (34.0-37.0 p.s.i.)</p> <p>(B) Pressure drop-max 0.7 kg/cm² (10 p.s.i.) in one minute</p>
<p>18</p> <p>A.</p> 	
<p>B.</p>  <p>IGNITION OFF</p> <p>R1833E</p>	

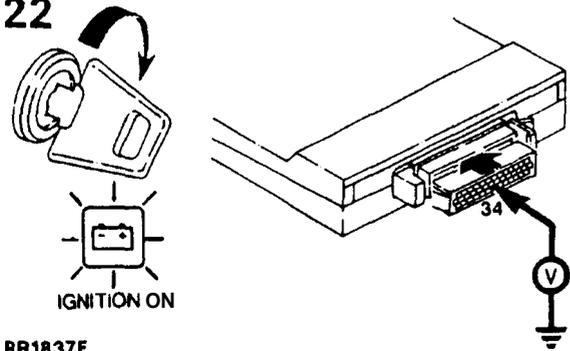
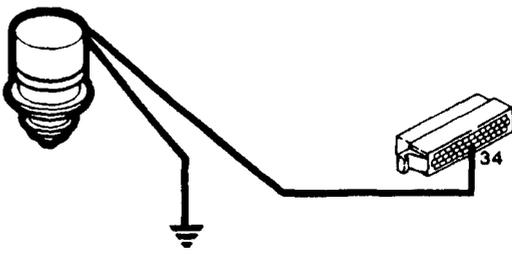
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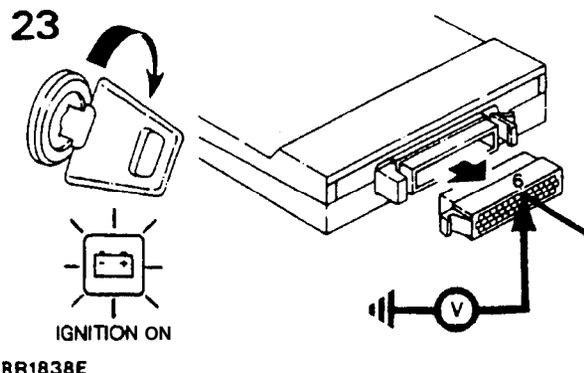
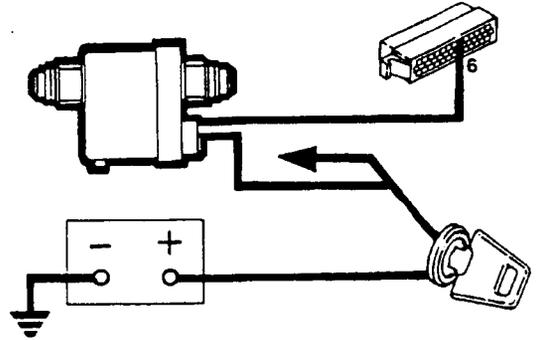
ESTPROCEDURE	RESULTS • Check cables and units shown in bold
<p>9. Check for leaking injector</p> <p>NOTE: Before removing any of the injectors, remove and examine the spark plugs. check for consistent colouration of plugs. A leaking injector will result in the appropriate spark plug being 'sooted up'.</p> <p>Remove all injectors from manifold but do not disconnect from fuel rail</p>	<p>WARNING: Ensure that all necessary precautions are taken to prevent fire and explosion.</p> <p>Replace any injector which leaks more than 2 drops of fuel per minute.</p>
<p>19</p>  <p>IR1834E</p>	

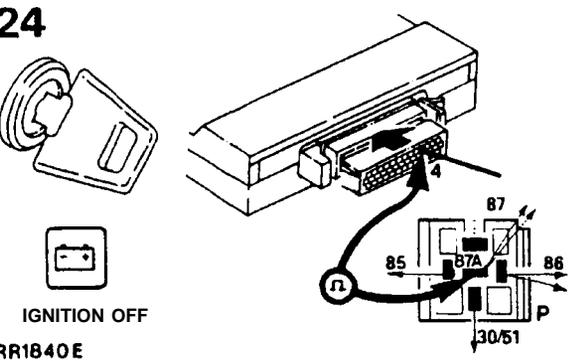
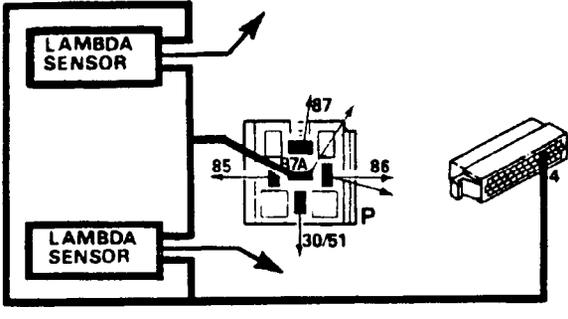
TEST PROCEDURE	RESULTS - Check cables and units shown in bold
<p>20. Check for injector operation Left bank injectors 1,3,5,7</p>	<p>WARNING: Ensure that all necessary precautions are taken to prevent fire and explosion.</p> <p>Repeat test for other injectors Replace any injector which does not operate.</p> <p>NOTE: Fuel flow is 167cc minimum per minute per injector</p>
<p>20</p>  <p>RR1835E</p>	

TEST PROCEDURE	RESULTS - Check cables and units shown in bold
<p>21. Right bank injectors 2,4,6,8</p>	<p>WARNING: Ensure that all necessary precautions are taken to prevent fire and explosion.</p> <p>Repeat test for other injectors Replace any injector which does not operate.</p> <p>NOTE: Fuel flow is 167cc minimum per minute per injector</p>
<p>21</p>  <p>RR1836E</p>	

Continued

TESTPROCEDURE	RESULTS • Check cables and units shown in bold
<p>22. Check gear switch input</p>	<p>Voltmeter reading of zero volts- Neutral and park</p>
	<p>Voltmeter reading of 4.5-5.0 Volts -R.D.3.2.1- Proceed to Test 23</p>
<p>22</p>  <p>RR1837E</p>	

TEST PROCEDURE	RESULTS - Check cables and units shown in bold
<p>23. Check road speed input</p> <p>NOTE: Raise and rotate the left hand rear road wheel slowly</p>	<p>Voltmeter reading of 0 to 12V fluctuating 6 times per revolution - Proceed to Test 24</p> <p>Incorrect reading Check:</p>
<p>23</p>  <p>IGNITION ON</p> <p>RR1838E</p>	

TEST PROCEDURE	RESULTS - Check cables and units shown in bold
<p>24. Check Lambda sensor heater coils</p> <p>NOTE: Remove pump relay from its connector</p>	<p>Ohm-meter reading of 2.65-3.35 Ohms</p> <p>Incorrect reading Check:</p> <p>NOTE: A reading of 5.3 to 6.7 Ohms indicates a faulty Lambda sensor</p>
<p>24</p>  <p>IGNITION OFF</p> <p>RR1840E</p>	

After completing the tests with either the 'Diagnostic' equipment or multi-meter, re-test the vehicle to ensure the faults have been rectified. If faults still persist, recheck using the Lucas diagnostic equipment.

ENGINE TUNING PROCEDURE

Before carrying out 'Engine Tuning' on fuel injection vehicles, it is important that all other engine related setting procedures are undertaken first; air flow sensor to air cleaner correctly fitted, ignition and throttle potentiometer correctly set; all hoses correctly fitted and secured.

These checks should be carried out with the engine coolant temperature between 80° to 95°C (176° to 203°F).

CHECK AND ADJUST IGNITION TIMING

1. Check that ignition timing is at $6^{\circ} \pm 1^{\circ}$ BTDC.
2. Timing to be checked when engine speed is less than 800 rev/min using a stroboscopic lamp.
3. If adjustment is necessary, loosen the distributor clamp nut and rotate clockwise to retard or counter-clockwise to advance. When the required setting has been attained, tighten the clamp nut and recheck the setting.

NOTE: Timing to be checked with vacuum hose connected.

IDLE SPEED is preset at the factory and should not normally require adjustment.

CAUTION:

- A. If engine fails to start within a maximum time of 12 seconds the cause must be rectified. Following rectification the engine must be run at 1500 rpm (no load) for 3 minutes to clear any accumulation of fuel in the catalyts.
- B. If the engine is misfiring, it should be immediately shut down and the cause rectified.

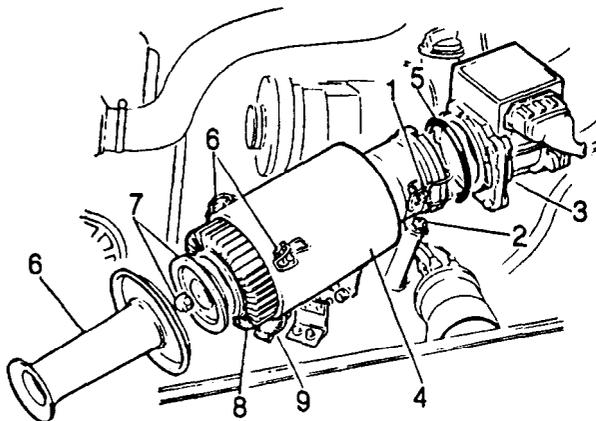
Failure to comply with A or B will result in irreparable damage to the catalyts.

AIR CLEANER

Remove and Refit

Removing

1. Release the two clamps securing the air cleaner to the airflow sensor.
2. Release the two nuts and bolts securing the air cleaner to the left hand valance mounting bracket.
3. Detach the airflow sensor from the air cleaner, and lay carefully to one side.
4. Detach the air cleaner from the centre mounting bracket and withdraw from the engine compartment.
5. Remove the large 'O' ring from the outlet tube of the air cleaner, inspect for condition, fit a new 'O' ring if in poor condition.
6. Unclip the three catches securing the inlet tube to the air cleaner canister and remove the inlet tube.
7. Remove the nut and end plate securing the air cleaner element in position.
8. Withdraw the air cleaner element and discard.
9. Inspect the dump valve for condition and that it is clear of obstructions.



RR1854E

Refitting

10. Fit a new element and secure in position.
11. Refit the inlet tube to the air cleaner canister.
12. Refit the air cleaner to the mounting bracket and tighten the two nuts and bolts.
13. Clip the air flow sensor to the air cleaner.

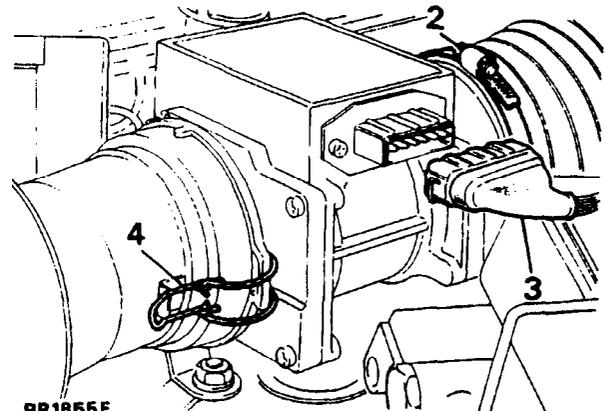
AIR FLOW SENSOR

Remove and refit

Removing

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

1. Disconnect the battery negative terminal.
2. Release the large hose clamp at the rear of the air flow meter and disconnect the hose from the sensor.
3. Disconnect the multi-plug.
4. Release the two clips securing the air flow sensor to the air cleaner case detach the sensor from the case and withdraw it from the engine compartment.



RR1855E

Refitting

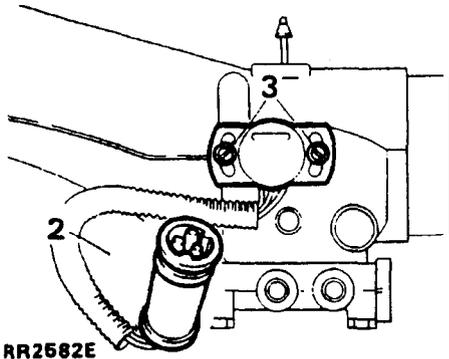
5. Reverse the removal procedure ensuring that the multi-plug is firmly reconnected to the air flow sensor and that the hose clamp at the rear of the sensor is securely tightened, to prevent un-metered air entering the engine.

THROTTLE POTENTIOMETER

Remove, refit and reset

Remove

1. Disconnect the battery negative terminal.
2. Disconnect the electrical three-pin plug.
3. Remove the two screws securing the switch to the plenum chamber and carefully pull the switch off the throttle valve shaft.



4. Remove the old gasket.

Refit

5. Fit a new gasket between the throttle switch and plenum chamber.
6. Align the switch and shaft flats; slide the switch *on* to the throttle shaft and secure the switch to the plenum chamber.
7. The throttle potentiometer must be reset using the following procedure.

CAUTION: The throttle mechanism must not be operated while the potentiometer is loosely fitted, otherwise damage may be caused to the potentiometer wiper track.

Setting the Potentiometer using a multi meter.

ENSURE THE MULTI METER USED TO CARRY OUT THIS CHECK IS SET TO VOLTS. A MULTI METER SETTING OTHER THAN VOLTS WILL RESULT IN DAMAGE TO THE POTENTIOMETER.

8. Loosen the potentiometer securing screws.
9. Reconnect the potentiometer three-pin plug and reconnect the battery. Switch on the ignition.
10. Connect the multi meter between the red and green leads at the potentiometer electrical plug.
11. Rotate the potentiometer clockwise or counter-clockwise, until the multi meter reads 325 ± 35 mV.
12. Tighten the potentiometer securing screws.
13. Re-check the multi-meter reading. Check also for a 'smooth swing' of the meter needle between minimum and maximum throttle opening between the voltage reading of 4.6 - 5.0 volts

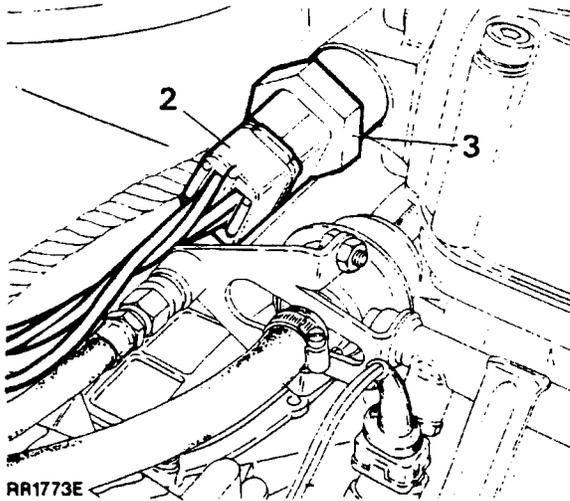
NOTE: After setting the potentiometer, lock and tamperproof each screw head by coating them with yellow paint.

**BY-PASS AIR VALVE
(STEPPER MOTOR)**

Remove and refit

Removing

1. Disconnect the battery negative terminal.
2. Remove the multi-plug from the unit.
3. Unscrew the valve from its location at the rear of the plenum chamber.
4. Remove the captive washer.



Refitting

5. Fit a NEW sealing washer.

NOTE: If the same by-pass valve is being refitted clean any previous sealing compounds from the threads. Apply Loctite 241 to threads of the valve before reassembly.

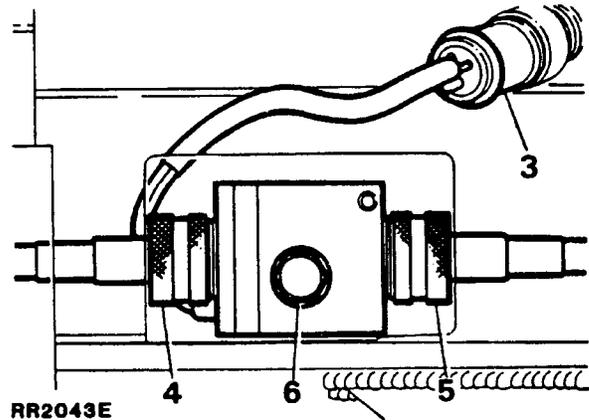
6. Tighten the valve to the specified torque (see Torque values-section 06).
7. Reverse the remaining removal instructions.

SPEED TRANSDUCER

Remove and refit

Removing

1. Place the vehicle on a hydraulic hoist and apply the parking brake.
2. Disconnect the battery negative terminal.
3. Raise the hoist and disconnect the speed transducer electrical plug.
4. Disconnect the speedometer cable from the transducer to the binnacle at the transducer.
5. Disconnect the speedometer cable from the transducer to the speedometer housing at the transducer.
6. Remove the single bolt securing the transducer to its mounting bracket and withdraw the unit from the vehicle.



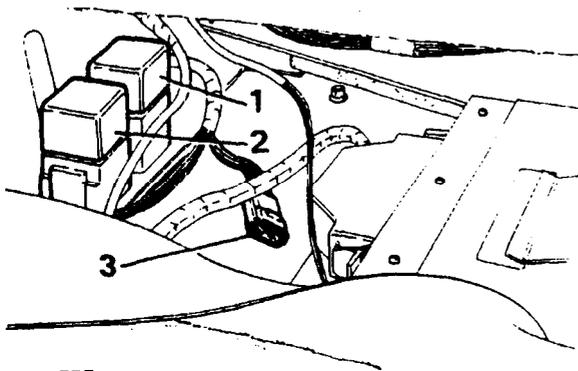
Refitting

7. Reverse the removal instructions.

ELECTRONIC FUEL INJECTION RELAYS

incorporated into the fuel injection electrical circuits are two relays. The relays are located beneath the front right-hand seat, adjacent to the E.C.U.

1. Fuel pump relay (mounted on a blue terminal block).
2. Main relay (mounted on a black terminal block).
3. Diagnostic plug.



RR1857E

Remove and refit

Removing

1. Disconnect the battery negative terminal.
2. Pull the relay(s) from the multi-plug(s).

Refitting

3. Reverse the removal procedure.

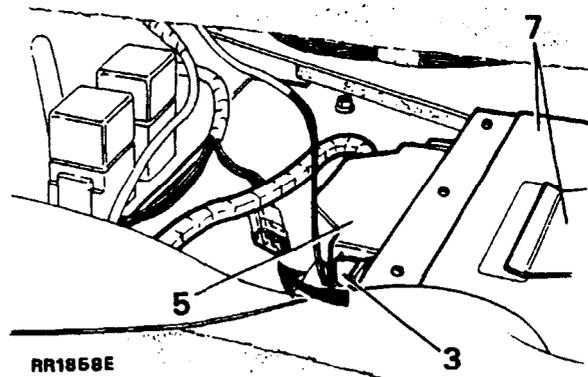
ELECTRONIC CONTROL UNIT-ECU

NOTE: The ECU is not itself a serviceable item, in the event of a unit failure, the ECU must be replaced.

Remove and refit

Removing

1. Disconnect the battery negative terminal.
2. The ECU is located under the front right hand seat and is accessible through the rear opening of the seat base when the seat is in its most forward position.
3. Release the E.C.U plug retaining clip.
4. Pull the rear of the multi-plug out of the ECU.
5. Maneuver the front of the plug (in the direction of the bold arrow) to release the hooked rear end of the plug from the retaining peg.
6. Release the screws securing the ECU to the mounting bracket.
7. Withdraw the ECU from the spring clip and remove it from the vehicle.



RR1858E

Refitting

8. Refit the E.C.U. securely in the spring clip and tighten the two screws.
9. Re-connect the E.C.U. harness plug, ensure the plug is firmly pushed into its location and that the retaining clip secures the plug in position.

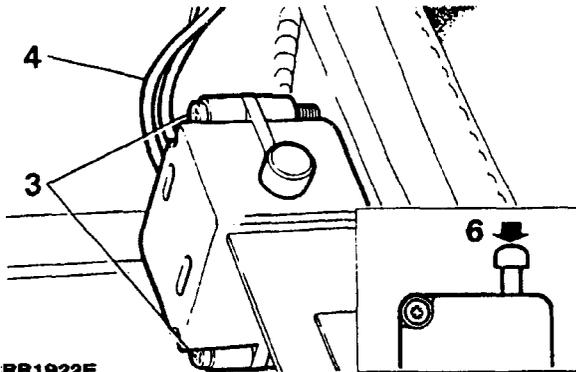
INERTIA SWITCH

The inertia switch is located under the left hand front seat attached to the inner face of the rear front seat base. Access to the switch is gained through the opening at the rear of the seat base.

Remove and refit

Removing

1. Ensure the seat is in its fully forward position.
2. Disconnect the battery negative terminal.
3. Remove the two screws securing the switch to the cross member.
4. Withdraw the switch and disconnect the electrical multi-plug.
5. Remove the switch from the vehicle.



RR1922E

Refitting

6. Reverse the removal procedure ensuring that the multi-plug clips firmly into position, and that the plunger is reset (plunger is in its lowest position).

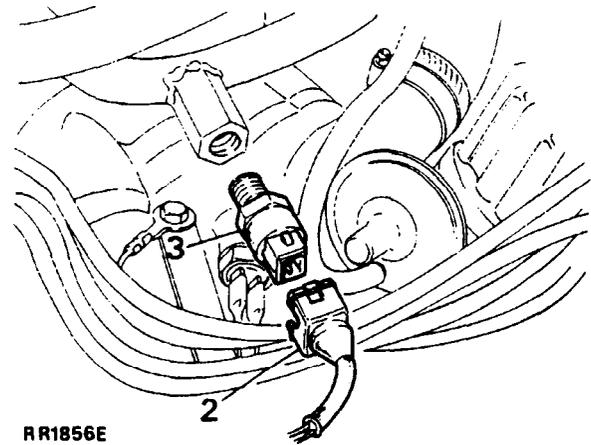
FUEL TEMPERATURE THERMISTOR (SENSOR)

Remove and refit

Removing

NOTE: No fuel leakage will occur when the thermistor is removed from the fuel rail therefore it is not necessary to depressurize the fuel system before removal.

1. Disconnect the battery negative terminal.
2. Remove the electrical multi - plug from the thermistor.
3. Release the thermistor from the fuel feed rail.



RR1856E

Refitting

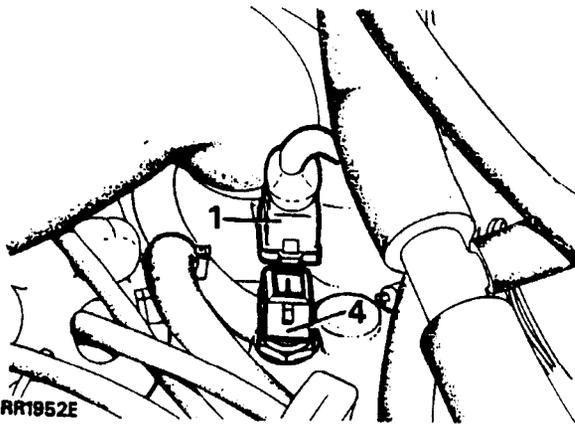
4. Reverse the removal procedure, ensuring that the thermistor is tightened securely in the fuel rail.

COOLANT TEMPERATURE THERMISTOR (SENSOR)

Remove and refit

Removing

1. Remove the multi-plug from the thermistor.
2. Release the radiator bottom hose and partially drain the cooling system.
3. Refit the hose and tighten the clamp securely.
4. Remove the thermistor from the left hand front branch of the intake manifold.
5. Remove the copper washer.



