

# DIAGNOSIS

## SYSTEM DIAGNOSIS

### DIAGNOSTIC AIDS

If an intermittent problem is evident, follow the guidelines below.

#### Preliminary Checks

Before using this section you should have already performed the "On-Board Diagnostic System Check."

Perform a thorough visual inspection. This inspection can often lead to correcting a problem without further checks and can save valuable time. Inspect for the following conditions:

- Engine Control Module (ECM) grounds for being clean, tight, and in their proper location.
- Vacuum hoses for splits, kinks, collapsing and proper connections as shown on the Vehicle Emission Control Information label. Inspect thoroughly for any type of leak or restriction.
- Air leaks at the throttle body mounting area and the intake manifold sealing surfaces.
- Ignition wires for cracks, hardness, proper routing, and carbon tracking.
- Wiring for proper connections.
- Wiring for pinches or cuts.

#### Diagnostic Trouble Code Tables

Do not use the Diagnostic Trouble Code (DTC) tables to try and correct an intermittent fault. The fault must be present to locate the problem.

Incorrect use of the DTC tables may result in the unnecessary replacement of parts.

#### Faulty Electrical Connections or Wiring

Most intermittent problems are caused by faulty electrical connections or wiring. Perform a careful inspection of suspect circuits for the following:

- Poor mating of the connector halves.
- Terminals not fully seated in the connector body.
- Improperly formed or damaged terminals. All connector terminals in a problem circuit should be carefully inspected, reformed, or replaced to insure contact tension.
- Poor terminal-to-wire connection. This requires removing the terminal from the connector body.

#### Road Test

If a visual inspection does not find the cause of the problem, the vehicle can be driven with a voltmeter or a scan tool connected to a suspected circuit. An abnormal voltage or scan tool reading will indicate that the problem is in that circuit.

If there are no wiring or connector problems found and a DTC was stored for a circuit having a sensor, except for DTC P0171 and DTC P0172, replace the sensor.

#### Fuel System

Some intermittent driveability problems can be attributed to poor fuel quality. If a vehicle is occasionally running rough, stalling, or otherwise performing badly, ask the customer about the following fuel buying habits:

- Do they always buy from the same source? If so, fuel quality problems can usually be discounted.
- Do they buy their fuel from whichever fuel station that is advertising the lowest price? If so, check the fuel tank for signs of debris, water, or other contamination.

### IDLE LEARN PROCEDURE

Whenever the battery cables, the Engine Control Module (ECM), or the fuse is disconnected or replaced, the following idle learn procedure must be performed:

1. Turn the ignition ON for 5 seconds.
2. Turn the ignition OFF for 10 seconds.
3. Turn the ignition ON for 5 seconds.
4. Start the engine in park/neutral.
5. Allow the engine to run until the engine coolant is above 185°F (85°C).
6. Turn the A/C ON for 10 seconds, if equipped.
7. Turn the A/C OFF for 10 seconds, if equipped.
8. If the vehicle is equipped with an automatic transaxle, apply the parking brake. While pressing the brake pedal, place the transaxle in D (drive).
9. Turn the A/C ON for 10 seconds, if equipped.
10. Turn the A/C OFF for 10 seconds, if equipped.
11. Turn the ignition OFF. The idle learn procedure is complete.



- 7. A scan tool parameter which is not within the typical range may help to isolate the area which is causing the problem.
- 10. This vehicle is equipped with an ECM, which utilizes an Electrically Erasable Programmable Read

Only Memory (EEPROM). The replacement ECM must be reprogrammed. Refer to the latest Techline procedure for ECM reprogramming.

**On–Board Diagnostic (OBD II) System Check**

Step	Action	Value(s)	Yes	No
1	1. Turn the ignition ON with the engine OFF. 2. Observe the Malfunction Indicator Lamp (MIL). Is the MIL on?		Go to <i>Step 2</i>	Go to "No Malfunction Indicator Lamp"
2	1. Turn the ignition OFF. 2. Install the scan tool. 3. Turn the ignition ON. 4. Attempt to display the Engine Control Module (ECM) engine data with the scan tool. Does the scan tool display the ECM engine data?		Go to <i>Step 3</i>	Go to <i>Step 8</i>
3	1. Using the scan tool output test function, select the MIL dash lamp control and command the MIL off. 2. Observe the MIL. Does the MIL turn off?		Go to <i>Step 4</i>	Go to "Malfunction Indicator Lamp on Steady"
4	Attempt to start the engine. Does the engine start and continue to run?		Go to <i>Step 5</i>	Go to "Engine Cranks But Will Not Run"
5	Select DISPLAY DTC with the scan tool. Are any Diagnostic Trouble Codes stored?		Go to <i>Step 6</i>	Go to <i>Step 7</i>
6	Check the display for DTCs P0107, P0108, P0113, P0118, P0122, P0123, P0172, P1392. Are two or more of the following DTCs stored?		Go to "Multiple ECM Information Sensor DTCs Set"	Go to "Applicable DTC table"
7	Compare the ECM data values displayed on the scan tool to the typical engine scan data values. Are the displayed values normal or close to the typical values?		Go to "ECM Output Diagnosis"	Go to indicated component system check
8	1. Turn the ignition OFF and disconnect the ECM. 2. Turn the ignition ON with the engine OFF. 3. Check the class 2 data circuit for an open, short to ground, or short to voltage. Also check the Data Link Connector (DLC) ignition feed circuit for an open or short to ground, and check the DLC ground circuits for an open. Is a problem found?		Go to <i>Step 9</i>	Go to <i>Step 10</i>
9	Repair the open, short to ground, or short to voltage in the class 2 data circuit or the DLC ignition feed circuit. Is the repair complete?		System OK	
10	1. Attempt to reprogram the ECM. 2. Attempt to display the ECM data with the scan tool. Does the scan tool display ECM engine data?		Go to <i>Step 2</i>	Go to <i>Step 11</i>
11	Replace the ECM. Is the repair complete?		System OK	

## ECM OUTPUT DIAGNOSIS

### Circuit Description

The Engine Control Module (ECM) controls most components with electronic switches which complete a ground circuit when turned on. These switches are arranged in groups of 4 and 7, and they are called either a Surface Mounted Quad Driver Module, which can independently control up to 4 output terminals or an Output Driver Module (ODM), which can independently control up to 7 outputs. Not all of the outputs are always used.

Drivers are fault protected. If a relay or solenoid is shorted, having very low or zero resistance, or if the control side of the circuit is shorted to voltage, it would allow too much current flow into the ECM. The driver senses this and the output is either turned OFF or its internal resistance increases to limit current flow and protect the ECM and driver. The result is high output terminal voltage when it should be low. If the circuit from B+ to the component or the component is open, or the control side of the circuit is shorted to ground, terminal voltage will be low. Either of these conditions is considered to be a driver fault.

Drivers also have a fault line to indicate the presence of a current fault to the ECM's central processor. A scan tool displays the status of the driver fault lines as 0=OK and 1=Fault.

### Diagnostic Aids

The scan tool has the ability to command certain components and functions ON and OFF. If a component or function does not have this capability, operate the vehicle during its normal function criteria to check for an open or shorted circuit.

An open or short to ground will appear in the open positions on the scan tool only when it is not commanded by the ECM or the scan tool, while a short to voltage will appear in the short positions on the scan tool only while the component is being commanded by the ECM or scan tool.

### Test Description

Number(s) below refer to the step number(s) on the Diagnostic Table.

1. The On-Board Diagnostic (OBD II) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.
2. A 1 in any of the positions indicates that an open or short is present in the corresponding circuit for that position.
4. An open or short to ground will appear in the open positions on the scan tool only when it is not commanded by the ECM or scan tool, while a short to voltage will appear in the short positions on the scan tool only while the component is being commanded by the ECM or scan tool.
5. Proper operation of any component of function with no 1 in any operation of the positions indicates that system operation is normal at this time.
6. A component or function that failed to operate at this point indicates that the fault is not on the ECM side of the circuitry.
7. The 1 disappears after disconnecting the component electrical connector. This indicates that the component or component side wiring is at fault. If the scan tool indicates a fault after disconnecting the component electrical connector and verifying that no open or short is present in the circuit, then the ECM is faulty.
8. The replacement ECM must be reprogrammed. Refer to the latest Techline procedure for ECM reprogramming.
9. If no faults have been found at this point, refer to "Diagnostic Aids" in this section for additional checks and information.

