

# Computers and Control Systems: Pinpoint Tests

## HE - Exhaust Gas Recirculation (EGR) Systems

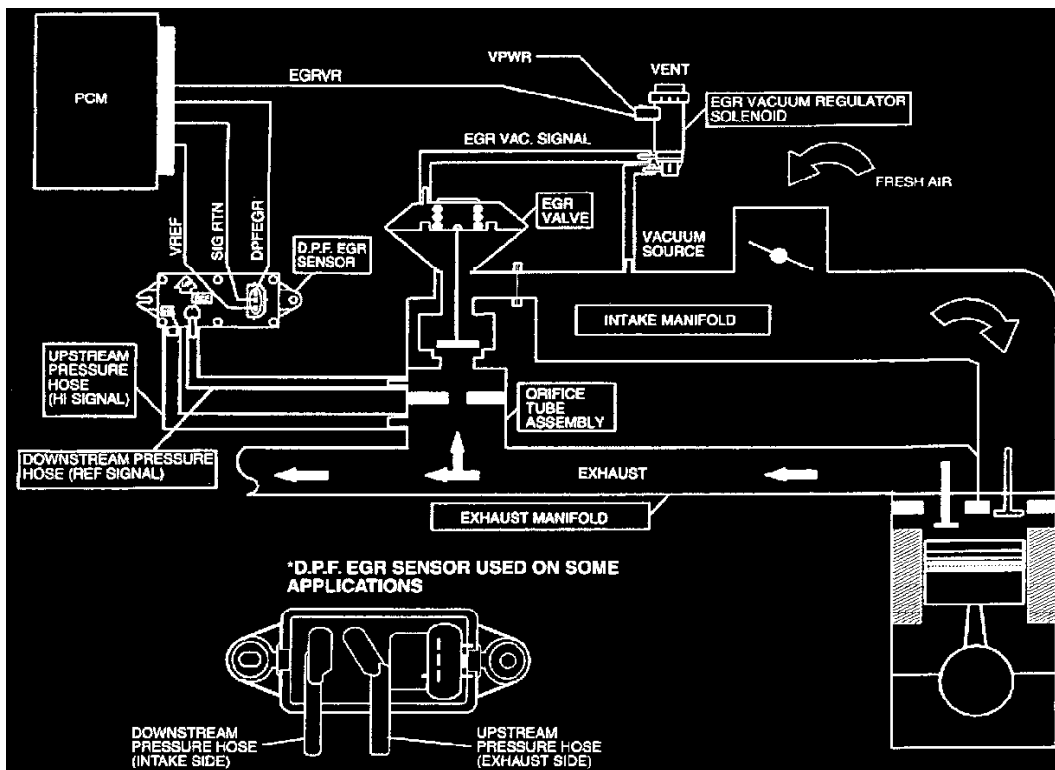
### Test Notes

Enter this pinpoint test only when directed here.

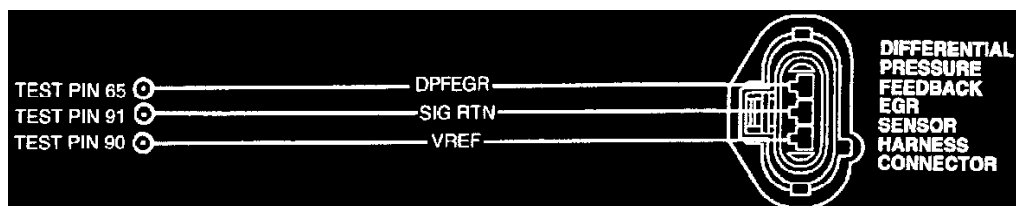
This pinpoint test is intended to diagnose the following:

- Differential Pressure Feedback EGR Sensor
- Exhaust Gas Recirculation (EGR) Valve
- EGR Vacuum Regulator Solenoid
- Orifice Tube Assembly
- Differential Pressure Feedback EGR Sensor Pressure Hoses
- Vacuum Lines
- Harness Circuits: VREF, DPFE, SIG, SIG RTN, EVR, EVR PWR
- Powertrain Control Module

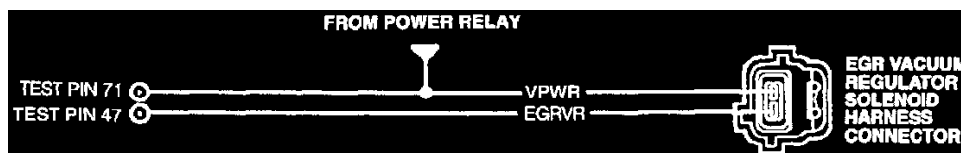
### Pinpoint Test Schematics



System Schematic



DPFE Sensor Connector



EGR Vacuum Regulator Solenoid Connector

## DPFE Sensor Identification

0.55 (+0.25/-0.2) Voltage Offset	1.0 (+0.25/-0.25) Voltage Offset
Aluminum Housing (F48E-9J460-BB)	Aluminum Housing (F7UE-9J460-AA) Black Plastic (F77E-9J460-AB)
Continental 5.0L Explorer/Mountaineer 4.6L F-Series and Expedition 4.6L E-Series	All other applications

The differential pressure feedback EGR sensor will either have an aluminum housing or a black plastic housing depending on the application. Also, sensors will have either a **0.55 voltage** offset or **1.0 voltage** offset (the voltage offset refers to the sensor key ON engine OFF voltage). Refer to the table to identify the sensor for your application when performing Pinpoint Test HE. The part numbers shown in the table are engineering part numbers stamped on the sensor.

Test Step		Result	Action to Take
<b>HE1</b>	<b>DTC P1400: VERIFY DIFFERENTIAL PRESSURE FEEDBACK EGR (D.P.F. EGR) VOLTAGE</b>		
	Diagnostic Trouble Code (DTC) P1400 indicates that Self-Test has detected a DPFEGR circuit input below the minimum. Possible causes: <ul style="list-style-type: none"> <li>— Leaking upstream pressure hose.</li> <li>— DPFEGR shorted to GND or SIG RTN.</li> <li>— VREF shorted to GND or SIG RTN.</li> <li>— Damaged D.P.F. EGR sensor.</li> <li>— Damaged PCM.</li> <li>● Key on, engine off.</li> <li>● Access DPFEGR PID with a scan tool.</li> <li>● Key off.</li> <li>● Was DPFEGR PID voltage less than 0.2 volt?</li> </ul>	<p>Yes ▶ The D.P.F. EGR sensor voltage is less than the acceptable minimum. GO to <b>HE2</b>.</p> <p>No ▶ INSPECT pressure signal hoses for leaks. REPAIR as necessary. If OK, fault that produced DTC P1400 is intermittent. GO to <b>HE6</b>.</p>	
<b>HE2</b>	<b>INDUCE OPPOSITE D.P.F. EGR SENSOR VOLTAGE</b>		
	<ul style="list-style-type: none"> <li>● Disconnect D.P.F. EGR sensor vehicle harness connector.</li> <li>● Connect a jumper wire between VREF and DPFEGR circuits at the D.P.F. EGR sensor harness connector.</li> <li>● Key on, engine off.</li> </ul> <p>NOTE: If a Scan Tool communication concern exists, remove jumper immediately and go directly to <b>HE3</b>.</p> <ul style="list-style-type: none"> <li>● Access DPFEGR PID with a Scan Tool.</li> <li>● Is DPFEGR PID value between 4.0 and 6.0 volts?</li> </ul>	<p>Yes ▶ REPLACE damaged D.P.F. EGR sensor. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.</p> <p>No ▶ REMOVE jumper. GO to <b>HE3</b>.</p>	
<b>HE3</b>	<b>CHECK VOLTAGE BETWEEN VREF AND SIGRTN CIRCUITS TO D.P.F. EGR SENSOR</b>		
	<ul style="list-style-type: none"> <li>● Measure voltage between VREF and SIG RTN circuits at the D.P.F. EGR sensor harness connector.</li> <li>● Key off.</li> <li>● Was VREF voltage between 4.0 and 6.0 volts?</li> </ul>	<p>Yes ▶ GO to <b>HE4</b>.</p> <p>No ▶ VREF voltage is out of range. GO to Pinpoint Test Step <b>C1</b>.</p>	