RR1952E

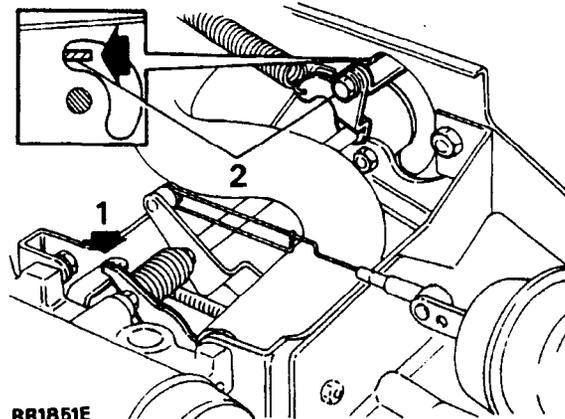
Refitting

6. Fit a NEW copper washer to the thermistor.
7. Fit the thermistor to the intake manifold and tighten securely.
8. Refill the cooling system.
9. Run the engine, check for water leaks around the coolant temperature thermistor.

RESETTING THROTTLE LEVERS

NOTE: The setting procedure outlined is applicable at minimum throttle condition only.

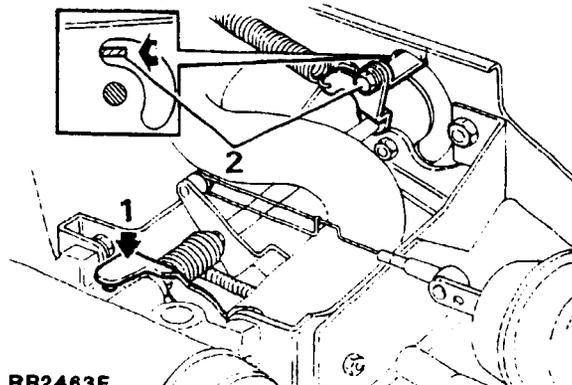
1. Ensure that the throttle valve is retained at its 90° vertical setting by holding down the stop lever and throttle/kick down lever denoted by the bold arrow while adjusting the throttle operating levers.
2. Release the throttle operating lever securing screw and adjust the lever until contact is made with the top end of the slot in the throttle lever mounting bracket; retaining the lever in this position retighten the screw.
3. Lightly grease all throttle lever bearing surfaces and torsion spring with Admax 13 grease or a suitable equivalent.



RR1851E

NOTE: Check the clearance between the cruise control actuator link and throttle lever (see Cruise Control Actuator Setting-Section 19, Page 47).

LATER MODELS:- have a redesigned stop lever that seats on a factory-set adjustment screw which is located in the plenum chamber casting. The screw should not normally require adjustment. If new throttle bracketry and linkages are fitted it is advisable to check that the throttle valve is vertical before adjusting the screw.



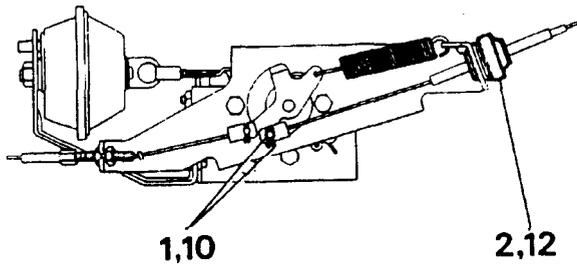
RR2463E

THROTTLE CABLE

Remove and refit

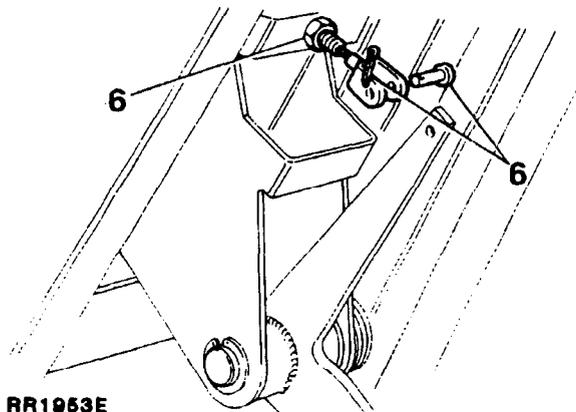
Removing

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



RR1964E

4. Release the outer cable from the retaining clips within the engine compartment.
5. Remove the lower dash panel from beneath the steering column.
6. Disconnect the cable from the throttle pedal and release the cable locknut.
7. Feed the cable through the bulkhead grommet and into the engine compartment.



RR1963E

FIT NEW THROTTLE CABLE

8. Feed the new cable from the engine compartment through the bulkhead grommet.
9. Connect the cable to the throttle pedal.

10. Connect the cable to the throttle linkage, fit a new cotter pin and secure in position.
11. Clip the outer cable adjustment nut into the mounting bracket.
12. Adjust the outer cable to give 1.57 mm (0.062 in) free play in the throttle cable and check the throttle operation.

THROTTLE PEDAL

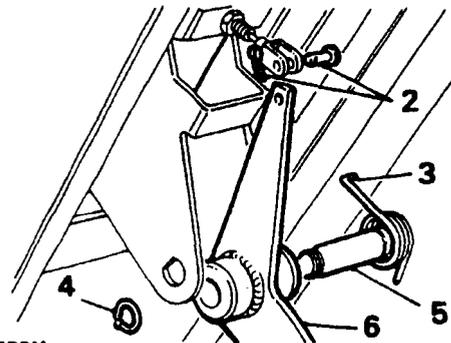
Remove and refit

Remove

1. Release the six screws securing the lower dash panel, lower the panel and disconnect the two electrical leads to the rheostat switch, detach the bulb check unit from the spring clip and remove the dash panel from the vehicle.
2. Remove the cotter pin and clevis pin securing the throttle cable to the throttle pedal.
3. Release the tension from the pedal return spring.
4. Remove the circlip from the pedal pivot pin.
5. Withdraw the pivot pin.

NOTE: It may be necessary to remove the steering column fixings enabling the column to be lowered to gain access to the pedal pivot pin circlip.

6. Withdraw the throttle pedal.



RR 732M

Refitting

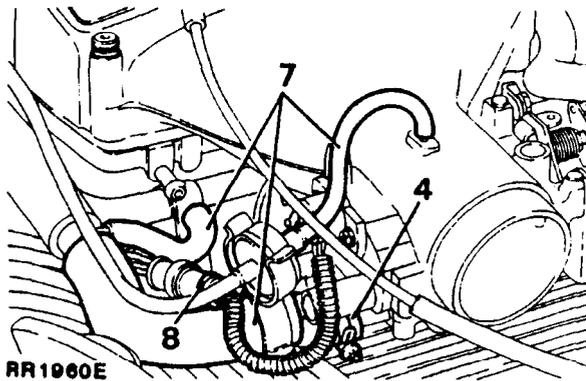
7. Lightly grease the pivot pin and clevis pin before re-assembly.
8. Fit a **NEW** cotter pin to the clevis pin.
9. Reverse the remaining removal instructions.

PLENUM CHAMBER

Remove and refit

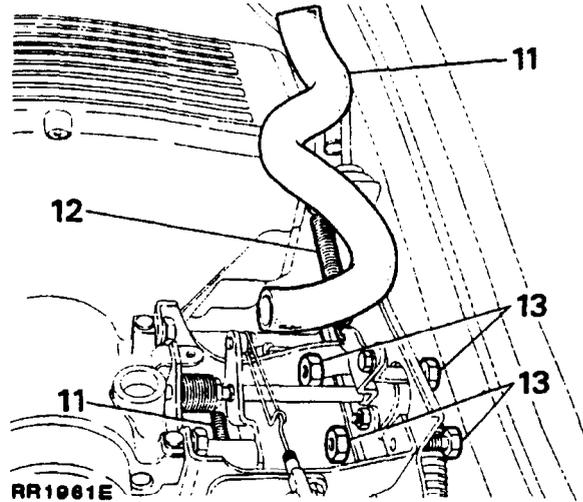
Removing

1. Disconnect the battery negative terminal.
2. Release the radiator bottom hose and partially drain the cooling system, reconnect the hose to the radiator.
3. Release the two large hose clamps from the neck of the plenum chamber and outlet bore of the airflow sensor and remove the hose from its location.
4. Release the clamps and remove the two coolant hoses from the bottom of the plenum chamber inlet neck. Identify each hose to aid re-assembly.
5. Remove the vacuum supply hose from the cruise control actuator.
6. Disconnect the actuating link at the cruise control actuator.
7. Remove the distributor vacuum hose, positive crankcase ventilation breather filter hose and servo hose.
8. Disconnect the throttle potentiometer multi-plug.



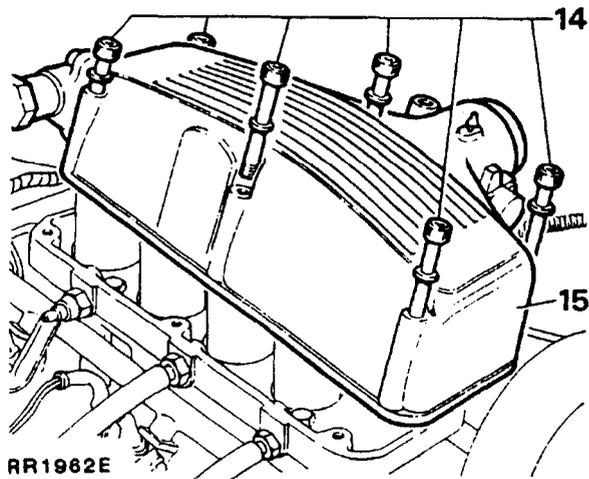
9. Disconnect the multi-plug from the air by-pass valve.
10. Disconnect the small vacuum hose at the rear of the plenum chamber, located below the air by-pass valve.
11. Remove the hose from the air by-pass valve to plenum chamber to enable the small return spring located below the throttle levers to be unhooked.

12. Release the two throttle return springs.
13. Remove the two bolts (with spring washers) securing the throttle cable and kick-down cable anchor bracket to the throttle lever support bracket, lay the assembly to one side.



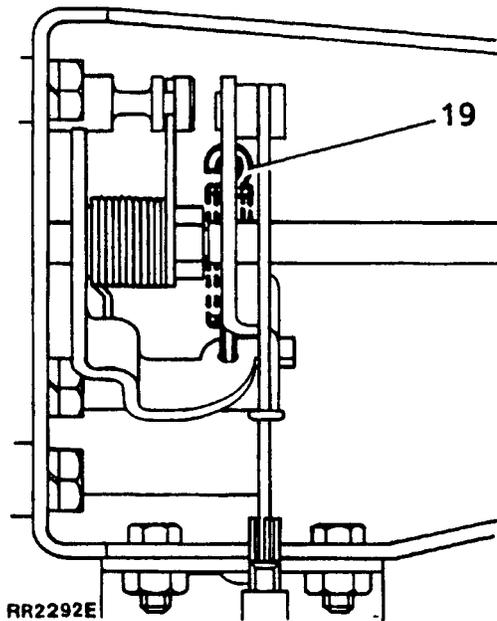
14. Remove the six socket head bolts (with plain washers) securing the plenum chamber to the ram housing.
15. Maneuver the plenum chamber and remove it from the ram housing.

NOTE: To prevent ingress of dirt into the ram tubes, place a protective cover over the ram tube openings.



Refitting

16. Ensure that all mating faces are free from any previous sealing compounds.
17. Coat the mating faces of the plenum chamber and ram housing with 'Hylomar' sealant.
18. Refit the plenum chamber and tighten the six bolts to the specified torque (see torque values-section 06).
19. When refitting the small return spring, item 11 in the removal procedure, it must be noted that the 'hooked' open end of the spring **MUST** face the plenum chamber as shown in illustration RR2292E below.



20. Reverse the remaining removal instructions.

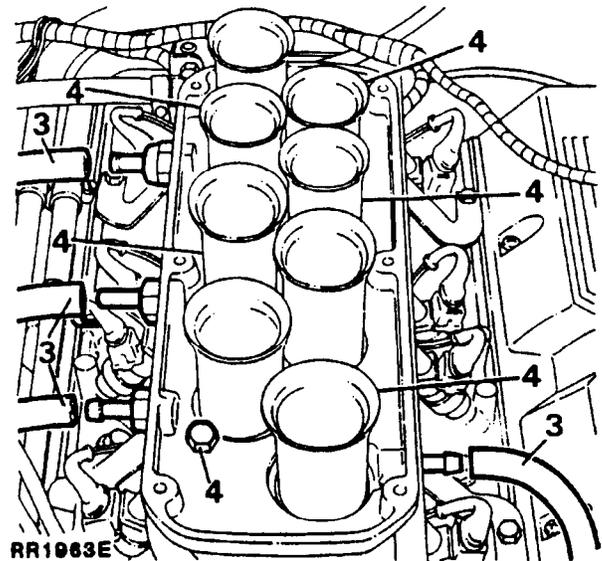
NOTE: Ensure that all hoses are connected securely to prevent un-metered air entering the engine.

RAM HOUSING

Remove and refit

Removing

1. Disconnect the battery negative terminal.
2. Remove the plenum chamber (see Plenum Chamber remove and refit).
3. Release the hoses from around the outer edges of the ram housing.
4. Remove the six through bolts (with plain washers) securing the ram housing to the intake manifold.



5. Lift the ram housing off the intake manifold and remove it from the engine compartment.
6. Place a protective cover over the top of the intake manifold inlet bores to prevent ingress of dirt.

Refitting

7. Ensure that all mating faces are clean and free from dirt and **any** previous sealing compounds.
8. Apply 'Hylomar' sealant to the intake manifold face before refitting the ram housing.
9. Fit the ram housing and retighten the bolts, working from the two centre bolts, **diagonally** towards the outer four bolts.
10. Tighten to the correct torque (See section 06-Torque values).

DEPRESSURIZING THE FUEL SYSTEM

WARNING: Under normal operating conditions the fuel injection system is pressurized by a high pressure fuel pump, operating at up to 2.3 to 2.5 bar (34 to 37 p.s.i.). When the engine is stationary this pressure is maintained within the system. To prevent pressurized fuel escaping and to avoid personal injury it is necessary to depressurize the fuel injection system before any service operations are carried out.

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

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

1. The fuel pump relay is located under the front right hand seat.
2. Pull the fuel pump relay off its multi-plug (see Electronic Fuel Injection Relays-Section 19, Page 28).
3. Start and run the engine.
4. When sufficient fuel has been used up causing the fuel line pressure to drop, the injectors will become inoperative, resulting in engine stall. Switch the ignition off.
5. Disconnect the battery negative terminal.

NOTE: Fuel at low pressure will remain in the system. To remove this low pressure fuel, place an absorbent cloth around the fuel feed hose at the fuel rail and release the fuel feed hose at the appropriate end.

6. Disconnect either:
 - a) The nut and ferrule at the fuel rail
 - OR
 - b) The hose at the inlet end of the fuel filter.

Refitting

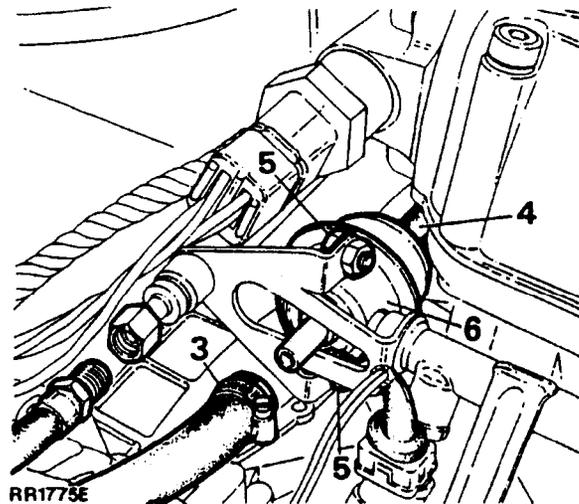
7. Refit the fuel feed hose.
8. Refit the fuel pump relay, reconnect the battery.
9. Crank the engine (engine will fire within approximately 6 to 8 seconds).

FUEL PRESSURE REGULATOR

Remove and refit

Removing

1. Depressurize the fuel system.
2. Disconnect the negative battery terminal.
3. Release the hose clamp securing the fuel return hose to the regulator and remove the hose.
4. Pull the vacuum hose from the rear of the regulator.
5. Remove the two nuts and bolts securing the regulator to the fuel rail, carefully ease the regulator fuel inlet pipe out of the fuel rail.
6. Withdraw the regulator from the engine compartment.



NOTE: If the original regulator is being refitted, fit a NEW 'O' ring to the fuel inlet pipe.

Refitting

7. Lightly coat the 'O' ring with silicon grease 300 before fitting the regulator to the fuel rail.
8. Reverse the removal procedure.
9. Reconnect the battery, and pressurize the fuel system and check that there are no fuel leaks around the regulator connections.

FUEL RAIL-INJECTORS R/H AND L/H

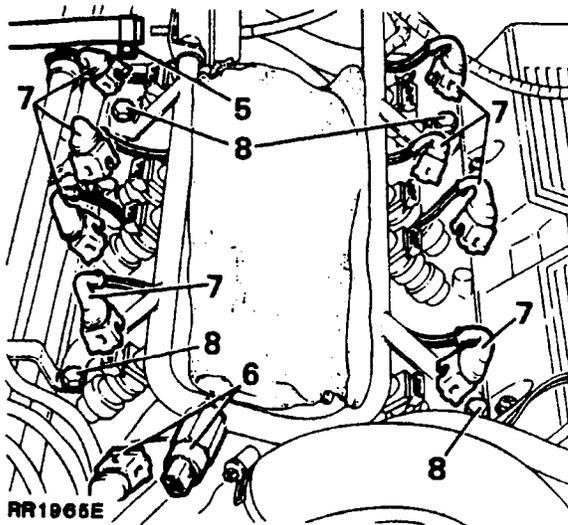
Remove and refit

Removing

1. Depressurize the fuel system.
2. Disconnect the negative battery terminal.
3. Remove the plenum chamber. (See Plenum Chamber, remove and refit).
4. Remove the ram housing. (See Ram Housing remove and refit).

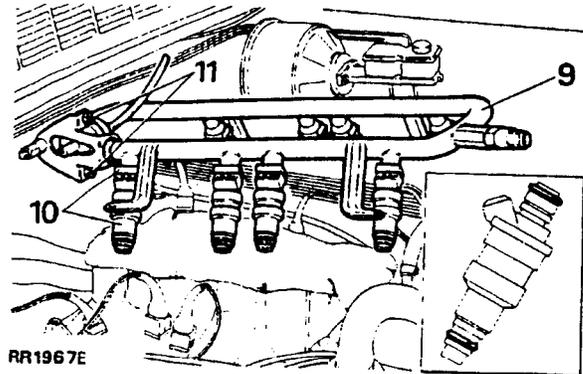
NOTE: Place a cloth over the ram tube openings to prevent ingress of dirt into the engine.

5. Release the hose clamp and remove the fuel return hose from the pressure regulator.
6. Disconnect the multi-plug from the fuel temperature thermistor (sensor).
7. Disconnect the multi-plugs from the eight injectors.
8. Remove the five bolts securing the fuel rail support and heater pipe brackets to the intake manifold. Lay the heater pipes to one side.



9. Remove the fuel rail, complete with injectors, from the intake manifold.
10. Remove the retaining clips securing the injectors to the fuel rail, ease the injectors from the rail.

11. If necessary, remove the two nuts and bolts securing the regulator to the fuel rail, and carefully pull the regulator away from the rail.



Refitting

12. Fit NEW 'O' rings, protective cap and supporting disc to the injectors, lightly coat the 'O' rings with silicon grease 300 and insert the injectors into the fuel rail, multi-plug connections facing outwards.
13. Refit the retaining clips.

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

14. Fit a NEW 'O' ring to the pressure regulator lightly coat the 'O' ring with silicon grease 300 and secure the regulator to the fuel rail.
15. Fit the fuel rail and heater pipe assemblies to the intake manifold, secure the rail and pipes in position with the five bolts.
16. Reverse the remaining removal instructions.
17. Pressurize the fuel system and check for fuel leaks around the injectors and pressure regulator.

INTAKE MANIFOLD

Remove and refit

Removing

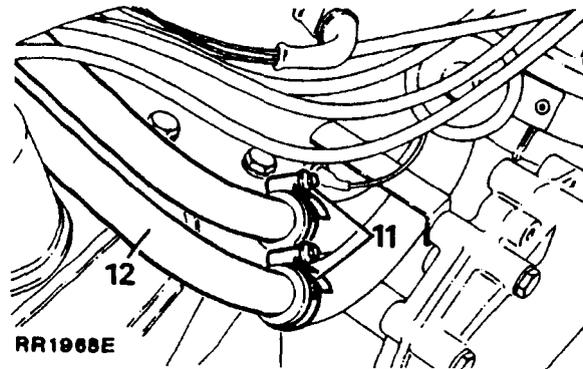
1. Depressurize the fuel system.
2. Disconnect the battery negative terminal.
3. Release the hose clamp and remove the radiator bottom hose to enable the cooling system to be partially drained, so that coolant level is below the thermostat housing, refit the hose and secure in position with the hose clamp.
4. Remove the plenum chamber (see Plenum Chamber, remove and refit).
5. Remove the ram housing (see ram housing remove and refit).

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

6. Disconnect the electrical multi-plugs to the fuel temperature thermistor (sensor), coolant temperature thermistor (sensor) and injectors.
7. Remove the two nuts and bolts securing the pressure regulator to the fuel rail, ease the regulator out of the rail, seal the end of the fuel rail with suitable plastic plugs to prevent ingress of dirt.

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

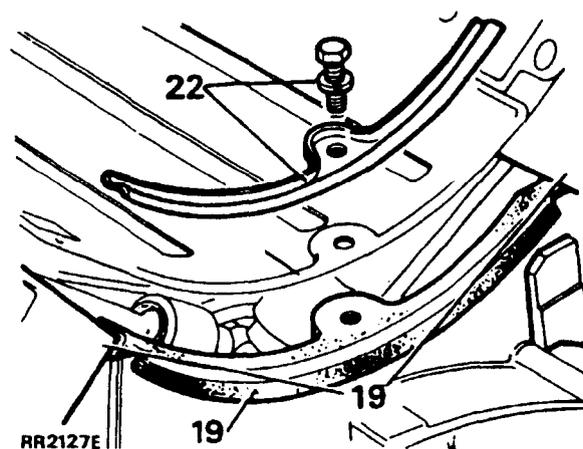
8. Disconnect the electrical leads from the air-conditioning engine coolant sensor located on the thermostat elbow.
9. Disconnect the electrical leads to the coolant temperature transmitter (sensor) located at the front of the intake manifold.
10. Remove the injector harnesses from behind the fuel rail and lay to one side.
11. Release the hose clamps securing the two heater hoses to the rigid heater pipes at the front of the right hand rocker cover.
12. Remove the two bolts securing the rigid heater pipes to the intake manifold and ease the pipes out of the hoses.