## ECM Output Diagnosis

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (OBD II) System Check. Is the check complete?		Go to <i>Step 2</i>	Go to "On–Board Diagnostic System Check"
2	Install the scan tool. Is there a number 1 below any of the numbered positions in the OUTPUT DRIVERS?		Go to <i>Step 3</i>	Go to <i>Step 4</i>
3	Check for an open or shorted circuit in any corresponding position (circuit) that contained a number 1 and repair as necessary. Is a repair necessary?		Go to <i>Step 10</i>	Go to <i>Step 8</i>
4	Command the output being checked with a scan tool while watching the corresponding position for each circuit. Do any of the positions change to a 1?		Go to <i>Step 7</i>	Go to <i>Step 5</i>
5	Command the output being checked with a scan tool while watching the corresponding position for each circuit. Does the component or function operate when commanded?		Go to <i>Step 10</i>	Go to the appropriate component table for repair
6	Repair the short to voltage in the corresponding circuit for position (circuit) that displayed a 1. Is the repair complete?		Go to <i>Step 10</i>	
7	Disconnect the electrical connector to the component connected to the faulty circuit. Is a 1 still displayed in the corresponding OUTPUT DRIVER position?		Go to <i>Step 9</i>	Go to the appropriate component table for repair
8	Replace the Engine Control Module (ECM). Is the repair complete?		Go to <i>Step 10</i>	
9	Operate the vehicle within the conditions under which the original symptom was noted. Does the system now operate properly?		System OK	Go to <i>Step 2</i>

## MULTIPLE ECM INFORMATION SENSOR DTCS SET

### Circuit Description

The Engine Control Module (ECM) monitors various sensors to determine engine operating conditions. The ECM controls fuel delivery, spark advance, transaxle operation, and emission control device operation based on the sensor inputs.

The ECM provides a sensor ground to all of the sensors. The ECM applies 5 volts through a pull-up resistor and monitors the voltage present between the sensor and the resistor to determine the status of the Engine Coolant Temperature (ECT) sensor, the Intake Air Temperature (IAT) sensor. The ECM provides the Exhaust Gas Recirculation (EGR) Pintle Position Sensor, the Throttle Position (TP) sensor, the Manifold Absolute Pressure (MAP) sensor, and the Fuel Tank Pressure Sensor with a 5 volt reference and a sensor ground signal. The ECM monitors the separate feedback signals from these sensors to determine their operating status.

### Diagnostic Aids

Be sure to inspect the ECM and the engine grounds for being secure and clean.

A short to voltage in one of the sensor circuits can cause one or more of the following DTCs to be set: P0108, P0113, P0118, P0123, P1106, P1111, P1115, P1121, P1625.

If a sensor input circuit has been shorted to voltage, ensure that the sensor is not damaged. A damaged sensor will continue to indicate a high or low voltage after the affected circuit has been repaired. If the sensor has been damaged, replace it.

An open in the sensor ground circuit between the ECM and the splice will cause one or more of the following DTCs to be set: P0108, P0113, P0118, P0123, P1106, P1111, P1115, P1121.

A short to ground in the 5 volt reference circuit or an open in the 5 volt reference circuit between the ECM and the splice will cause one or more of the following DTCs to be set: P0107, P0112, P0117, P0122, P1107, P1112, P1114, P1122.

Check for the following conditions:

- Inspect for a poor connection at the ECM. Inspect harness connectors for backed-out terminals, improper mating, broken locks, improperly formed or damaged terminals, and poor terminal-to-wire connection.
- Inspect the wiring harness for damage. If the harness appears to be OK, observe an affected sensor's displayed value on the scan tool with the ignition ON and the engine OFF while moving connectors and wiring harnesses related to the affected sensors. A change in the affected sensor's displayed value will indicate the location of the fault.

### Test Description

Number(s) below refer to the step number(s) on the Diagnostic Table.

1. The On-Board Diagnostic (OBD II) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.
9. A faulty EGR valve can leak a small amount of current from the ignition feed circuit to the 5 volt reference circuit. If the problem does not exist with the EGR valve disconnected, replace the EGR valve.
12. –19. If a sensor input circuit has been shorted to voltage, ensure that the sensor has not been damaged. A damaged IAT or ECT sensor will continue to indicate a high voltage or low temperature after the affected circuit has been repaired. A damaged Air Conditioning Pressure (ACP), TP, MAP, Fuel Tank Pressure, or EGR Pintle Position sensor will indicate a high or low voltage or may be stuck at a fixed value after the affected circuit has been repaired. If the sensor has been damaged, replace it.
21. The replacement ECM must be reprogrammed. Refer to the latest Techline procedure for ECM reprogramming.

### Multiple ECM Information Sensor DTCs Set

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (OBD II) System Check. Is the check complete?		Go to <i>Step 2</i>	Go to "On–Board Diagnostic System Check"
2	1. Turn the ignition OFF and disconnect the Engine Control Module (ECM). 2. Turn the ignition ON and check the 5 volt reference circuit for the following conditions: <ul style="list-style-type: none"> <li>• Poor connection at the ECM.</li> <li>• Open between the ECM connector affected sensors shorted to ground or voltage.</li> </ul> 3. If a problem is found, locate and repair the open or short circuit as necessary. Is a problem found?		Go to <i>Step 19</i>	Go to <i>Step 3</i>
3	1. Check the sensor ground circuit for the following conditions: <ul style="list-style-type: none"> <li>• Poor connection at the ECM or affected sensors.</li> <li>• Open between the ECM connector and the affected sensors.</li> </ul> 2. If a problem is found, repair it as necessary. Is a problem found?		Go to <i>Step 19</i>	Go to <i>Step 4</i>
4	Measure the voltage between the Exhaust Gas Recirculation (EGR) Pintle Position Sensor signal circuit at the ECM harness connector and ground. Does the voltage measure near the specified value?	0 v	Go to <i>Step 5</i>	Go to <i>Step 9</i>
5	Measure the voltage between the Manifold Absolute Pressure (MAP) sensor signal circuit and the ECM harness connector and ground. Does the voltage measure near the specified value?	0 v	Go to <i>Step 6</i>	Go to <i>Step 11</i>
6	Measure the voltage between the Throttle Position (TP) sensor signal circuit and the ECM harness connector and ground. Does the voltage measure near the specified value?	0 v	Go to <i>Step 7</i>	Go to <i>Step 12</i>
7	Measure the voltage between the Intake Air Temperature (IAT) sensor signal circuit and the ECM harness connector and ground. Does the voltage measure near the specified value?	0 v	Go to <i>Step 8</i>	Go to <i>Step 13</i>
8	Measure the voltage between the Engine Coolant Temperature (ECT) sensor signal circuit and the ECM harness connector and ground. Does the voltage measure near the specified value?	0 v	Go to <i>Step 16</i>	Go to <i>Step 14</i>
9	1. Disconnect the EGR valve. 2. Measure the voltage between the EGR Pintle Position sensor signal circuit and the ECM harness connector and ground. Does the voltage measure near the specified value?	0 v	Go to <i>Step 10</i>	Go to <i>Step 15</i>
10	Replace the EGR valve. Is the repair complete?		Go to <i>Step 19</i>	

Step	Action	Value(s)	Yes	No
11	Locate and repair the short to voltage in the MAP sensor signal circuit. Is the repair complete?		Go to <i>Step 19</i>	
12	Locate and repair the short to voltage in the TP sensor signal circuit. Is the repair complete?		Go to <i>Step 19</i>	
13	Locate and repair the short to voltage in the IAT sensor signal circuit. Is the repair complete?		Go to <i>Step 19</i>	
14	Locate and repair the short to voltage in the ECT sensor signal circuit. Is the repair complete?		Go to <i>Step 19</i>	
15	Locate and repair the short to voltage in the EGR Pintle Position sensor circuit. Is the repair complete?		Go to <i>Step 19</i>	
16	Measure the voltage between the Fuel Tank Pressure sensor signal circuit and the ECM harness connector and ground. Does the voltage measure near the specified value?	0 v	Go to <i>Step 18</i>	Go to <i>Step 17</i>
17	Locate and repair the short to voltage in the Fuel Tank Pressure sensor signal circuit. Is the repair complete?		Go to <i>Step 19</i>	
18	Replace the ECM. Is the repair complete?		Go to <i>Step 19</i>	
19	<ol style="list-style-type: none"> <li>Using the scan tool, clear the Diagnostic Trouble Codes (DTCs).</li> <li>Start the engine and idle at normal operating temperature.</li> <li>Operate the vehicle within the conditions for setting the DTCs as specified in the supporting text.</li> </ol> Does the scan tool indicate that this diagnostic ran and passed?		Go to <i>Step 20</i>	Go to <i>Step 2</i>
20	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?		Go to "Applicable DTC table"	System OK



## ENGINE CRANKS BUT WILL NOT RUN

### Test Description

The number(s) below refer to step(s) on the diagnostic table.