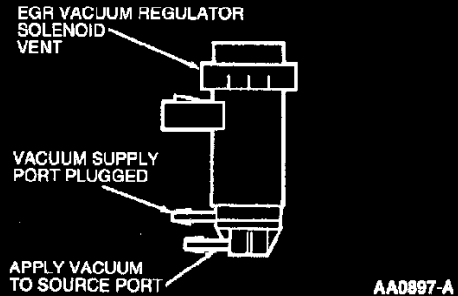
Test Step		Result	Action to Take
<b>HE4</b>	<b>CHECK DPFEGR CIRCUIT FOR SHORT TO GROUND AND SIG RTN IN HARNESS</b>		
	<ul style="list-style-type: none"> <li>● Disconnect Scan Tool from DLC.</li> <li>● Install breakout box, leave PCM disconnected.</li> <li>● Measure resistance between PCM Test Pin 65 and PCM Test Pins 51, 91 and 103.</li> <li>● <b>Is each resistance greater than 10,000 ohms?</b></li> </ul>	<p>Yes</p> <p>No</p>	<p>▶ REPLACE damaged PCM. RESTORE vehicle. RERUN Quick Test.</p> <p>▶ REPAIR short circuit. RESTORE vehicle. RERUN Quick Test.</p>
<b>HE6</b>	<b>WIGGLE TEST D.P.F. EGR SENSOR AND HARNESS</b>		
	<ul style="list-style-type: none"> <li>● Key on, engine off.</li> <li>● Access DPFEGR PID with a Scan Tool.</li> <li>● Observe DPFEGR PID for an indication of a fault while performing the following: <ul style="list-style-type: none"> <li>— Lightly tap on D.P.F. EGR sensor. Wiggle the D.P.F. EGR sensor connector and harness between sensor and PCM. A fault is indicated by a sudden change in DPFEGR PID voltage.</li> </ul> </li> <li>● <b>Is a fault indicated?</b></li> </ul>	<p>Yes</p> <p>No</p>	<p>▶ ISOLATE fault and REPAIR as necessary. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test</p> <p>▶ Unable to duplicate or identify fault at this time. GO to Pinpoint Test Step <b>Z1</b> with the following data: DPFEGR and EGRVR PIDs and list of Possible causes.</p>
<b>HE10</b>	<b>DTC P1401: VERIFY DIFFERENTIAL PRESSURE FEEDBACK EGR SENSOR VOLTAGE</b>		
	<p>Diagnostic Trouble Code (DTC) P1401 indicates that Self-Test has detected DPFEGR circuit input above the maximum.</p> <p>Possible causes:</p> <ul style="list-style-type: none"> <li>— DPFEGR open.</li> <li>— DPFEGR shorted to VREF or PWR.</li> <li>— VREF shorted to PWR.</li> <li>— SIG RTN open.</li> <li>— Damaged D.P.F. EGR sensor.</li> <li>— Damaged PCM.</li> <li>● Key on, engine off.</li> <li>● Access DPFEGR PID with a scan tool.</li> <li>● Key off.</li> <li>● <b>Was DPFEGR PID voltage greater than 4.0 volts?</b></li> </ul>	<p>Yes</p> <p>No</p>	<p>▶ The D.P.F. EGR sensor voltage is greater than the acceptable maximum. GO to <b>HE11</b>.</p> <p>▶ The fault that produced DTC P1401 is intermittent. GO to <b>HE19</b>.</p>
<b>HE11</b>	<b>CHECK DPFEGR CIRCUIT FOR SHORT TO PWR</b>		
	<ul style="list-style-type: none"> <li>● Disconnect D.P.F. EGR sensor.</li> <li>● Key on, engine off.</li> <li>● Measure DPFEGR circuit voltage at the D.P.F. EGR sensor harness connector.</li> <li>● Key off.</li> <li>● <b>Was voltage greater than 10.5 volts?</b></li> </ul>	<p>Yes</p> <p>No</p>	<p>▶ The D.P.F. EGR sensor voltage input is indicating a short to PWR. GO to <b>HE12</b>.</p> <p>▶ GO to <b>HE13</b>.</p>

Test Step		Result	Action to Take
<b>HE 12</b>	<b>CHECK DPFEGR CIRCUIT FOR SHORT TO PWR IN HARNESS</b>		
	<ul style="list-style-type: none"> <li>● D.P.F. EGR sensor disconnected.</li> <li>● Install breakout box, leave PCM disconnected.</li> <li>● Key on, engine off.</li> <li>● Measure voltage between PCM Test Pin 65 and PCM Test Pins 51 and 103.</li> <li>● Key off.</li> <li>● <b>Was voltage greater than 10.5 volts?</b></li> </ul>	Yes  No	REPAIR short circuit. RESTORE vehicle. RERUN Quick Test.  REPLACE damaged PCM. RESTORE vehicle. RERUN Quick Test.
<b>HE 13</b>	<b>INDUCE OPPOSITE D.P.F. EGR SENSOR VOLTAGE</b>		
	<ul style="list-style-type: none"> <li>● Connect a jumper wire between DPFEGR and SIG RTN circuits at the D.P.F. EGR sensor harness connector.</li> <li>● Key on, engine off.</li> </ul> <p>NOTE: If a scan tool communication concern exists, remove jumper immediately and go directly to <b>HE 18</b>.</p> <ul style="list-style-type: none"> <li>● Access DPFEGR PID with a scan tool.</li> <li>● Key off.</li> <li>● <b>Was DPFEGR PID voltage less than 0.05 volt?</b></li> </ul>	Yes No	REMOVE jumper. GO to <b>HE 14</b> .  Unable to induce opposite signal. GO to <b>HE 16</b> .
<b>HE 14</b>	<b>CHECK VREF VOLTAGE TO D.P.F. EGR SENSOR</b>		
	<ul style="list-style-type: none"> <li>● Key on, engine off.</li> <li>● Measure voltage between VREF and SIG RTN circuits at the D.P.F. EGR sensor harness connector.</li> <li>● Key off.</li> <li>● <b>Was VREF voltage between 4.0 and 6.0 volts?</b></li> </ul>	Yes No	GO to <b>HE 15</b> .  VREF voltage is out of range. GO to Pinpoint Test Step <b>C1</b> .
<b>HE 15</b>	<b>CHECK DPFEGR CIRCUIT FOR SHORT TO VREF IN HARNESS</b>		
	<ul style="list-style-type: none"> <li>● Install breakout box, leave PCM disconnected.</li> <li>● Measure voltage between PCM Test Pins 65 and 90.</li> <li>● <b>Is voltage less than 1.0 volt?</b></li> </ul>	Yes  No	REPLACE damaged D.P.F. EGR sensor. RESTORE vehicle. RERUN Quick Test.  REPAIR short circuit. RESTORE vehicle. RERUN Quick Test.
<b>HE 16</b>	<b>CHECK DPFEGR CIRCUIT FOR OPEN IN HARNESS</b>		
	<ul style="list-style-type: none"> <li>● Install breakout box, leave PCM disconnected.</li> <li>● Measure resistance of DPFEGR circuit between PCM Test Pin 65 and D.P.F. EGR sensor harness connector.</li> <li>● <b>Is resistance less than 5.0 ohms?</b></li> </ul>	Yes No	GO to <b>HE 17</b> .  REPAIR open circuit. RESTORE vehicle. RERUN Quick Test.

Test Step		Result	Action to Take
HE17	CHECK SIG RTN CIRCUIT FOR OPEN IN HARNESS	Yes	REPLACE damaged PCM. RESTORE vehicle. RERUN Quick Test.
	<ul style="list-style-type: none"> <li>Measure resistance of SIG RTN circuit between PCM Test Pin 91 and D.P.F. EGR sensor harness connector.</li> <li>Is resistance less than 5.0 ohms?</li> </ul>	No	REPAIR open circuit. RESTORE vehicle. RERUN Quick Test.
HE18	CHECK DPFEGR CIRCUIT FOR SHORT TO VREF IN HARNESS	Yes	REPLACE damaged PCM. RESTORE vehicle. RERUN Quick Test.
	<ul style="list-style-type: none"> <li>Install breakout box, leave PCM disconnected.</li> <li>Measure voltage between PCM Test Pins 65 and 90.</li> <li>Is voltage less than 1.0 volt?</li> </ul>	No	REPAIR short circuit. RESTORE vehicle. RERUN Quick Test.
HE19	WIGGLE TEST D.P.F. EGR SENSOR AND HARNESS	Yes	ISOLATE fault and REPAIR as necessary. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.
	<ul style="list-style-type: none"> <li>Key on, engine off.</li> <li>Access DPFEGR PID with a scan tool.</li> <li>Observe DPFEGR PID for an indication of a fault while performing the following: <ul style="list-style-type: none"> <li>Lightly tap on D.P.F. EGR sensor; wiggle the D.P.F. EGR sensor connector and harness between sensor and PCM. A fault is indicated by a sudden change in DPFEGR PID voltage.</li> </ul> </li> <li>Is a fault indicated?</li> </ul>	No	Unable to duplicate or identify fault at this time. GO to Pinpoint Test Step [Z1] with the following data: DPFEGR and EGRVR PIDS and list of Possible causes.

