

HH: Exhaust Gas Recirculation System Module (ESM)[← HH: Introduction](#)**HH1 CHECK FOR DTCS**

Are DTCs P0401, P0402, P0403, P0405, P0406, P1408, or P1409 present?

Yes	No
For DTC P0401, GO to HH16 . For DTC P0402, GO to HH12 . For DTCs P0403 and P1409, GO to HH22 . For DTC P0405, GO to HH2 . For DTC P0406, GO to HH5 . For DTC P1408, GO to HH17 .	For symptoms without DTCs, GO to HH28 . For all others, GO to Section 4, Diagnostic Trouble Code (DTC) Charts and Descriptions .

HH2 DTC P0405: DETERMINE THE PRESENT DPFEGR PID VOLTAGE

- Ignition ON, engine OFF.
- Access the PCM and monitor the DPFEGR PID.

Is the voltage less than 0.05 V?

Yes	No
GO to HH3 .	GO to HH11 .

HH3 INDUCE THE OPPOSITE DIFFERENTIAL PRESSURE FEEDBACK EGR SENSOR SIGNAL

- Ignition OFF.
- ESM connector disconnected.
- Ignition ON, engine OFF.
- Access the PCM and monitor the DPFEGR PID.

Is the voltage between 4 - 6 V?

Yes	No
INSTALL a new Differential Pressure Feedback EGR sensor. REFER to the Workshop Manual Section 303-08, Engine Emission Control. CLEAR the DTCs. REPEAT the self-test.	GO to HH4 .

HH4 CHECK THE DPFE CIRCUIT FOR A SHORT TO SIGRTN OR GND IN THE HARNESS

- Ignition OFF.
- PCM connector disconnected.
- Measure the resistance between:

(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side
DPFE	SIGRTN

- Measure the resistance between:

(+) PCM Connector, Harness Side	(-) Vehicle Battery
DPFE	Negative terminal

Is the resistance greater than 10K ohms?

Yes	No
GO to HH29 .	REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.

HH5 DTC P0406: DETERMINE THE PRESENT DPFEGR PID VOLTAGE

- Ignition ON, engine OFF.
- Access the PCM and monitor the DPFEGR PID.

Is the voltage greater than 4 V?

Yes	No
GO to HH6 .	GO to HH11 .

HH6 CHECK THE VREF VOLTAGE TO THE ESM

- Ignition OFF.
- ESM connector disconnected.
- Ignition ON, engine OFF.
- Measure the voltage between:

(+) ESM Connector, Harness Side	(-) Vehicle Battery
VREF - Pin 2	Negative terminal

Is the voltage between 4 - 5.5 V?

Yes	No
GO to HH7 .	REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.

HH7 CHECK THE DPFE CIRCUIT FOR A SHORT TO VOLTAGE

- Ignition OFF.

- PCM connector disconnected.
- Ignition ON, engine OFF.
- Measure the voltage between:

(+) ESM Connector, Harness Side	(-) Vehicle Battery
DPFE - Pin 5	Negative terminal

Is the voltage less than 1 V?

Yes	No
GO to HH8 .	REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.

HH8 CHECK THE DPFE CIRCUIT FOR A SHORT TO VREF

- Ignition OFF.
- Measure the resistance between:

(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side
VREF	DPFE

Is the resistance greater than 10K ohms?

Yes	No
GO to HH9 .	REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.

HH9 CHECK THE DPFE AND SIGRTN CIRCUITS FOR AN OPEN IN THE HARNESS

- Measure the resistance between:

(+) PCM Connector, Harness Side	(-) ESM Connector, Harness Side
DPFE	DPFE - Pin 5
SIGRTN	SIGRTN - Pin 6

Are the resistances less than 5 ohms?

Yes	No
GO to HH10 .	REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.

HH10 INDUCE THE OPPOSITE DIFFERENTIAL PRESSURE FEEDBACK EGR SENSOR VOLTAGE

- PCM connector connected.
- Connect a 5 amp fused jumper wire between the following:

Point A ESM Connector, Harness Side	Point B ESM Connector, Harness Side
DPFE - Pin 5	SIGRTN - Pin 6

- Ignition ON, engine OFF.
- Access the PCM and monitor the DPFEGR PID.

Is the voltage less than 0.1 V?

Yes	No
INSTALL a new Differential Pressure Feedback EGR sensor. REFER to the Workshop Manual Section 303-08, Engine Emission Control. CLEAR the DTCs. REPEAT the self-test.	GO to HH29 .