3. By performing a compression test, it can be determined if the engine has the mechanical ability to run.
9. It is important to check for the presence of spark from all of the ignition wires. If spark is present from one to three of the ignition coil terminals, the crankshaft position (CKP) sensor is OK.
19. In checking the Engine Control Module (ECM) outputs for the electronic spark timing signal, it is recommended to use an oscilloscope to view the varying voltage signals. In measuring these outputs with a voltmeter, intermittent errors may occur that cannot be seen by a voltmeter.
35. This step checks for proper operation of the ECM's control of the fuel pump circuit.
59. This step checks for a ground signal being supplied by the ECM to operate the fuel injectors. If there is no ground present during the cranking of the engine, and the fuel injector wiring is OK, the ECM is at fault.

### Engine Cranks But Will Not Run

**CAUTION :** Use only electrically insulated pliers when handling ignition wires with the engine running to prevent an electrical shock.

**CAUTION :** Do not pinch or restrict nylon fuel lines. Damage to the lines could cause a fuel leak, resulting in possible fire or personal injury.

**Important :** If a no start condition exists, ensure the fuel cutoff switch has not been tripped prior to further diagnosis.

Step	Action	Value(s)	Yes	No
1	Perform an On-Board Diagnostic (OBD II) System Check. Is the check complete?		Go to <i>Step 2</i>	Go to "On-Board Diagnostic System Check"
2	Crank the engine. Does the engine start and continue to run?		System OK	Go to <i>Step 3</i>
3	Perform a cylinder compression test. Is the cylinder compression for all of the cylinders at or above the value specified?	100 psi (689 kPa)	Go to <i>Step 7</i>	Go to <i>Step 4</i>
4	Inspect the timing belt alignment. Is the timing belt in alignment?		Go to <i>Step 6</i>	Go to <i>Step 5</i>
5	Align or replace the timing belt as needed. Is the repair complete?		Go to <i>Step 2</i>	
6	Repair the internal engine damage as needed. Is the repair complete?		Go to <i>Step 2</i>	
7	Inspect the fuel pump fuse. Is the problem found?		Go to <i>Step 8</i>	Go to <i>Step 9</i>
8	Replace the fuse. Is the repair complete?		Go to <i>Step 2</i>	
9	Check for the presence of spark from all of the ignition wires while cranking the engine. Is spark present from all of the ignition wires?		Go to <i>Step 34</i>	Go to <i>Step 10</i>
10	1. Measure the resistance of the ignition wires. 2. Replace any of the ignition wire(s) with a resistance above the value specified. 3. Check for the presence of spark from all of the ignition wires. Is spark present from all of the ignition wires?	30,000 $\Omega$	Go to <i>Step 2</i>	Go to <i>Step 11</i>

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Step	Action	Value(s)	Yes	No
11	<ol style="list-style-type: none"> <li>1. Turn the ignition OFF.</li> <li>2. Disconnect the crankshaft position (CKP) sensor connector.</li> <li>3. Turn the ignition ON.</li> <li>4. Measure the voltage between the CKP sensor connector terminals 1 and 3.</li> </ol> <p>Does the voltage measure near the value specified?</p>	1.08 v	Go toStep 12	Go toStep 13
12	<p>Measure the voltage between the CKP sensor connector terminals 2 and 3.</p> <p>Does the voltage measure near the value specified?</p>	1.08 v	Go toStep 19	Go toStep 14
13	<p>Measure the voltage between the CKP sensor connector terminal 1 and ground.</p> <p>Does the voltage measure near the value specified?</p>	1.08 v	Go toStep 15	Go toStep 16
14	<p>Measure the voltage between the CKP sensor connector terminal 2 and ground.</p> <p>Does the voltage measure near the value specified?</p>	1.08 v	Go toStep 15	Go toStep 17
15	<p>Check for an open or short in the wire between the CKP sensor connector terminal 3 and ground.</p> <p>Is the problem found?</p>		Go toStep 18	Go toStep 33
16	<p>Check for an open or short in the wire between the CKP sensor connector terminal 1 and the Engine Control Module (ECM) connector terminal C6.</p> <p>Is the problem found?</p>		Go toStep 18	Go toStep 33
17	<p>Check for an open or short in the wire between the CKP sensor connector terminal 2 and the ECM connector terminal C5.</p> <p>Is the problem found?</p>		Go toStep 18	Go toStep 33
18	<p>Repair the wiring as needed.</p> <p>Is the repair complete?</p>		Go toStep 2	
19	<ol style="list-style-type: none"> <li>1. Disconnect the Electronic Ignition (EI) system ignition coil connector to prevent the vehicle from starting.</li> <li>2. Measure the voltage at the ECM connector terminal C6 by backprobing the ECM connector.</li> </ol> <p>Are the voltage readings near the values specified?</p>	1.08 v with ignition ON, 1.20 v during cranking	Go toStep 20	Go toStep 21
20	<p>Measure the voltage at the ECM connector terminal C5 by backprobing the ECM connector.</p> <p>Are the voltage readings near the values specified?</p>	1.08 v with ignition ON, 1.20 v during cranking	Go toStep 22	Go toStep 21
21	<p>Replace the CKP sensor.</p> <p>Is the repair complete?</p>		Go toStep 2	
22	<ol style="list-style-type: none"> <li>1. Turn the ignition OFF.</li> <li>2. Disconnect the electrical connector at the EI system ignition coil.</li> <li>3. Connect a test light between terminal D of the EI system ignition coil connector and ground.</li> <li>4. Turn the ignition ON.</li> </ol> <p>Is the test light on?</p>		Go toStep 23	Go toStep 24
23	<p>Connect a test light between terminal C of the EI system ignition coil connector and battery positive.</p> <p>Is the test light on?</p>		Go toStep 27	Go toStep 25

Step	Action	Value(s)	Yes	No
24	Check for an open in the wiring between the battery and the EI system ignition coil connector terminal D. Is the problem found?		Go to <i>Step 26</i>	Go to "Ignition 1 Relay Circuit Check"
25	Check for an open in the wire from the EI system ignition coil to ground. Is the problem found?		Go to <i>Step 26</i>	
26	1. Repair the wiring as needed. 2. Connect the EI system ignition coil connector. 3. Check for the presence of spark from all of the ignition wires. Is spark present from all of the ignition wires?		Go to <i>Step 2</i>	Go to <i>Step 27</i>
27	1. Turn the ignition OFF. 2. Disconnect the EI system ignition coil connector. 3. While cranking the engine, measure the voltage at the EI system ignition coil connector terminal B. Does the voltage fluctuate within the values specified?	0.2–2.0 v	Go to <i>Step 28</i>	Go to <i>Step 29</i>
28	While cranking the engine, measure the voltage at the EI system ignition coil connector terminal A. Does the voltage fluctuate within the values specified?	0.2–2.0 v	Go to <i>Step 32</i>	Go to <i>Step 30</i>
29	Check for an open in the wire from the EI system ignition coil connector terminal B to the ECM connector terminal C4. Is the problem found?		Go to <i>Step 31</i>	Go to <i>Step 33</i>
30	Check for an open in the wire from the EI system ignition coil connector terminal A to the ECM connector terminal D5. Is the problem found?		Go to <i>Step 31</i>	Go to <i>Step 33</i>
31	1. Repair the wiring as needed. 2. Connect the EI system ignition coil connector. 3. Check for the presence of spark from all of the ignition wires.		Go to <i>Step 2</i>	Go to <i>Step 32</i>
32	Replace the EI system ignition coil. Is the repair complete?		Go to <i>Step 2</i>	
33	Replace the ECM. Is the repair complete?		Go to <i>Step 2</i>	
34	1. Turn the ignition OFF. 2. Connect a fuel pressure gauge. 3. Crank the engine. Is any fuel pressure present?		Go to <i>Step 37</i>	Go to <i>Step 35</i>