Test Step		Result	Action to Take
<b>HE20</b>	<b>DTC P0402: CHECK FOR EGR FLOW AT IDLE WITH EGR VACUUM HOSE DISCONNECTED</b>		
	<p>Diagnostic Trouble Code (DTC) P0402 indicates that Self-Test has detected EGR flow at idle.</p> <p>NOTE: If DTC P 1405 is in continuous memory, diagnose that first starting with HE50.</p> <p>Possible causes:</p> <ul style="list-style-type: none"> <li>— EGR valve stuck open.</li> <li>— EGR vacuum regulator solenoid vent plugged or iced.</li> <li>— EGRVR circuit shorted to GND.</li> <li>— EGRVR circuit shorted to VREF.</li> <li>— Improper vacuum hose connection.</li> <li>— Plugged / pinched EGR vacuum regulator Solenoid vacuum hose.</li> <li>— Plugged EGR tube.</li> <li>— Damaged EGR vacuum regulator solenoid.</li> <li>— Pinched / iced pressure hoses.</li> <li>— Damaged differential pressure feedback EGR (D.P.F. EGR) sensor.</li> <li>— Damaged PCM.</li> <li>● Disconnect vacuum hose at EGR valve and plug hose.</li> <li>● Run Key On Engine Running (KOER) Self-Test.</li> <li>● Key off.</li> <li>● Was KOER DTC P0402 output or unable to run KOER Self-Test due to engine stall or no start?</li> </ul>	<p>Yes</p> <p>No</p>	<p>▶ There is possible EGR flow at idle. INSPECT pressure hoses first for pinching and icing. If OK, REMOVE and INSPECT the EGR valve and EGR tube for signs of contamination, unusual wear, carbon deposits, binding and other damage. REPAIR as necessary. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.</p> <p>▶ RECONNECT vacuum hose to EGR valve. GO to <b>HE21</b>.</p>
<b>HE21</b>	<b>CHECK FOR EGR FLOW AT IDLE WITH EGR VACUUM HOSE CONNECTED</b>		
	<ul style="list-style-type: none"> <li>● EGR vacuum hose connected.</li> <li>● Run KOER Self-Test.</li> <li>● Key off.</li> <li>● Was KOER DTC P0402 output or unable to run KOER Self-Test due to engine stall or no start?</li> </ul>	<p>Yes</p> <p>No</p>	<p>▶ There is possible EGR flow at idle. GO to <b>HE22</b>.</p> <p>▶ The fault that produced DTC P0402 is intermittent. INSPECT pressure hoses for pinching and icing. REPAIR as necessary. If OK, GO to <b>HE30</b>.</p>
<b>HE22</b>	<b>CHECK EGR SYSTEM VACUUM HOSES FOR INTEGRITY AND CONNECTION</b>		
	<p>NOTE: A pinched or plugged EGR vacuum hose can trap vacuum between the EGR vacuum regulator solenoid and EGR valve not allowing the EGR valve to close.</p> <ul style="list-style-type: none"> <li>● Trace each vacuum hose from EGR vacuum regulator solenoid and verify that each hose is connected correctly. (Refer to vehicle vacuum diagram label.)</li> <li>● Verify that the EGR valve vacuum hose is not pinched or plugged and routed properly.</li> <li>● Are vacuum hoses OK?</li> </ul>	<p>Yes</p> <p>No</p>	<p>▶ RECONNECT vacuum hoses. GO to <b>HE23</b>.</p> <p>▶ REPAIR vacuum hoses as necessary. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.</p>

	Test Step	Result	Action to Take
HE23	<p><b>CHECK D.P.F. EGR SENSOR OUTPUT BY APPLYING VACUUM WITH HAND PUMP</b></p> <ul style="list-style-type: none"> <li>● Disconnect pressure hoses at D.P.F. EGR sensor.</li> <li>● Connect a hand vacuum pump to the downstream connection at sensor (intake manifold side of sensor or the smaller diameter pickup tube).</li> <li>● Key on, engine off.</li> <li>● Access DPFEGR PID with a scan tool and note PID value.</li> <li>● Apply 27 to 30 kPa (8 to 9 in-Hg) vacuum to the D.P.F. EGR sensor and hold for a few seconds.</li> <li>● Quickly release vacuum.</li> </ul> <p>NOTE: For D.P.F. EGR sensor applications, refer to the Description in the front of this test.</p> <ul style="list-style-type: none"> <li>● <b>For applications with 1.0 voltage offset D.P.F. EGR sensor:</b> <ul style="list-style-type: none"> <li>— The DPFEGR PID voltage must be between 0.75 and 1.25 volt with the key on and no vacuum applied.</li> <li>— The DPFEGR PID voltage must increase to greater than 4.0 volts with the vacuum applied.</li> <li>— The DPFEGR PID must drop to less than 1.5 volts in less than 3 seconds when vacuum is released.</li> </ul> </li> <li>● <b>For applications with 0.55 voltage offset D.P.F. EGR sensor:</b> <ul style="list-style-type: none"> <li>— The DPFEGR PID voltage must be between 0.35 and 0.8 volt with the key on and no vacuum applied.</li> <li>— The DPFEGR PID voltage must increase to greater than 4.0 volts with the vacuum applied.</li> <li>— The DPFEGR PID must drop to less than 1.0 volt in less than 3 seconds when vacuum is released.</li> </ul> </li> <li>● <b>Does the DPFEGR PID voltage indicate a fault in the D.P.F. EGR sensor?</b></li> </ul>	<p>Yes</p> <p>No</p>	<p>▶ REPLACE damaged D.P.F. EGR sensor. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.</p> <p>▶ RECONNECT D.P.F. EGR sensor. GO to <b>HE24</b>.</p>
HE24	<p><b>CHECK FOR EGR FLOW AT IDLE WITH EGR VACUUM REGULATOR SOLENOID CONNECTOR OFF</b></p> <ul style="list-style-type: none"> <li>● Disconnect vacuum hose at EGR valve and connect hose to vacuum gauge.</li> <li>● Start engine and bring to an idle.</li> <li>● While monitoring vacuum gauge, disconnect the EGR vacuum regulator solenoid harness connector. <ul style="list-style-type: none"> <li>— The EGR valve requires vacuum greater than 5.4 kPa (1.6 in-Hg) to begin to open. If the vacuum reading remains greater than 5.4 kPa (1.6 in-Hg) after the EGR vacuum regulator solenoid is electrically disconnected, this would indicate a mechanical fault in the EGR vacuum regulator solenoid.</li> </ul> </li> <li>● Key off.</li> <li>● <b>Did the EGR vacuum remain greater than 5.4 kPa (1.6 in-Hg) at idle even after EGR vacuum regulator solenoid is electrically disconnected?</b></li> </ul>	<p>Yes</p> <p>No</p>	<p>▶ This indicates a fault in the EGR vacuum regulator solenoid. GO to <b>HE25</b>.</p> <p>▶ GO to <b>HE26</b>.</p>

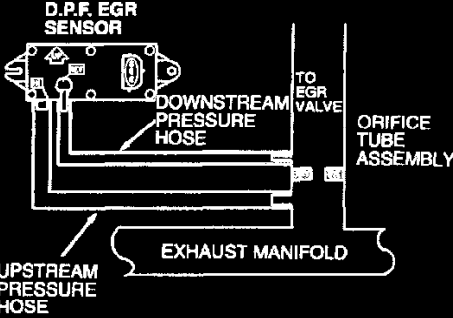
Test Step		Result	Action to Take
<b>HE25</b>	<b>INSPECT EGR VACUUM REGULATOR SOLENOID VENT FOR PLUGGING</b>		
	<p>NOTE: A plugged EGR vacuum regulator solenoid vent will not allow EGR vacuum to vent to atmosphere.</p> <ul style="list-style-type: none"> <li>Disconnect EGR vacuum regulator solenoid vacuum hoses.</li> <li>Remove EGR vacuum regulator solenoid vent cap (if removable).</li> <li>Remove filter and inspect for blockage or icing in some cases.</li> <li>With the EGR vacuum supply port plugged, apply 34 to 51 kPa (10 to 15 in-Hg) of vacuum directly to EGR vacuum regulator solenoid vacuum source port with a hand vacuum pump. If the vacuum holds or is slow to release to atmosphere, the EGR vacuum regulator solenoid vent could be plugged or restricted.</li> </ul>  <p>AA0897-A</p> <ul style="list-style-type: none"> <li>Is the EGR vacuum regulator solenoid vent or vent filter plugged or restricted?</li> </ul>	<p>Yes</p> <p>No</p>	<p>REPAIR EGR vacuum regulator solenoid as necessary. If unable to repair, REPLACE EGR vacuum regulator solenoid. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.</p> <p>REPLACE damaged EGR vacuum regulator solenoid. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.</p>
<b>HE26</b>	<b>MEASURE EGR VACUUM REGULATOR SOLENOID COIL RESISTANCE</b>		
	<ul style="list-style-type: none"> <li>Measure resistance across EGR vacuum regulator solenoid.</li> <li>Is resistance between 26 and 40 ohms?</li> </ul>	<p>Yes</p> <p>No</p>	<p>GO to <b>HE27</b>.</p> <p>REPLACE damaged EGR vacuum regulator solenoid. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.</p>
<b>HE27</b>	<b>CHECK EGRVR CIRCUIT FOR SHORT TO GROUND IN HARNESS</b>		
	<ul style="list-style-type: none"> <li>Disconnect scan tool from DLC.</li> <li>Install breakout box, leave PCM disconnected.</li> <li>Measure resistance between PCM Test Pin 47 and PCM Test Pins 51 and 103.</li> <li>Is resistance greater than 10,000 ohms?</li> </ul>	<p>Yes</p> <p>No</p>	<p>GO to <b>HE28</b>.</p> <p>REPAIR short circuit. RESTORE vehicle. RERUN Quick Test.</p>



