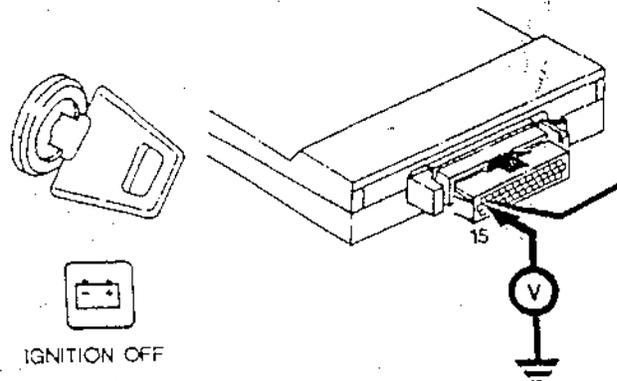
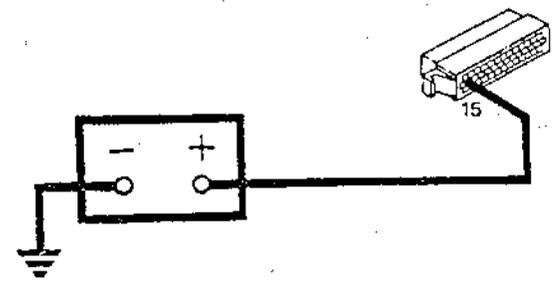
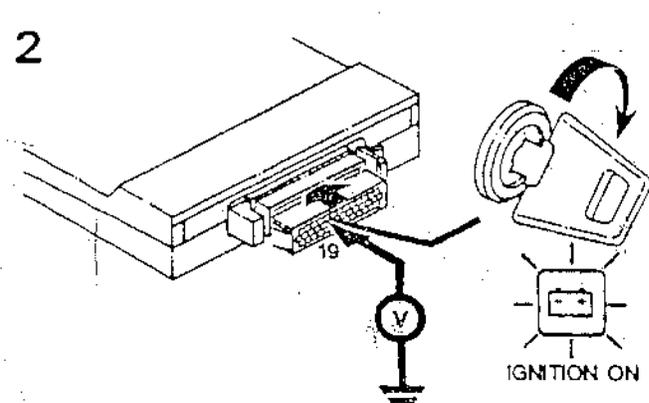
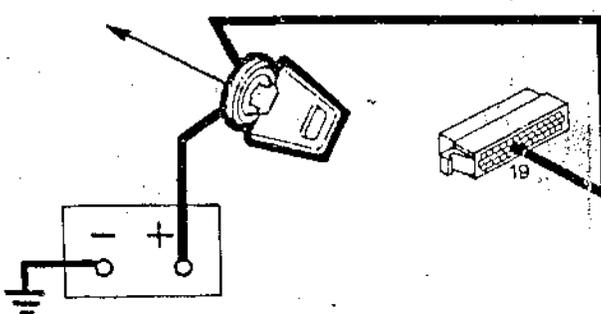
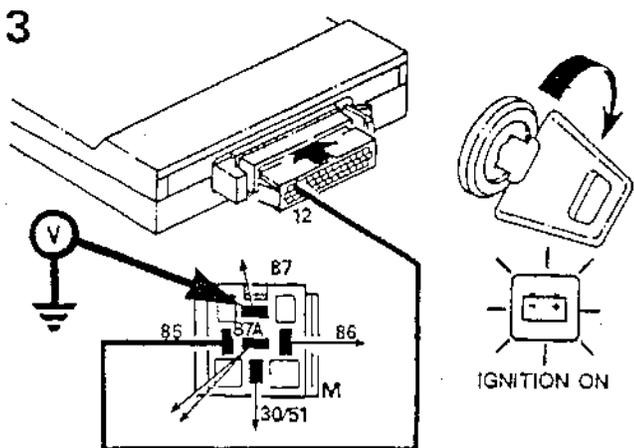


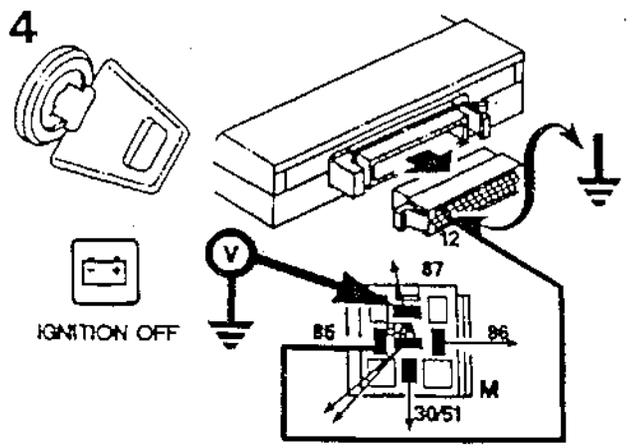
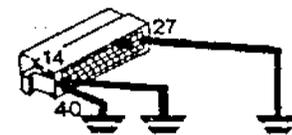
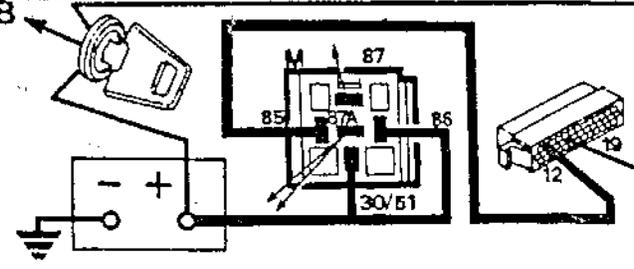
NOTE: All tests are carried out from the electronic control unit (ECU) harness multi-plug unless stated otherwise in the test procedure.