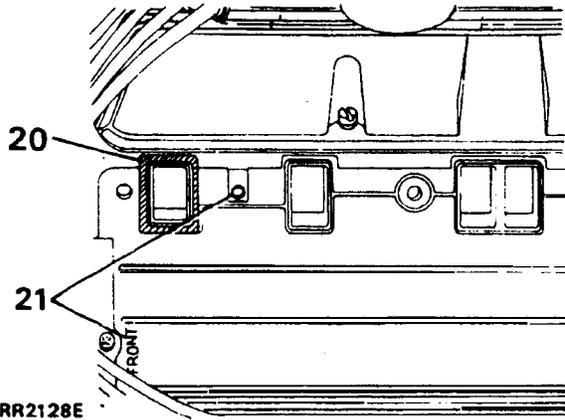
13. Lay the heater pipe assembly to one side.
14. Release the twelve bolts securing the intake manifold to the cylinder heads.
15. Lift the manifold off the cylinder heads and remove from the engine compartment.
16. Remove the two gasket clamps from the top of the cylinder block.
17. Lift off the gasket and remove the gasket seals.
18. Remove previous sealing compound from around the water passage openings of the cylinder heads.

Refitting

19. Locate the NEW seals in position with their ends engaged in the notches formed between the cylinder heads and block.



20. Lightly apply 'Hylomar' sealant around the outside of the water passage openings on the cylinder heads, manifold gasket and intake manifold.



RR2128E

21. Fit the manifold gasket with the word 'FRONT' to the front and the open bolt hole to the front right hand side.
22. Fit the gasket clamps but **DO NOT** fully tighten the bolts at this stage.
23. Locate the intake manifold onto the cylinder heads, clean the threads of the manifold securing bolts.
24. Fit all manifold bolts and tighten them a little at a time, evenly, alternate sides working from the centre outwards.
25. Tighten to correct torque (see section 06 Torque values).
26. Tighten the gasket clamps to the correct torque (see section 06 Torque values).
27. Reverse remaining removal instructions.
28. Replenish the cooling system.
29. Start the engine, check for water and fuel leaks.

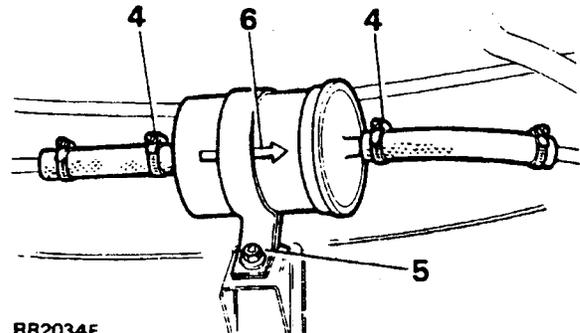
FUEL FILTER

Remove and refit

Refitting

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

1. Depressurize the fuel system.
2. The fuel filter is located on the right hand chassis side member forward of the fuel tank filler neck. Access to the filter is gained through the right hand rear wheel arch.
3. Thoroughly clean the immediate area around the hose connections to prevent ingress of foreign matter into the fuel system.
4. Loosen the two hose clamps nearest the filter to enable the hoses to be removed from the filter canister. Plug the end of the hoses to prevent ingress of dirt.
5. Release the securing bolt and bracket and remove the filter from the chassis side member.



RR2034E

Refitting

6. Fit a new filter observing the direction of flow arrows stamped on the canister.
7. Start the engine and inspect for fuel leaks around the hose connections.

FUEL TANK

Remove and refit

Removing

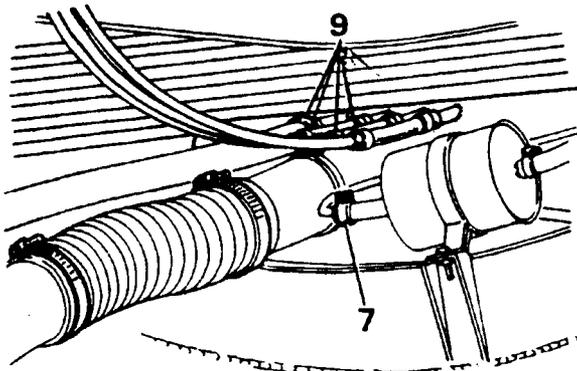
WARNING: Ensure that the Fuel Handling Precautions given in Section 01 - Introduction regarding fuel handling are strictly adhered to when carrying out the following instructions.

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

1. Drive the vehicle onto a suitable hoist.
2. Depressurize the fuel system. (see depressurizing procedure-page 34)
3. Disconnect the battery negative terminal.
4. Disconnect the electrical leads to the fuel tank sender unit. Disconnect the fuel pump electrical multiplug, access to which is gained through the left hand rear wheel arch, the plug is located between the underside of the body and chassis side member.
5. Raise the hoist.
6. Remove the drain plug from the bottom of the fuel tank and drain the fuel into a suitable container that can be sealed afterwards.
ENSURE THAT THE TANK IS DRAINED COMPLETELY.
Refit the drain plug (refer to Warning concerning fuel handling at start of this procedure.

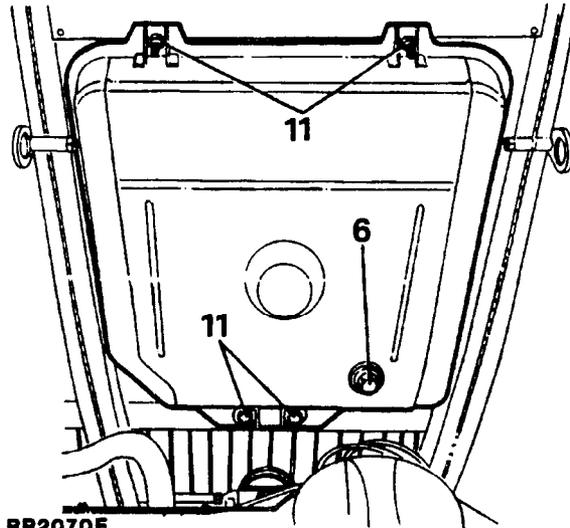
From underneath the vehicle

7. Disconnect the fuel hose from the inlet side of the fuel filter.
8. Disconnect the fuel return pipe to the fuel tank.
9. Remove the breather hose and three evaporative loss hoses from the fuel tank, seal all hose and pipe openings to prevent ingress of foreign matter.



RR2089E

10. Release the two large hose clamps, securing the inter-connecting hose to tank and filler tube, maneuver the hose up the outside of the filler tube to enable it to be withdrawn from the tank filler neck.
11. With assistance from a second person supporting the fuel tank, remove the four tank fixings.



RR2070E

12. Tilt the left hand side of the tank downwards and maneuver it out of the chassis frame. Care should be taken to ensure that the fuel feed pipe to filter is not damaged when lowering the tank.
13. Place the tank in a safe area and ensure that all necessary precautions are undertaken to make all personnel within the vicinity aware that the tank will give off residual fuel fumes.
14. If necessary remove the fuel pump from the tank. (See Fuel Pump remove and refit).

Refitting

15. Refit the fuel tank to the chassis, taking care to relocate the fuel feed pipe grommets between the fuel tank and chassis.
16. Reverse the removal procedure, ensuring that the sealing ring, fuel line and hose connections are secure.
17. Run the engine and re-check all connections to ensure no fuel leaks exist. Reverse the remaining removal procedure. Recode the radio.

FUEL PUMP

Remove and refit

Removing

WARNING: Ensure that the Fuel Handling Precautions given in Section 01 - Introduction regarding fuel handling are strictly adhered to when carrying out the following instructions.

1. Drive the vehicle onto a suitable hoist.
2. Depressurize the fuel pump system. (see depressurizing procedure-page 34)
3. Disconnect the battery negative terminal.
4. Remove the fuel tank from the chassis frame. (see fuel tank remove and refit-page 38)
5. Place the tank in a safe area.
6. Disconnect the fuel supply hose from the pump.
7. Remove any previous sealant from the top of the pump flange.
8. Remove the five screws and withdraw the pump from the tank.

Refitting

9. Clean the immediate area around the pump opening in the fuel tank.
10. Fit a **NEW** pump seal.
11. Secure the pump to the tank and tighten the screws securely.
12. Liberally coat the heads of the screws and flange of the fuel pump with Sikaflex 221 flexible adhesive sealant.
13. Reverse the removal procedure, ensuring that the sealing ring, fuel line and hose connections are secure. Recode the radio.
14. Run the engine and re-check all connections to ensure no fuel leaks exist. Reverse the remaining removal procedure.

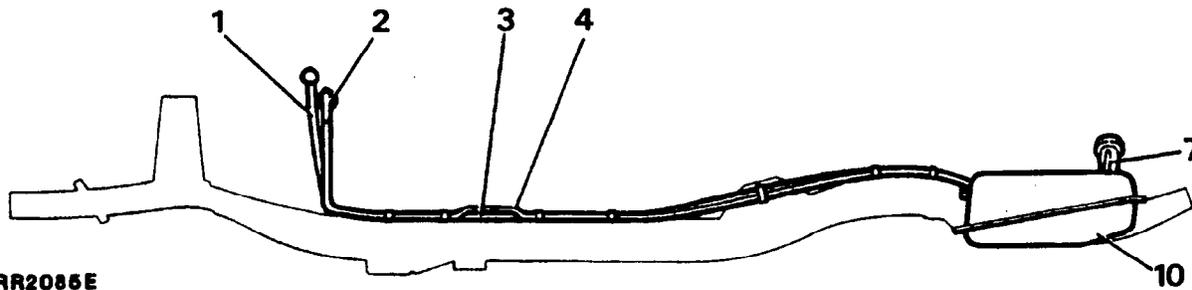
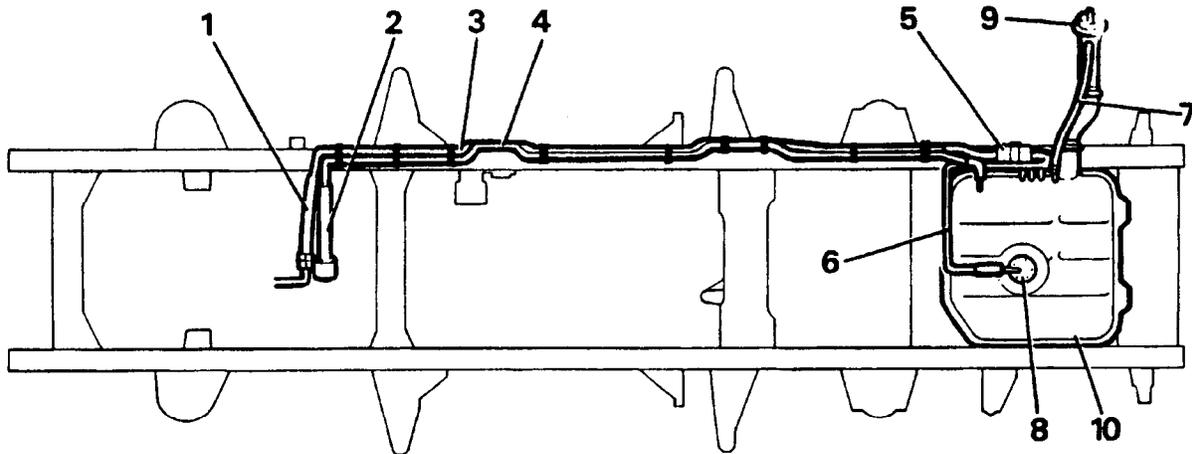
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FUEL PIPES

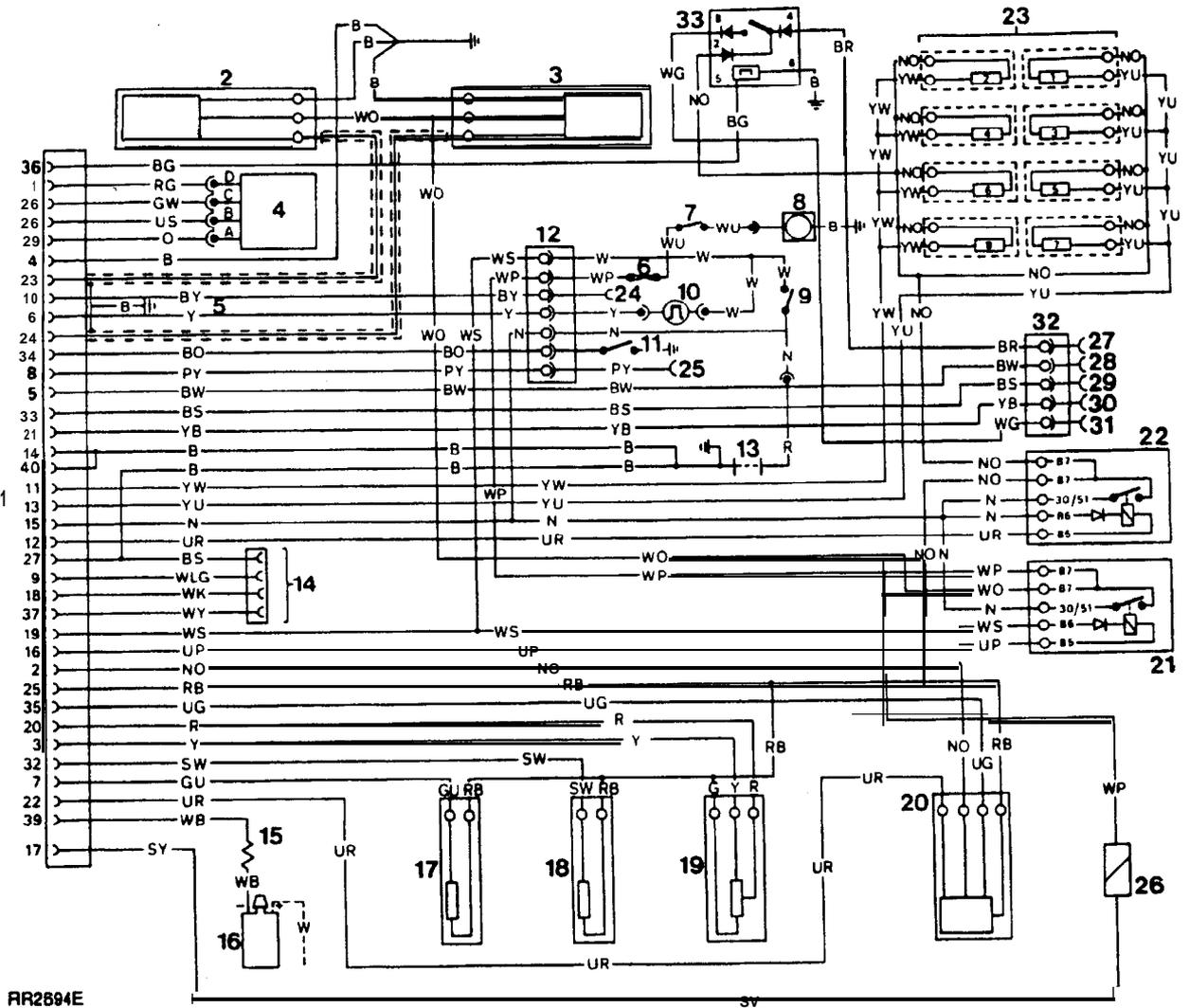
WARNING: Depressurize fuel system before disconnecting any of the fuel pipes and ensure that all necessary precautions are taken against fuel spillage.

KEY

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



RR2086E



RR2694E

FUEL INJECTION - Circuit Diagram - 1989 Model Year

- | | |
|--|---|
| <ol style="list-style-type: none"> 1. 40 way connector to Electronic Control Unit (ECU). 2. Lambda sensor (left side - bank A). 3. Lambda sensor right side - bank B). 4. By-pass air valve (stepper motor) (fast idle). 5. Lambda sensor screened ground. 6. Fuse 18 - main fuse panel. 7. Inertia switch. 8. Fuel pump. 9. Ignition switch. 10. Speed transducer (road speed input). 11. Neutral switch (automatic gearbox) (load input). 12. Main cable connector. 13. Battery. 14. Diagnostic plug. 15. In-line resistor. 16. Coil/-ve (engine RPM input). 17. Coolant temperature thermistor (sensor) (input). | <ol style="list-style-type: none"> 18. Fuel temperature thermistor (sensor) (input). 19. Throttle potentiometer. 20. Air flow sensor. 21. Fuel pump relay. 22. Main relay. 23. Injectors-1 to 8. 24. Pick-up point E.F.I. warning symbol (instrument binnacle). 25. Heated front screen sense. 26. Purge control valve. 27. 12V from fan relay. 28. Air conditioning switch sense. 29. Air conditioning output control. 30. Air conditioning load input. 31. Fan relay feed. 32. Heater/air con. cable connector. 33. Condenser fan timer control. <p>== = Denotes screened ground.</p> |
|--|---|

NOTE: Reference to left and right side is made when viewing vehicle from rear.

FUEL INJECTION SYSTEM

For 1989 model year, the EFI system has a Lucas 14CU electronic control unit. This is a development of the 13CU used on 3.5 litre vehicles.

In most respects the 14CU works in the same way using the same engine components, it does however have additional capacity, enabling it to control fuel tank vapour purging and air conditioning.

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.

Throttle potentiometer

A further improvement is the fitting of a 'self adaptive' throttle potentiometer. This means that adjustment of the throttle potentiometer is no longer possible. It also means that the potentiometer setting is not lost, for example, when throttle stop wear occurs.

Purge valve

The operation of the charcoal canister purge valve is checked during the fuel injection system test. See TESTS 9 and 10 Section 19, page 48.

Recommended equipment

The diagnostic equipment used for checking out the 14CU system is the same as that used for 13CU, with the addition of a new memory card for the Hand held test unit.

14CU Memory card
Lucas Part Number - 54746500

CONTINUITY TEST PROCEDURE

Test procedure using a multi-meter is carried out as for 13CU, with the addition of tests for the purge control valve, air conditioning, heated front screen and condenser fan inputs.

The use of a hand held vacuum pump, for example a 'Mityvac', is required to carry out Tests 9 and 10.

Note that the 40 way multi-plug to the ECU is wired as in the following table.

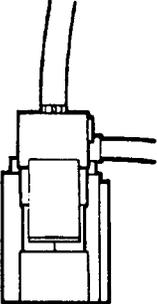
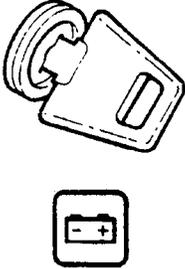
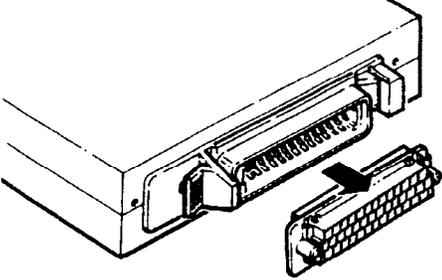
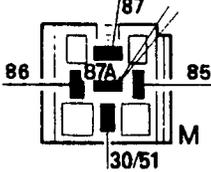
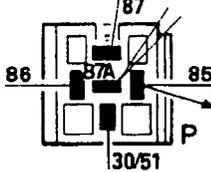
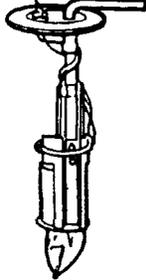
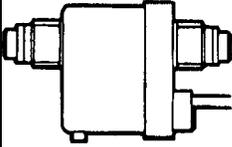
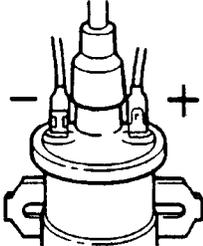
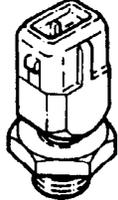
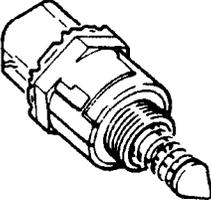
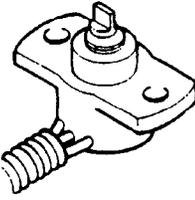
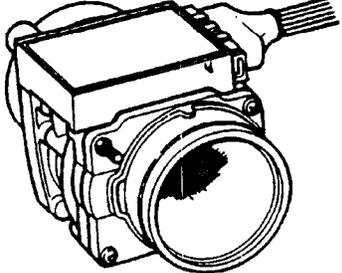
PIN NOS. CABLE COLOUR

1. Red/green
2. Brown/orange
3. Yellow
4. Black
5. Black/white
6. Yellow
7. Green/blue
8. Purple/yellow
9. White/light green
10. Black/Yellow
11. Yellow/white
12. Blue/red
13. Yellow/blue
14. Black
15. Brown
16. Blue/purple
17. Grey/yellow
18. White/pink
19. White/grey
20. Red
21. Yellow/black
22. Blue/red
23. Blue
24. Blue
25. Red/black
26. Green/white
27. Black/grey
28. Blue/grey
29. Orange
30. Not used
31. Not used
32. Grey/white
33. Black/grey
34. Black/orange
35. Blue/green
36. Black/green
37. White/yellow
38. Not used
39. White/black
40. Black

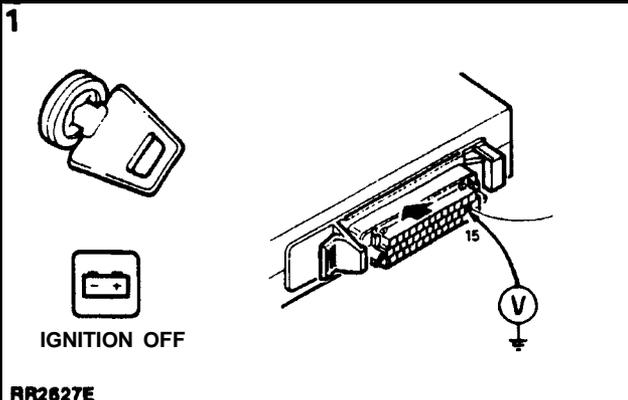
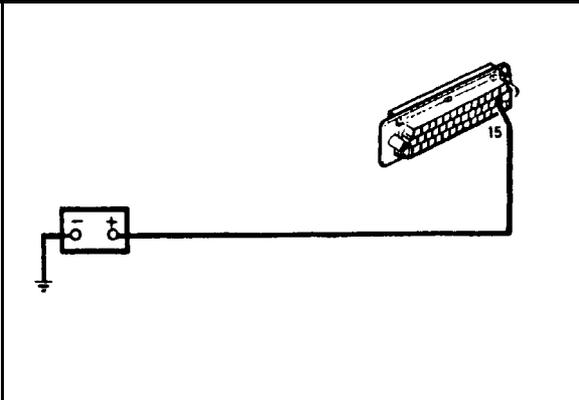
The last colour denotes the wire tracer colour.