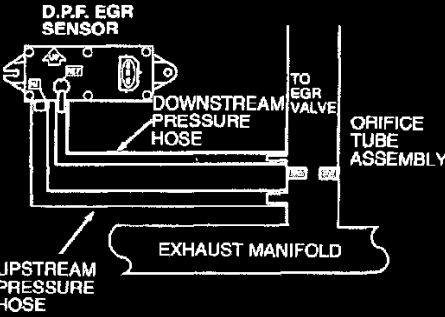
Test Step		Result	Action to Take
<b>HE28</b>	<b>CHECK EGRVR CIRCUIT FOR SHORT TO VREF</b>		
	<ul style="list-style-type: none"> <li>Measure resistance between PCM Test Pin 47 (EGRVR) and Test Pin 90 (VREF) at the breakout box.</li> <li>Is resistance greater than 10,000 ohms?</li> </ul>	Yes	REPLACE damaged PCM. RESTORE vehicle. RERUN Quick Test.
		No	REPAIR short circuit. RESTORE vehicle. RERUN Quick Test.
<b>HE30</b>	<b>CHECK D.P.F. EGR SENSOR OUTPUT BY APPLYING VACUUM WITH HAND PUMP</b>		
	<ul style="list-style-type: none"> <li>Disconnect pressure hoses at D.P.F. EGR sensor.</li> <li>Connect a hand vacuum pump to the downstream connection at sensor (intake manifold side of sensor or the smaller diameter pickup tube).</li> <li>Key on, engine off.</li> <li>Access DPFEGR PID with a scan tool and note PID value.</li> <li>Apply 27 to 30 kPa (8 to 9 in-Hg) vacuum to the D.P.F. EGR sensor and hold for a few seconds</li> <li>Quickly release vacuum.</li> </ul> <p>NOTE: For D.P.F. EGR sensor applications, refer to the Description in the front of this test.</p> <ul style="list-style-type: none"> <li><b>For applications with 1.0 voltage offset D.P.F. EGR sensor:</b> <ul style="list-style-type: none"> <li>The DPFEGR PID voltage must be between 0.75 and 1.25 volt with the key on and no vacuum applied.</li> <li>The DPFEGR PID voltage must increase to greater than 4.0 volts with the vacuum applied.</li> <li>The DPFEGR PID must drop to less than 1.5 volts in less than 3 seconds when vacuum is released.</li> </ul> </li> <li><b>For applications with 0.55 voltage offset D.P.F. EGR sensor:</b> <ul style="list-style-type: none"> <li>The DPFEGR PID voltage must be between 0.35 and 0.8 volt with the key on and no vacuum applied.</li> <li>The DPFEGR PID voltage must increase to greater than 4.0 volts with the vacuum applied.</li> <li>The DPFEGR PID must drop to less than 1.0 volt in less than 3 seconds when vacuum is released.</li> </ul> </li> <li>Key off.</li> <li>Did the DPFEGR PID voltage indicate a fault in the D.P.F. EGR sensor?</li> </ul>	Yes	REPLACE damaged D.P.F. EGR sensor. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.
		No	RECONNECT D.P.F. EGR sensor. GO to <b>HE31</b> .

Test Step		Result	Action to Take
<b>HE31</b>	<b>CHECK D.P.F. EGR SENSOR VOLTAGE WHILE EXERCISING EGR VALVE</b>		
	<ul style="list-style-type: none"> <li>● Key on, engine off.</li> <li>● View DPFEGR PID with a scan tool and make note of voltage.</li> <li>● For applications with 1.0 voltage offset D.P.F. EGR sensor:               <ul style="list-style-type: none"> <li>— Typical D.P.F. EGR sensor voltage with no EGR flow is between 0.75 and 1.25 volt.</li> </ul> </li> <li>● For applications with 0.55 voltage offset D.P.F. EGR sensor:               <ul style="list-style-type: none"> <li>— Typical D.P.F. EGR sensor voltage with no EGR flow is between 0.35 and 0.8 volt.</li> </ul> </li> <li>● Disconnect vacuum hose at EGR valve and plug hose.</li> <li>● Connect a hand vacuum pump to EGR valve.</li> <li>● Start engine and bring to idle.</li> <li>● Observe DPFEGR PID at idle and compare to the key on engine off voltage. (A higher voltage at idle could be due to a non-seating EGR valve.)</li> <li>● Apply just enough vacuum to EGR valve to open it 7-10 kPa (2-3 in-Hg) without stalling engine and release vacuum. Repeat several times while observing DPFEGR PID on scan tool. (DPFEGR PID voltage must increase as valve begins to open and return to initial value as vacuum is released. A slow to return voltage could be an indication of a binding or a slow-closing EGR valve.)</li> <li>● Key off.</li> <li>● <b>Did the DPFEGR PID voltage indicate an open, binding or slow-closing EGR valve?</b></li> </ul>	<p>Yes</p> <p>▶ REMOVE and INSPECT the EGR valve for signs of contamination, unusual wear, carbon deposits, binding and other damage. REPAIR as necessary. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.</p> <p>No</p> <p>▶ GO to <b>HE32</b>.</p>	

Test Step		Result	Action to Take
<b>HE32</b>	<b>MONITOR EGR VALVE VACUUM WHILE WIGGLING EGRVR CIRCUIT</b>		
	<p>NOTE: An intermittent short to GND in the EGRVR circuit will cause the vacuum applied to the EGR valve to be higher than normal while the short is present. The vacuum available at the EGR valve at idle is normally below 3.4 kPa (1.0 in-Hg) and it takes about 5.4 kPa (1.6 in-Hg) for the valve to begin to open.</p> <ul style="list-style-type: none"> <li>● Disconnect vacuum hose at EGR valve from hand vacuum pump and connect hose to a vacuum gauge.</li> <li>● Key on, engine running.</li> <li>● Observe vacuum gauge for an indication of a fault while performing the following:               <ul style="list-style-type: none"> <li>— Lightly tap on the EGR vacuum regulator solenoid; wiggle the EGR vacuum regulator solenoid connector and vehicle harness between solenoid and PCM. A fault is indicated by a sudden jump in vacuum reading.</li> </ul> </li> <li>● Key off.</li> <li>● <b>Was a fault indicated?</b></li> </ul>	<p>Yes</p> <p>▶ ISOLATE fault and REPAIR as necessary. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.</p> <p>No</p> <p>▶ RECONNECT vacuum hose. GO to <b>HE33</b>.</p>	
<b>HE33</b>	<b>INSPECT EGR VACUUM REGULATOR SOLENOID AND VACUUM HOSES FOR POTENTIAL PLUGGING</b>		
	<ul style="list-style-type: none"> <li>● Remove EGR vacuum regulator solenoid vent filter and inspect for contamination and excessive water absorption. (In cold climate, excessive water in filter could freeze and plug the EGR vacuum regulator solenoid vent.)</li> <li>● Inspect EGR vacuum hose for possible blockage or pinching.</li> <li>● Key off.</li> <li>● <b>Was EGR vacuum regulator solenoid vent or filter contaminated or vacuum hose plugged?</b></li> </ul>	<p>Yes</p> <p>▶ REPAIR EGR vacuum regulator solenoid or EGR vacuum hose as necessary. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.</p> <p>No</p> <p>▶ Unable to duplicate or identify fault at this time. GO to Pinpoint Test Step <b>Z1</b> with the following data: DPFEGR and EGRVR PIDs and list of Possible causes.</p>	