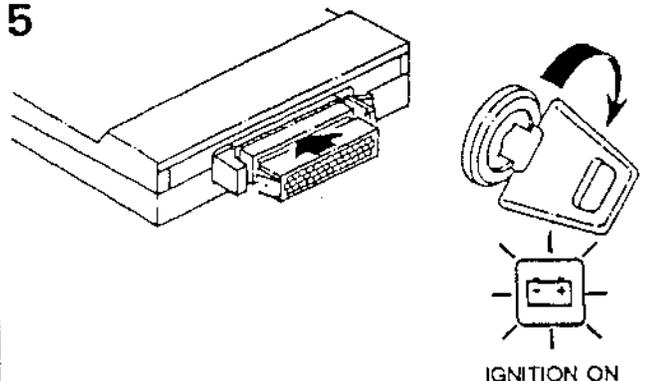
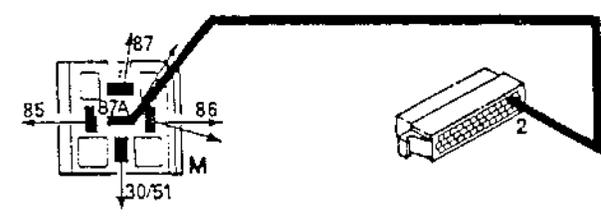
TEST PROCEDURE	RESULTS - Check cables and units shown in bold
<p>1. Check battery supply to ECU</p>	<p>Voltmeter reading of battery volts - (minimum battery voltage 10 volts) Proceed to Test 2 Voltmeter reading of zero volts Check:-</p>
<p>1</p>  <p>RR1816E</p>	

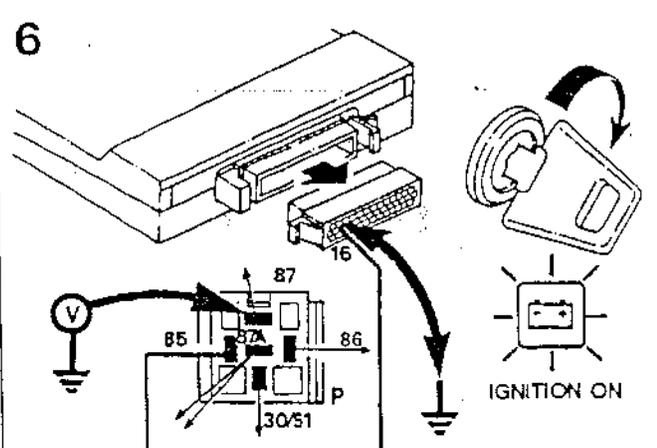
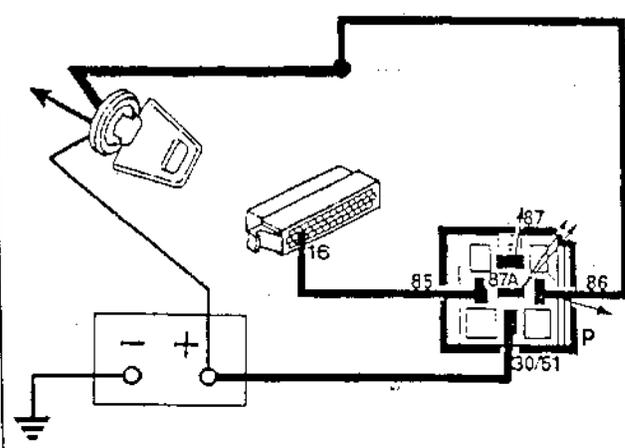
TEST PROCEDURE	RESULTS - Check cables and units shown in bold
<p>2. Check ignition supply to ECU</p>	<p>Voltmeter reading of battery volts - (minimum battery voltage 10 volts) Proceed to Test 3 Incorrect reading check:-</p>
<p>2</p>  <p>RR1817E</p>	

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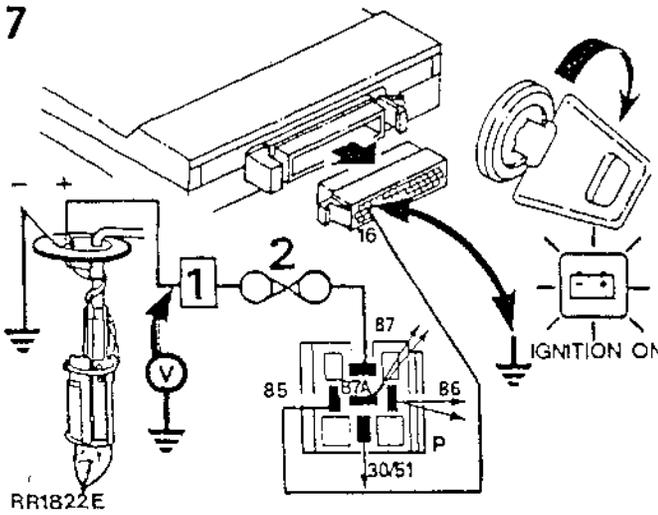
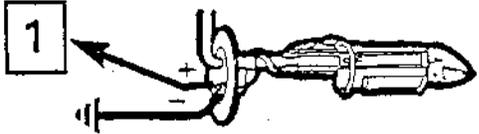
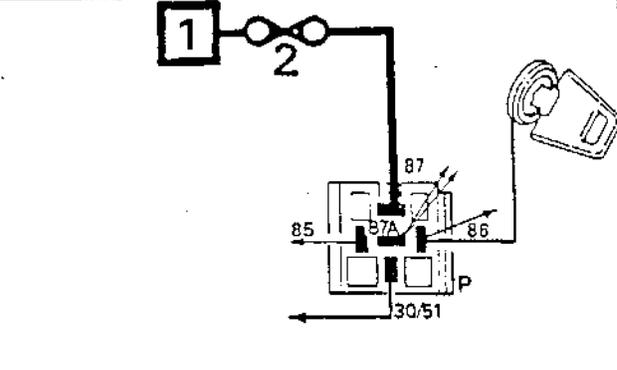
TEST PROCEDURE	RESULTS - Check cables and units shown in bold
<p>3. Check operation of Main relay</p>	<p>Voltmeter reading of battery volts - Proceed to Test 5</p> <p>Voltmeter reading of zero volts - Proceed to Test 4</p>
<p>3</p>  <p>RR1818E</p>	