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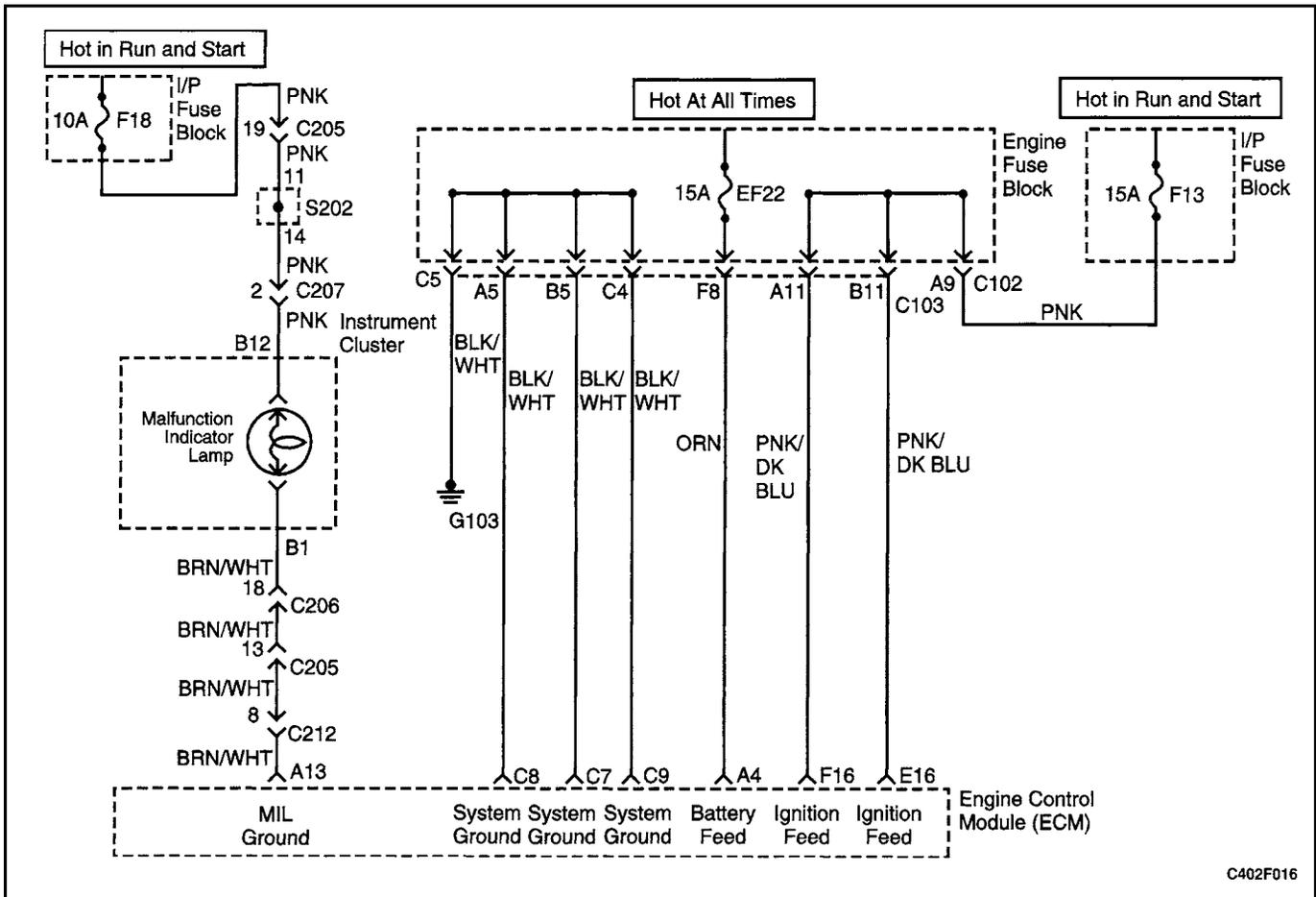
Step	Action	Value(s)	Yes	No
35	<ol style="list-style-type: none"> <li>1. Turn the ignition OFF.</li> <li>2. Disconnect the electrical connector at the fuel pump.</li> <li>3. Connect a test light between the fuel pump connector terminals 3 and 2.</li> <li>4. Turn the ignition ON.</li> <li>5. With the ignition ON, the test light should light for the time specified.</li> </ol> <p>Is the test light on?</p>	2 sec	Go to <i>Step 36</i>	Go to <i>Step 46</i>
36	<p>Replace the fuel pump.</p> <p>Is the repair complete?</p>		Go to <i>Step 2</i>	
37	<p>Is the fuel pressure within the value specified?</p>	41–47 psi (283–324 kPa)	Go to <i>Step 41</i>	Go to <i>Step 38</i>
38	<ol style="list-style-type: none"> <li>1. Check the fuel filter for a restriction.</li> <li>2. Inspect the fuel lines for kinks and restrictions.</li> </ol> <p>Is the problem found?</p>		Go to <i>Step 39</i>	Go to <i>Step 40</i>
39	<ol style="list-style-type: none"> <li>1. Replace the fuel filter and/or the fuel lines as needed.</li> <li>2. Connect a fuel pressure gauge.</li> <li>3. Crank the engine.</li> </ol> <p>Is the fuel pressure within the value specified?</p>	41–47 psi (283–324 kPa)	Go to <i>Step 2</i>	Go to <i>Step 40</i>
40	<ol style="list-style-type: none"> <li>1. Disconnect the vacuum line from the fuel pressure regulator.</li> <li>2. Inspect the vacuum line for the presence of fuel.</li> <li>3. Inspect the fuel pressure regulator vacuum port for the presence of fuel.</li> </ol> <p>Is any fuel present?</p>		Go to <i>Step 43</i>	Go to <i>Step 44</i>
41	<p>Check the fuel for contamination.</p> <p>Is the fuel contaminated?</p>		Go to <i>Step 42</i>	Go to <i>Step 64</i>
42	<ol style="list-style-type: none"> <li>1. Remove the contaminated fuel from the fuel tank.</li> <li>2. Clean the fuel tank as needed.</li> </ol> <p>Is the repair complete?</p>		Go to <i>Step 2</i>	
43	<p>Replace the fuel pressure regulator.</p> <p>Is the repair complete?</p>		Go to <i>Step 2</i>	
44	<ol style="list-style-type: none"> <li>1. Remove the fuel pump assembly from the fuel tank.</li> <li>2. Inspect the fuel pump sender and the fuel coupling hoses for a restriction.</li> <li>3. Inspect the in-tank fuel filter for a restriction.</li> </ol> <p>Is the problem found?</p>		Go to <i>Step 45</i>	Go to <i>Step 36</i>
45	<p>Replace the fuel pump sender, the in-tank fuel filter, and/or the fuel coupling hoses as needed.</p> <p>Is the repair complete?</p>		Go to <i>Step 2</i>	

Step	Action	Value(s)	Yes	No
46	<ol style="list-style-type: none"> <li>1. Turn the ignition OFF.</li> <li>2. Disconnect the electrical connector at the fuel pump.</li> <li>3. Connect a test light between the fuel pump connector terminal 3 and a known good ground.</li> <li>4. Turn the ignition ON.</li> <li>5. With the ignition ON, the test light should illuminate for the time specified.</li> </ol> Is the test light on?	2 sec	Go toStep 47	Go toStep 48
47	Repair the open wire between the fuel pump connector terminal 2 and ground. Is the repair complete?		Go toStep 2	
48	<ol style="list-style-type: none"> <li>1. Turn the ignition OFF.</li> <li>2. Disconnect the fuel pump relay.</li> <li>3. Connect a test light between the fuel pump relay connector terminal 86 and battery positive.</li> <li>4. Turn the ignition ON.</li> </ol> Is the test light on?		Go toStep 49	Go toStep 60
49	<ol style="list-style-type: none"> <li>1. Turn the ignition OFF.</li> <li>2. Connect a test light between the fuel pump relay connector terminal 85 and ground.</li> <li>3. Turn the ignition ON.</li> <li>4. With the ignition ON, the test light should light for the time specified.</li> </ol> Is the test light on?	2 sec	Go toStep 50	Go toStep 61
50	<ol style="list-style-type: none"> <li>1. Turn the ignition OFF.</li> <li>2. Connect a test light between the fuel pump relay connector terminal 30 and ground.</li> </ol> Is the test light on?		Go toStep 51	Go toStep 63
51	<ol style="list-style-type: none"> <li>1. Turn the ignition ON.</li> <li>2. Measure the voltage at the fuse EF19 connection.</li> </ol> Is the voltage within the specified value?	11–14 v	Go toStep 53	Go toStep 52
52	Replace the fuel pump relay. Is the repair complete?		Go toStep 2	
53	Measure the voltage at the fuse EF19 again. Is the voltage within the specified value?	11–14 v	Go toStep 55	Go toStep 54
54	Replace the engine fuse block. Is the repair complete?		Go toStep 2	
55	<ol style="list-style-type: none"> <li>1. Disconnect the fuel cutoff switch connector.</li> <li>2. Measure the voltage at terminal 1 of the fuel cutoff switch connector.</li> </ol> Is the voltage within the specified value?		Go toStep 57	Go toStep 56
56	Repair the open or short between the fuel cutoff switch and fuse EF19. Is the repair complete?		Go toStep 2	