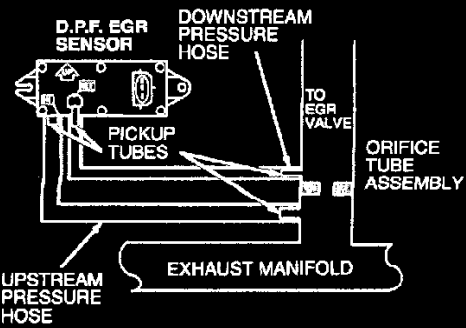
	Test Step	Result	Action to Take
HE50	<p><b>DTC P1405: INSPECT UPSTREAM PRESSURE HOSE CONNECTIONS</b></p> <p>Diagnostic Trouble Code (DTC) P1405 indicates that Continuous Memory Self-Test has detected the exhaust manifold side (upstream) differential pressure feedback D.P.F. EGR sensor pressure hose is off or plugged.</p> <p>Possible causes:</p> <ul style="list-style-type: none"> <li>— Improper upstream pressure hose connection.</li> <li>— Upstream pressure hose plugged.</li> <li>— Plugged or damaged pressure pickup tubes.</li> <li>● Inspect upstream hose at D.P.F. EGR sensor and orifice tube assembly for disconnect or poor connection.</li> <li>● <b>Is hose off or poorly connected?</b></li> </ul>  <p style="text-align: center;">A21168-B</p>	<p>Yes</p> <p>No</p>	<p>▶ REPAIR as necessary. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. COMPLETE EGR Monitor Repair Verification Drive Cycle. RERUN Quick Test.</p> <p>▶ GO to <b>HE51</b>.</p>
HE51	<p><b>INSPECT UPSTREAM PRESSURE HOSE FOR PLUGGING</b></p> <p>NOTE: It is essential that the D.P.F. EGR pressure hose used is the correct repair part and not a substitute.</p> <ul style="list-style-type: none"> <li>● Visually inspect upstream pressure hose routing. Hose must not be pinched or have dips in it where water could settle or freeze.</li> <li>● Remove upstream pressure hose and carefully inspect for plugging, water or leaks.</li> <li>● <b>Is there a fault detected in the hose?</b></li> </ul>	<p>Yes</p> <p>No</p>	<p>▶ REPAIR or REPLACE upstream pressure hose as necessary. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. COMPLETE EGR Monitor Repair Verification Drive Cycle. RERUN Quick Test.</p> <p>▶ GO to <b>HE52</b>.</p>
HE52	<p><b>CHECK ORIFICE TUBE ASSEMBLY AND D.P.F. EGR SENSOR</b></p> <ul style="list-style-type: none"> <li>● Inspect the connection marked HI on the D.P.F. EGR sensor for plugging or damage at the sensor.</li> <li>● Inspect the exhaust manifold side pressure pickup tube at the orifice tube assembly for plugging or damage.</li> <li>● <b>Is the D.P.F. EGR sensor or orifice tube assembly plugged or damaged?</b></li> </ul>	<p>Yes</p> <p>No</p>	<p>▶ REPAIR or REPLACE D.P.F. EGR sensor or orifice tube assembly as necessary. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. COMPLETE EGR Monitor Repair Verification Drive Cycle. RERUN Quick Test.</p> <p>▶ GO to <b>HE53</b>.</p>

Test Step		Result	Action to Take
<b>HES3</b>	<b>CHECK D.P.F. EGR SENSOR OUTPUT BY APPLYING VACUUM WITH HAND PUMP</b>		
	<ul style="list-style-type: none"> <li>● Disconnect pressure hoses at D.P.F. EGR sensor.</li> <li>● Connect a hand vacuum pump to the downstream connection at sensor (intake manifold side of sensor or the smaller diameter pickup tube).</li> <li>● Key on, engine off.</li> <li>● Access DPFEGR PID with a scan tool and note PID value.</li> <li>● Apply 27 to 30 kPa (8 to 9 in-Hg) vacuum to the D.P.F. EGR sensor and hold for a few seconds.</li> <li>● Quickly release vacuum.</li> </ul> <p>NOTE: For D.P.F. EGR sensor applications, refer to the Description in the front of this test.</p> <ul style="list-style-type: none"> <li>● <b>For applications with 1.0 voltage offset D.P.F. EGR sensor:</b> <ul style="list-style-type: none"> <li>— The DPFEGR PID voltage must be between 0.75 and 1.25 volt with the key on and no vacuum applied.</li> <li>— The DPFEGR PID voltage must increase to greater than 4.0 volts with the vacuum applied.</li> <li>— The DPFEGR PID must drop to less than 1.5 volts in less than 3 seconds when vacuum is released.</li> </ul> </li> <li>● <b>For applications with 0.55 voltage offset D.P.F. EGR sensor:</b> <ul style="list-style-type: none"> <li>— The DPFEGR PID voltage must be between 0.35 and 0.8 volt with the key on and no vacuum applied.</li> <li>— The DPFEGR PID voltage must increase to greater than 4.0 volts with the vacuum applied.</li> <li>— The DPFEGR PID must drop to less than 1.0 volt in less than 3 seconds when vacuum is released.</li> </ul> </li> <li>● Key off.</li> <li>● <b>Did the DPFEGR PID voltage indicate a fault in the D.P.F. EGR sensor?</b></li> </ul>	<p>Yes</p> <p>No</p>	<p>▶ REPLACE damaged D.P.F. EGR sensor. RESTORE vehicle. COMPLETE an EGR Monitor Repair Verification Drive Cycle. RERUN Quick Test.</p> <p>▶ Fault not found. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.</p>

	Test Step	Result	Action to Take
<b>HE60</b>	<p><b>DTC P1406: INSPECT DOWNSTREAM PRESSURE HOSE CONNECTIONS</b></p> <p>Diagnostic Trouble Code (DTC) P1406 indicates that Continuous Memory Self-Test has detected the intake manifold side (downstream) differential pressure feedback EGR (D.P.F. EGR) sensor pressure hose is off or plugged.</p> <p><b>NOTE:</b> If the fault is currently present, DTC P1406 will be output in Key On Engine Running (KOER) Self-Test.</p> <p>Possible causes:</p> <ul style="list-style-type: none"> <li>— Improper downstream pressure hose connection.</li> <li>— Downstream pressure hose plugged.</li> <li>— Orifice tube assembly loose.</li> <li>— Orifice tube assembly broken.</li> <li>— Plugged or damaged pressure pickup tubes.</li> <li>— Slow responding D.P.F. EGR sensor.</li> <li>● Inspect downstream hose at D.P.F. EGR sensor and orifice tube assembly for disconnect or poor connection.</li> <li>● <b>Is hose OFF or poorly connected?</b></li> </ul>  <p style="text-align: center;"><b>A21168-B</b></p>	<p>Yes</p> <p>No</p>	<p>▶ REPAIR downstream hose as necessary. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.</p> <p>▶ GO to <b>HE61</b>.</p>
<b>HE61</b>	<p><b>INSPECT DOWNSTREAM PRESSURE HOSE FOR PLUGGING</b></p> <p><b>NOTE:</b> It is essential that the D.P.F. EGR sensor pressure hose is the correct repair part and not a substitute.</p> <ul style="list-style-type: none"> <li>● Visually inspect downstream pressure hose routing. Hose must not be pinched or have dips in it where water can settle or freeze.</li> <li>● Remove downstream pressure hose and carefully inspect for plugging, water or leaks.</li> <li>● <b>Is there a fault detected in the hose?</b></li> </ul>	<p>Yes</p> <p>No</p>	<p>▶ REPAIR or REPLACE downstream pressure hose as necessary. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.</p> <p>▶ GO to <b>HE62</b>.</p>
<b>HE62</b>	<p><b>CHECK ORIFICE TUBE ASSEMBLY AND D.P.F. EGR SENSOR</b></p> <ul style="list-style-type: none"> <li>● Inspect the connections at the D.P.F. EGR sensor for plugging or damage.</li> <li>● Inspect the intake manifold side pressure pickup tube and orifice tube assembly for plugging, loose connection or damage.</li> <li>● <b>Is the D.P.F. EGR sensor or orifice tube assembly plugged, loose or damaged?</b></li> </ul>	<p>Yes</p> <p>No</p>	<p>▶ REPAIR or REPLACE D.P.F. EGR sensor or orifice tube assembly as necessary. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.</p> <p>▶ RESTORE vehicle. GO to <b>HE63</b>.</p>