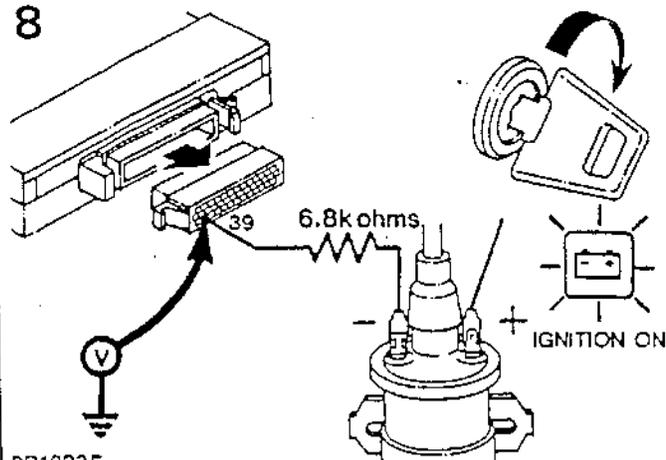
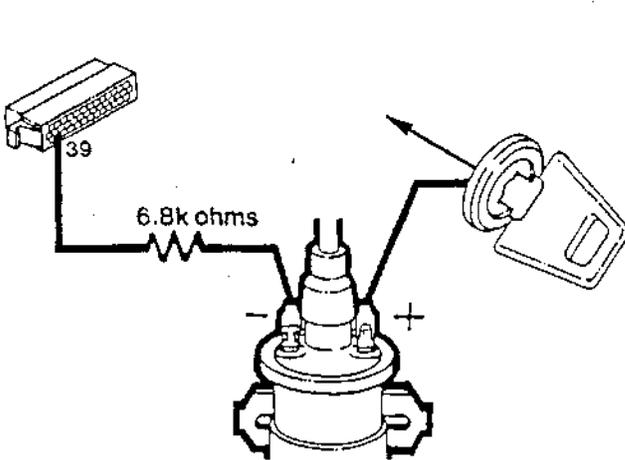
TEST PROCEDURE	RESULTS - Check cables and units shown in bold
<p>4. Fault Diagnosis Main relay circuits</p>	<p>A. Voltmeter reading of battery volts - Check:- If OK Suspect ECU</p> <p>B. Voltmeter reading of zero volts Check:-</p>
<p>4</p>  <p>RR1819E</p>	<p>A</p>  <p>B</p> 

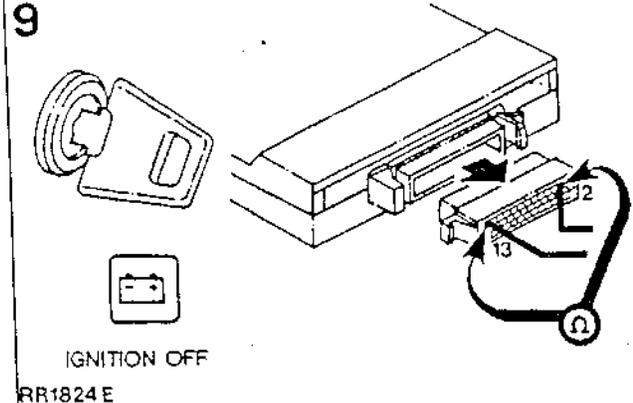
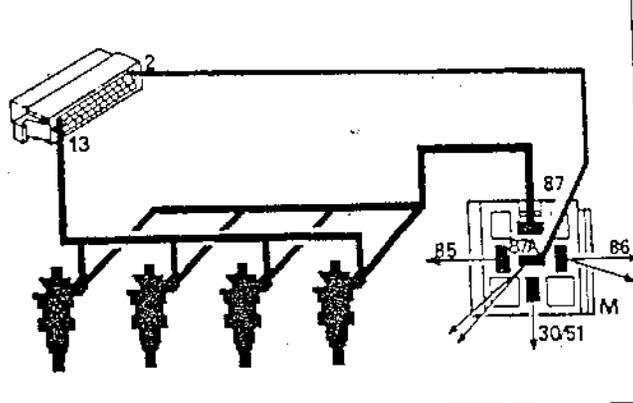
TEST PROCEDURE	RESULTS - Check cables and units shown in bold
<p>5. Check operation of pump relay</p>	<p>Listen for audible 'click' from pump relay. If O.K - Proceed to Test 7</p> <p>No audible 'click' from pump relay Check:- If OK proceed to Test 6.</p>
<p>5</p>  <p>RR1820E</p>	