# 1F – 44 ENGINE CONTROLS

Step	Action	Value(s)	Yes	No
57	<ol style="list-style-type: none"> <li>1. Reconnect the fuel cutoff switch.</li> <li>2. Measure the voltage at terminal 3 of the fuel cutoff switch connector.</li> </ol> <p>Is the voltage within the specified value?</p>	11–14 v	Go to <i>Step 58</i>	Go to <i>Step 59</i>
58	<p>Repair the short or opening the circuit between the fuel cutoff switch and the fuel pump.</p> <p>Is the repair complete?</p>		Go to <i>Step 2</i>	
59	<p>Replace the fuel cutoff switch.</p> <p>Is the repair complete?</p>		Go to <i>Step 2</i>	
60	<p>Check for an open or short to voltage in the circuit between the fuel pump relay terminal 86 and ground.</p> <p>Is a problem found and corrected?</p>		Go to <i>Step 2</i>	Go to <i>Step 61</i>
61	<p>Check the wire between the fuel pump relay connector terminal 85 to the ECM connector terminal E13 for an open.</p> <p>Is the problem found?</p>		Go to <i>Step 62</i>	Go to <i>Step 33</i>
62	<p>Repair the wire between the fuel pump relay connector terminal 85 to the ECM connector terminal E13.</p> <p>Is the repair complete?</p>		Go to <i>Step 2</i>	
63	<p>Repair the wire between the fuel pump relay connector terminal 30 and the battery.</p> <p>Is the repair complete?</p>		Go to <i>Step 2</i>	
64	<ol style="list-style-type: none"> <li>1. Turn the ignition OFF.</li> <li>2. Disconnect the fuel injector harness connectors from all of the fuel injectors.</li> <li>3. Turn the ignition ON.</li> <li>4. Connect a test light between the fuel injector harness connector 1 and ground.</li> <li>5. Repeat step 4 for each of the remaining fuel injectors.</li> </ol> <p>Is the test light on at all of the fuel injectors?</p>		Go to <i>Step 65</i>	Go to <i>Step 68</i>
65	<ol style="list-style-type: none"> <li>1. Turn the ignition OFF.</li> <li>2. Connect a test light between the fuel injector harness connector terminal 2 and battery positive.</li> <li>3. Crank the engine.</li> <li>4. Repeat steps three and four for each of the remaining fuel injectors.</li> </ol> <p>Does the test light flash for all of the fuel injectors?</p>		Go to <i>Step 66</i>	Go to <i>Step 69</i>
66	<p>Measure the resistance of each fuel injector.</p> <p>Is the resistance within the value specified (the resistance will increase slightly at higher temperatures)?</p>	11.6–12.4 $\Omega$	System OK	Go to <i>Step 67</i>
67	<p>Replace any of the fuel injectors with a resistance out of specification.</p> <p>Is the repair complete?</p>		Go to <i>Step 2</i>	
68	<ol style="list-style-type: none"> <li>1. Inspect the engine fuse block fuse EF17.</li> <li>2. Check for an open between the circuit from terminal 1 for each of the four fuel injectors and the ignition 1 relay connector terminal 87.</li> </ol> <p>Is the problem found?</p>		Go to <i>Step 2</i>	

Step	Action	Value(s)	Yes	No
69	1. Check for an open between the fuel injector 1 harness connector terminal 2 and the ECM connector terminal D3. 2. Check for an open between the fuel injector 2 harness connector terminal 2 and the ECM connector terminal C1. 3. Check for an open between the fuel injector 3 harness connector terminal 2 and the ECM connector terminal D1. 4. Check for an open between the fuel injector 4 harness connector terminal 2 and the ECM connector terminal F13. Is the problem found?		Go to <i>Step 70</i>	Go to <i>Step 72</i>
70	Repair the open fuel injector harness wire(s). Is the repair complete?		Go to <i>Step 2</i>	
71	1. Inspect the engine fuse block fuse EF17. 2. Check for an open between the circuit from terminal 1 for each of the four fuel injectors and the ignition 1 relay connector terminal 87. Is the problem found?		Go to <i>Step 65</i>	Go to "Ignition 1 Relay Circuit Check"



C402F016

## NO MALFUNCTION INDICATOR LAMP

### Circuit Description

When the ignition is turned ON, the Malfunction Indicator Lamp (MIL) will momentarily flash ON then OFF and remain ON until the engine is running, if no Diagnostic Trouble Codes (DTCs) are stored. Battery voltage is supplied through the ignition switch directly to the MIL telltale. The engine control module (ECM) controls the MIL by providing a ground path through the MIL control circuit to turn ON the MIL.

### Diagnostic Aids

An open ignition #5 fuse will cause the entire cluster to be inoperative, and may set DTC P1625.

Check the battery and ignition feed circuits for poor connections if the MIL is intermittent.

Any circuitry, that is suspected as causing an intermittent complaint, should be thoroughly checked for backed-out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal-to-wiring connections or physical damage to the wiring harness.

### Test Description

Number(s) below refer to the step number(s) on the diagnostic table.

1. The On-Board Diagnostic (OBD II) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool, if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is stored in the scan tool for later reference.
3. Connections that are suspected of being faulty should be thoroughly checked as described in the diagnostic aids.
4. If the engine fails to start and the MIL is inoperative, then the fault can be isolated to either the ECM ignition feed, the battery feed, or a poor ground at the engine block or the ECM.
6. Probing the MIL circuit with a test light to ground stimulates the ECM's control of the MIL. If the MIL illuminates, then the malfunction can be isolated to the control of the MIL or a poor connection at the MIL terminal to the ECM. Connections that are suspected of being faulty should be thoroughly checked as described in the diagnostic aids.
8. It takes very little resistance for the battery and ignition feed circuits to cause an intermittent condition and should also be checked for a poor connection as described in diagnostic aids.

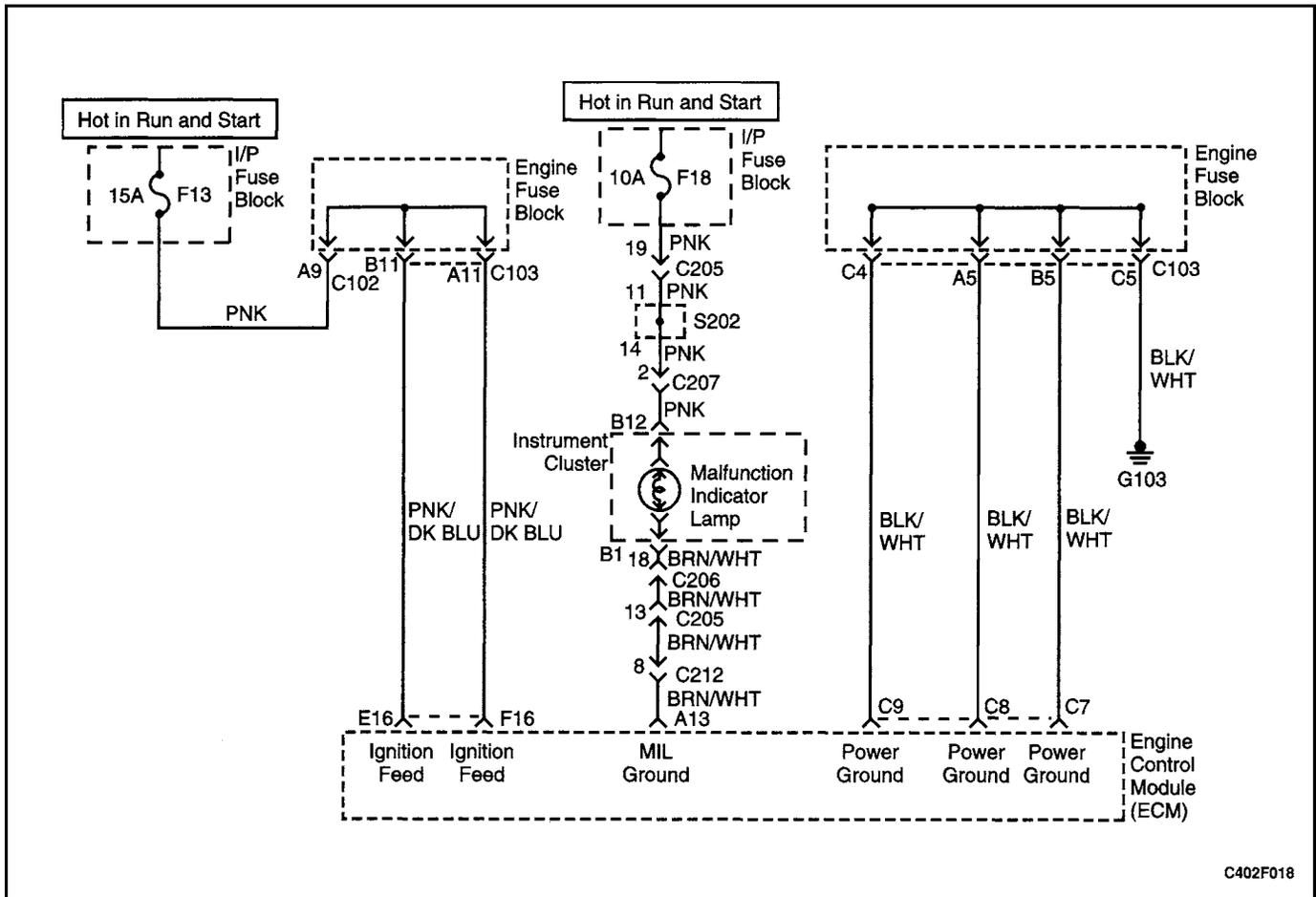
11. Before replacing the ECM, check for backed-out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal-to-wiring harness. Replacement ECMs must be reprogrammed. Refer to the latest Techline information for reprogramming procedures.
20. ECM grounds will only cause a problem if all of the grounds are not making a good connection. If an ECM ground problem is suspected, the most probable place to check is where all the grounds meet, at the engine block.
22. If not faults have been found at this point and no DTCs were set, refer to the diagnostic aids for additional checks and information.