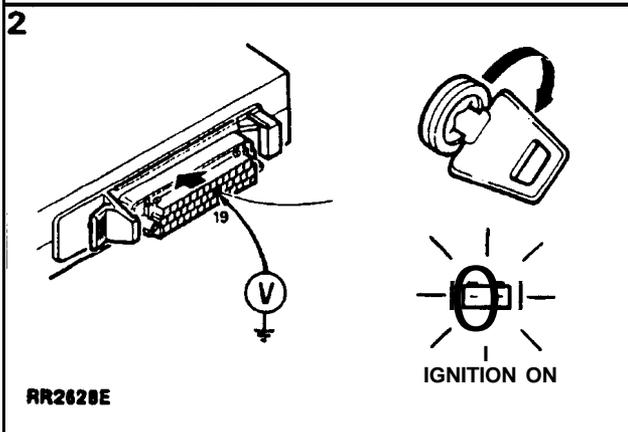
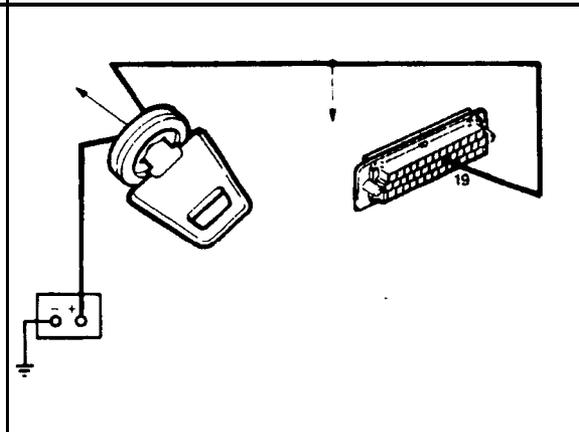
TESTS • Using a Multi-Meter • 14CU system • Key to Symbols

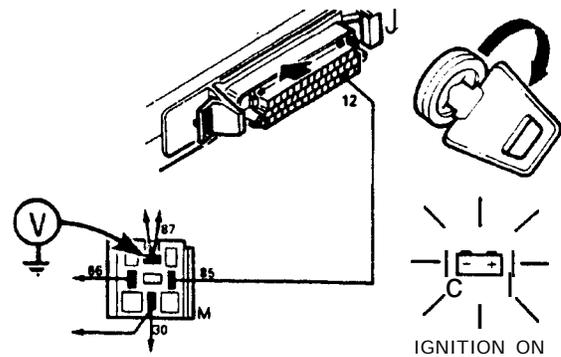
The following continuity tests are intended as a guide to identifying where a fault may be within a circuit; reference should be made to the fuel injection circuit diagram for full circuit information.

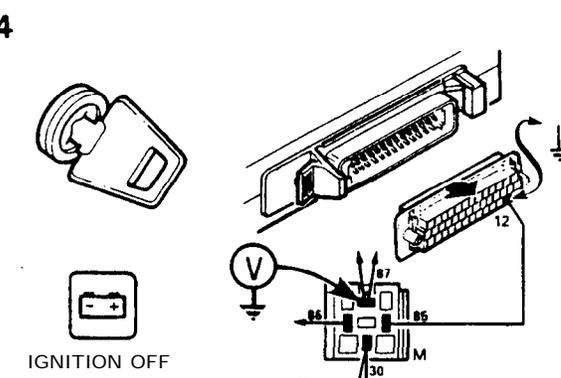
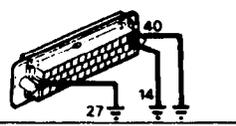
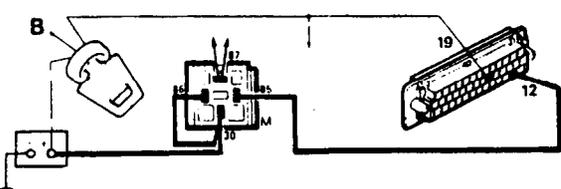
 <p>PURGE VALVE</p>	 <p>IGNITION SWITCH</p>	 <p>ELECTRONIC CONTROL UNIT AND MULTIPLUG</p>		 <p>TEMPORARY CONNECTION</p>
 <p>OHMMETER CONNECTIONS</p>	 <p>VOLTMETER CONNECTIONS</p>	 <p>MAIN RELAY</p>	 <p>PUMP RELAY</p>	 <p>FUEL PUMP</p>
 <p>ROAD SPEED INPUT (SPEED TRANSDUCER)</p>	 <p>GEAR INPUT SWITCH (INHIBITOR SWITCH)</p>	 <p>INJECTOR</p>	 <p>IGNITION COIL</p>	 <p>FUEL TEMPERATURE SENSOR</p>
 <p>COOLANT TEMPERATURE SENSOR</p> <p>RR2626E</p>	 <p>AIR BYPASS VALVE</p>	 <p>THROTTLE POTENTIOMETER</p>	 <p>HOT WIRE AIRFLOW METER</p>	

NOTE: All tests are carried out from the electronic control unit (ECU) harness multi-plug unless stated otherwise in the test procedure.

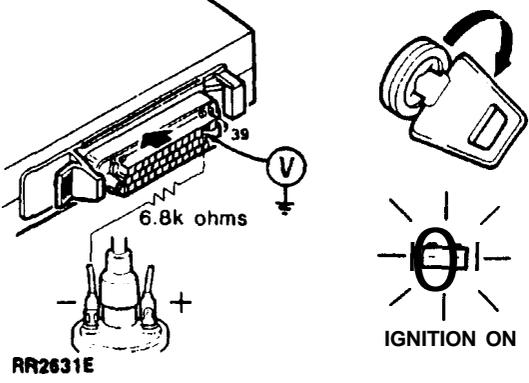
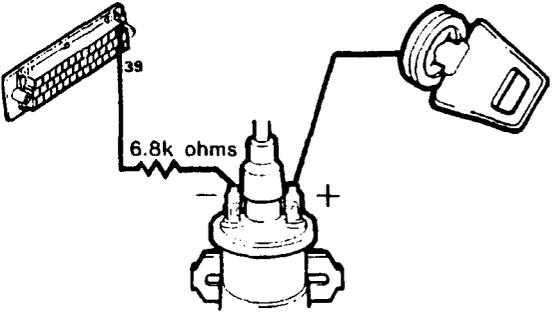
TEST PROCEDURE	RESULTS • Check cables and units shown in bold
<p>1. Check battery supply to ECU</p>	<p>Voltmeter reading of battery/ volts - (minimum battery voltage 10 volts) Proceed to Test 2 Voltmeter reading of zero volts Check:-</p>
<p>1</p>  <p>IGNITION OFF</p> <p>RR2627E</p>	

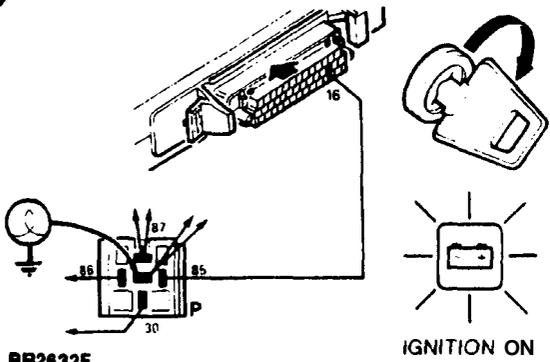
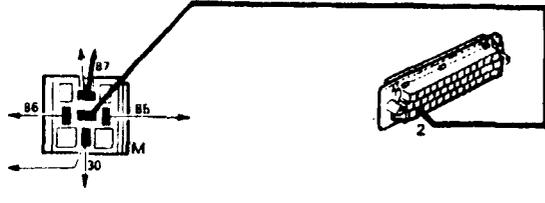
TEST PROCEDURE	RESULTS • Check cables and units shown in bold
<p>2. Check ignition supply to ECU</p>	<p>Voltmeter reading of battery volts - (minimum battery voltage 10 volts) Proceed to Test 3 Incorrect reading check:-</p>
<p>2</p>  <p>IGNITION ON</p> <p>RR2628E</p>	

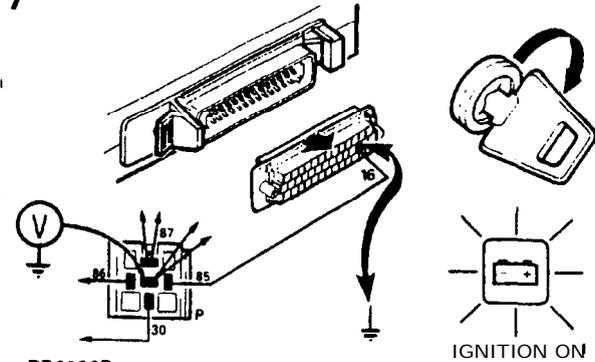
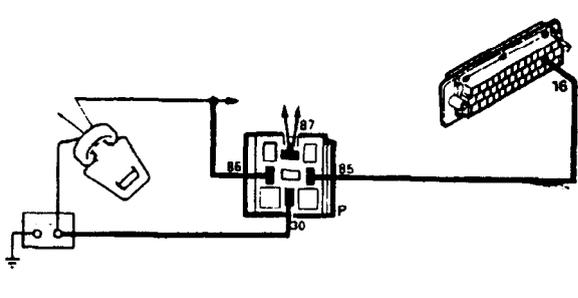
TEST PROCEDURE	RESULTS - Check cables and units shown in bold
<p>3. Check operation of Main relay</p>	<p>Voltmeter reading of battery volts - Proceed to Test 5</p>
<p>3</p>  <p>RR2629E</p> <p>IGNITION ON</p>	<p>Voltmeter reading of zero volts - Proceed to Test 4</p>

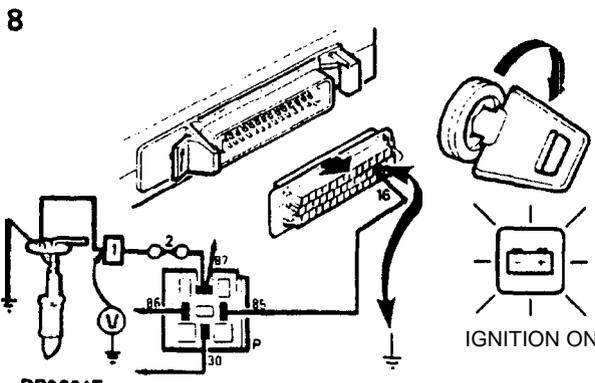
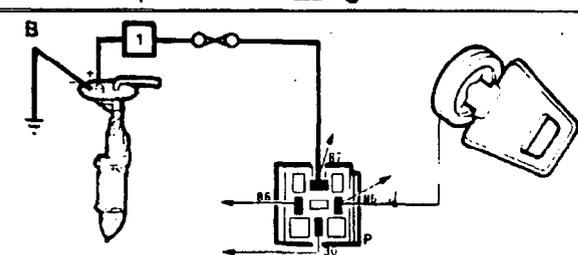
TEST PROCEDURE	RESULTS - Check cables and units shown in bold
<p>4. Fault Diagnosis Main relay circuits</p>	<p>A. Voltmeter reading of battery volts - Check:- If OK Suspect ECU</p>
<p>4</p>  <p>IGNITION OFF</p> <p>RR2630E</p>	<p>A</p>  <p>B</p> 

Continued

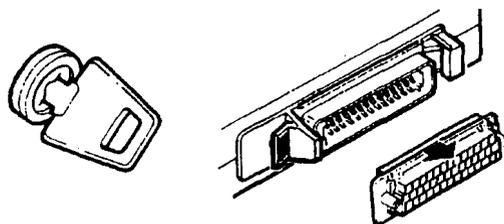
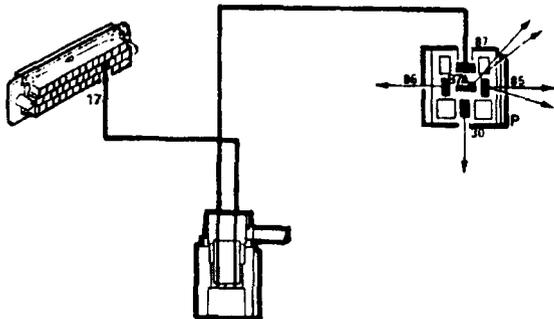
TEST PROCEDURE	RESULTS - Check cables and units shown in bold
<p>5. Check engine speed signal Cable and resistor</p>	<p>Voltmeter reading of 9.5 volts \pm 1 volt Proceed to Test 6</p> <p>Voltmeter reading of zero volts Check:-</p>
<p>5</p>  <p>RR2631E</p> <p>IGNITION ON</p>	

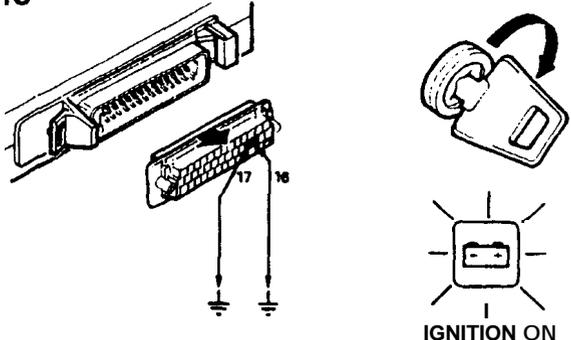
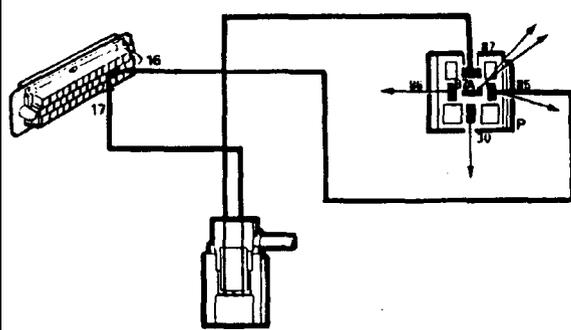
TESTPROCEDURE	RESULTS - Check cables and units shown in bold
<p>6. Check operation of pump relay</p>	<p>Test lamp will illuminate for approximately 1 second when ignition is switched on If O.K - Proceed to Test 8</p> <p>Lamp does not illuminate Check:- If OK proceed to Test 8</p>
<p>6</p>  <p>RR2632E</p> <p>IGNITION ON</p>	

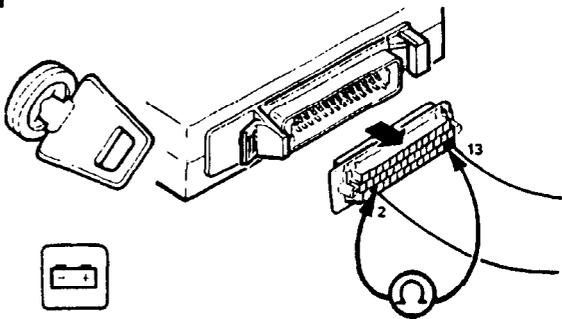
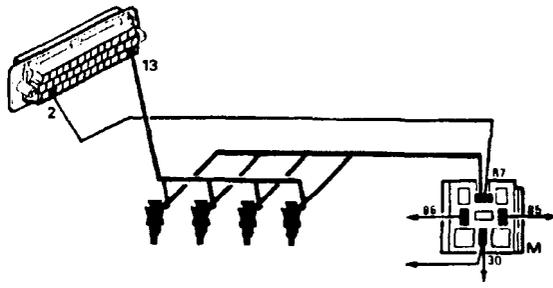
TEST PROCEDURE	RESULTS - Check cables and units shown in bold
<p>7. Fault diagnosis Pump relay circuits</p>	<p>Voltmeter reading of battery volts - Suspect ECU</p>
<p>7</p>  <p>RR2633E</p>	<p>Voltmeter reading of zero volts Check:-</p> 

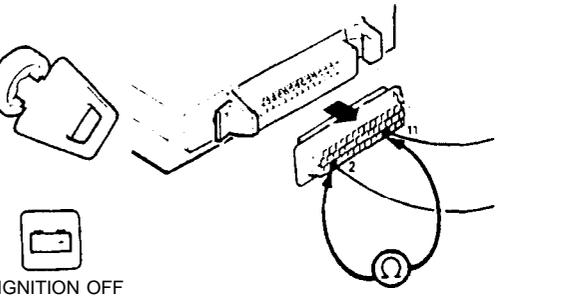
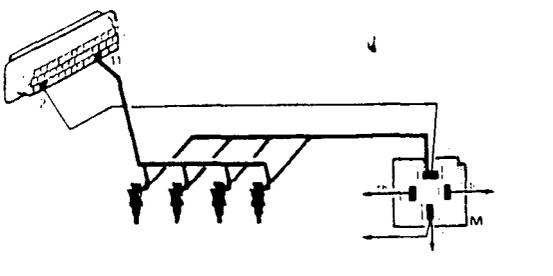
TEST PROCEDURE	RESULTS - Check cables and units shown in bold
<p>8. Check operation of Fuel pump</p> <p>NOTE: It is not possible to place the multi-meter probes directly onto the pump terminals. A link lead attached to the pump is accessible behind the rear left hand wheel located between the chassis and stowage area floor panel.</p> <p>KEY: 1. Inertia switch 2. Fuse 18</p>	<p>Voltmeter reading of battery volts - Pump operating - Proceed to Test 10</p> <p>(A) Voltmeter reading of battery volts - Pump not operating Check:-</p> <p>(B) Voltmeter reading of zero volts Check:-</p>
<p>8</p>  <p>RR2634E</p>	<p>A</p>  <p>B</p> 

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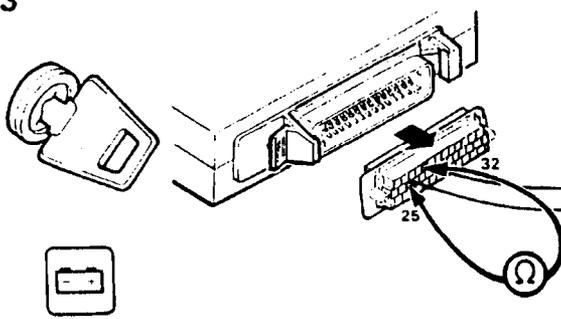
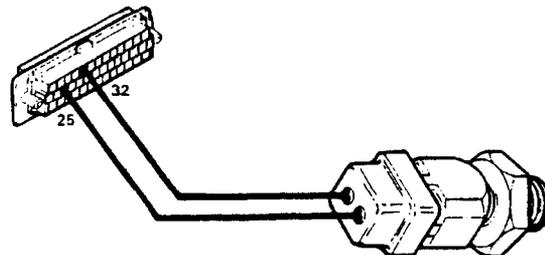
TEST PROCEDURE	RESULTS - Check cables and units shown in bold
<p>9. Check purge valve. Part 1 - seating</p> <ol style="list-style-type: none"> 1. Disconnect pipe from purge valve to plenum (at plenum) 2. Connect vacuum pump to pipe to purge valve 3. Apply vacuum of 2.5 in/Hg 	<p>Vacuum should hold for 2.5 minutes If vacuum correct proceed to test 10</p> <hr/> <p>If vacuum incorrect check:</p>
<p>3</p>  <p>0 IGNITION OFF RR2012E</p>	

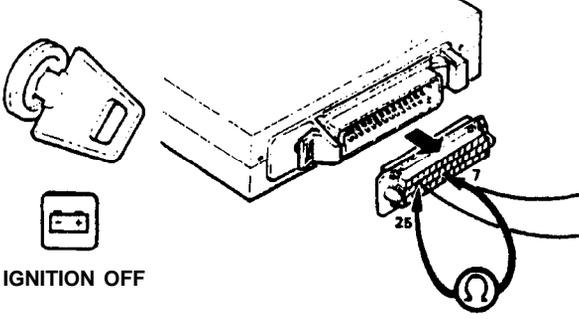
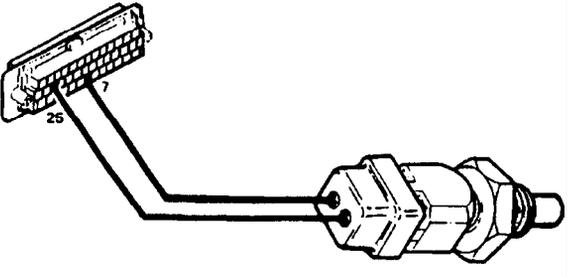
TEST PROCEDURE	RESULTS - Check cables and units shown in bold
<p>10. Check purge valve. Part 2 - operation</p> <ol style="list-style-type: none"> 1. Apply vacuum - 2.5 in/Hg, switch ignition on 2. Connect pins 16 and 17 to earth to energise pump relay. 	<p>Vacuum should be released If OK proceed to test 11</p> <hr/> <p>If vacuum not released check:</p>
<p>10</p>  <p>IGNITION ON RR2013E</p>	

TEST PROCEDURE	RESULTS - Check cables and units shown in bold
<p>11. Check injectors, Injector circuit</p> <p>(Pin 13 left bank 'A' injectors 1,3,5,7).</p>	<p>Ohm-meter reading of 4-4.5 Ohms - Proceed to Test 12</p> <p>Ohm-meter reading of 5-6 Ohms - Suspect 1 injector</p> <p>Ohm-meter reading of 8-9 Ohms - Suspect 2 injectors</p> <p>Ohm-meter reading of 16-17 Ohms - Suspect 3 injectors</p> <p>Check for open circuit injector(s) or wiring faults.</p> <p>Ohm-meter reading of Infinity Check:</p>
<p>11</p>  <p>IGNITION OFF</p> <p>RR2635E</p>	

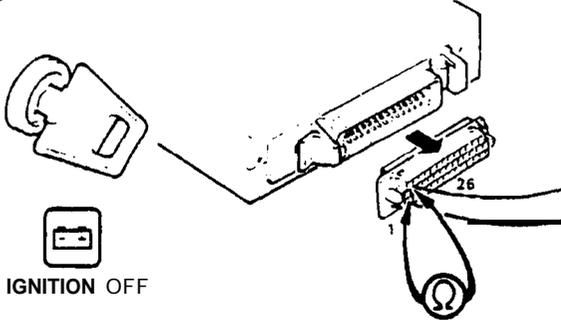
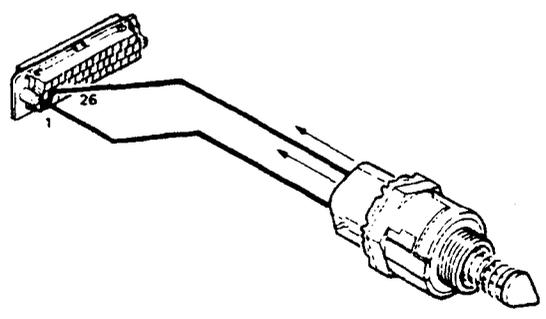
TEST PROCEDURE	RESULTS - Check cables and units shown in bold
<p>12. Check injectors, Injector circuit</p> <p>(Pin 11 rightbank 'B' injectors 2,4,6,8)</p>	<p>Ohm-meter reading of 4-4.5 Ohms - Proceed to Test 13</p> <p>Ohm-meter reading of 5-6 Ohms - Suspect 1 injector</p> <p>Ohm-meter reading of 8-9 Ohms - Suspect 2 injectors</p> <p>Ohm-meter reading of 16-17 Ohms - Suspect 3 injectors</p> <p>Check for open circuit injector(s) or wiring faults.</p> <p>Ohm-meter reading of Infinity Check:</p>
<p>12</p>  <p>IGNITION OFF</p> <p>RR2636E</p>	

