Idle Air Control (IAC) System Diagnosis

Circuit Description

The idle air control (IAC) valve is located in the throttle body. It consists of a movable pintle, driven by a gear attached to an electric motor called a stepper motor. The IAC valve motor is a two phase bi-polar permanent magnet stepper motor that is capable of highly accurate rotation, or movement, every time the polarity of a winding is changed. This change in polarity can be seen when observing a test lamp connected between ground or B+ and an IAC valve circuit while the powertrain control module (PCM) is attempting to change engine RPM (the test lamp will flash on or off each time the polarity is changed). The PCM does not use a physical sensor to determine IAC pintle position, but uses a predicted number of counts, one count represents one change in polarity which equals one step of the stepper motor. The PCM counts the steps it has commanded to determine IAC pintle position. The PCM uses the IAC valve to control engine idle speed. It does this by changing the pintle position in the idle air passage of the throttle body. This varies the air flow around the throttle plate when the throttle is closed. To determine the desired position of the IAC pintle at idle or during deceleration, the PCM refers to the following inputs: engine RPM, battery voltage, air temperature, engine coolant temperature (ECT), throttle position sensor (TPS) angle, engine load, and vehicle speed. When the ignition key is turned OFF, after an ignition cycle, the PCM will first seat the IAC pintle in the air bypass bore and then retract it a predetermined amount of counts to allow the proper amount of air to bypass the throttle plate for engine start-up. This procedure is known as an IAC Reset.

Diagnostic Aids

Inspect for the following conditions:

- A skewed high throttle position (TP) sensor
- Restricted air intake system
- Objects blocking the IAC passage or throttle bore.
- The correct positive crankcase ventilation (PCV) valve, properly installed and proper operation of the PCV valve.
- Proper operation and installation of all air intake components.
- Proper installation and operation of the mass air flow (MAF) sensor (if equipped).
- A tampered with or damaged throttle stop screw.
- A tampered with or damaged throttle plate, throttle shaft, throttle linkage, or cruise control linkage (if equipped).
- Excessive deposits in the IAC passage or on the IAC pintle.
- Excessive deposits in the throttle bore or on the throttle plate.
- Vacuum leaks.
- Excessive load on engine i.e. transmission, power steering, alternator, etc.
- A high or unstable idle condition could be caused by a non-IAC system problem that can not be overcome by the IAC valve. Refer to Symptoms - Engine Controls.
- A low or unstable idle condition could be caused by a non-IAC system problem that can not be overcome by the IAC valve. Refer to Symptoms - Engine Controls.
- If the problem is determined to be intermittent, refer to the Intermittent Conditions table in Symptoms - Engine Controls.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

5. This test will determine the ability of the PCM and IAC valve circuits to control the IAC valve.
7. This test will determine the ability of the PCM to provide the IAC valve circuits with a ground. On a normally operating system, the test lamp should not flash while the IAC counts are incrementing.

### Idle Air Control (IAC) System Diagnosis

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Did you perform the Diagnostic System Check-Engine Controls?</td>
<td>Go to Step 2</td>
<td>Go to Diagnostic System Check - Engine Controls</td>
</tr>
</tbody>
</table>

**Important**

Ensure engine speed stabilizes with each commanded RPM change to determine if engine speed stays within 100 RPM of the commanded RPM.

1. Set the parking brake and block the drive wheels.
2. Install a scan tool.
3. Start the engine.
4. Turn OFF all accessories.
5. With the scan tool RPM control function, slowly increment engine speed to 1,700 RPM, then to 600 RPM, Then to 1,700 RPM.
6. Exit the RPM control function.

Did the engine speed stabilize within 100 RPM of the commanded RPM during the above test?

1. Turn OFF the ignition.
2. Disconnect the IAC valve harness connector.
3. Connect an **J 37027-A** IAC motor driver to the IAC valve.
4. Start the engine.
5. With the IAC motor driver, command the IAC valve in until near 600 RPM is reached.
6. With the IAC motor driver, command the IAC valve out until near 1,700 RPM is reached.
7. Return engine speed to desired idle as indicated on the scan tool data list.

Did the engine speed steadily decrease to near 600 RPM and steadily increase to near 1,700 RPM when the IAC valve was commanded in and out?

1. With a test lamp connected to ground, probe one of the IAC valve circuits at the IAC valve harness connector using **J 35616-A** Connector Test Adaptor Kit.
2. Start the engine.
3. With the IAC motor driver, command low RPM while observing a scan tool until the IAC Counts start to increment.
4. With the IAC motor driver, command high RPM while observing a scan tool until the IAC Counts start to increment.
5. While the IAC Counts are incrementing observe the test lamp.
6. Return engine speed to desired idle as indicated on the scan tool data list.
7. Repeat the above procedure for the other three IAC valve circuits.