### No Malfunction Indicator Lamp

Step	Action	Value(s)	Yes	No
1	Perform an On-Board Diagnostic (OBD II) System Check. Is the check complete?		Go to <i>Step 2</i>	Go to "On-Board Diagnostic System Check"
2	Turn the ignition switch ON with the engine OFF. Is the Malfunction Indicator Lamp (MIL) on?		Go to <i>Step 3</i>	Go to <i>Step 4</i>
3	Check for a poor connection at the battery feed terminal A4 or ignition feed terminal F16. Is the problem found and repaired?		Go to <i>Step 22</i>	Go to <i>Step 5</i>
4	Attempt to start the engine. Does the engine start?		Go to <i>Step 6</i>	Go to <i>Step 5</i>
5	Check for a faulty Engine Control Module (ECM) ground connection at the engine block or ECM connector ground terminals and repair as necessary. Is the repair complete?		Go to <i>Step 22</i>	
6	1. Turn the ignition OFF. 2. Disconnect the ECM connectors from the ECM. 3. Turn the ignition switch ON. Is the MIL ON?		Go to <i>Step 8</i>	Go to <i>Step 9</i>
7	Inspect the ignition and battery feed fuses. Are the fuses OK?		Go to <i>Step 10</i>	Go to <i>Step 11</i>
8	Check for a poor connection in the battery feed terminal A4, ignition feed terminal F16 or the MIL control circuits and repair as necessary. Is a repair necessary?		Go to <i>Step 22</i>	Go to <i>Step 12</i>
9	Probe the MIL control circuit with a test light connected to ground. Is the test light illuminated?		Go to <i>Step 13</i>	Go to <i>Step 14</i>
10	1. Turn the ignition switch OFF. 2. Disconnect the ECM connectors from the ECM. 3. Turn the ignition switch ON. 4. Probe the ignition feed terminal F16 with a test light connected to ground. Does the test light illuminate?		Go to <i>Step 15</i>	Go to <i>Step 16</i>
11	1. Check for a short to ground in the circuit of the fuse that was open and repair if necessary. 2. Replace the open fuse. Is the repair complete?		Go to <i>Step 22</i>	
12	Replace the ECM. Is the repair complete?		Go to <i>Step 22</i>	

## 1F – 48 ENGINE CONTROLS

Step	Action	Value(s)	Yes	No
13	Repair the short to voltage in the MIL control circuit. Is the repair complete?	41–47 psi 284–325 kPa)	Go to <i>Step 22</i>	
14	Check for an open or a poor connection in the MIL control circuit and repair as necessary. Is a repair necessary?		Go to <i>Step 22</i>	Go to <i>Step 17</i>
15	With a test light still connected to the ground, probe the ignition feed terminal F16. Does the test light illuminate?		Go to <i>Step 18</i>	Go to <i>Step 19</i>
16	Repair the open battery feed circuit. Is the repair complete?		Go to <i>Step 22</i>	
17	Check for an open ignition feed circuit or fuse to the MIL and repair as necessary. Is a repair necessary?		Go to <i>Step 22</i>	Go to <i>Step 20</i>
18	Check for a poor connection in the battery feed terminal A4 or the ignition feed terminal F16 and repair as necessary. Is a repair necessary?		Go to <i>Step 22</i>	Go to <i>Step 21</i>
19	Repair the open in the ignition feed circuit from terminal F16. Is the repair complete?		Go to <i>Step 22</i>	
20	Replace the instrument panel cluster. Refer to <i>Section 9E, Instrumentation/Driver Information</i> . Is the repair complete?		Go to <i>Step 22</i>	
21	Check for a faulty ECM ground connection at the engine block or ECM connector and repair as necessary. Is the repair necessary?		Go to <i>Step 22</i>	Go to <i>Step 12</i>
22	1. Allow the engine to idle until normal operating temperature is reached. 2. Check if any DTCs are set. Are any DTCs displayed that have not been diagnosed?		Go to the "Applicable DTC table"	System OK



C402F018

## MALFUNCTION INDICATOR LAMP ON STEADY

### Circuit Description

When the ignition is turned ON, the Malfunction Indicator Lamp (MIL) will momentarily flash ON then OFF and remain ON until the engine is running if no Diagnostic Trouble Codes (DTCs) are stored. Battery voltage is supplied through the ignition switch directly to the MIL telltale. The engine control module (ECM) controls the MIL by providing a ground path through the MIL control circuit to turn ON the MIL.

### Test Description

Number(s) below refer to the step number(s) on the diagnostic table.

1. The On-Board Diagnostic (OBD II) System Check prompts the technician to complete some basic checks and store the freeze frame and failure re-

ords data on then scan tool, if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is stored in the scan tool for later reference.

2. When the ignition is turned on, the MIL should momentarily flash ON and OFF then remain ON until the engine is running or if an emission related DTC is stored.
3. This step checks the ability of the ECM to control the MIL. The scan tool has the ability to command the MIL ON and OFF.
5. A shorted MIL circuit can be diagnosed with a scan tool.
7. The replacement ECM must be reprogrammed. Refer to the latest Techline information for reprogramming procedures.

**Malfunction Indicator Lamp On Steady**

<b>Step</b>	<b>Action</b>	<b>Value(s)</b>	<b>Yes</b>	<b>No</b>
1	Perform an On–Board Diagnostic (OBD II) System Check. Is the check complete?		Go to <i>Step 2</i>	Go to "On–Board Diagnostic System Check"
2	Turn the ignition switch ON with the engine OFF. Is the Malfunction Indicator Lamp (MIL) ON?		Go to <i>Step 3</i>	Go to "No Malfunction Indicator Lamp"
3	1. Install the scan tool. 2. Command the MIL On and OFF. Does the MIL turn ON and OFF when commanded?		Go to <i>Step 8</i>	Go to <i>Step 4</i>
4	1. Turn the ignition switch OFF. 2. Disconnect the Engine Control Module (ECM) connectors. 3. Turn the ignition switch ON. Is the MIL OFF?		Go to <i>Step 7</i>	Go to <i>Step 5</i>
5	Check the MIL control circuit for a short to ground and repair if necessary. Is a repair necessary?		Go to <i>Step 8</i>	Go to <i>Step 6</i>
6	Replace the instrument panel cluster. Refer to <i>Section 9E, Instrumentation/Driver Information</i> . Is the repair complete?		Go to <i>Step 8</i>	
7	Replace the ECM. Is the repair complete?		Go to <i>Step 8</i>	
8	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Attempt to start the engine. Does the engine start and continue to run?		Go to <i>Step 9</i>	Go to <i>Step 1</i>
9	1. Allow the engine to idle until normal operating temperature is reached. 2. Check if any DTCs are set. Are any DTCs displayed that have not been diagnosed?		Go to the "Applicable DTC table"	System OK

## FUEL SYSTEM DIAGNOSIS

### Circuit Description

The fuel pump is an in-tank fuel pump mounted to a fuel sender assembly. The fuel pump will remain on as long as the engine is cranking or running and the engine control module (ECM) is receiving reference pulses from the crankshaft position (CKP) sensor. If there are no reference pulses, the ECM will turn off the fuel pump two seconds after the ignition switch is turned ON or two seconds after the engine stops running. The fuel pump delivers fuel to the fuel rail and the fuel injectors, where the fuel system pressure is controlled from 284 to 325 kPa (41 to 47 psi) by the fuel pressure regulator. The excess fuel is returned to the fuel tank.