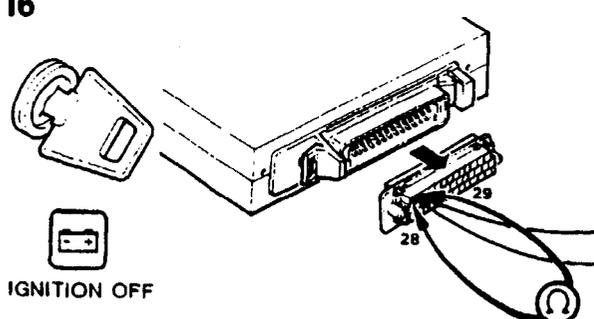
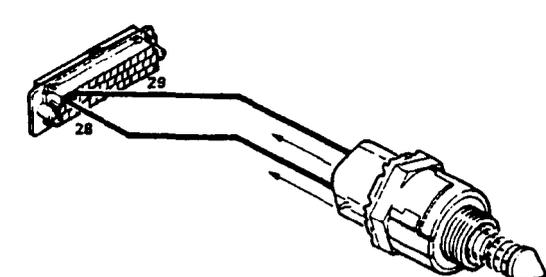
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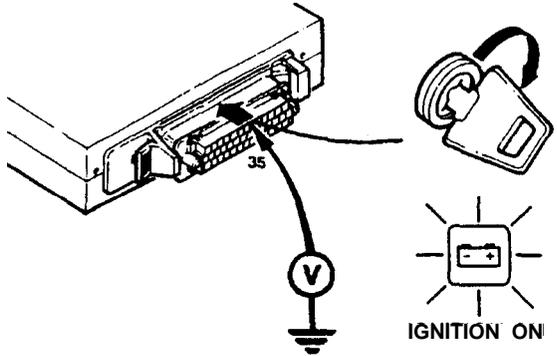
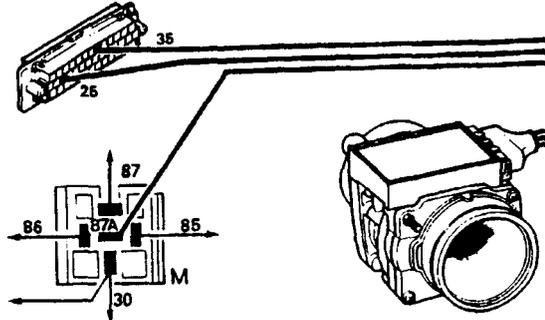
TEST PROCEDURE	RESULTS - Check cables and units shown in bold
<p>13. Check fuel temperature thermistor (sensor)</p>	<p>Correct reading-temperature to resistance - Proceed to Test 14 (Refer to Temperature Conversion Charts in Test 14)</p> <p>Incorrect Ohm-meter reading Check</p>
<p>13</p>  <p>IGNITION OFF</p> <p>RR2638E</p>	

TEST PROCEDURE	RESULTS - Check cables and units shown in bold																											
<p>14. Check coolant temperature thermistor (sensor)</p>	<p>Correct reading-Temperature to resistance - Proceed to Test 15 (Refer to Temperature Conversion Chart below.)</p> <table border="1" data-bbox="922 410 1409 697"> <thead> <tr> <th colspan="2">Fuel and Coolant Temperature</th> <th>Ohm-meter Reading Should be</th> </tr> <tr> <th>°C</th> <th>°F</th> <th>Ohms</th> </tr> </thead> <tbody> <tr> <td>-10°</td> <td>14°</td> <td>9100 - 9300</td> </tr> <tr> <td>0°</td> <td>32°</td> <td>5700 - 5900</td> </tr> <tr> <td>20°</td> <td>68°</td> <td>2400 - 2600</td> </tr> <tr> <td>40°</td> <td>104°</td> <td>1100 - 1300</td> </tr> <tr> <td>60°</td> <td>140°</td> <td>500 - 700</td> </tr> <tr> <td>80°</td> <td>176°</td> <td>300 - 400</td> </tr> <tr> <td>100°</td> <td>212°</td> <td>150 - 200</td> </tr> </tbody> </table> <p>Incorrect Ohm-meter reading Check:-</p>	Fuel and Coolant Temperature		Ohm-meter Reading Should be	°C	°F	Ohms	-10°	14°	9100 - 9300	0°	32°	5700 - 5900	20°	68°	2400 - 2600	40°	104°	1100 - 1300	60°	140°	500 - 700	80°	176°	300 - 400	100°	212°	150 - 200
Fuel and Coolant Temperature		Ohm-meter Reading Should be																										
°C	°F	Ohms																										
-10°	14°	9100 - 9300																										
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20°	68°	2400 - 2600																										
40°	104°	1100 - 1300																										
60°	140°	500 - 700																										
80°	176°	300 - 400																										
100°	212°	150 - 200																										
<p>14</p>  <p>IGNITION OFF</p> <p>RR2637E</p>																												

Continued

MT PROCEDURE	RESULTS - Check cables and units shown in bold
<p>15. Check air bypass valve - Part 1</p>	<p>Ohm-meter reading of 40-60 Ohms - Proceed to Test 16</p> <p>Incorrect reading Check:-</p>
<p>15</p>  <p>IGNITION OFF</p> <p>RR2639E</p>	

TEST PROCEDURE	RESULTS - Check cables and units shown in bold
<p>16. Check air bypass valve - Part 2</p>	<p>Ohm-meter reading of 40-60 Ohms - Proceed to Test 17</p> <p>Incorrect reading Check:-</p>
<p>16</p>  <p>IGNITION OFF</p> <p>IR2640E</p>	

TEST PROCEDURE	RESULTS - Check cables and units shown in bold
<p>IS. Check output of Airflow sensor</p>	<p>Voltmeter reading of 0.2-0.7 volts- Proceed to Test 20</p> <p>Incorrect voltmeter reading Check:-</p>
 <p>IR2643E</p>	

PRECAUTION:

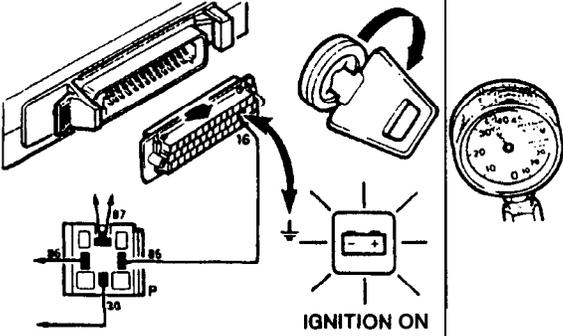
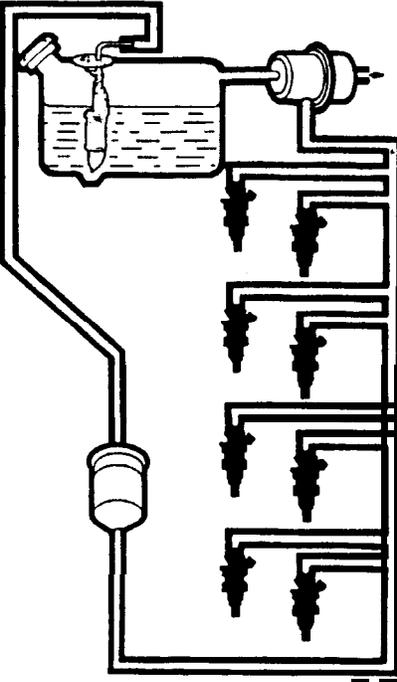
Depressurize the fuel system when fitting the fuel pressure gauge or disconnecting/replacing fuel system components.

CAUTION: Thoroughly clean the immediate area around the fuel filter and hose connections before disconnecting the fuel feed line from the filter. Failure to do so could cause foreign matter to be present in the fuel system which would be detrimental to the fuel system components.

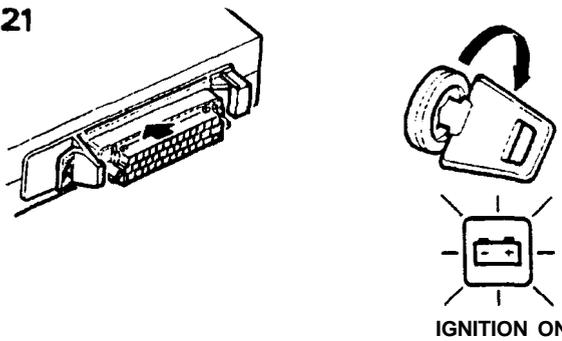
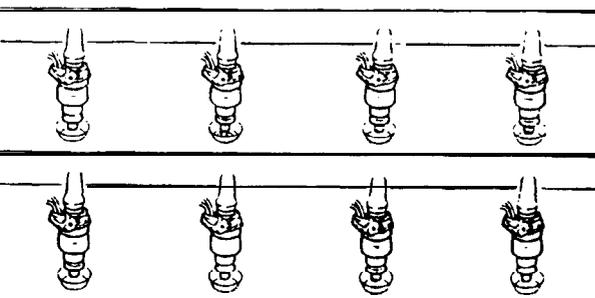
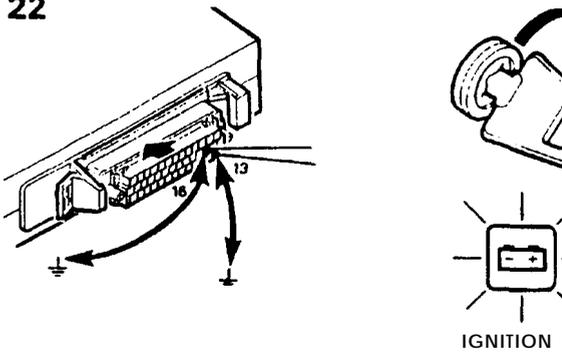
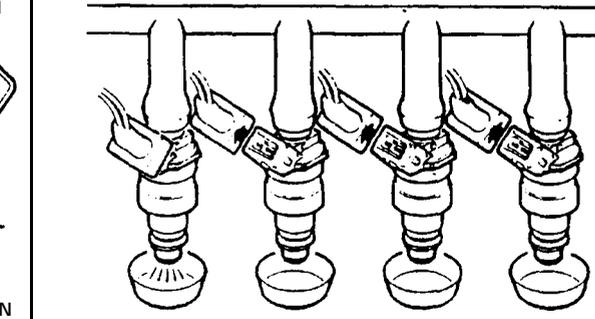
WARNING: The spillage of fuel from the fuel filter is unavoidable when disconnecting the fuel feed line, ensure that all necessary precautions are taken to prevent fire and explosion due to fuel vapour and fuel seepage,

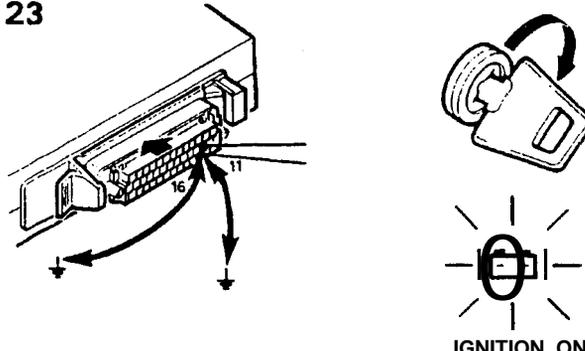
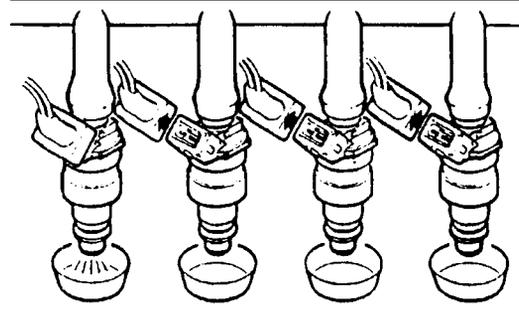
DEPRESSURIZING PROCEDURE

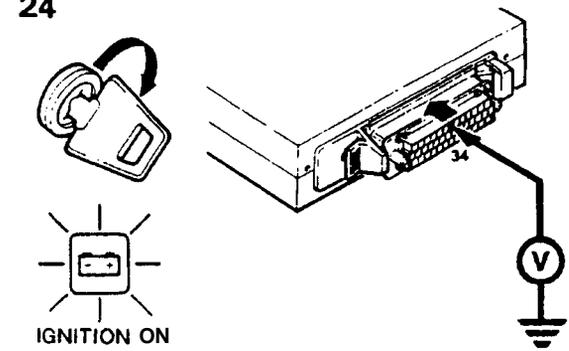
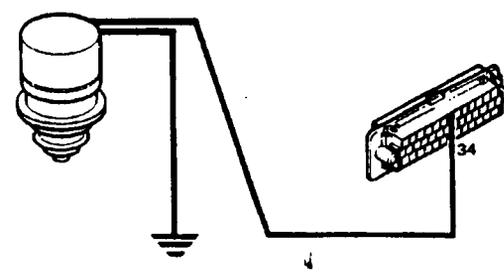
- a) Ignition off, pull pump relay off its terminal block.
- b) Crank engine for a few seconds - engine may fire and run until fuel pressure is reduced.
- c) Switch off the ignition.
- d) Connect fuel pressure gauge in the fuel supply line between the fuel rail and the fuel filter, adjacent to the filter (see Test 20).
- e) Reconnect the pump relay.

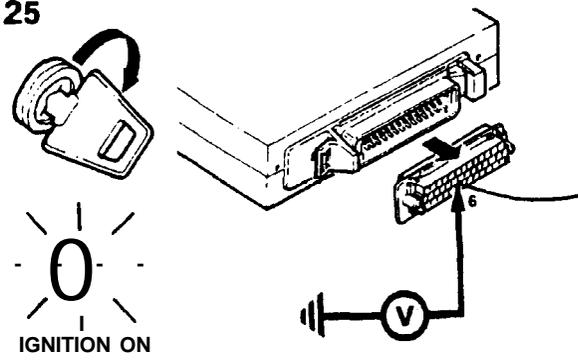
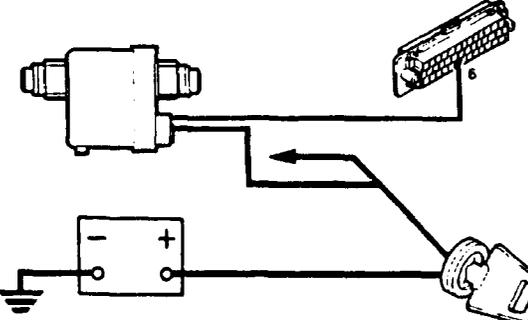
TEST PROCEDURE	RESULTS • Check cables and units shown in bold
<p>20. Check fuel system pressure Service tool 18G 1500</p> <p>NOTE: Insert the pressure gauge in the fuel feed line immediately after the fuel line filter. The filter is located beneath the right hand rear wheel arch attached to the chassis</p>	<p>(A) Expected reading 2,39-2,672 kgf/cm² (34.0-38.0 p.s.i.)</p> <p>(B) Pressure drop-max 0.7 kgf/cm² (10 p.s.i.) in one minute</p> <p>Proceed to Test 21</p>
<p>20</p> 	
 <p>RR2644E</p>	

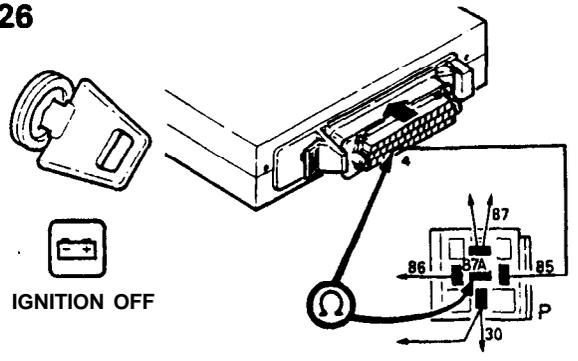
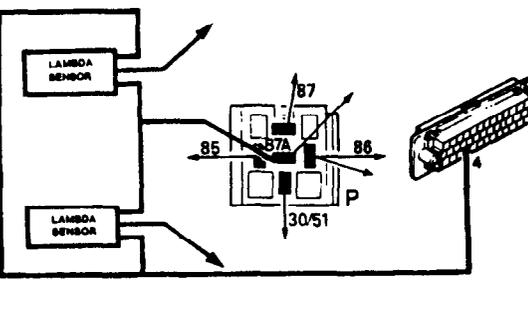
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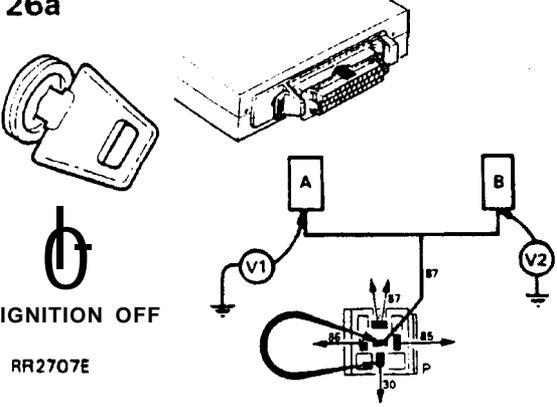
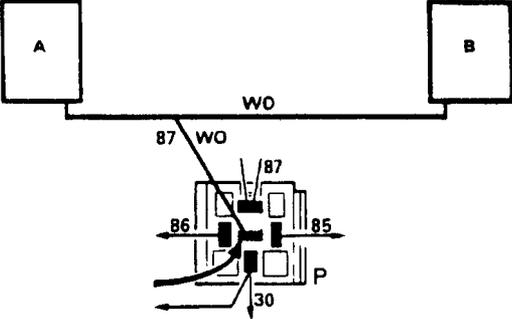
EST PROCEDURE	RESULTS - Check cables and units shown in bold
<p>11. Check for leaking injector</p> <p>NOTE: Before removing any of the injectors, remove and examine the spark plugs, check for consistent colouration of plugs. A leaking injector will result in the appropriate spark plug being 'sooted up'.</p> <p>Remove all injectors from manifold but do not disconnect from fuel rail</p>	<p>WARNING: Ensure that all necessary precautions are taken to prevent fire and explosion.</p> <p>Replace any injector which leaks more than 2 drops of fuel per minute.</p>
<p>21</p>  <p>RR2645E</p>	
EST PROCEDURE	RESULTS - Check cables and units shown in bold
<p>12. Check for injector operation Left bank 'A' injectors 1,3,5,7</p>	<p>WARNING: Ensure that all necessary precautions are taken to prevent fire and explosion.</p> <p>Repeat test for other injectors Replace any injector which does not operate.</p> <p>NOTE: Fuel flow is 160-175 cc (using white spirit) or 180-195 cc using petrol) (minimum) per minute per injector, at 2.54 kgf/cm² (36.25 psi) system pressure at 20°C ± 2°C</p>
<p>22</p>  <p>RR2646E</p>	

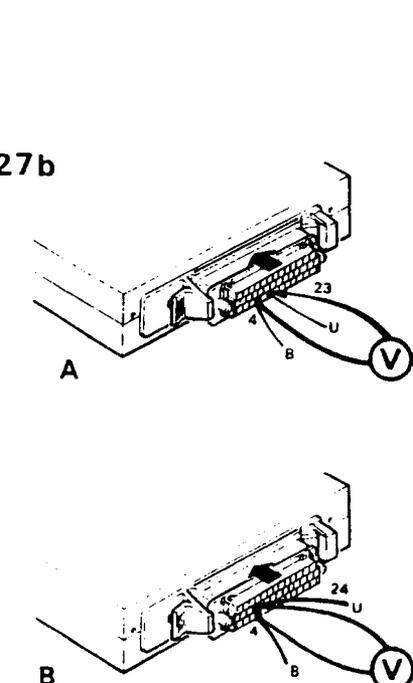
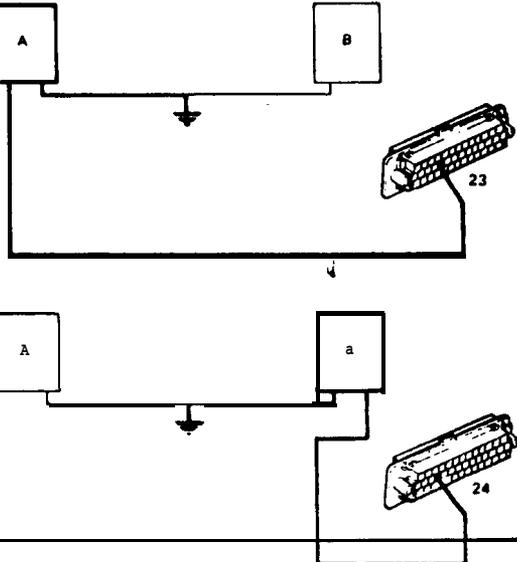
TEST PROCEDURE	RESULTS - Check cables and units shown in bold
<p>23. Right bank 'B' injectors 2,4,6,8</p>	<p>WARNING: Ensure that all necessary precautions are taken to prevent fire and explosion</p> <p>Repeat test for other injectors Replace any injector which does not operate</p> <p>NOTE: Fuel flow is 160-175 cc fusing mineral spirits) or 180-195 cc (using gasoline) (minimum) per minute per injector, at 2.54 kgf/cm² (36.25 psi) system pressure at 20°C ± 2°C</p>
<p>23</p>  <p>RR2647E</p>	

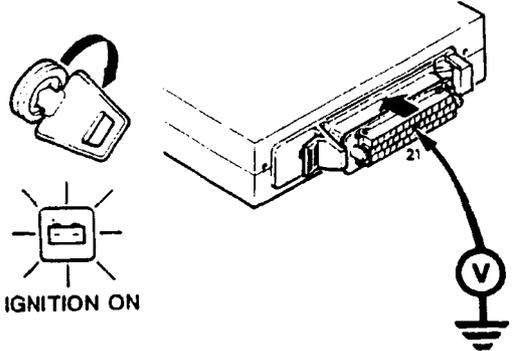
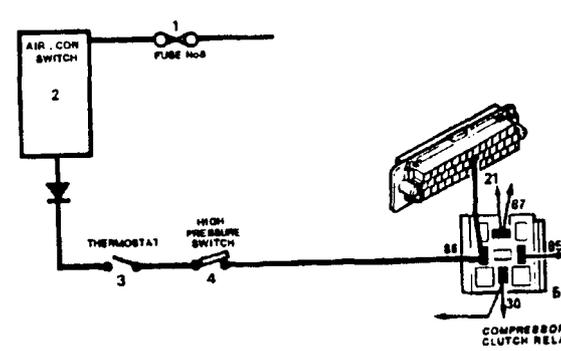
TEST PROCEDURE	RESULTS - Check cables and units shown in bold
<p>24. Check gear switch input</p>	<p>Voltmeter reading of zero volts- Neutral and park</p> <p>Voltmeter reading of 2.5-5.0 Volts -R.D.3.2.1- Proceed to Test 25</p> <p>Incorrect reading Check:</p>
<p>24</p>  <p>RR2648E</p>	

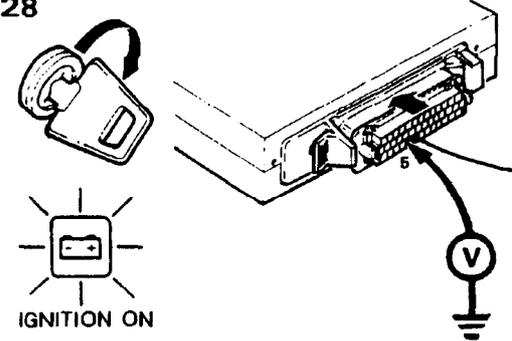
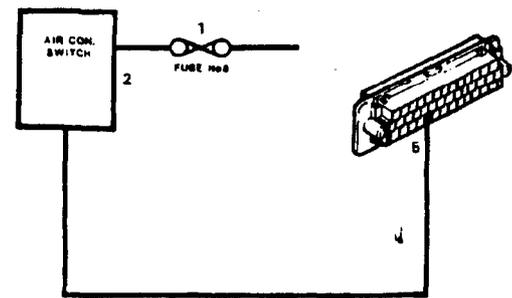
TEST PROCEDURE	RESULTS - Check cables and units shown in bold
<p>25. Check road speed input</p> <p>NOTE: Raise and rotate the left hand test road wheel slowly</p>	<p>Voltmeter reading of 0 to 12V fluctuating 6 times per revolution - Proceed to Test 26</p> <p>Incorrect reading Check:</p>
<p>25</p>  <p>IGNITION ON</p> <p>RR2649E</p>	 <p>RR2649E</p>