Test Step		Result	Action to Take
HE63	CHECK EGR SENSOR OUTPUT BY APPLYING VACUUM WITH HAND PUMP		
	<ul style="list-style-type: none"> <li>● Disconnect pressure hoses at D.P.F. EGR sensor.</li> <li>● Connect a hand vacuum pump to the downstream connection at sensor (intake manifold side of sensor or the smaller diameter pickup tube).</li> <li>● Key on, engine off.</li> <li>● Access DPFEGR PID with a scan tool and note PID value.</li> <li>● Apply 27 to 30 kPa (8 to 9 in-Hg) vacuum to the D.P.F. EGR sensor and hold for a few seconds.</li> <li>● Quickly release vacuum.</li> </ul> <p>NOTE: For D.P.F. EGR sensor applications, refer to the Description in the front of this test.</p> <ul style="list-style-type: none"> <li>● <b>For applications with 1.0 voltage offset D.P.F. EGR sensor:</b> <ul style="list-style-type: none"> <li>— The DPFEGR PID voltage must be between 0.75 and 1.25 volt with the key on and no vacuum applied.</li> <li>— The DPFEGR PID voltage must increase to greater than 4.0 volts with the vacuum applied.</li> <li>— The DPFEGR PID must drop to less than 1.5 volts in less than 3 seconds when vacuum is released.</li> </ul> </li> <li>● <b>For applications with 0.55 voltage offset D.P.F. EGR sensor:</b> <ul style="list-style-type: none"> <li>— The DPFEGR PID voltage must be between 0.35 and 0.8 volt with the key on and no vacuum applied.</li> <li>— The DPFEGR PID voltage must increase to greater than 4.0 volts with the vacuum applied.</li> <li>— The DPFEGR PID must drop to less than 1.0 volt in less than 3 seconds when vacuum is released.</li> </ul> </li> <li>● Key off.</li> <li>● <b>Did the DPFEGR PID voltage indicate a fault in the D.P.F. EGR sensor?</b></li> </ul>	<p>Yes</p> <p>No</p>	<p>REPLACE damaged D.P.F. EGR sensor. RECONNECT all components. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.</p> <p>Fault not found. RECONNECT all components. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.</p>

	Test Step	Result	Action to Take
<b>HE70</b>	<p><b>DTC P0401: RUN KOER SELF-TEST</b></p> <p>Diagnostic Trouble Code (DTC) P0401 indicates that Continuous Memory Self-Test has detected insufficient EGR flow.</p> <p>Possible causes:</p> <ul style="list-style-type: none"> <li>— Fault in vacuum supply to EGR vacuum regulator solenoid.</li> <li>— EGR valve stuck closed or iced.</li> <li>— EGR valve diaphragm leaks.</li> <li>— EGR valve or flow path restricted.</li> <li>— EGR vacuum hose off, plugged or leaks.</li> <li>— VPWR circuit open to EGR vacuum regulator solenoid.</li> <li>— EGRVR circuit to PCM open.</li> <li>— EGRVR circuit to PCM shorted to PWR.</li> <li>— Differential pressure feedback EGR (D.P.F. EGR) sensor pressure hoses both connected improperly.</li> <li>— D.P.F. EGR sensor pressure hoses reversed.</li> <li>— D.P.F. EGR sensor VREF circuit open.</li> <li>— Downstream pressure hose off.</li> <li>— Downstream pressure hose plugged.</li> <li>— Damaged orifice tube assembly.</li> <li>— Damaged EGR vacuum regulator solenoid.</li> <li>— Damaged D.P.F. EGR sensor.</li> <li>— Damaged PCM.</li> <li>● Run KOER Self-Test.</li> <li>● Key off.</li> <li>● <b>Was KOER DTC P 1408 output?</b></li> </ul>	<p>Yes</p> <p>No</p>	<p>The KOER Self-Test has detected an EGR fault that is currently present. GO to <b>HE71</b>.</p> <p>REMOVE and INSPECT the EGR valve and intake manifold EGR port for restriction. If OK, the fault that produced DTC P0401 is intermittent. GO to <b>HE90</b>.</p>
<b>HE71</b>	<p><b>DTC P 1408: RETRIEVE CONTINUOUS MEMORY DTCS</b></p> <p>Diagnostic Trouble Code (DTC) P 1408 indicates that Key On Engine Running (KOER) Self-Test has detected EGR flow out of range.</p> <p>Possible causes:</p> <ul style="list-style-type: none"> <li>— Fault in vacuum supply to EGR vacuum regulator solenoid.</li> <li>— EGR valve stuck closed or iced.</li> <li>— EGR valve diaphragm leaks.</li> <li>— EGR valve or flow path restricted.</li> <li>— EGR vacuum hose off, plugged or leaks.</li> <li>— VPWR circuit open to EGR vacuum regulator solenoid.</li> <li>— EGRVR circuit to PCM open.</li> <li>— EGRVR circuit to PCM shorted to PWR.</li> <li>— Differential Pressure Feedback EGR (D.P.F. EGR) sensor pressure hoses both improperly connected.</li> <li>— D.P.F. EGR sensor pressure hoses reversed.</li> <li>— D.P.F. EGR sensor VREF circuit open.</li> <li>— Improper downstream pressure hose connection.</li> <li>— Downstream pressure hose plugged.</li> <li>— Damaged orifice tube assembly.</li> <li>— Damaged EGR vacuum regulator solenoid.</li> <li>— Damaged D.P.F. EGR sensor.</li> <li>— Damaged PCM.</li> </ul> <p>NOTE: If any DTC other than DTC P 1406 is output, record DTC and refer to Diagnostic Trouble Code Charts after completing this Pinpoint Test.</p> <ul style="list-style-type: none"> <li>● Retrieve all Continuous Memory DTCS.</li> <li>● <b>Is DTC P 1406 output?</b></li> </ul>	<p>Yes</p> <p>No</p>	<p>GO to <b>HE60</b>.</p> <p>GO to <b>HE72</b>.</p>

	Test Step	Result	Action to Take
<b>HE72</b>	<b>RUN KOER SELF-TEST WHILE MONITORING EGR VACUUM</b> <ul style="list-style-type: none"> <li>● Disconnect vacuum hose at EGR valve and connect hose to a vacuum gauge.</li> <li>● NOTE: Since the EGR vacuum hose is disconnected, ignore DTCs during this KOER Self-Test.</li> </ul> <p>Run Key On Engine Running (KOER) Self-Test while monitoring gauge. Approximately 30 seconds into test, EGR flow will be requested for a few seconds. The vacuum at this time should increase above 5.4 kPa (1.6 in-Hg) to open the valve.</p> <ul style="list-style-type: none"> <li>● Key off.</li> <li>● Did the vacuum increase to 10 kPa (3.0 in-Hg) or greater at any time during KOER Self-Test?</li> </ul>	<p>Yes</p> <p>No</p>	<p>▶ The vacuum indicated is sufficient to open the EGR valve. Fault is unlikely to be in EGR vacuum control system. GO to <b>HE73</b>.</p> <p>▶ The vacuum indicated is insufficient to open the EGR valve. GO to <b>HE80</b>.</p>
<b>HE73</b>	<b>INSPECT D.P.F. EGR SENSOR PRESSURE HOSES</b> <ul style="list-style-type: none"> <li>● Visually inspect both pressure hoses for reversed connection at D.P.F. EGR sensor or at orifice tube assembly.</li> <li>● Inspect both hoses for improper routing. Hoses should not be pinched or have dips where water could settle or freeze.</li> <li>● Inspect both hoses for leaks and blockage.</li> <li>● Inspect D.P.F. EGR sensor and orifice tube assembly for blockage or damage at the pickup tubes.</li> <li>● Is a fault detected?</li> </ul>  <p style="text-align: center;">A21169-B</p>	<p>Yes</p> <p>No</p>	<p>▶ REPAIR pressure hoses as necessary. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.</p> <p>▶ GO to <b>HE74</b>.</p>



	Test Step	Result	Action to Take
<b>HE74</b>	<b>CHECK D.P.F. EGR SENSOR OUTPUT BY APPLYING VACUUM WITH HAND PUMP</b>		
	<ul style="list-style-type: none"> <li>● Disconnect pressure hoses at D.P.F. EGR sensor.</li> <li>● Connect a hand vacuum pump to the downstream connection at sensor (intake manifold side of sensor or the smaller diameter pickup tube.)</li> <li>● Key on, engine off.</li> <li>● Access DPFEGR PID with a scan tool and note PID value.</li> <li>● Apply 27-30 kPa (8-9 in-Hg) vacuum to the D.P.F. EGR sensor and hold for a few seconds.</li> <li>● Quickly release vacuum.</li> </ul> <p>NOTE: For D.P.F. EGR sensor applications, refer to the Description in the front of this test.</p> <ul style="list-style-type: none"> <li>● <b>For applications with 1.0 voltage offset D.P.F. EGR sensor:</b> <ul style="list-style-type: none"> <li>— The DPFEGR PID voltage must be between 0.75 and 1.25 volt with the key on and no vacuum applied.</li> <li>— The DPFEGR PID voltage must increase to greater than 4.0 volts with the vacuum applied.</li> <li>— The DPFEGR PID must drop to less than 1.5 volts in less than 3 seconds when vacuum is released.</li> </ul> </li> <li>● <b>For applications with 0.55 voltage offset D.P.F. EGR sensor:</b> <ul style="list-style-type: none"> <li>— The DPFEGR PID voltage must be between 0.35 and 0.8 volt with the key on and no vacuum applied.</li> <li>— The DPFEGR PID voltage must increase to greater than 4.0 volts with the vacuum applied.</li> <li>— The DPFEGR PID must drop to less than 1.0 volt in less than 3 seconds when vacuum is released.</li> </ul> </li> <li>● Key off.</li> <li>● <b>Did the DPFEGR PID voltage indicate a fault in the D.P.F. EGR sensor?</b></li> </ul>	<p>Yes</p> <p>No</p>	<p>▶ GO to <b>HE75</b>.</p> <p>▶ <b>RECONNECT</b> pressure hoses. GO to <b>HE76</b>.</p>