### Test Description

The number(s) below refer to step(s) on the diagnostic table.

- When the engine is idling, the intake manifold vacuum is high. This vacuum is applied to the fuel pressure regulator diaphragm, offsetting the spring pressure inside the fuel pressure regulator and lowering the fuel pressure.

- If there is fuel bleeding back through the fuel return outlet, this is due to a faulty fuel pressure regulator.
- Another symptom often present when the fuel injectors are leaking is hard starting. Leaking fuel injectors can cause a flooding condition.
- Fuel leaking from the fuel pump inlet is due to a faulty one-way check valve in the fuel pump.

**CAUTION :** *The fuel system is under pressure. To avoid fuel spillage and the risk of personal injury or fire, it is necessary to relieve the fuel system pressure before disconnecting the fuel lines.*

**CAUTION :** *Do not pinch or restrict nylon fuel lines. Damage to the lines could cause a fuel leak, resulting in possible fire or personal injury.*

### Fuel Pressure Relief Procedure

- Remove the fuel cap.
- Remove the fuel pump fuse EF19 from the engine fuse box.
- Start the engine and allow the engine to stall.
- Crank the engine for an additional 10 seconds.

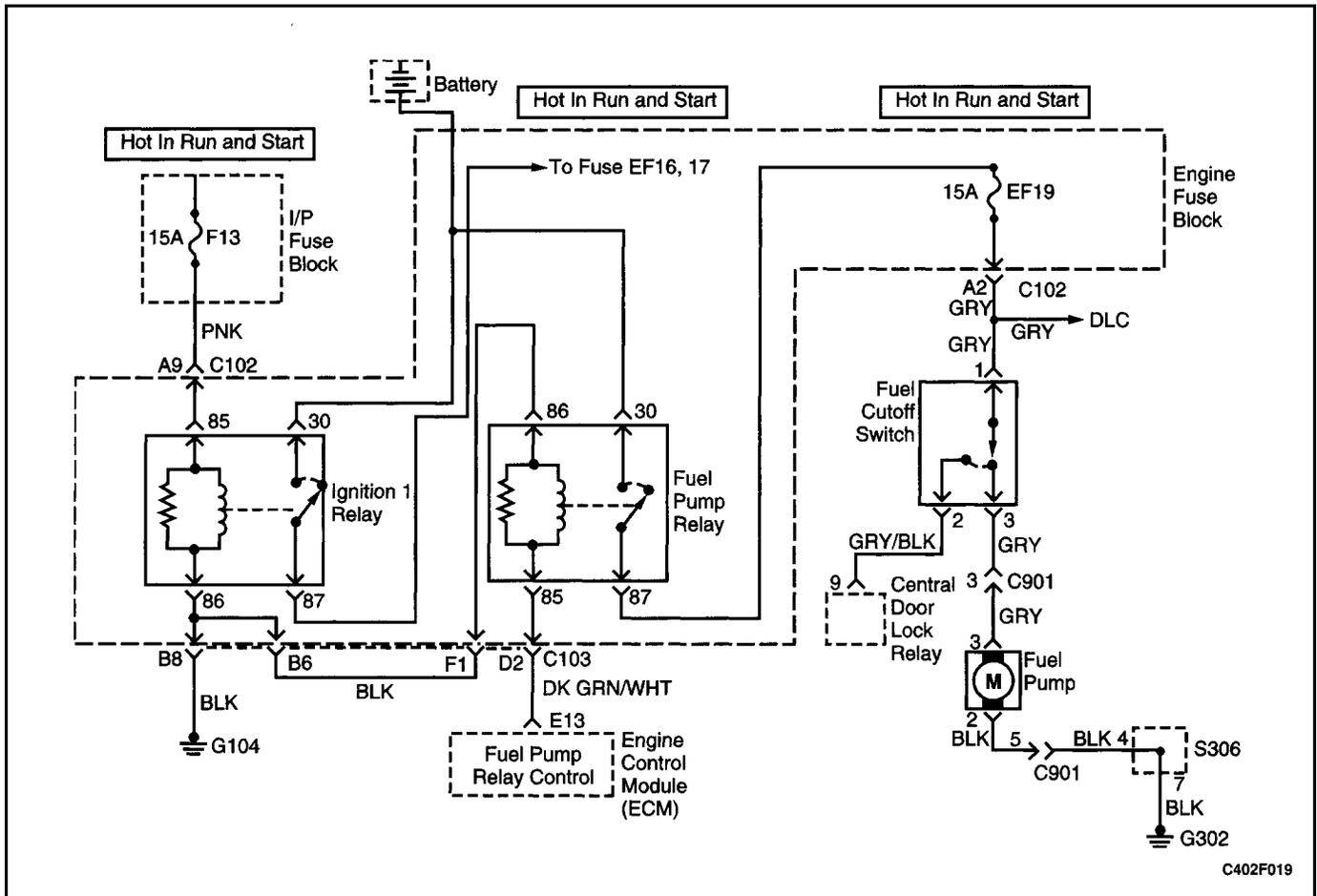
### Fuel System Diagnosis

Step	Action	Value(s)	Yes	No
1	<ol style="list-style-type: none"> <li>Relieve the fuel system pressure.</li> <li>Install a fuel pressure gauge.</li> <li>Turn the ignition ON.</li> </ol> Is the fuel pressure within the values specified and holding steady?	41–47 psi (284–325 kPa)	Go to <i>Step 2</i>	Go to <i>Step 5</i>
2	<ol style="list-style-type: none"> <li>Disconnect the fuel pressure regulator vacuum hose.</li> <li>Start the engine.</li> <li>Allow the engine to idle.</li> <li>Connect the fuel pressure regulator vacuum hose.</li> </ol> Did the fuel pressure decrease?		System OK	Go to <i>Step 3</i>
3	<ol style="list-style-type: none"> <li>Allow the engine to idle.</li> <li>Disconnect the vacuum hose from the fuel pressure regulator.</li> <li>Connect a vacuum pump with a gauge to the fuel pressure regulator vacuum port.</li> <li>Apply 41–47 kPa (12–14 in. Hg) of vacuum to the fuel pressure regulator.</li> </ol> Did the fuel pressure decrease?		Go to <i>Step 4</i>	Go to <i>Step 16</i>
4	<ol style="list-style-type: none"> <li>Locate and correct the cause of the vacuum restriction to the fuel pressure regulator.</li> <li>Confirm the operation of the fuel pressure regulator.</li> </ol> Is the repair complete?		System OK	

# 1F – 52 ENGINE CONTROLS

Step	Action	Value(s)	Yes	No
5	<ol style="list-style-type: none"> <li>1. Relieve the fuel system pressure.</li> <li>2. Install a fuel pressure gauge.</li> <li>3. Turn the ignition ON.</li> </ol> <p>Is the fuel pressure within the values specified but not holding steady?</p>	41–47 psi (284–325 kPa)	Go to <i>Step 6</i>	Go to <i>Step 17</i>
6	<p>Inspect the fuel lines for a leak.</p> <p>Is the problem found?</p>		Go to <i>Step 7</i>	Go to <i>Step 8</i>
7	<ol style="list-style-type: none"> <li>1. Replace the fuel line(s) as needed.</li> <li>2. Install a fuel pressure gauge.</li> <li>3. Turn the ignition ON.</li> </ol> <p>Is the fuel pressure within the values specified but not holding steady?</p>	41–47 psi (284–325 kPa)	System OK	
8	<ol style="list-style-type: none"> <li>1. Remove the fuel pump assembly.</li> <li>2. With the fuel pump under pressure, inspect the fuel pump coupling hoses for leaking.</li> </ol> <p>Is the problem found?</p>		Go to <i>Step 9</i>	Go to <i>Step 10</i>
9	<ol style="list-style-type: none"> <li>1. Tighten or replace the fuel pump coupling hoses as needed.</li> <li>2. Install a fuel pressure gauge.</li> <li>3. Turn the ignition ON.</li> </ol> <p>Is the fuel pressure within the values specified but not holding steady?</p>	41–47 psi (284–325 kPa)	System OK	
10	<p>With the fuel system under pressure, inspect the fuel return outlet for leaking.</p> <p>Is the problem found?</p>		Go to <i>Step 11</i>	Go to <i>Step 12</i>
11	<ol style="list-style-type: none"> <li>1. Replace the fuel pressure regulator.</li> <li>2. Install a fuel pressure gauge.</li> <li>3. Turn the ignition ON.</li> </ol> <p>Is the fuel pressure within the values specified but not holding steady?</p>	41–47 psi (284–325 kPa)	System OK	
12	<p>With the fuel system under pressure, inspect the fuel inlet for leaking.</p> <p>Is the problem found?</p>		Go to <i>Step 13</i>	Go to <i>Step 14</i>
13	<ol style="list-style-type: none"> <li>1. Replace the fuel pump assembly.</li> <li>2. Install a fuel pressure gauge.</li> <li>3. Turn the ignition ON.</li> </ol> <p>Is the fuel pressure within the values specified but not holding steady?</p>		System OK	
14	<ol style="list-style-type: none"> <li>1. Remove the fuel rail and the fuel injectors as an assembly.</li> <li>2. With the fuel system under pressure, inspect all of the fuel injectors for leaking.</li> </ol> <p>Is the problem found?</p>		Go to <i>Step 15</i>	
15	<ol style="list-style-type: none"> <li>1. Replace the leaking fuel injector(s).</li> <li>2. Install a fuel pressure gauge.</li> <li>3. Turn the ignition ON.</li> </ol> <p>Is the fuel pressure within the values specified but not holding steady?</p>	41–47 psi (284–325 kPa)	System OK	