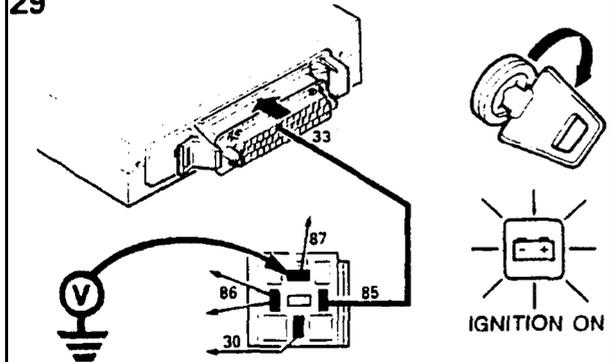
TEST PROCEDURE	RESULTS - Check cables and units shown in bold
<p>26. Check Lambda sensor heater coils</p> <p>NOTE: Remove pump relay from its connector</p>	<p>Ohm-meter reading of 2.5-6.0 Ohms</p> <p>Incorrect reading Check:</p>
<p>26</p>  <p>IGNITION OFF</p> <p>RR2650E</p>	 <p>RR2650E</p>

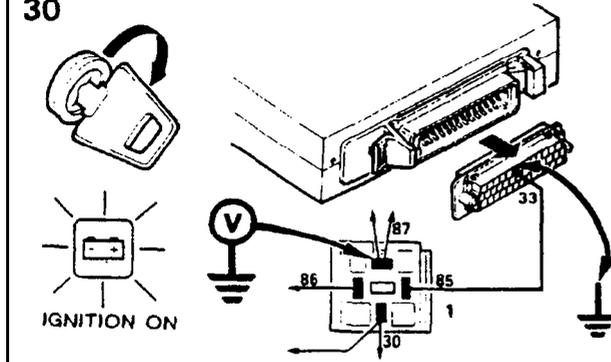
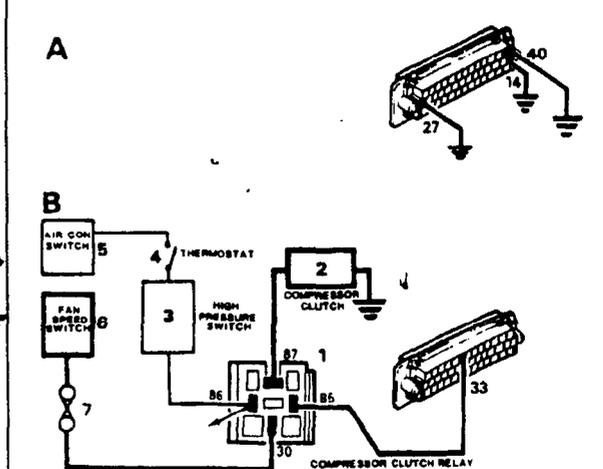
TEST PROCEDURE	RESULTS • Check cables and units shown in bold
<p>26a. Check Lambda sensor supply</p> <p>A. LH Lambda sensor B. RH Lambda sensor</p>	<p>Correct V1 and V2 • 12 volts Proceed to Test 26b</p> <p>Incorrect reading Check:</p>
<p>26a</p>  <p>IGNITION OFF</p> <p>RR2707E</p>	

TEST PROCEDURE	RESULTS • Check cables and units shown in bold
<p>26b. Check Lambda sensor operation</p> <p>Note: Select 'P' in main gearbox and run engine at 1000 rev/min, normal operating temperature</p> <p>A. LH Lambda sensor B. RH Lambda sensor</p>	<p>Correct 0.50V - 1.00V fluctuating</p> <p>Incorrect 0.050 V • Check: Air leaks, faulty or contaminated injectors, low fuel pressure • if OK fit new Lambda sensor</p> <p>Incorrect 1.00V • Check: High fuel pressure, leaking injectors, saturated carbon canister • if OK fit new Lambda sensor.</p>
<p>27b</p>  <p>RR2708E</p>	

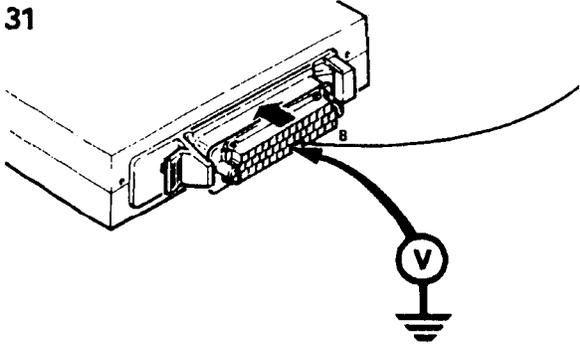
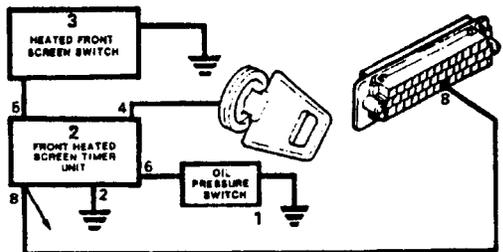
TEST PROCEDURE	RESULTS - Check cables and units shown in bold
<p>27. Check air conditioning thermostat input</p> <p>NOTE: Select air conditioning position and move thermostat switch to cold</p> <p>KEY: 1. Fuse 8 2. Air conditioning switch 3. Air conditioning thermostat 4. High pressure switch - air conditioning 5. Compressor clutch relay</p>	<p>Voltmeter reading of battery volts - Proceed to Test 28</p> <p>Incorrect reading Check:</p>
<p>27</p>  <p>1R2651E</p>	

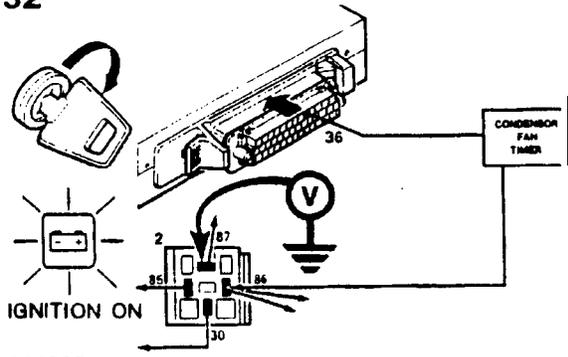
TEST PROCEDURE	RESULTS - Check cables and units shown in bold
<p>28. Check air conditioning input</p> <p>NOTE: Select heater fan speed I, II or III</p> <p>KEY: 1. Fuse 6 2. Air conditioning switch</p>	<p>Voltmeter reading of battery volts - Proceed to Test 29</p> <p>Incorrect reading Check:</p>
<p>28</p>  <p>RR2652E</p>	

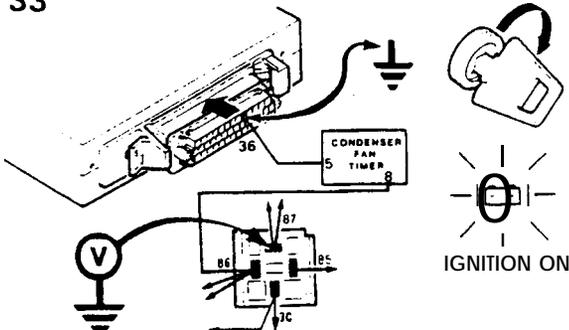
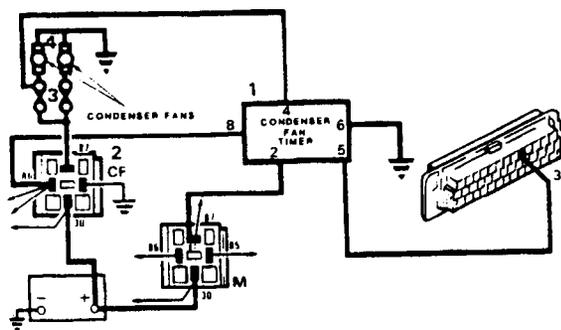
TEST PROCEDURE	RESULTS • Check cables and units shown in bold
<p>29. Check operation of compressor clutch relay</p> <p>NOTE: Select air conditioning position, thermostat cold, and fan speed I, II, or III</p>	<p>Voltmeter reading of 12 volts - Proceed to Test 31</p> <p>Incorrect reading of zero volts Proceed to Test 30</p>
<p>29</p>  <p>RR2653E</p>	

TEST PROCEDURE	RESULTS • Check cables and units shown in bold
<p>30. Fault diagnosis • compressor clutch relay</p> <p>NOTE: Select air conditioning position, thermostat cold, and fan speed I, II or III</p> <p>KEY:</p> <ol style="list-style-type: none"> 1. Compressor clutch relay 2. Compressor clutch 3. High pressure switch 4. Thermostat 5. Air conditioning switch 6. Fan speed switch 7. Fuse A3 	<p>Voltmeter reading of 12 volts - Check A</p> <p>Voltmeter reading of zero volts Check B</p>
<p>30</p>  <p>RR2654E</p>	

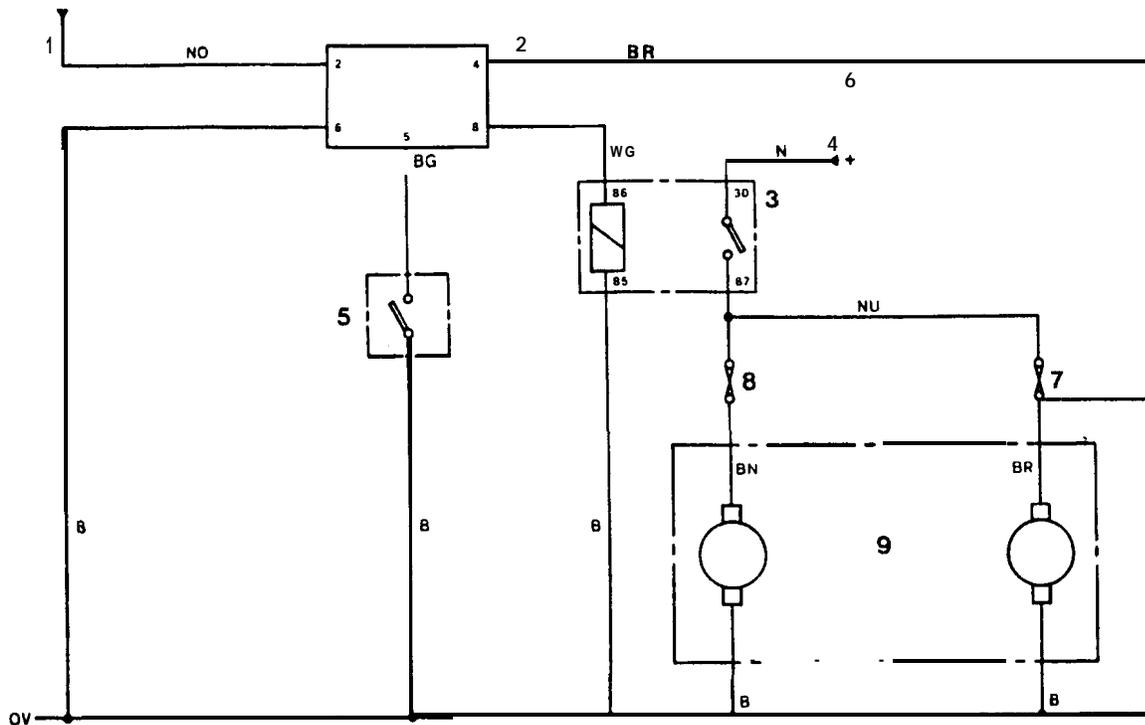
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TEST PROCEDURE	RESULTS - Check cables and units shown in bold
<p>31. Check heated front screen input</p> <p>NOTE: Engine running, heated front screen switched 'ON'</p> <p>KEY: 1. Oil pressure switch 2. Front screen timer unit 3. Front screen switch</p>	<p>Voltmeter reading of 12 volts - Proceed to Test 32</p> <p>Incorrect reading of zero volts Check:</p>
<p>31</p>  <p>RR2655E</p>	

TEST PROCEDURE	RESULTS - Check cables and units shown in bold
<p>32. Check operation of condenser fan output</p> <p>Disconnect coolant temperature sensor and fuel temperature sensor and bridge plug connectors</p> <p>NOTE: Switch ignition 'ON' for 5 seconds, switch ignition 'OFF'</p> <p>The fan timer will operate the fans for approximately 10 minutes unless it is disconnected</p> <p>KEY: 1. Condenser fan timer 2. Condenser fan relay</p>	<p>Voltmeter reading of 12 volts - end of tests</p> <p>Voltmeter reading of zero volts Proceed to Test 33</p>
<p>32</p>  <p>RR2660E</p>	

'EST PROCEDURE	RESULTS • Check cables and units shown in bold
<p>13. Fault diagnosis • condenser fan output</p> <p>KEY:</p> <ol style="list-style-type: none"> 1. Condenser fan timer 2. Condenser fan relay 3. Fuses A1 and A2 4. Condenser fans 	<p>Voltmeter reading of 12 volts - Suspect ECU</p> <p>Incorrect reading Check:</p>
<p>33</p>  <p>IR 2676E</p>	

After completing the tests with either the 'Diagnostic' equipment or multi-meter, re-test the vehicle to **ensure** the faults have been rectified. If faults still persist, recheck using the Lucas diagnostic equipment.



RR2610E

Condenser fan circuit diagram RR2610E

1. 12V from EFI main relay.
2. Condenser fan timer unit.
3. Fan relay.
4. 12V battery feed.
5. Trigger, from ECU.
6. 12V from fan relay.
7. Fuse A1-20 amp.
8. Fuse A2-20 amp.
9. Fan motors

Condenser fans/Condenser fan timer

Check operation

1. Start engine.
2. Move air con/heater control to air conditioning position.
3. Check condenser fans, if working the condenser fan relay and wiring to the fans is functioning.
4. If not working check fuses A1 and A2, and the voltage between connections 86 on fan relay and earth. If 12 volts is not present, check wiring back to air con switch.
5. If 12 volts is present, but fans NOT working, short out connections 30 and 87 on fan relay. If fans work fit new relay. If fans NOT working, check supply to fan relay from main harness.
6. Apply a 12 volt supply for at least two seconds to connection 5 on fan timer within **SIX SECONDS** of switching engine off. The condenser fans should run for 9.5 minutes \pm 0.5 minutes, and switch off.
7. If the fans do not work after applying voltage to timer, short out connections 4 and 8 on fan timer, if fans work fit new fan timer. If fans do not work, check wiring.

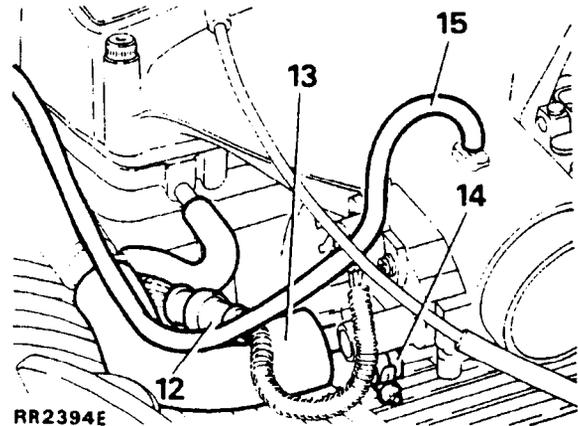
OVERHAUL THROTTLE LEVERS AND THROTTLE VALVE - 3.9 V8 Model

Preparation, remove, overhaul and refit

Preparation

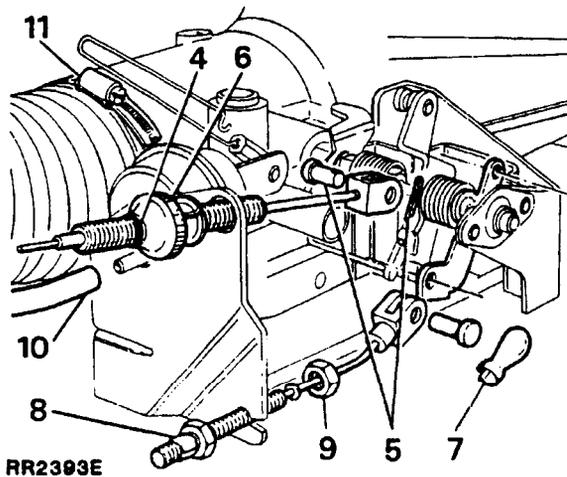
1. Disconnect the battery negative terminal.
2. Disconnect the electrical multi-plug from the bypass air valve (stepper motor).
3. Disconnect the small vacuum hose at the rear of the plenum chamber, located below the bypass air valve.
4. To assist re-assembly mark an identification line on the throttle cable outer covering directly behind the adjustment thumb wheel before disconnecting the throttle cable from the throttle lever.
5. Remove the cotter pin and clevis pin securing the throttle cable to the lever.
6. Carefully pry the adjustment thumb wheel from the throttle bracket. Lay the cable aside.
7. Release the retaining clip from the kick down cable and remove the clevis pin.
8. To assist re-assembly apply adhesive tape behind the rear adjustment nut on the kick down cable outer sleeve to prevent the nut moving out of position.
9. Release the front lock nut and remove it from the outer sleeve to enable the cable to be removed from the throttle bracket. Lay the cable aside.
10. Remove the vacuum hose from the cruise control actuator.

11. Remove the large hose from the neck of the plenum chamber.
12. Disconnect the multi-plug to the throttle potentiometer.
13. Remove the PCV breather hose.
14. Disconnect the two coolant hoses in turn and immediately plug the end of each hose to prevent excessive loss of coolant. Identify each hose for re-assembly.
15. Remove the distributor vacuum hose.

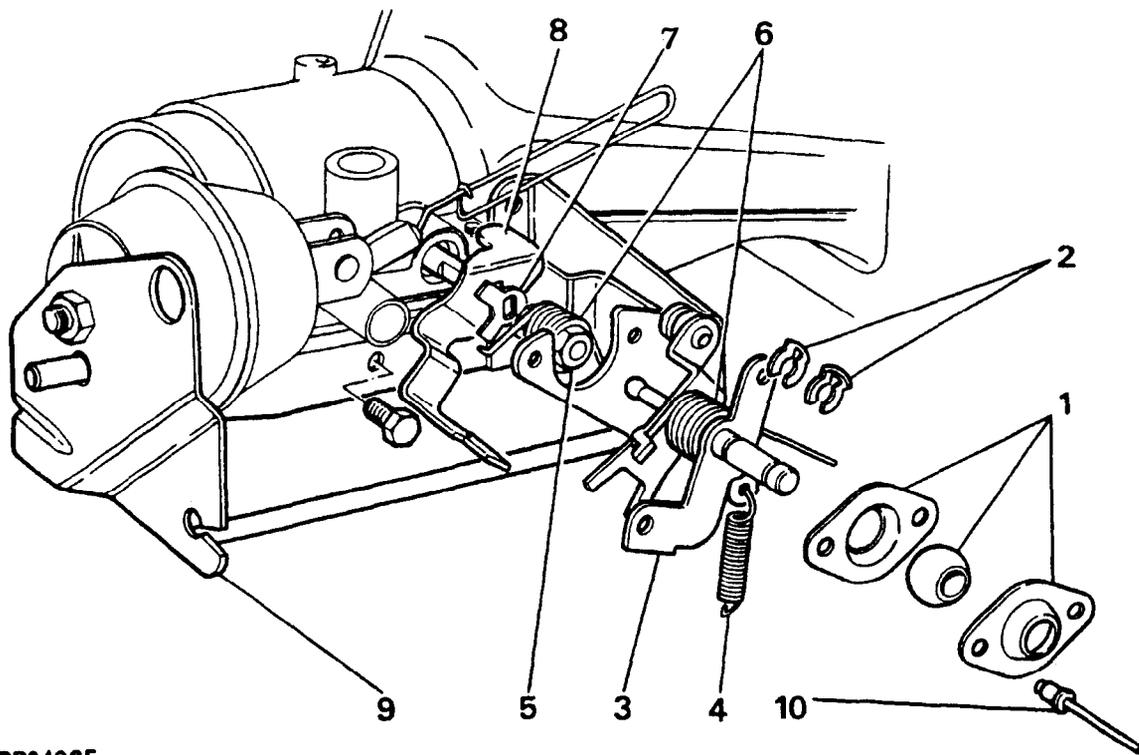


RR2394E

16. Release the two screws and remove the potentiometer.



RR2393E



RR2406E

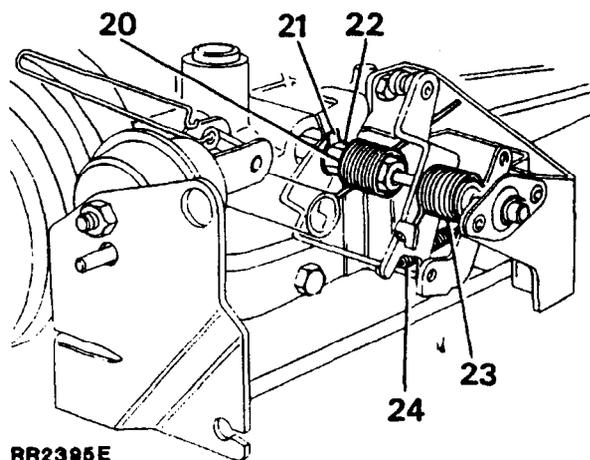
KEY

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

- 21. Bend back the the tabs of the lock washer.
- 22. While holding the throttle stop lever in the closed position, **release the nut** until it is free of the throttle valve shaft.
- 23. Release the tension on the outboard throttle return spring.
- 24. Unhook and remove the over-travel spring.

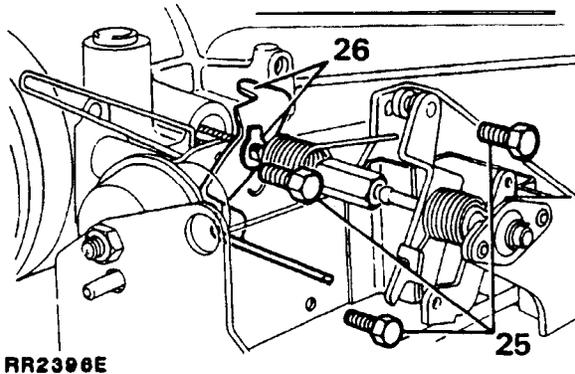
Remove throttle lever assembly

- 17. Remove the six screws securing the plenum chamber to the ram housing. Lift off the plenum chamber.
- 18. Remove the hose from the air bypass valve housing and plenum chamber air inlet pipe.
- 19. Unclip the cruise control actuator link. While holding the throttle valve fully open release the link from the countershaft assembly. Carefully return the lever assembly to the closed throttle position.
- 20. Release the tension on the inboard throttle return spring and slide the spring along the countershaft assembly to give access to the throttle shaft nut.