TEST PROCEDURE	RESULTS - Check cables and units shown in bold
<p>6. 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>	

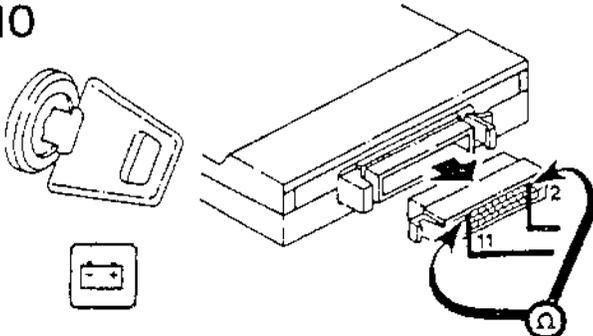
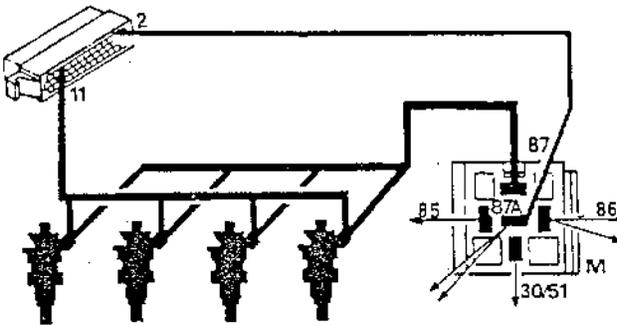
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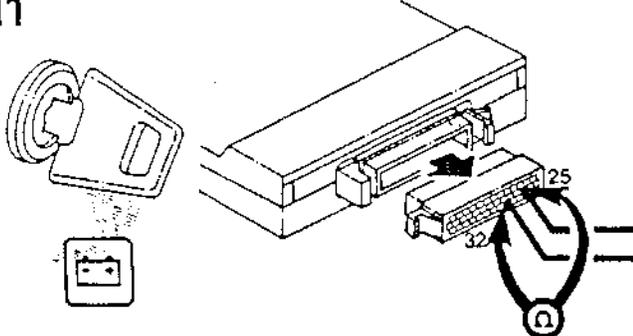
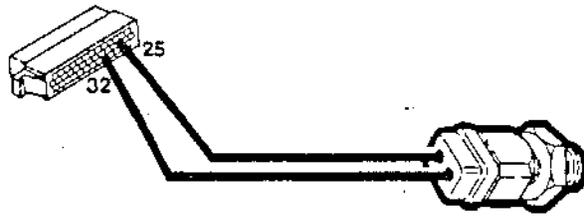
TEST PROCEDURE	RESULTS - Check cables and units shown in bold
<p>7. Check operation of Fuel pump</p> <p>NOTE: It is not possible to place the multi-meter probes directly onto the pump terminals. A link lead attached to the pump is accessible behind the rear left hand wheel located between the chassis and stowage area floor panel.</p> <p>KEY: 1. Harness plug - link lead 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> 

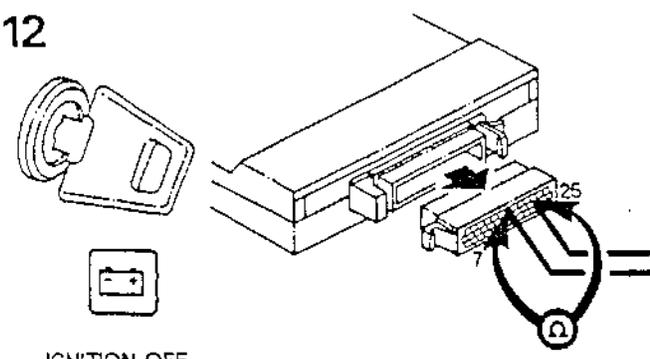
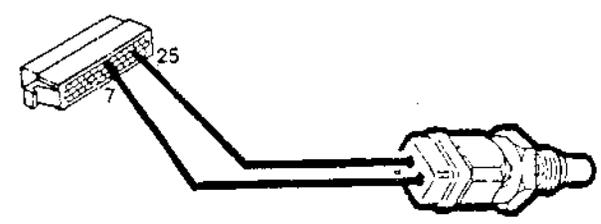
TEST PROCEDURE	RESULTS - Check cables and units shown in bold
<p>8. Check engine speed signal Cable and resistor</p>	<p>Voltmeter reading of battery volts - Proceed to Test 9</p>
<p>8</p>  <p>RR1823E</p>	<p>Voltmeter reading of zero volts Check:</p> 