Step	Action	Value(s)	Yes	No
16	<ol style="list-style-type: none"> <li>1. Replace the fuel pressure regulator.</li> <li>2. Disconnect the fuel pressure regulator vacuum hose.</li> <li>3. Start the engine.</li> <li>4. Allow the engine to idle.</li> <li>5. Connect the fuel pressure regulator vacuum hose.</li> </ol> <p>Did the fuel pressure decrease?</p>		System OK	
17	<ol style="list-style-type: none"> <li>1. Relieve the fuel system pressure.</li> <li>2. Install a fuel pressure gauge.</li> <li>3. Turn the ignition ON.</li> </ol> <p>Is the fuel system pressure below the values specified and holding steady?</p>	41–47 psi (284–325 kPa)	Go to <i>Step 13</i>	Go to <i>Step 18</i>
18	<ol style="list-style-type: none"> <li>1. Relieve the fuel system pressure.</li> <li>2. Install a fuel pressure gauge.</li> <li>3. Turn the ignition ON.</li> </ol> <p>Is the fuel system pressure below the values specified and holding steady?</p>	41–47 psi (284–325 kPa)	Go to <i>Step 19</i>	
19	<p>Inspect the fuel lines for leaks.</p> <p>Is the problem found?</p>		Go to <i>Step 7</i>	Go to <i>Step 20</i>
20	<ol style="list-style-type: none"> <li>1. Remove the fuel pump assembly.</li> <li>2. With the fuel pump under pressure, inspect the fuel pump coupling hoses for leaking.</li> </ol> <p>Is the problem found?</p>		Go to <i>Step 9</i>	Go to <i>Step 21</i>
21	<ol style="list-style-type: none"> <li>1. Remove the fuel pump assembly.</li> <li>2. With the fuel system under pressure, inspect the fuel return outlet for leaking.</li> </ol> <p>Is the problem found?</p>		Go to <i>Step 11</i>	Go to <i>Step 22</i>
22	<ol style="list-style-type: none"> <li>1. Remove the fuel pump assembly.</li> <li>2. With the fuel system under pressure, inspect the fuel inlet for leaking.</li> </ol> <p>Is the problem found?</p>		Go to <i>Step 13</i>	Go to <i>Step 23</i>
23	<ol style="list-style-type: none"> <li>1. Remove the fuel rail and the fuel injectors as an assembly.</li> <li>2. With the fuel system under pressure, inspect all of the fuel injectors for leaking.</li> </ol> <p>Is the problem found?</p>		Go to <i>Step 15</i>	Go to <i>Step 13</i>



## FUEL PUMP RELAY CIRCUIT CHECK

### Circuit Description

When the ignition switch is turned ON, the Engine Control Module (ECM) will activate the fuel pump relay and run the in-tank fuel pump. The fuel pump will operate as long as the engine is cranking or running and the ECM is receiving ignition reference pulses.

If there are no reference pulses, the ECM will shut off the fuel pump within 2 seconds after the ignition switch is turned ON.

### Diagnostic Aids

An intermittent problem may be caused by a poor connection, rubbed through wire insulation, or a broken wire inside the insulation.

### Test Description

The number(s) below refer to step(s) on the diagnostic table.

3. This step checks for the Engine Control Module (ECM) providing a ground for the operation of the fuel pump relay.
7. By confirming that the wiring is OK using steps 2 through 6, it can be determined that the fuel pump relay is at fault.
9. After determining that there is no ground being provided by the ECM to the fuel pump relay, the fault is either the ECM or the wiring between the ECM and the fuel pump relay.

### Fuel Pump Relay Circuit Check

Step	Action	Value(s)	Yes	No
1	<ol style="list-style-type: none"> <li>1. Turn the ignition OFF for 10 seconds.</li> <li>2. Turn the ignition ON.</li> <li>3. Listen for in-tank fuel pump operation.</li> </ol> Does the fuel pump operate for the time specified?	2 sec	System OK	Go to <i>Step 2</i>
2	<ol style="list-style-type: none"> <li>1. Turn the ignition OFF.</li> <li>2. Disconnect the fuel pump relay.</li> <li>3. Connect a test light between the fuel pump relay connector terminal 86 and battery positive.</li> <li>4. Turn the ignition ON.</li> </ol> Is the test light on?		Go to <i>Step 3</i>	Go to <i>Step 8</i>
3	<ol style="list-style-type: none"> <li>1. Turn the ignition OFF.</li> <li>2. Connect a test light between the fuel pump relay connector terminal 85 and ground.</li> <li>3. Turn the ignition ON.</li> <li>4. With the ignition ON, the test light should light for the time specified.</li> </ol> Is the test light on?	2 sec	Go to <i>Step 4</i>	Go to <i>Step 9</i>
4	<ol style="list-style-type: none"> <li>1. Turn the ignition OFF.</li> <li>2. Connect a test light between the fuel pump relay connector terminal 30 and ground.</li> </ol> Is the test light on?		Go to <i>Step 5</i>	Go to <i>Step 11</i>
5	Check for an open or short to ground in the wire between the fuel pump relay connector terminal 87 and the fuel cutoff switch terminal 1. Is the problem found?		Go to <i>Step 6</i>	Go to <i>Step 7</i>
6	<ol style="list-style-type: none"> <li>1. Repair the wire between the fuel pump relay connector terminal 87 and the fuel cutoff switch terminal 1.</li> <li>2. Install the fuel pump relay.</li> <li>3. Turn the ignition OFF for 10 seconds.</li> <li>4. Turn the ignition ON.</li> </ol> Does the fuel pump operate for the time specified?	2 sec	System OK	
7	<ol style="list-style-type: none"> <li>1. Replace the fuel pump relay.</li> <li>2. Turn the ignition OFF for 10 seconds.</li> <li>3. Turn the ignition ON.</li> </ol> Does the fuel pump operate for the time specified?	2 sec	System OK	
8	Check for an open wire between the fuel pump relay connector terminal 86 and the ignition 1 relay connector terminal 86. Is the problem found?		Go to <i>Step 13</i>	Go to "Ignition 1 Relay Circuit Check"
9	Check for an open wire between the fuel pump relay connector terminal 85 to the Engine Control Module (ECM) connector terminal E13. Is the problem found?		Go to <i>Step 10</i>	Go to <i>Step 12</i>

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Step	Action	Value(s)	Yes	No
10	1. Repair the wire between the fuel pump relay connector terminal 85 to the ECM connector terminal E13. 2. Install the fuel pump relay. 3. Turn the ignition OFF for 10 seconds. 4. Turn the ignition ON. Does the fuel pump operate for the time specified?	2 sec	System OK	
11	1. Repair the wire between the fuel pump relay connector terminal 30 and the battery. 2. Install the fuel pump relay. 3. Turn the ignition OFF for 10 seconds. 4. Turn the ignition ON. Does the fuel pump operate for the time specified?	2 sec	System OK	
12	1. Replace the ECM. 2. Turn the ignition OFF for 10 seconds. 3. Turn the ignition ON. Does the fuel pump operate for the time specified?	2 sec	System OK	
13	Repair the wire between the fuel pump relay connector terminal 86 and the ignition 1 relay connector terminal 86. Is the repair complete?		System OK	