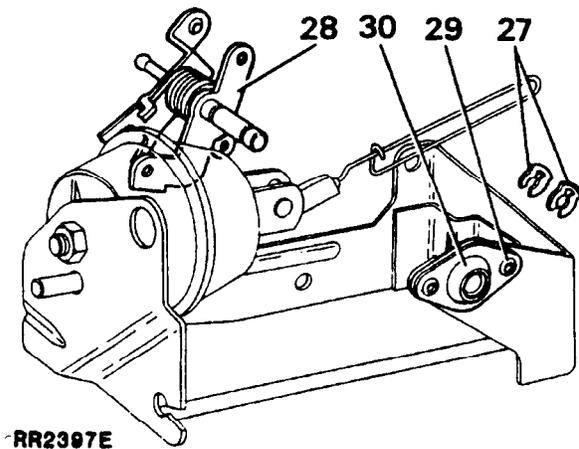
RR2395E

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

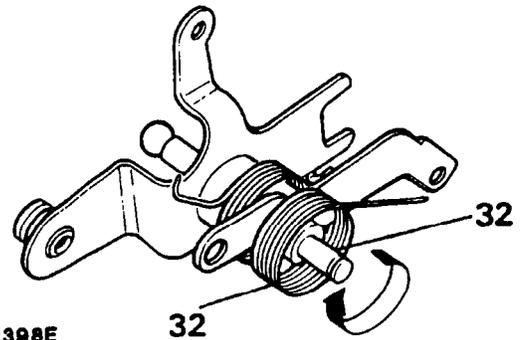


Inspect and overhaul throttle lever assembly

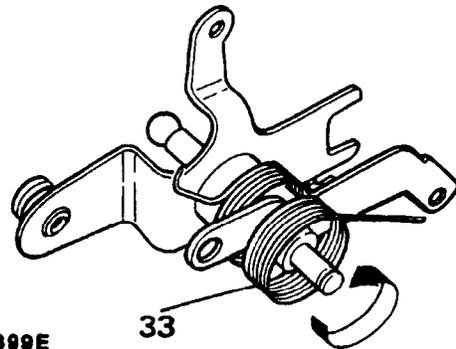
27. Remove the two retaining clips from either side of the spherical bearing.
28. Remove the countershaft assembly from the bearing.
29. If the spherical bush appears to be worn, dismantle as follows. Using a 4,7 mm (3/16 in) diameter drill, drill out the two pop rivets securing the spherical bearing to the throttle bracket assembly.
30. Split the bearing assembly and discard the bearing bush.



31. Pre-grease a new bush with Admax L3 or Energrease LS3 assemble the bush into the bearing retaining plates and pop-rivet the assembly to the throttle bracket with two 4.7 mm (3/16 in) diameter domed head rivets 9 mm (0.361 in) long.
32. Examine the bearing surface of the countershaft assembly. If worn fit a new assembly, otherwise wind the throttle return spring off the levers.



33. Wind a new spring onto the countershaft assembly noting that the small hooked end of the spring is wound on first.

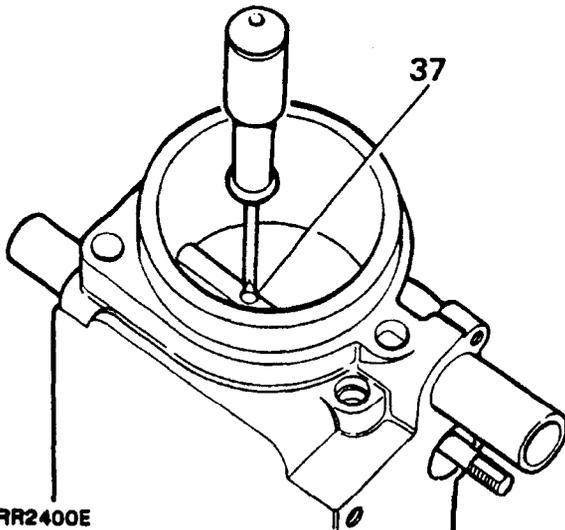


34. Pre-grease the shaft with Admax L3 or Energrease LS3 and fit the countershaft assembly to the spherical bearing and secure with the two clips.
35. Examine the throttle stop lever for wear, fit a new lever if necessary.

Continued

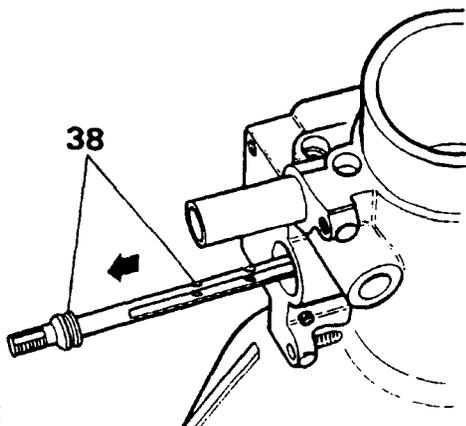
Inspect and overhaul throttle valve

36. Examine the throttle valve shaft for excessive wear between the bearing bushes in the plenum chamber and the shaft. A small amount of clearance is permissible. If excessive wear is evident fit new shaft and bushes as follows.
37. Remove the two split screws securing the throttle valve disc and withdraw the disc, taking care not to damage the shaft.



RR2400E

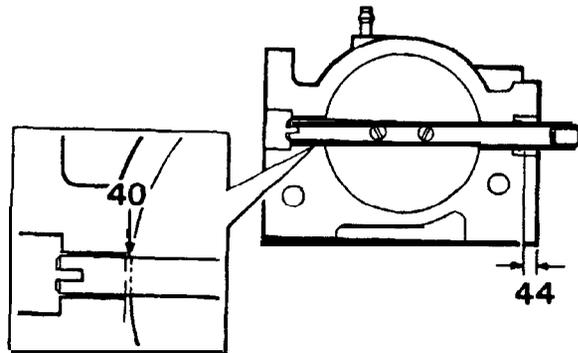
38. Remove the shaft and air seal from the plenum chamber.



RR2401E

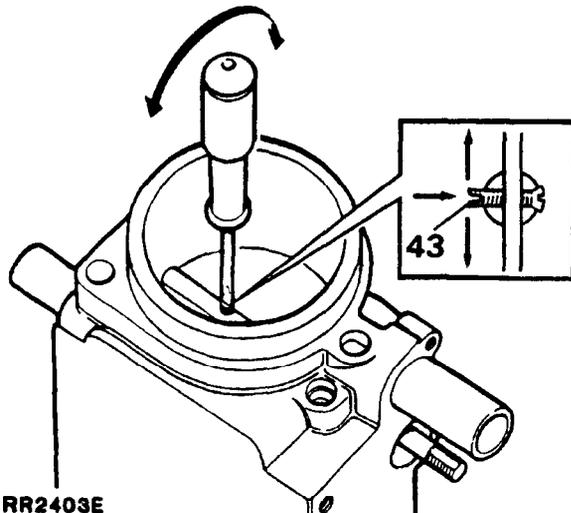
39. Using a suitable drift, drive out the bushes taking care not damage the bores in the plenum chamber.
40. Press in new bushes until they are flush with the throttle valve bore.

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



RR2402E

41. Fit the throttle valve shaft and disc, secure in position with the two split screws. Do not fully tighten the screws at this stage.
42. Rotate the throttle shaft 360° once or twice to centralise the disc in the bore. Tighten the two screws.
43. Rotate the shaft until the split end of the screws are accessible. Using the blade of a screw driver spread the split to secure the screws in the shaft.

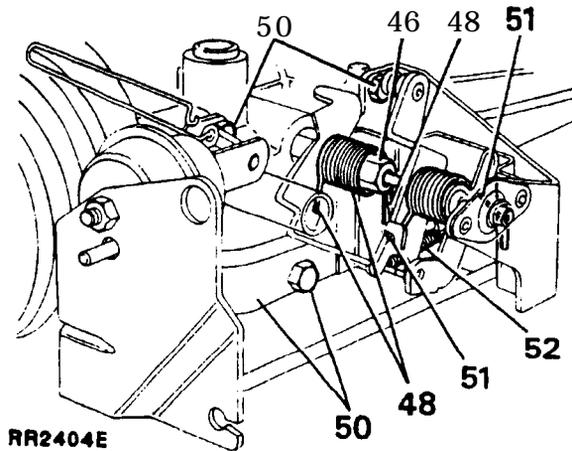


RR2403E

44. Pre-grease a new air seal with Admax L3 or Energrease LS3. Fit the seal pushing it down the shaft and into the counterbore until the seal is 6.0 mm (0.236 in) below the face of the plenum chamber.

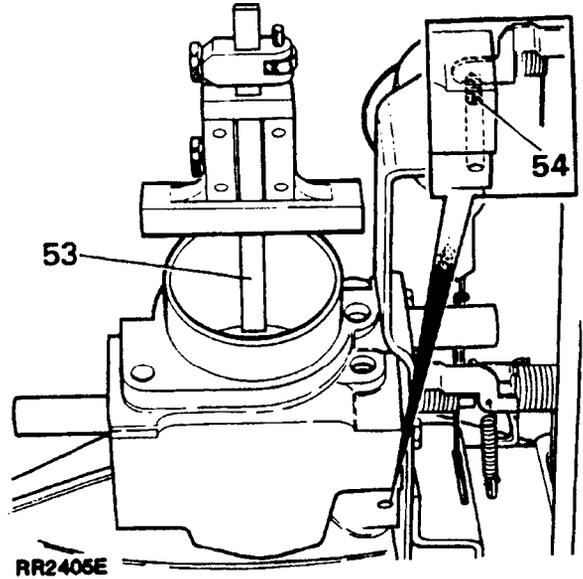
Assemble throttle levers and bracket

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



NOTE: If new throttle levers have been fitted the minimum throttle setting of the disc must be checked to ensure that it is 50° to the bore.

53. Using a depth vernier or depth micrometer from the mouth of the bore check the top and bottom of the valve disc. The disc must be within 0.5 mm (0.019 in) total indicator reading across the full diameter of the disc.
54. If the throttle disc is out of limits adjust the small set screw below the stop lever. Access to the screw is gained from the bottom of the plenum chamber neck adjacent to the throttle levers support bracket.



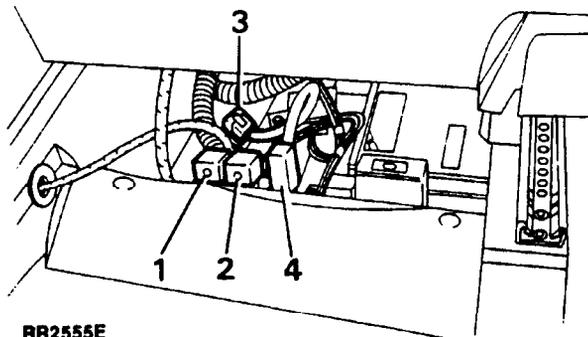
Refitting

55. Reconnect and adjust the cruise control actuator link. (See cruise control-actuator link setting)
56. Clean any previous sealant from the joint face of the plenum chamber and ram housing. Apply 'Hylomar' sealant to the faces and refit the plenum chamber. Tighten the bolts to the correct torque value-see section 06.
57. Reverse the remaining preparation instructions.

ELECTRONIC FUEL INJECTION-RELAYS

Incorporated in the fuel injection electrical system are two relays which are located beneath the front right hand seat adjacent to the cruise control relay and emission maintenance reminder. Access to the relays is gained through the opening at the bottom of the seat when the seat is in its fully forward position on the seat slides.

1. Fuel pump relay (mounted on a blue terminal block).
2. Main relay (mounted on a black terminal block).
3. Diagnostic plug.
4. Condenser fan timer unit.



RR2555E

Remove and refit

Removing

1. Disconnect the battery negative terminal.
2. Pull the relay(s) from the terminal block(s).

Refitting

3. Reverse the removal procedure.

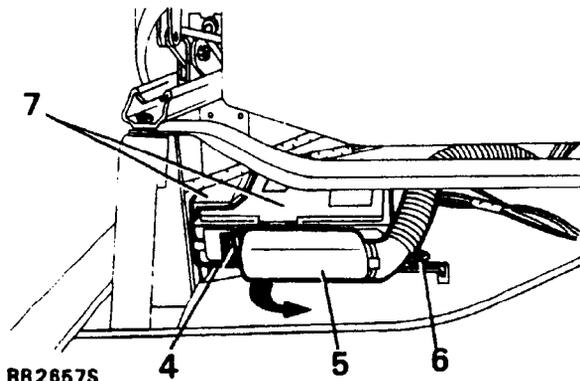
ELECTRONIC CONTROL UNIT (ECU)-14 CU

NOTE: The ECU is not a serviceable item. In the event of a unit failure the ECU must be replaced.

Remove and refit

Removing

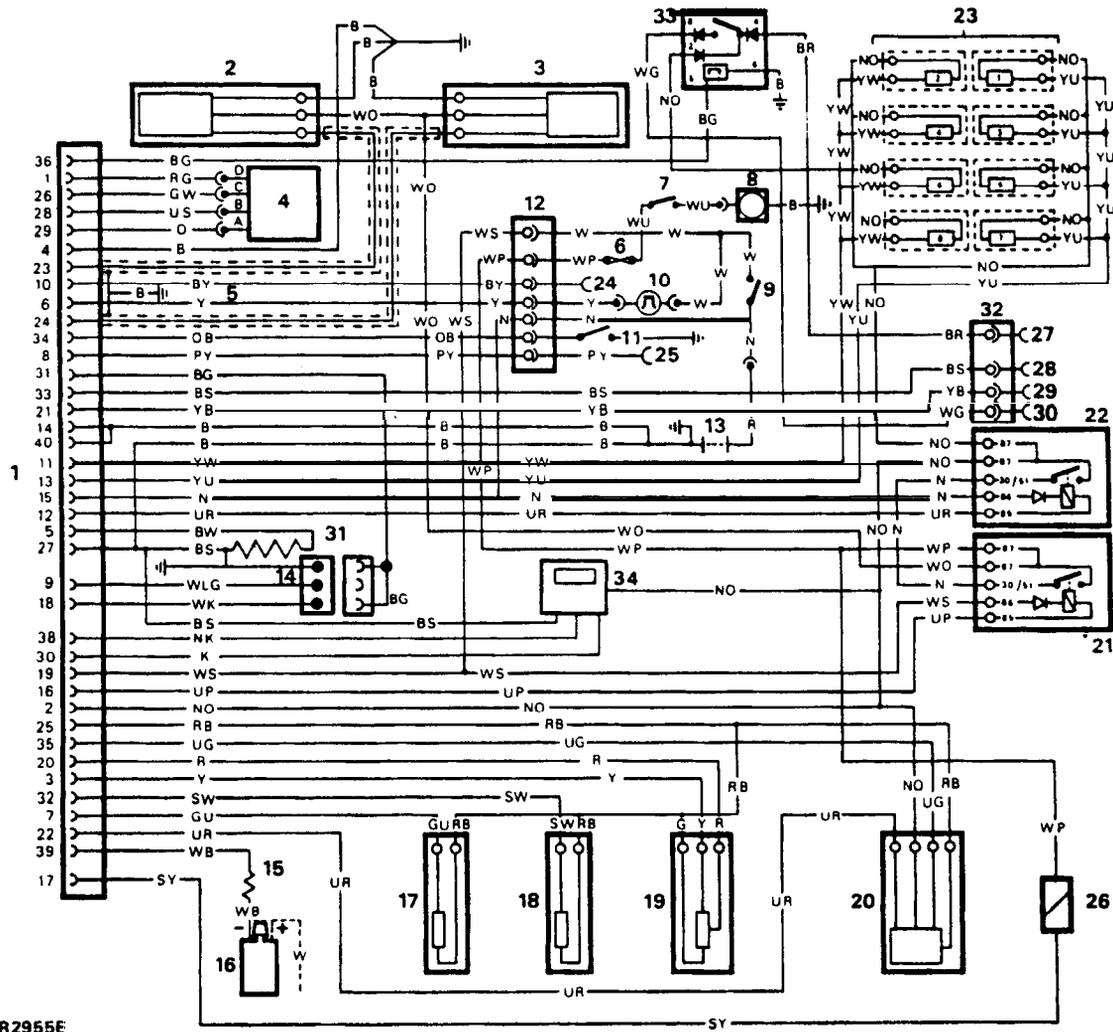
1. Remove the front and side seat base trim of the front right hand seat.
2. Adjust the seat to its most rearward position and raise the seat cushion height to allow access to the ECU fixings.
3. Disconnect the battery negative terminal.
4. Release the ECU plug retaining clip.
5. Maneuver the front of 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 ECU to the mounting bracket.
7. Withdraw the ECU from the spring clip and remove it from the vehicle.



RR2657S

Refitting

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



RR2955E

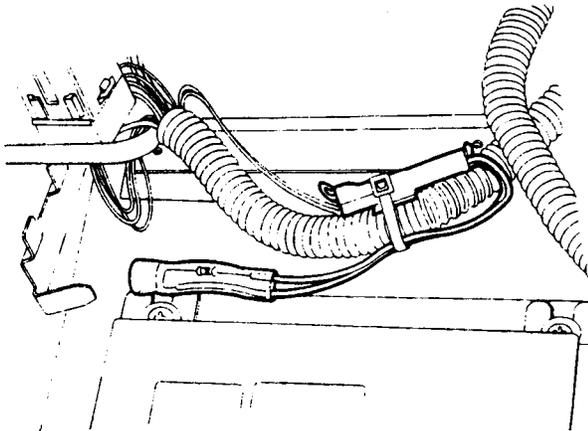
FUEL INJECTION - Circuit Diagram - 1990/91 model year

- | | |
|---|---|
| <ul style="list-style-type: none"> 1. 40 way connector to Electronic Control Unit (ECU). 2. Lambda sensor (left side - bank A). 3. Lambda sensor (right side - bank B). 4. By-pass air valve (stepper motor) (fast idle). 5. Lambda sensor screened ground. 6. Fuse C4 - main fuse panel. 7. Inertia switch. 8. Fuel pump. 9. Ignition switch. 10. Speed transducer (road speed input). 11. Neutral switch (automatic gearbox) (load input). 12. Main cable connector. 13. Battery. 14. Diagnostic plug. 15. In-line resistor. 16. Coil/-ve (engine RPM input). 17. Coolant temperature thermistor (sensor) (input). | <ul style="list-style-type: none"> 18. Fuel temperature thermistor (sensor) (input). 19. Throttle potentiometer. 20. Air flow sensor. 21. Fuel pump relay. 22. Main relay. 23. Injectors-1 to 8. 24. Pick-up point E.F.I. warning symbol (instrument binnacle). 25. Heated front screen sense. 26. Purge control valve. 27. 12V from fan relay. 28. Air conditioning output control. 29. Air conditioning load input. 30. Fan relay feed. 31. Tune resistor (early vehicles). 32. Heater/air con. cable connector. 33. Condenser fan timer control. 34. Fault display input. |
|---|---|
- == = Denotes screened ground.

NOTE: Reference to left and right side is made when viewing the vehicle from the rear.

**ELECTRONIC FUEL INJECTION
-LUCAS 14CUX SYSTEM**

1990 model year vehicles have an enhanced fuel injection system, using a Lucas 14CUX electronic control unit. The system is a development of the 14CU system introduced on 3.9 litre vehicles. The system works in the same way, new components being a tune select resistor and a fault code display unit.

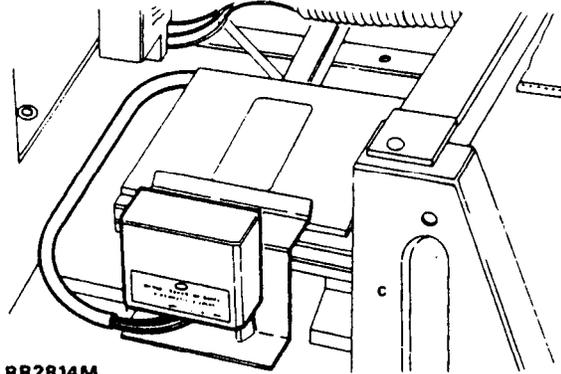
TUNE SELECT RESISTOR - RR281 1M**RR2811M**

The 14CUX system is used in various markets, but a common ECU is used. To suit individual market requirements a tune select resistor is connected across pins 5 and 27 of the ECU.

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

NOTE: For USA market models the resistor value is 3900 Ohms, wire colour, white.

NOTE: Vehicles after VIN No 451518 are fitted with a new ECU, Part No. PRC 8747 to replace PRC 7081. This ECU no longer requires the tune select resistor, which is therefore deleted. Fault code 21 is no longer stored by the ECU.

17EM FAULT CODE DISPLAY UNIT - RR2814M**RR2814M**

1990 model year vehicles have a fault code display unit which is located underneath the right hand front seat, adjacent to the EFI ECU. The unit will display the relevant fault code, in addition to the EFI warning light being illuminated.

NOTE: Fault code 59 will NOT be indicated by the EFI warning light.

Recommended equipment

The diagnostic equipment for checking out the 14CUX system is the same as that used for 14CU, with the addition of two new memory cards for Hand Held Tester.

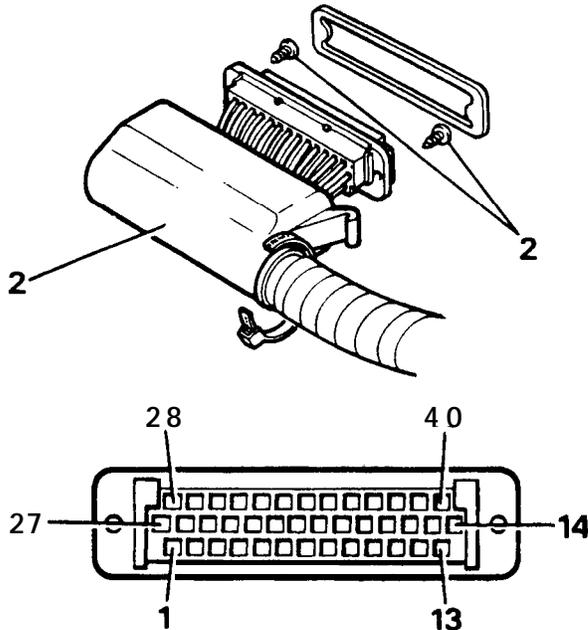
14CUX Memory cards, Lucas Part Number:
- 606 01 379.

CONTINUITY TEST PROCEDURE

NOTE: The continuity test procedure for 14CUX systems is similar to that for 14CU. Note the addition of the tune select resistor test and the deletion of Test 28, which does not apply to 14CUX systems.

TESTING

1. Release the ECU plug retaining clip and remove the plug from the ECU. Access is gained by removing the front seat base trim of the right hand front seat.
2. Remove the plug shroud and manoeuvre it along the harness until there is enough clearance to enable meter probes to be inserted into the back of the plug.
3. There are six pin numbers 1, 13, 14, 27, 28 and 40 moulded onto the rear of the plug as shown in the illustration below, for clarity the electrical leads have been omitted.



RR2800M

Pins 1 to 13 bottom row.
 Pins 14 to 27 centre row.
 Pins 28 to 40 top row.