HH11 CARRY OUT A THOROUGH WIGGLE TEST ON THE ESM HARNESS

- Access the PCM and monitor the DPFEGR PID.
- Wiggle, shake, and bend small sections of the wiring harness while working from the sensor to the PCM.

Is there any change in the voltage reading, or is a concern found?

Yes	No
REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test.	Unable to duplicate or identify the concern at this time. GO to Pinpoint Test Z .

HH12 DTC P0402: CHECK THE VREF VOLTAGE TO THE ESM

Note: Diagnose and repair all circuit concern DTCs before diagnosing range/performance or flow concerns. For circuit concern DTC diagnosis, refer to Section 4 [Diagnostic Trouble Code \(DTC\) Charts and Descriptions](#).

- Ignition OFF.
- ESM connector disconnected.
- Ignition ON, engine OFF.
- Measure the voltage between:

(+) ESM Connector, Harness Side	(-) Vehicle Battery
VREF - Pin 2	Negative terminal

Is the voltage between 4.5 - 5.5 V?

Yes	No
GO to HH13 .	GO to Pinpoint Test C .

HH13 SIMULATE THE DIFFERENTIAL PRESSURE FEEDBACK EGR SENSOR SIGNAL WITH A VACUUM PUMP

- Disconnect the downstream differential pressure feedback EGR sensor port hose at the ESM.
- Verify the hose and port are clear and free of obstructions.
- Connect a vacuum pump to the downstream differential pressure feedback EGR sensor port.
- Ignition ON, engine OFF.
- Access the PCM and monitor the DPFEGR PID.

- Apply 27 - 30 kPa (8 - 9 in-Hg) vacuum to the differential pressure feedback EGR sensor and hold for 10 seconds.
- Quickly release the vacuum.
 - The DPFEGR PID voltage must be between 0.25 and 1.3 volts with the ignition ON and no vacuum applied.
 - The DPFEGR PID voltage must increase to greater than 4 volts with the vacuum applied.
 - The DPFEGR PID must drop to less than 1.5 volts in less than 3 seconds when the vacuum is released.

Does the DPFEGR PID voltage indicate a concern in the differential pressure feedback EGR sensor?

Yes	No
INSTALL a new Differential Pressure Feedback EGR sensor. REFER to the Workshop Manual Section 303-08, Engine Emission Control. CLEAR the DTCs. REPEAT the self-test.	GO to HH14 .

HH14 INSPECT THE EGR VACUUM REGULATOR SOLENOID VENT FOR BLOCKAGE

Note: When the EGR valve is closed, the EGR vacuum regulator solenoid vacuum is vented through the solenoid vent to the atmosphere. A plugged EGR vacuum regulator solenoid vent does not allow EGR vacuum to vent to the atmosphere.

- EGR vacuum regulator vacuum hoses disconnected.
- Connect a hand vacuum pump to the EGR vacuum regulator source port.
- Apply 34 to 51 kPa (10 to 15 in-Hg) vacuum.

Does the EGR vacuum regulator solenoid vacuum bleed off?

Yes	No
GO to HH15 .	INSTALL a new EGR vacuum regulator solenoid. REFER to the Workshop Manual Section 303-08, Engine Emission Control. CLEAR the DTCs. REPEAT the self-test.

HH15 CHECK THE EGR VALVE FOR CARBON BUILD-UP

- Remove the ESM.
- Visually inspect the EGR valve and valve seat for correct seating, carbon build-up and debris.

Is a concern present?

Yes	No
REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test.	Unable to duplicate or identify the concern at this time.

HH16 DTC P0401: CARRY OUT THE KOER SELF-TEST

Note: Diagnose and repair all circuit concern DTCs before diagnosing range/performance or flow concerns.

- Carry out the KOER self-test.

Is DTC P1408 present?

Yes	No
GO to HH17 .	GO to HH18 .

HH17 DTC P1408: CHECK THE VREF VOLTAGE TO THE ESM

- Ignition OFF.
- ESM connector disconnected.
- Ignition ON, engine OFF.
- Measure the voltage between:

(+) ESM Connector, Harness Side	(-) Vehicle Battery
VREF - Pin 2	Negative terminal

Is the voltage between 4.5 - 5.5 V?

Yes	No
GO to HH18 .	GO to Pinpoint Test C .

HH18 CHECK THE EGR VACUUM REGULATOR SOLENOID VACUUM

- ESM connector connected.
- Disconnect the EGR vacuum regulator vacuum source hose.
- Connect a vacuum gauge to the EGR vacuum regulator vacuum source hose.
- Ignition ON, engine running.
- Monitor the vacuum gauge.

Is the manifold vacuum greater than 34 kPa (10 in-Hg)?