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*Schematic Reference: MAF and IAC Signals*
<table>
<thead>
<tr>
<th>Step</th>
<th>Instruction</th>
<th>Next Step 1</th>
<th>Next Step 2</th>
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</thead>
<tbody>
<tr>
<td>6</td>
<td>Did the test lamp remain ON (never flashing) while the IAC Counts where incrementing at any of the IAC valve circuits during the above test?</td>
<td>Go to Step 10</td>
<td>Go to Step 6</td>
</tr>
</tbody>
</table>
| 7    | 1. Connect a test lamp between the IAC coil A low circuit and the IAC coil A high circuit at the IAC valve harness connector using J35616-A Connector Test Adaptor Kit.  
2. With the IAC motor driver, command low RPM while observing a scan tool until the IAC Counts start to increment.  
3. With the IAC motor driver, command high RPM while observing a scan tool until the IAC Counts start to increment.  
4. While the IAC Counts are incrementing observe the test lamp.  
5. Return engine speed to desired idle as indicated on the scan tool data list.  
6. Repeat the above procedure with the test lamp connected between the IAC coil B low circuit and the IAC coil B high circuit at the IAC valve harness connector. | Go to Step 8 | Go to Step 16 |
| 8    | Did the test lamp remain OFF (never flashing) while the IAC Counts where incrementing at any of the IAC valve circuits during the above test? | Go to Step 9 | Go to Step 7 |
| 9    | 1. Turn OFF the ignition.  
2. Disconnect the PCM harness connectors.  
3. With a DMM, test for an open or short to ground on the IAC valve circuit where the test lamp remained off. Refer to Circuit Testing and Wiring Repairs in Wiring Systems. | Go to Step 17 | Go to Diagnostic Aids |
| 10   | 1. Turn ON the ignition.  
2. With a DMM, test for a short to voltage on the IAC valve circuit where the test lamp remained illuminated. Refer to Circuit Testing and Wiring Repairs in Wiring Systems. | Go to Step 17 | Go to Step 13 |
| 11   | 1. Visually/Physically inspect for the following:  
   o Throttle body damage and tampering.  
   o Skewed TP sensor signal.  
   o Throttle lever screw tampering (if equipped).  
   o Vacuum leaks.  
   o Faulty, incorrectly installed PCV valve and hose (if equipped).  
   o Throttle shaft binding.  
   o Throttle linkage or Cruise Control linkage binding (if equipped).  
2. Remove the IAC Valve. Idle Air Control (IAC) Valve Replacement.  
   o Inspect for debris in the IAC passage. | Go to Step 17 | Go to Step 13 |
<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
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</table>
| 12   | Visually/Physically inspect for the following:  
|     | o Throttle Body damage and tampering, Throttle lever screw tampering (if equipped).  
|     | o Restricted air intake system. Inspect for a possible collapsed/clogged air intake duct (before and after the air filter element), restricted air filter element, restriction at the throttle body intake screen (if equipped).  
|     | o Excessive deposits on the throttle plate.  
|     | o Excessive deposits in the throttle bore.  
|     | o Remove the IAC Valve and inspect for excessive deposits on the IAC Valve pintle and in the IAC valve passage.  
|     | o Repair any of the above conditions as necessary. Refer to the appropriate repair procedure.  
|     | Did you find and correct the condition?  
|     | Go to Step 17 | Go to Step 14 |
| 13   | Inspect for a poor connection at the PCM harness connectors. Refer to Testing for Intermittent and Poor Connections and Connector Repairs in Wiring Systems.  
|     | Did you find and correct the condition?  
|     | Go to Step 17 | Go to Step 14 |
| 14   | Inspect for a poor connection at the IAC Valve harness connector. Refer to Testing for Intermittent and Poor Connections and Connector Repairs in Wiring Systems.  
|     | Did you find and correct the condition?  
|     | Go to Step 17 | Go to Step 15 |
| 15   | Replace the IAC valve. Refer to Idle Air Control (IAC) Valve Replacement.  
|     | Did you complete the replacement?  
|     | Go to Step 17 | -- |
| 16   | Replace the PCM. Refer to Powertrain Control Module (PCM) Replacement and Powertrain Control Module (PCM) Programming.  
|     | Did you complete the replacement?  
|     | Go to Step 17 | -- |
| 17   | 1. Use the scan tool in order to clear any DTCs that may have set.  
|     | 2. Turn OFF the ignition for 30 seconds.  
|     | 3. Operate the vehicle within conditions to verify the repair.  
|     | Did you verify the repair?  
|     | Go to Step 18 | Go to Step 2 |
| 18   | With a scan tool observe the stored information, Capture info.  
|     | Does the scan tool display any DTCs that you have not diagnosed?  
|     | Go to Diagnostic Trouble Code (DTC) List | System OK |