	Test Step	Result	Action to Take
HE75	MEASURE VREF VOLTAGE AT D.P.F. EGR SENSOR HARNESS CONNECTOR		
	<ul style="list-style-type: none"> <li>● Disconnect D.P.F. EGR sensor.</li> <li>● Key on, engine off.</li> <li>● Measure voltage between the sensor VREF circuit and SIG RTN circuit at the D.P.F. EGR sensor harness connector.</li> <li>● Key off.</li> <li>● Was VREF voltage between 4.0 and 6.0 volts?</li> </ul>	<p>Yes</p> <p>No</p>	<p>REPLACE damaged D.P.F. EGR sensor. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.</p> <p>VREF voltage is out of range. GO to Pinpoint Test Step <b>C1</b>.</p>
HE76	CHECK EGR VALVE FUNCTION BY APPLYING VACUUM WITH HAND PUMP		
	<ul style="list-style-type: none"> <li>● Disconnect vacuum hose at EGR valve and plug hose.</li> <li>● Connect a hand vacuum pump to EGR valve.</li> <li>● Start engine and bring to idle.</li> <li>● Access DPFEGR and RPM PIDs with a scan tool.</li> <li>● Slowly apply 27 to 34 kPa (8 to 10 in-Hg) of vacuum to the EGR valve and hold it for 10 seconds. If engine wants to stall, increase rpm with throttle to maintain a minimum of 1000 rpm.</li> <li>● Look for the following: <ul style="list-style-type: none"> <li>— EGR valve starts opening at about 5.4 kPa (1.6 in-Hg) vacuum indicated by increasing DPFEGR PID voltage.</li> <li>— DPFEGR PID voltage increasing until EGR valve is fully open. DPFEGR PID must read 2.5 volts minimum with full vacuum applied.</li> <li>— DPFEGR PID voltage steady when vacuum is held. If voltage drops within a few seconds, the EGR valve or vacuum source can be leaking.</li> </ul> </li> <li>● Key off.</li> <li>● Did the DPFEGR PID voltage indicate that the EGR valve is operating as described in this test?</li> </ul>	<p>Yes</p> <p>No</p>	<p>RESTORE vehicle. GO to <b>HE85</b>.</p> <p>REMOVE and INSPECT the EGR valve for signs of contamination, unusual wear, carbon deposits, binding, leaking diaphragm and other damage. If EGR valve is OK, look for an obstructed EGR port in the intake manifold or plugged orifice tube assembly. REPAIR as necessary. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.</p>

	Test Step	Result	Action to Take
HE80	<p>CHECK VACUUM SOURCE AND VACUUM HOSES TO AND FROM EGR VACUUM REGULATOR SOLENOID</p> <ul style="list-style-type: none"> <li>● Inspect vacuum lines between vacuum source and EGR vacuum regulator solenoid and between EGR vacuum regulator solenoid and EGR valve for leaks, kinks, disconnects, blockage, routing or any damage.</li> <li>● Disconnect vacuum hoses at EGR vacuum regulator solenoid.</li> <li>● Connect EGR vacuum regulator solenoid vacuum source hose to a vacuum gauge.</li> <li>● With engine warm and at idle, take vacuum gauge reading.</li> <li>● Key off.</li> <li>● Was the vacuum gauge reading a minimum of 51 kPa (15 in-Hg) at idle and vacuum lines OK?</li> </ul>	<p>Yes</p> <p>No</p>	<p>▶ RESTORE vehicle. GO to <b>HE81</b>.</p> <p>▶ ISOLATE fault and REPAIR as necessary. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.</p>
HE81	<p>CHECK VPWR VOLTAGE TO EGR VACUUM REGULATOR SOLENOID</p> <ul style="list-style-type: none"> <li>● Disconnect EGR vacuum regulator solenoid.</li> <li>● Key on, engine off.</li> <li>● Measure VPWR circuit voltage at EGR vacuum regulator solenoid harness connector.</li> <li>● Key off.</li> <li>● Was EGR vacuum regulator solenoid VPWR voltage greater than 10.5 volts?</li> </ul>	<p>Yes</p> <p>No</p>	<p>▶ GO to <b>HE82</b>.</p> <p>▶ REPAIR open circuit. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.</p>
HE82	<p>CHECK EGR VACUUM REGULATOR SOLENOID RESISTANCE</p> <ul style="list-style-type: none"> <li>● EGR vacuum regulator solenoid disconnected.</li> <li>● Measure EGR vacuum regulator solenoid resistance.</li> <li>● Is solenoid resistance between 26 and 40 ohms?</li> </ul>	<p>Yes</p> <p>No</p>	<p>▶ GO to <b>HE83</b>.</p> <p>▶ REPLACE damaged EGR vacuum regulator solenoid. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.</p>
HE83	<p>CHECK EGRVR CIRCUIT FOR SHORT TO PWR IN HARNESS</p> <ul style="list-style-type: none"> <li>● Install breakout box, leave PCM disconnected.</li> <li>● Key on, engine off.</li> <li>● Measure voltage between PCM Test Pin 47 and ground.</li> <li>● Key off.</li> <li>● Was voltage greater than 1.0 volt?</li> </ul>	<p>Yes</p> <p>No</p>	<p>▶ REPAIR short circuit. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.</p> <p>▶ GO to <b>HE84</b>.</p>

Test Step		Result	Action to Take
<b>HE84</b>	<b>CHECK EGRVR CIRCUIT FOR OPEN IN HARNESS</b>		
	<ul style="list-style-type: none"> <li>Measure resistance of EGRVR circuit between PCM Test Pin 47 and EVR vacuum regulator solenoid harness connector.</li> <li>Is resistance less than 5.0 ohms?</li> </ul>	Yes	▶ RECONNECT EGR vacuum regulator solenoid. GO to <b>HE85</b> .
		No	▶ REPAIR open in EVR circuit. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.
<b>HE85</b>	<b>CHECK EGR VACUUM REGULATOR SOLENOID VACUUM OUTPUT CAPABILITY BY GROUNDING EVR CIRCUIT</b>		
	<ul style="list-style-type: none"> <li>Reconnect PCM and EGR vacuum regulator solenoid.</li> <li>Disconnect vacuum hose at the EGR valve and connect to a vacuum gauge.</li> <li>Key on, engine running.</li> <li>With engine at idle, jumper PCM Test Pin 47 (EGRVR) to chassis ground.</li> <li>Is vacuum gauge reading 13.5 kPa (4.0 in-Hg) or greater?</li> </ul>	Yes	▶ REPLACE damaged PCM. RESTORE vehicle. RERUN Quick Test.
		No	▶ REPLACE damaged EGR vacuum regulator solenoid. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.
<b>HE90</b>	<b>INSPECT EGR SYSTEM FOR AN INTERMITTENT FAILURE</b>		
	<ul style="list-style-type: none"> <li>Visually inspect the EGR system for signs of intermittent failure.</li> <li>Is a fault found?</li> </ul>	Yes	▶ REPAIR fault as necessary. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.
		No	▶ GO to <b>HE91</b> .