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>RR1824E</p>	

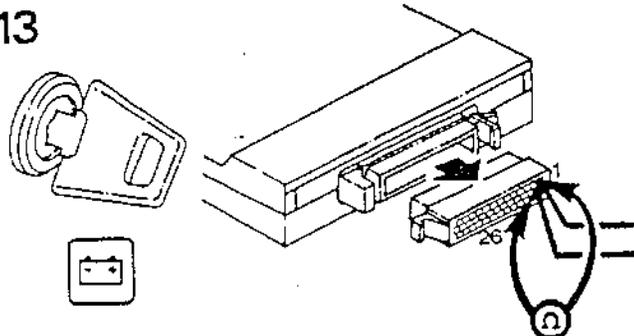
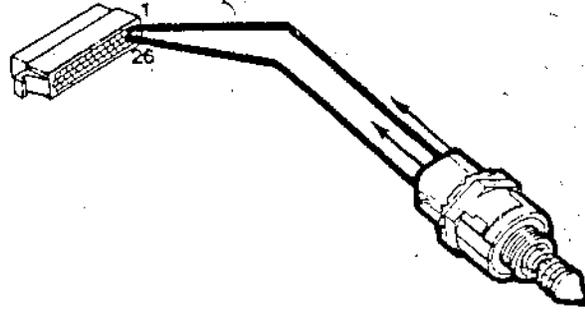
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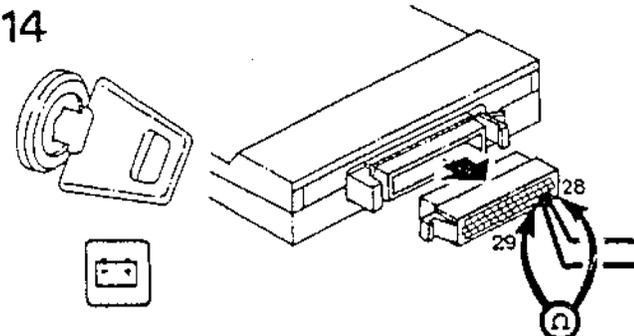
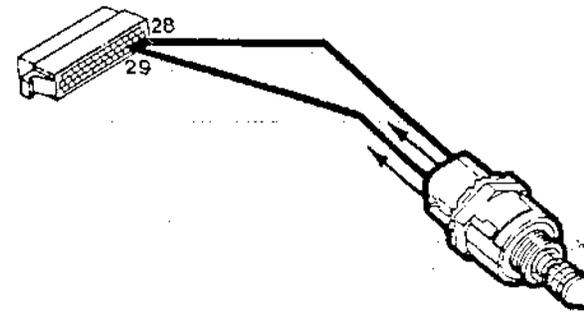
TEST PROCEDURE	RESULTS - Check cables and units shown in bold
<p>10. Check injectors Injector circuit</p> <p>(Pin 11 rightbank injectors 2,4,6,8)</p>	<p>Ohm-meter reading of 4-5 Ohms - Proceed to Test 11.</p> <p>Ohm-meter reading of 5-6 Ohms - Suspect 1 injector Ohm-meter reading of 8-9 Ohms - Suspect 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>	

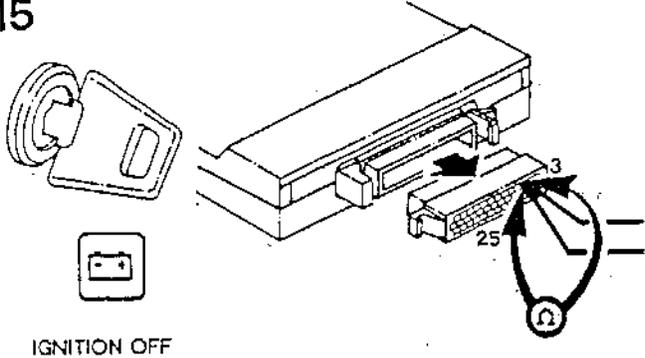
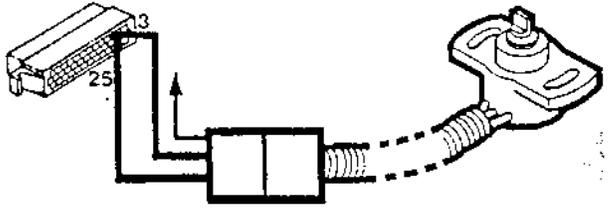
TEST PROCEDURE	RESULTS - Check cables and units shown in bold
<p>11. Check fuel temperature thermistor (sensor)</p>	<p>Correct reading-temperature to resistance - Proceed to Test 12 (Refer to Temperature Conversion Charts in Test 12)</p> <p>Incorrect Ohm-meter reading Check</p>
<p>11</p>  <p>IGNITION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

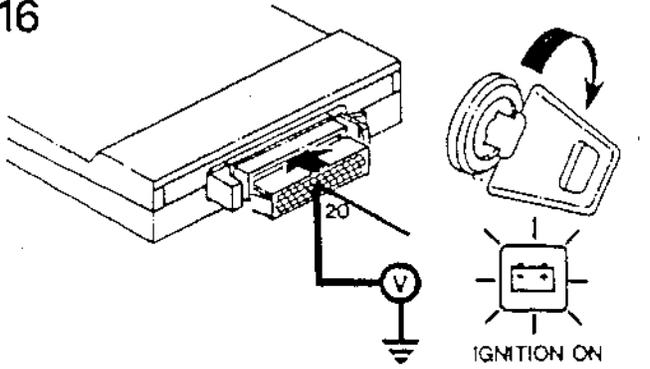
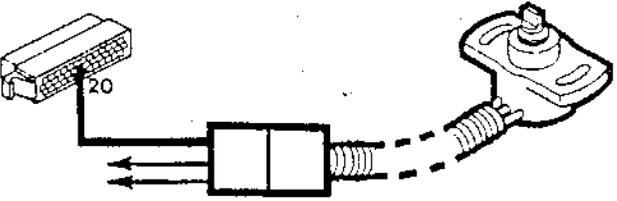
TEST PROCEDURE	RESULTS - Check cables and units shown in bold																											
<p>12. Check coolant temperature thermistor (sensor)</p>	<p>Correct reading-Temperature to resistance - Proceed to Test 13 (Refer to Temperature Conversion Chart below).</p> <table border="1" data-bbox="885 436 1429 739"> <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																										
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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>12</p>  <p>IGNITION OFF RR1827E</p>																												