CONNECTIONS TO 40 WAY CONNECTOR

PIN Nos. CABLE COLOUR

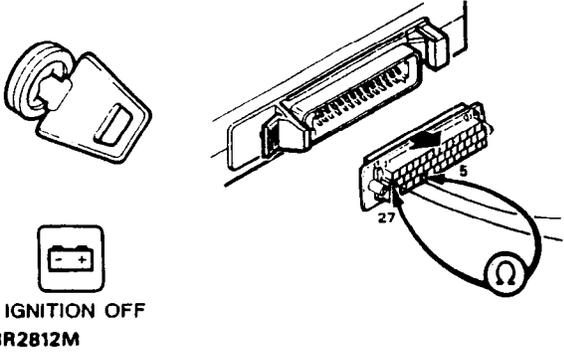
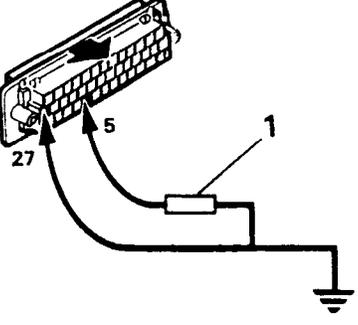
1. Red/green
2. Brown/orange
3. Yellow
4. Blak
5. Grey/Black
6. Yellow
7. Green/blue
8. Purple/yellow
9. White/light green
10. Black/yellow
11. Yellow/white
12. Blue/red
13. Yellow/blue
14. Black
15. Brown
16. Blue/purple
17. Grey/yellow
18. White/pink
19. White/grey
20. Red
21. Yellow/black
22. Blue/red
23. Blue
24. Blue
25. Red/black
26. Green/white
27. Black/grey
28. Blue/grey
29. Orange
30. Pink
31. Black/green
32. Grey/white
33. Black/grey
34. Orange/black
35. Blue/green
36. Black/green
37. Not used
38. Brown/pink
39. White/black
40. Black

The last colour denotes the wire tracer colour

Tune select resistor test

It is recommended that this test is carried out before Test 1. of Continuity Test Procedure, Section 19, page 44.

NOTE: This test is not required on vehicles after VIN No 451518, which are no longer fitted with a tune select resistor.

TEST PROCEDURE	RESULTS - check cables and units shown in bold
<p>TUNE SELECT RESISTOR TEST KEY 1) Tune select resistor</p>	<p>CORRECT READING: 3700-4100 OHMS Resistor wire colour: White INCORRECT OHMMETER READING CHECK:</p>
 <p>IGNITION OFF RR2812M</p>	 <p>RR2813M</p>

Description of fault codes

The fault codes are listed in order of priority. Where more than one fault exists, clearing the first fault code will permit the next code to be displayed.

NOTE: Fault code 02 will show if the ECU has just been reconnected. Switch on ignition to clear the display.

Clearing fault code display

It is necessary to clear the code displayed when the fault has been rectified, and to access any further fault codes that may exist. Clear the fault code displayed using the following procedure:

1. Switch On ignition.
2. Disconnect serial link mating plug, wait 5 seconds, reconnect.
3. Switch OFF ignition, wait for main relay to drop out.
4. Switch ON ignition. The display should now reset. If no other faults exist, and the original fault has been rectified, the display will be blank.
5. If multiple faults exist repeat Steps 1. to 4. as each fault is cleared the code will change, until all faults are cleared. The display will now be blank.

Code 29 - ECU MEMORY CHECK - If this fault is detected, all other faults are unreliable and must therefore be ignored.

Proceed as follows:

1. Leave battery connected
2. Switch ignition off
3. Wait for approximately 5 seconds
4. Disconnect ECU plug
5. Re-connect ECU plug
6. Switch ignition on and check display unit.

NOTE: If fault code 29 is detected again, substitute ECU and restart test sequence.

Code 44 - LAMBDA SENSOR A - left bank
 Code 45 - LAMBDA SENSOR B - right bank

If one of these fault codes is displayed check the wiring to that particular lambda sensor.

If both codes are displayed, the voltage supply to the heater coils of the sensors must be checked. Refer to Test 26, continuity test procedure.

Code 25 - IGNITION MISFIRE - This code indicates that an ignition system misfire has been detected. Codes 40 or 50 indicate on which bank the misfire has occurred.

Code 40 - MISFIRE BANK A - left bank
Code 50 - MISFIRE BANK B - right bank

If both fault codes are displayed check the following components common to both banks:

- Distributor cap
- Rotor arm
- Coil
- Electrical connections
- Pick-up (air gap)
- Amplifier
- Injectors - if code 34 or 36 displayed.

If either fault code 40 or 50 is displayed check components applicable to the particular bank that the misfire has occurred on:

- Spark plugs
- HT leads
- Distributor cap
- Injectors - if code 34 bank A or 36 bank B displayed.

Code 12 - AIRFLOW METER - Refer to Test 19, continuity test procedure.

Code 21 - FUEL TUNE SELECT - Identifies that the tune select resistor is open circuit - Refer to tune select resistor test.

Code 34 - INJECTOR BANK A - The display will indicate if the injector/s are causing the engine to run rich or lean.

If the bank is running rich, check for:-
 - faulty injector wiring and connectors
 - stuck open injectors

If the bank is running lean, check for:-
 - faulty injector wiring and connectors
 - blocked injectors

Code 36 - INJECTOR BANK B - As code 34 except relevant to bank A injectors.

Code 14 - COOLANT THERMISTOR - Refer to Test 14, continuity test procedure.

Code 17 - THROTTLE POTENTIOMETER - Refer to Test 17, continuity test procedure.

Code 18 - THROTTLE POTENTIOMETER input high/AIRFLOW METER - low. - Refer to Tests 17, 18 and 19 of the continuity test procedure

Code 19 - THROTTLE POTENTIOMETER input low/AIRFLOW METER - high. - Refer to Tests 17, 18 and 19 of the continuity test procedure

Code 88 - PURGE VALVE LEAK - Refer to Test 9 and 10 of the continuity test procedure.

Code 28 - AIR LEAK - Check for air leaks in the following areas.

- Hose, air flow meter to plenum
- Breather system hoses to plenum
- Brake servo hose
- Vacuum reservoir hose (fresh air solenoid)
- Distributor vacuum advance
- Hose, purge valve to plenum
- Injector seals
- Joint - By pass air valve to plenum
 - Plenum chamber to ram housing
 - Ram housing to inlet manifold
 - Inlet manifold to cylinder head
- By pass air valve hose

Code 23 - FUEL SUPPLY - Check fuel system pressure, Test 20 of the continuity test procedure.

Code 48 - STEPPER MOTOR - Check base idle speed - see setting procedure. - Refer to Tests 15 and 16 of the continuity test procedure. Check road speed sensor - Refer to Test 25 of the continuity test procedure.

Code 68 - ROAD SPEED SENSOR - Refer to Test 25 of the continuity test procedure.

Code 69 - GEARSWITCH - Refer to Test 24 of the continuity test procedure.

Code 59 - GROUP FAULTS 23/28 - This indicates that a fault has been registered that is caused by the fuel supply or an air leak but the exact fault cannot be identified. Check all items outlined under code 23 and 28.

Code 15 - FUEL THERMISTOR - Refer to Test 13 of the continuity test procedure.

BASE IDLE SPEED SETTING

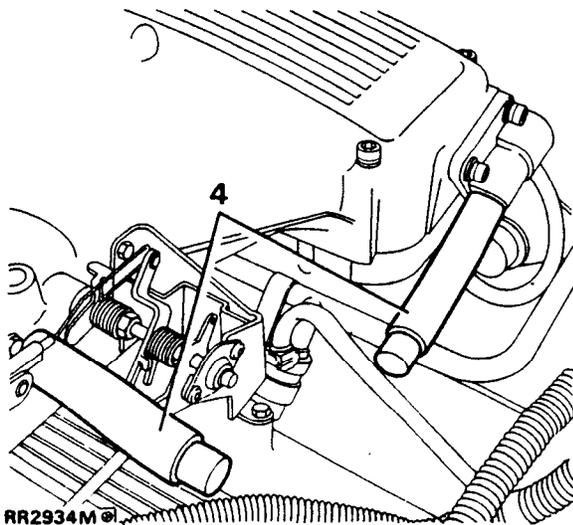
NOTE: the base idle speed is set at the factory. It should not require further adjustment unless the plenum chamber is changed. The adjustment screw is sealed with a plug to prevent unauthorised alteration. Check the ignition timing before attempting the following procedure, since this will affect the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

Equipment required

Two blanking hoses. It is recommended that these are manufactured using a new air by-pass valve hose - Part No.ETC7874. Cut two equal pieces 90mm (3 1/2 inches) long from the hose and seal one end of each, using 13mm (1/2 inch) diameter bar. A suitable clamp can be used to ensure an air tight seal

Checking procedure

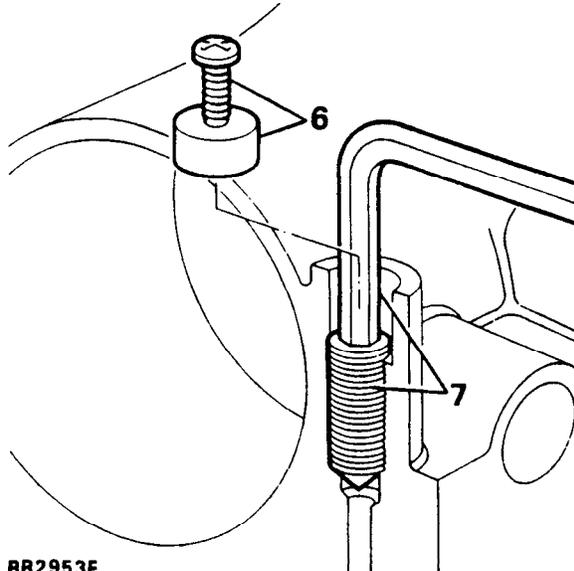
1. Drive the vehicle for at least two miles until the engine and transmission are hot. Switch off the engine.
2. Check that all electrical loads are off including air conditioning.
3. Remove the air by-pass valve hose.
4. Fit the blanking hoses to both the plenum chamber and the air by-pass valve. Ensure the hoses are securely fitted to prevent air leaks. Note that the throttle cable and cruise control actuator have been omitted from the illustration for clarity.



5. Start the engine and check that the idle speed is within the limits specified in Section 05 - Engine Tuning Data.

Adjusting base idle speed

6. Remove the tamper proof plug that protects the idle speed screw. Drill the plug and insert a self tapping screw to enable the plug to be extracted.



7. Start the engine, and using a suitable Allen key, adjust the idle screw clockwise to decrease or counter-clockwise to increase the idle speed.
8. Check fault code display, and clear the memory - see 'Clearing fault code display' - section 19, page 74.

FUEL SYSTEM 1991 MODEL YEAR

A revised fuel system is fitted to 1991 model year vehicles. The major change is the fitting of a plastic fuel tank with improved breather system. The remote expansion tank is now deleted.

A further improvement is the fitting of a combined fuel pump and sender unit. A panel in the floor of the vehicle permits access to the fuel pump/sender unit

FUEL PUMP/SENDER UNIT

WARNING: Ensure that the Fuel Handling Precautions given in Section 01 - Introduction regarding fuel handling are strictly adhered to when carrying out the following instructions.

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

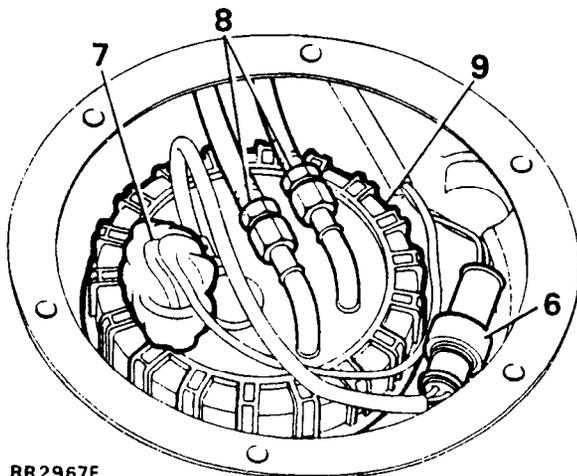
Special Tool - LST131, wrench - pump retaining ring

- LST 144 - 'Speedfit' disconnecter

Remove and refit

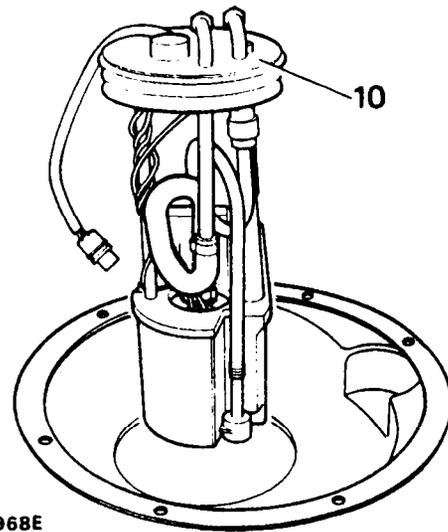
Removing

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

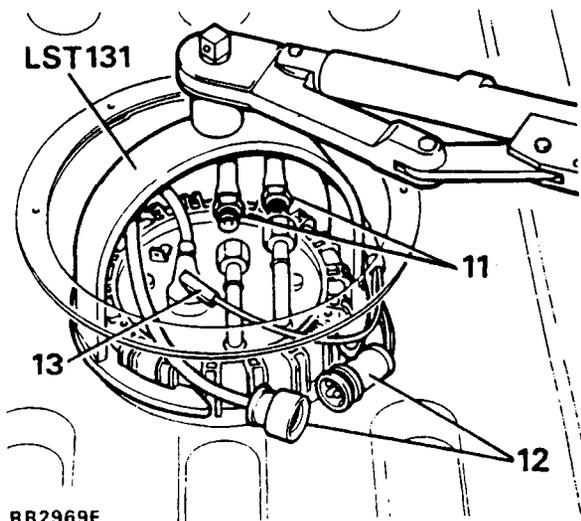


6. Remove the securing screws and detach the access panel from the floor.
7. Disconnect the electrical connections at the multi-plug.
8. Remove the insulation sealant from around the ground lead, and disconnect the ground lead.
9. Disconnect the two fuel line unions from the fuel pump.
10. Using Special Tool No. LST131, remove pump assembly retaining ring and withdraw the pump from the fuel tank.

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



RR2968E

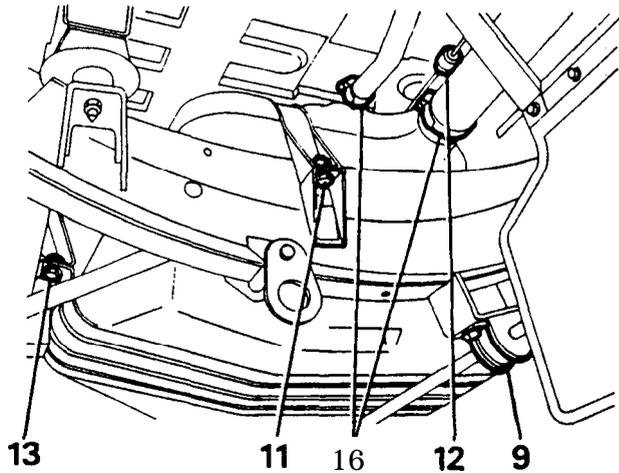


RR2969E

Refitting

11. Insert the fuel pump into the tank. Fit the retaining ring and tighten to a torque of 45-50 Nm (34-37 lbf ft).
12. Connect the fuel lines to the pump.
13. Connect the electrical leads at the multi-plug.
14. Connect the ground lead to the pump and insulate with suitable sealant.
15. When the fuel system has been reassembled check all fuel pipes, sealing rings and hose connections are secure.
16. Run the engine to check for fuel leaks before final assembly.
17. Inspect the access panel seal, fit a new seal if necessary.
18. Fit the access panel and secure to the floor with the screws.
19. Reverse operations 4 - 5 to refit the sound insulation and carpet.

7. Remove the insulation sealant from around the ground lead, and disconnect the ground lead.
8. Disconnect the two fuel line unions from the fuel pump.
9. Working underneath the vehicle, remove the rear anti-rol bar straps, and allow the bar to swing down clear of the tank.



RR2962E

FUEL TANK

WARNING: Ensure that the Fuel Handling Precautions given in Section 01 - Introduction regarding fuel handling are strictly adhered to when carrying out the following instructions.

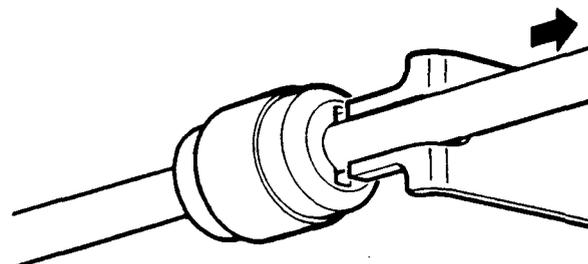
CAUTION: Before disconnecting any part of the fuel system, it is imperative that all dust, dirt and debris is removed from around the components to prevent ingress of foreign matter into the fuel system.

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

Remove and refit

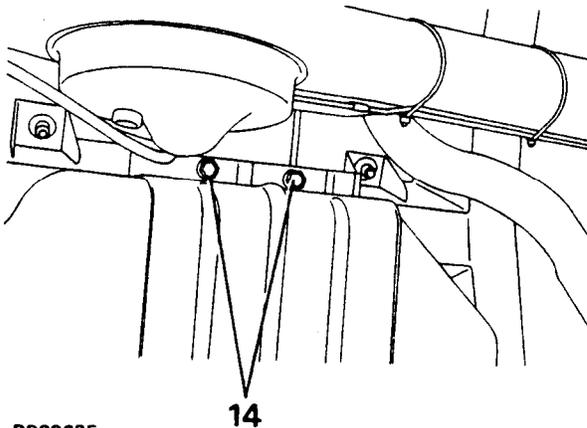
Removing

1. Depressurise fuel system. Disconnect battery negative lead.
2. Syphon the fuel tank into a suitable container that can be sealed afterwards. ENSURE THAT THE TANK IS DRAINED COMPLETELY. (refer to Warning concerning fuel vapor and spillage at start of this procedure).
3. Remove carpet from loadspace floor and tailgate.
4. Fold back the sound insulation to reveal the access panel.
5. Remove the securing screws and detach the access panel from the floor.
6. Disconnect the electrical connections at the multi-plug.



ST2877M

NOTE: To disconnect the 'speedfit' connector, forked end into the two slots of the connector as shown in the illustration above. Press down on the collet and simultaneously pull the pipe from the connector. Special tool LST 144 is available for this operation.



RR2963E

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

Refitting

16. Reverse the removal procedure, ensuring that the sealing ring, fuel pipe and hose connections are secure.
17. Run the engine and recheck all connections to ensure no fuel leaks exist. Reverse the remaining removal procedure.

FUEL FILTER

Remove and refit

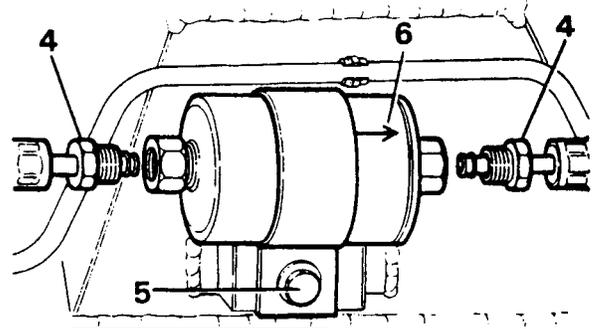
WARNING: ENSURE THAT THE FUEL HANDLING PRECAUTIONS GIVEN IN SECTION 01 - INTRODUCTION REGARDING FUEL HANDLING ARE STRICTLY ADHERED TO WHEN CARRYING OUT THE FOLLOWING INSTRUCTIONS.

WARNING: THE SPILLING OF FUEL IS UNAVOIDABLE DURING THIS OPERATION. ENSURE THAT ALL NECESSARY PRECAUTIONS ARE TAKEN TO PREVENT FIRE AND EXPLOSION.

Removing

1. Depressurise the fuel system.
2. The fuel filter is located on the right-hand chassis side member forward of the fuel tank filler neck. Access to the filter is gained through the right-hand rear wheel arch.

3. Clamp the inlet and outlet hoses to prevent the minimum of fuel spillage when disconnecting the hoses.
4. Loosen the two fuel line unions and remove the hoses from the filter canister.
5. Release the single nut and bolt securing the filter and clamp and remove the filter.



RR2966E

Refitting

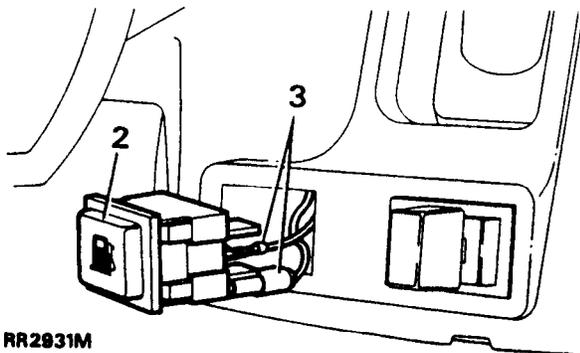
6. Fit a new filter observing the direction of flow arrow on the canister.
7. Tighten the single nut and bolt.
8. Fit the inlet and outlet hoses. Tighten the unions to a torque of 20-25 ft lb(27-34Nm).
9. Refit the fuel pump relay, reconnect the battery. Recode the radio.
10. Start the engine and inspect for fuel leaks around the hose connections.

FUEL FILLER FLAP RELEASE BUTTON

The fuel filler flap is no longer part of the central locking system on 1991 model year vehicles. The filler flap is permanently locked. To release the flap press the button situated on the steering column shroud. On closing, the filler flap will be locked automatically. Note that the release button will only work with ignition switched OFF.

Remove and refit**Removing**

1. Disconnect the battery negative lead.
2. Carefully pry the release button from the steering column shroud.

**RR2931M**

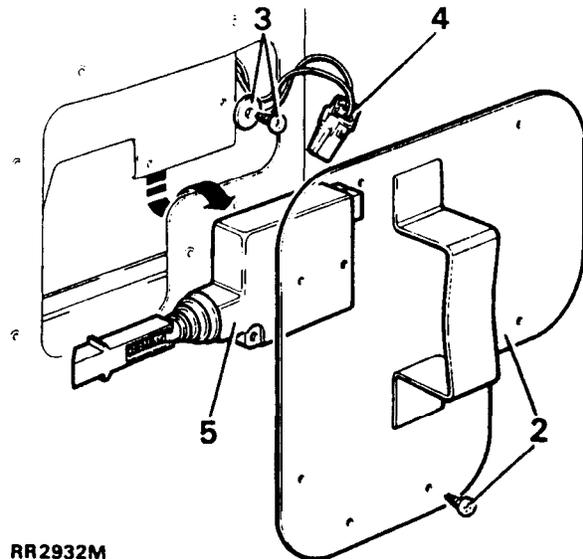
3. Remove the release button from the shroud and disconnect the two wiring connectors. Ensure that the wires protrude through the shroud to facilitate reassembly.

Refitting

4. Reverse the removal procedure. Recode the radio.

FUEL FILLER FLAP RELEASE ACTUATOR**Remove and refit****Removing**

1. Ensure that the fuel filler flap is released. Disconnect the battery negative lead.
2. Remove eight screws, and withdraw the closure panel, situated in the right hand side of the load space.
3. Release two screws and maneuver the actuator clear of its mounting.
4. Disconnect the wiring plug.
5. Withdraw the actuator.

**RR2932M****Refitting**

6. Reverse the removal procedure. Recode the radio.