Test Step		Result	Action to Take
<b>HE91</b>	<b>CHECK EGR VALVE FUNCTION BY APPLYING VACUUM WITH HAND PUMP</b>		
	<ul style="list-style-type: none"> <li>● Disconnect vacuum hose at EGR valve and plug hose.</li> <li>● Connect a hand vacuum pump to EGR valve.</li> <li>● Start engine and bring to idle.</li> <li>● Access DPFEGR and RPM PIDs with a scan tool.</li> <li>● Slowly apply 17 to 34 kPa (5 to 10 in-Hg) of vacuum to the EGR valve and hold it for 10 seconds. If engine wants to stall, increase rpm with throttle to maintain a minimum of 800 rpm.</li> <li>● Look for the following: <ul style="list-style-type: none"> <li>— EGR valve starts opening at about 5.4 kPa (1.6 in-Hg) vacuum indicated by increasing DPFEGR PID voltage.</li> <li>— DPFEGR PID voltage increasing until EGR valve is fully open. DPFEGR PID should read 2.5 volts minimum with full vacuum applied.</li> <li>— DPFEGR PID voltage steady when vacuum is held. If voltage drops within a few seconds, the EGR valve or vacuum source could be leaking.</li> </ul> </li> <li>● Key off.</li> <li>● <b>Did the DPFEGR PID voltage indicate that the EGR valve is operating as described in this test?</b></li> </ul>	<p>Yes</p> <p>No</p>	<p>▶ GO to <b>HE92</b>.</p> <p>▶ REMOVE and INSPECT the EGR valve for signs of contamination, unusual wear, carbon deposits, binding, leaking diaphragm and other damage. If EGR valve is OK, look for an obstructed EGR port in the intake manifold. REPAIR as necessary RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.</p>
<b>HE92</b>	<b>INSPECT EGR VACUUM SIGNAL SUPPLY FOR INTERMITTENT FAILURE</b>		
	<ul style="list-style-type: none"> <li>● Install breakout box and connect PCM to breakout box.</li> <li>● Disconnect plugged hose at EGR valve and connect to a vacuum gauge.</li> <li>● Key on, engine running.</li> <li>● Connect a jumper wire between PCM Test Pin 47 and ground to activate the solenoid to full on. At idle, the vacuum gauge should read above 13.5 kPa (4.0 in-Hg).</li> <li>● Observe vacuum gauge for an indication of a fault while performing the following: <ul style="list-style-type: none"> <li>— Lightly tap on the EGR vacuum regulator solenoid and wiggle the EGR vacuum regulator solenoid connector, vacuum lines and vehicle harness between the solenoid and PCM. A fault is indicated by a sudden drop in vacuum reading.</li> </ul> </li> <li>● Key off.</li> <li>● <b>Was a fault indicated?</b></li> </ul>	<p>Yes</p> <p>No</p>	<p>▶ ISOLATE fault and REPAIR as necessary. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.</p> <p>▶ Unable to duplicate or identify fault at this time. (In cold climates, the EGR valve may temporarily freeze shut and thaw when the engine warms up causing the intermittent DTC.) GO to Pinpoint Test Step <b>Z1</b> with the following data: DPFEGR and EGRVR PIDs and list of Possible causes.</p>

Test Step		Result	Action to Take
HE100	EGR DIAGNOSIS BY SYMPTOM: CHECK FOR EGR FLOW WITH EGR VACUUM HOSE DISCONNECTED AND PLUGGED		
	<p>NOTE: Perform KOER Self-Test and repair any DTCs before proceeding with this test.</p> <p>The symptom charts have indicated possible EGR flow at idle with no EGR diagnostic trouble codes output.</p> <p>Possible causes:</p> <ul style="list-style-type: none"> <li>— EGR valve not fully seating.</li> <li>— EGR vacuum regulator solenoid vent restricted.</li> <li>— Damaged EGR vacuum regulator solenoid.</li> <li>● Disconnect vacuum hose at EGR valve and plug hose.</li> <li>● Key on, engine off.</li> <li>● Access DPFEGR PID with a scan tool and note voltage.</li> <li>● Start engine and bring to idle.</li> <li>● With engine at idle, look at the DPFEGR PID voltage and compare to the engine off reading. An increase in the voltage at idle indicates that the differential pressure feedback EGR sensor is sensing EGR flow.</li> <li>● Key off.</li> <li>● <b>Was the DPFEGR PID voltage greater at idle by a minimum of 0.15 volt than with the engine off?</b></li> </ul>	<p>Yes</p> <p>No</p>	<p>▶ The DPFEGR PID voltage is indicating EGR flow at idle. Since the EGR vacuum hose is disconnected and plugged, the fault is most likely in the EGR valve. REMOVE and INSPECT the EGR valve for signs of contamination, unusual wear, carbon deposits, binding and other damage. REPAIR as necessary RESTORE vehicle. VERIFY a symptom no longer exists.</p> <p>▶ This indicates a fault in the EGR valve vacuum supply. INSPECT the EGR vacuum regulator solenoid vent and vent filter for restrictions. REPAIR as necessary. If OK, REPLACE EGR vacuum regulator solenoid. RESTORE vehicle. VERIFY a symptom no longer exists.</p>
HE110	DTC P1409: CHECK EGR VACUUM REGULATOR SOLENOID RESISTANCE		
	<p>Diagnostic Trouble Code (DTC) P1409 indicates that Self-Test has detected an electrical fault in the EGRVR circuit.</p> <p>Possible causes:</p> <ul style="list-style-type: none"> <li>— Open EGRVR circuit.</li> <li>— Open VPWR circuit to EGR vacuum regulator solenoid.</li> <li>— EGRVR circuit shorted to VPWR.</li> <li>— EGRVR circuit shorted to GND.</li> <li>— Damaged EGR vacuum regulator solenoid.</li> <li>— Damaged PCM.</li> <li>● Disconnect EGR vacuum regulator solenoid.</li> <li>● Measure EGR vacuum regulator solenoid resistance.</li> <li>● <b>Is solenoid resistance between 26 and 40 ohms?</b></li> </ul>	<p>Yes</p> <p>No</p>	<p>▶ The EGR vacuum regulator solenoid resistance is within specification. GO to <a href="#">HE111</a>.</p> <p>▶ REPLACE EGR vacuum regulator solenoid. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.</p>

Test Step		Result	Action to Take
HE111	CHECK VPWR VOLTAGE TO EGR VACUUM REGULATOR SOLENOID		
	<ul style="list-style-type: none"> <li>Key on, engine off.</li> <li>Measure VPWR circuit voltage at EGR vacuum regulator solenoid harness connector.</li> <li>Key off.</li> <li><b>Was voltage greater than 10.5 volts?</b></li> </ul>	Yes No	GO to <a href="#">HE112</a> . REPAIR open in VPWR circuit. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.
HE112	CHECK EGRVR CIRCUIT FOR OPEN IN HARNESS		
	<ul style="list-style-type: none"> <li>Install breakout box and leave PCM disconnected.</li> <li>Measure resistance of EGRVR circuit between PCM Test Pin 47 and EGR vacuum regulator solenoid harness connector.</li> <li><b>Is resistance less than 5.0 ohms?</b></li> </ul>	Yes No	GO to <a href="#">HE113</a> . REPAIR open in EVR circuit. RESTORE vehicle. RERUN Quick Test.
HE113	CHECK EGRVR CIRCUIT FOR SHORT TO POWER IN HARNESS		
	<ul style="list-style-type: none"> <li>Breakout box installed, leave PCM disconnected.</li> <li>Key on, engine off.</li> <li>Measure voltage between PCM Test Pin 47 and ground.</li> <li>Key off.</li> <li><b>Was voltage less than 1.0 volt?</b></li> </ul>	Yes No	GO to <a href="#">HE114</a> . REPAIR short circuit. RESTORE vehicle. RERUN Quick Test.
HE114	CHECK EGRVR CIRCUIT FOR SHORT TO GROUND IN HARNESS		
	<ul style="list-style-type: none"> <li>Measure resistance between PCM Test Pin 47 and PCM Test Pins 24 and 103.</li> <li><b>Is each resistance greater than 10,000 ohms?</b></li> </ul>	Yes No	REPLACE PCM. RESTORE vehicle. RERUN Quick Test. REPAIR short circuit. RESTORE vehicle. RERUN Quick Test.

Test Step		Result	Action to Take
HE120	CONTINUOUS MEMORY DTC P1409: WIGGLE EGR VACUUM REGULATOR SOLENOID WHILE MONITORING VPWR		
	<p>Continuous Memory DTC P1409 indicates that Continuous Memory Self-Test has detected an electrical malfunction in the EGR vacuum regulator solenoid sometime during vehicle operation.</p> <p>NOTE: If DTC P1409 was output in Key On Engine Off (KOEO) or Key On Engine Running (KOER) Self-Test, go to <a href="#">HE110</a> to diagnose present fault.</p> <p>Possible causes:</p> <ul style="list-style-type: none"> <li>Open EGRVR circuit.</li> <li>Open VPWR circuit to EGR vacuum regulator solenoid.</li> <li>EGRVR circuit shorted to VPWR.</li> <li>EGRVR circuit shorted to GND.</li> <li>Damaged EGR vacuum regulator solenoid.</li> <li>Damaged PCM.</li> <li>Install breakout box, leave PCM disconnected.</li> <li>Key on.</li> <li>Measure voltage between PCM Test Pins 47 and 24.</li> <li>Voltage must read greater than 10.5 volts. For an indication of a fault, look for this voltage to drop while performing the following:               <ul style="list-style-type: none"> <li>Lightly tap on the EGR vacuum regulator solenoid.</li> <li>Wiggle the EGR vacuum regulator solenoid connector.</li> <li>Grasp the EGR vacuum regulator solenoid harness connector and wiggle wires between solenoid and PCM.</li> </ul> </li> <li>Key off.</li> <li><b>Was a fault indicated?</b></li> </ul>	Yes No	ISOLATE fault and REPAIR as necessary. RESTORE vehicle. RERUN Quick Test. Unable to duplicate or identify fault at this time. GO to Pinpoint Test Step <a href="#">Z1</a> with the following data: DPFEGR and EGRVR PIDs and list of Possible Causes.