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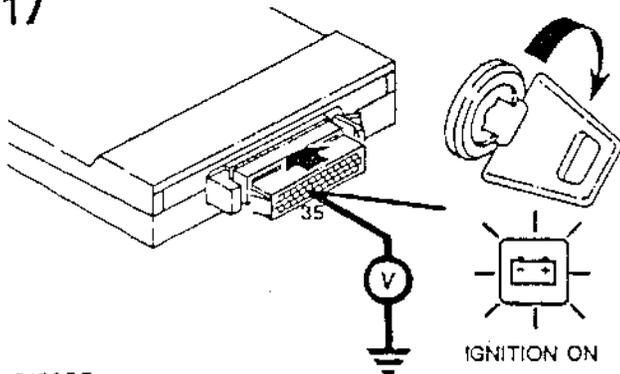
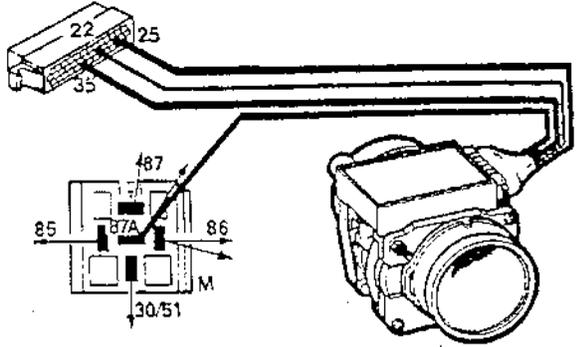
TEST PROCEDURE	RESULTS - Check cables and units shown in bold
<p>13. Check air bypass valve - Part 1</p>	<p>Ohm-meter reading of 48-58 Ohms - Proceed to Test 14</p> <p>Incorrect reading Check:-</p>
<p>13</p>  <p>IGNITION OFF RR1828E</p>	

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	<p>Correct voltmeter readings- Proceed to Test 17</p> <table border="0" data-bbox="990 1075 1412 1299"> <tr> <td>Throttle closed</td> <td></td> <td>Throttle open</td> </tr> <tr> <td>0.29)</td> <td></td> <td>(4.6 Volts</td> </tr> <tr> <td>)</td> <td>smooth</td> <td>(</td> </tr> <tr> <td>)</td> <td>-----</td> <td>(</td> </tr> <tr> <td>0.36)</td> <td>swing</td> <td>(5.0 Volts</td> </tr> </table> <p>Incorrect voltmeter readings Check:-</p>	Throttle closed		Throttle open	0.29)		(4.6 Volts)	smooth	()	-----	(0.36)	swing	(5.0 Volts
Throttle closed		Throttle open														
0.29)		(4.6 Volts														
)	smooth	(
)	-----	(
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:

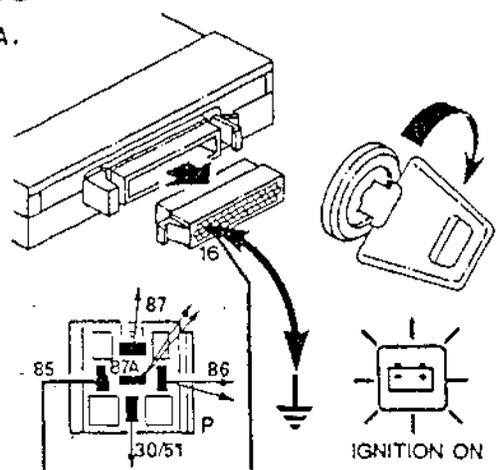
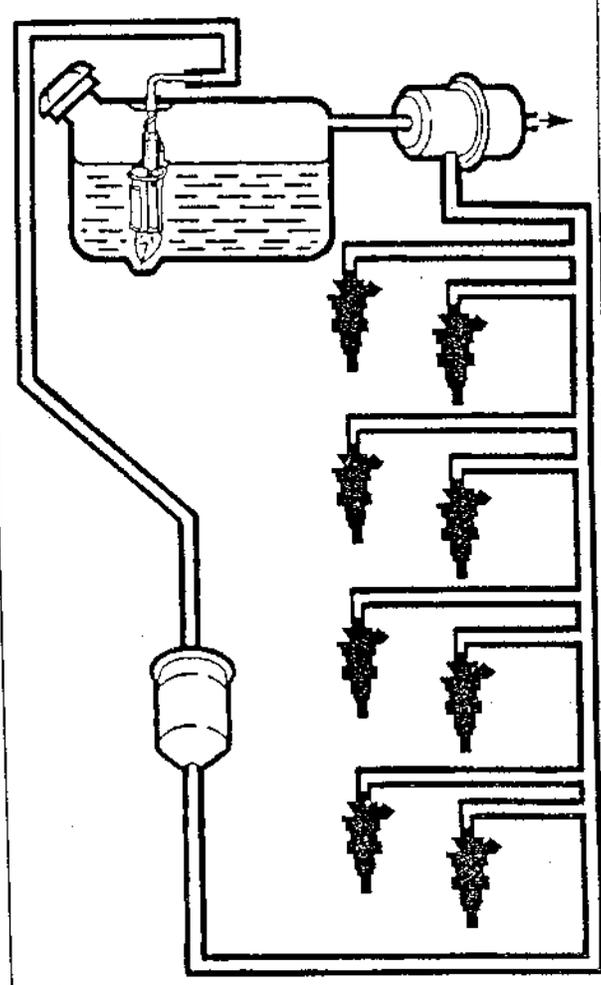
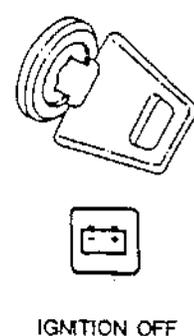
Depressurise the fuel system when fitting the fuel pressure gauge or disconnecting/replacing fuel system components.

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.

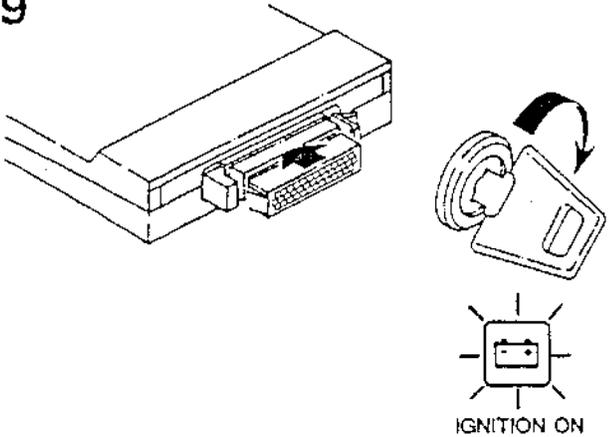
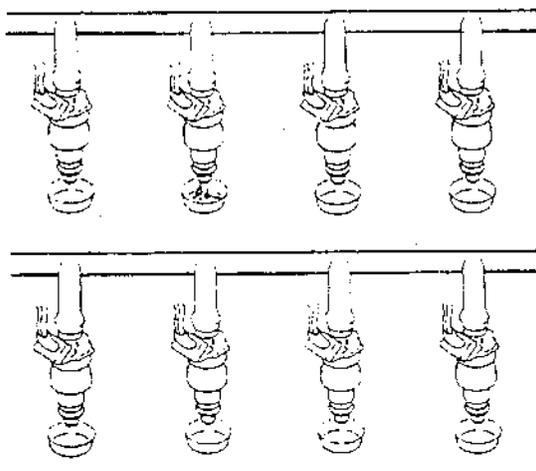
WARNING: The spillage of fuel from the fuel filter is unavoidable when disconnecting the fuel feed line, ensure that all necessary precautions are taken to prevent fire and explosion due to fuel vapour and fuel seepage.

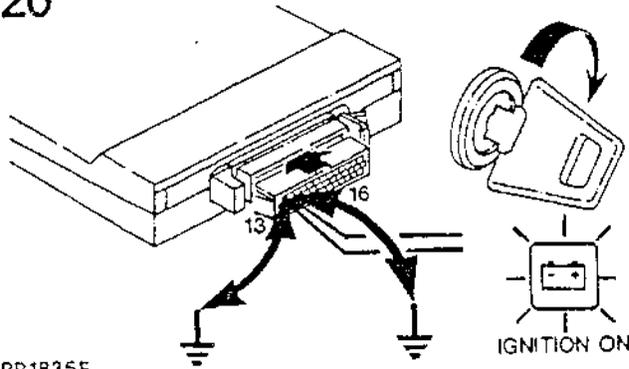
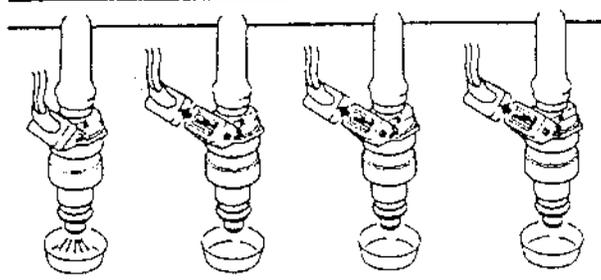
DEPRESSURISING PROCEDURE

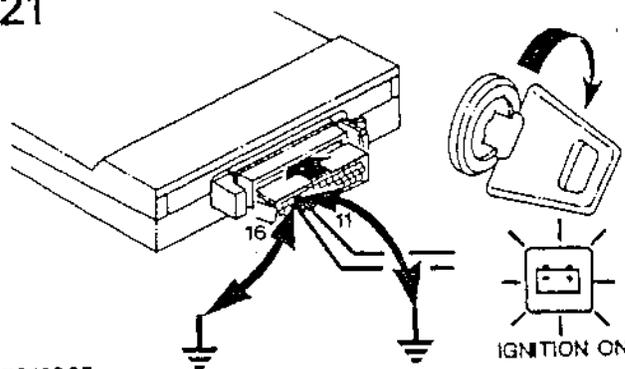
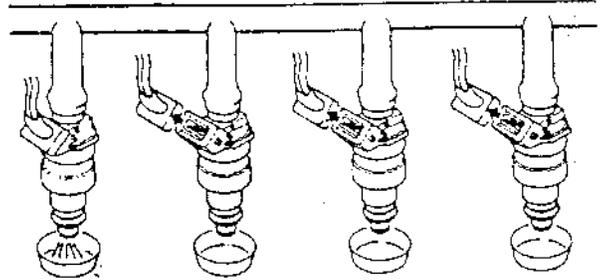
- a) Ignition off, pull pump relay off its terminal block.
- b) Crank engine for a few seconds - engine may fire and run until fuel pressure is reduced.
- c) Switch off the ignition.
- d) Connect fuel pressure gauge in the fuel supply line between the fuel rail and the fuel filter, adjacent to the filter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

TEST 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 kgf/cm² (34.0-37.0 p.s.i.)</p> <p>(B) Pressure drop-max 0.7 kgf/cm² (10 p.s.i.) in one minute</p>
<p>18 A.</p> 	
<p>B.</p>  <p>RR1833E</p>	

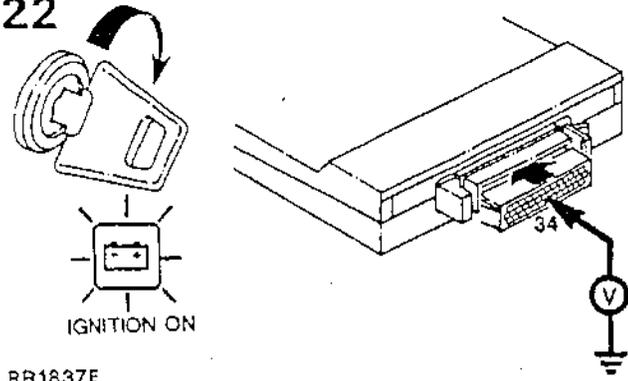
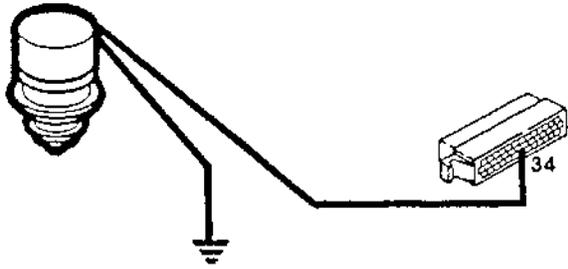
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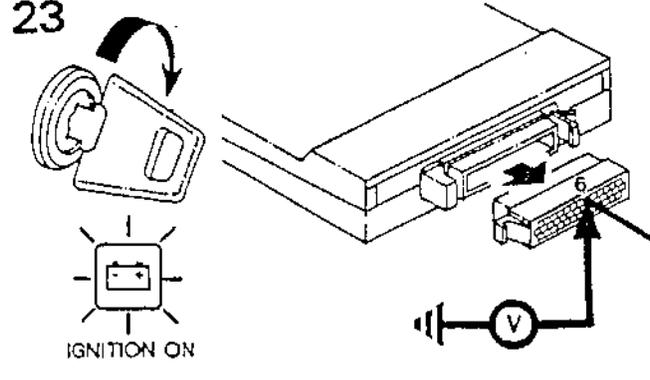
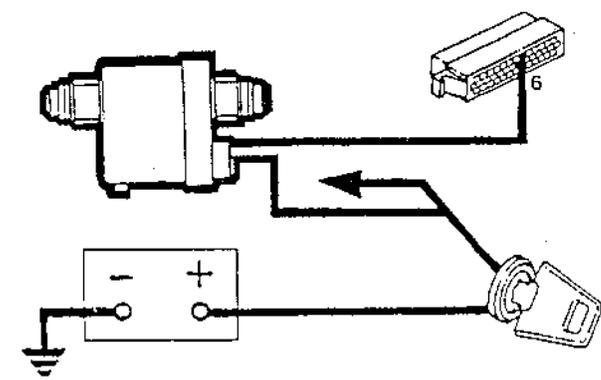
TEST PROCEDURE	RESULTS - Check cables and units shown in bold
<p>19. Check for leaking injector</p> <p>NOTE: Before removing any of the injectors, remove and examine the spark plugs, check for consistent colouration of plugs. A leaking injector will result in the appropriate spark plug being 'sooted 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>RR1834E</p>	

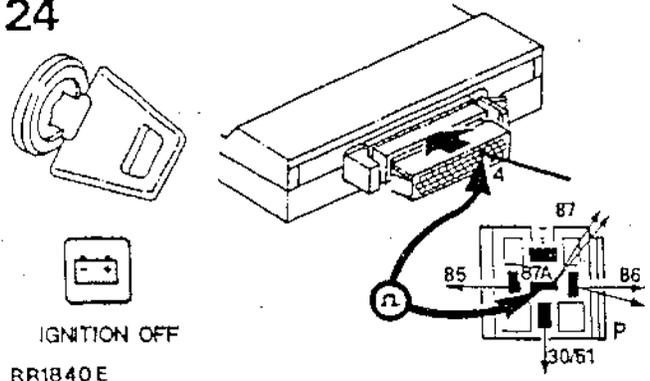
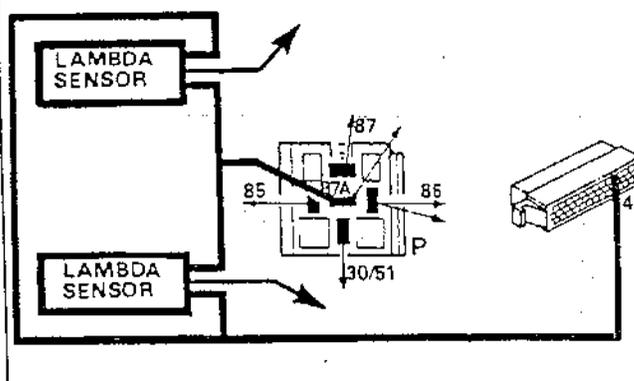
TEST PROCEDURE	RESULTS - Check cables and units shown in bold
<p>20. Check for injector operation Left bank injectors 1,3,5,7</p>	<p>WARNING: Ensure that all necessary precautions are taken to prevent fire and explosion.</p> <p>Repeat test for other injectors Replace any injector which does not operate.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

TEST PROCEDURE	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>Incorrect reading Check:</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: 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 re-check 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.