Yes	No
GO to HH19 .	REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test.

HH19 SIMULATE THE DIFFERENTIAL PRESSURE FEEDBACK EGR SENSOR SIGNAL WITH A VACUUM PUMP

- Ignition OFF.
- Disconnect the downstream differential pressure feedback EGR sensor port hose at the ESM.
- Verify the hose and port are clear and free of obstructions.
- Connect a vacuum pump to the downstream differential pressure feedback EGR sensor port.
- Ignition ON, engine OFF.
- Access the PCM and monitor the DPFEGR PID.
- Apply 27 - 30 kPa (8 - 9 in-Hg) vacuum to the differential pressure feedback EGR sensor and hold for 10 seconds.
- Quickly release the vacuum.
 - The DPFEGR PID voltage must be between 0.25 and 1.3 volts with the ignition ON and no vacuum applied.

- The DPFEGR PID voltage must increase to greater than 4 volts with the vacuum applied.
- The DPFEGR PID must drop to less than 1.5 volts in less than 3 seconds when the vacuum is released.

Does the DPFEGR PID voltage indicate a concern in the differential pressure feedback EGR sensor?

Yes	No
INSTALL a new Differential Pressure Feedback EGR sensor. REFER to the Workshop Manual Section 303-08, Engine Emission Control. CLEAR the DTCs. REPEAT the self-test.	CONNECT all the hoses. GO to HH20 .

HH20 CHECK THE EGR VACUUM REGULATOR SOLENOID OPERATION

- Ignition ON, engine running.
- Engine at normal operating temperature.
- Allow the engine idle to stabilize.
- Access the PCM and monitor the RPM PID.
- Access the PCM and control the EGRVR PID.
- Increase the EGR vacuum regulator duty cycle while monitoring the RPM PID.

Does the RPM decrease or the engine stall as the EGR vacuum regulator duty cycle is increased?

Yes	No
Unable to duplicate or identify the concern at this time.	GO to HH21 .

HH21 CHECK FOR THE PRESENCE OF CARBON BUILD-UP IN THE EGR PASSAGE

Note: In certain vehicle applications, carbon build-up may occur downstream of the ESM. An inspection is required to make sure the passage in the upper intake manifold plenum chamber behind the ESM is open to allow exhaust gas flow.

- Ignition OFF.
- Remove the ESM. Refer to the Workshop Manual Section 303-08, Engine Emission Control.
- Disconnect the air inlet tube from the throttle body.
- Prop open the throttle body.
- Apply regulated shop air to the EGR port at the location where the ESM attaches to the upper intake manifold.

Is a restriction concern present?

Yes	No
CLEAN the EGR port as necessary and INSTALL the ESM. REFER to the Workshop Manual Section 303-08, Engine Emission Control. CLEAR the DTCs. REPEAT the self-test.	INSTALL a new ESM. REFER to the Workshop Manual Section 303-08, Engine Emission Control. CLEAR the DTCs. REPEAT the self-test.

HH22 DTCS P0403 AND P1409: CHECK THE EGR VACUUM REGULATOR SOLENOID OPERATION

- Ignition ON, engine running.
- Engine at normal operating temperature.
- Allow the engine idle to stabilize.
- Access the PCM and monitor the RPM PID.
- Access the PCM and control the EGRVR PID.
- Increase the EGR vacuum regulator duty cycle while monitoring the RPM PID.

Does the RPM decrease or the engine stall as the EGR vacuum regulator duty cycle is increased?

Yes	No
Unable to duplicate or identify the concern at this time. GO to Pinpoint Test Z .	GO to HH23 .

HH23 CHECK THE VPWR VOLTAGE TO THE EGR VACUUM REGULATOR SOLENOID

- Ignition OFF.
- ESM connector disconnected.
- Ignition ON, engine OFF.
- Measure the voltage between:

(+) ESM Connector, Harness Side	(-) Vehicle Battery
VPWR - Pin 4	Negative terminal

Is the voltage greater than 10 V?

Yes	No
GO to HH24 .	REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.

HH24 CHECK THE EGR VACUUM REGULATOR SOLENOID COIL RESISTANCE

- Ignition OFF.
- Measure the resistance between:

(+) ESM Connector, Component Side	(-) ESM Connector, Component Side
VPWR - Pin 4	EVR - Pin 1

Is the resistance between 26 - 40 ohms?

Yes	No
GO to HH25 .	INSTALL a new EGR Vacuum Regulator solenoid. REFER to the Workshop Manual Section 303-08, Engine Emission Control. CLEAR the DTCs. REPEAT the self-test.

HH25 CHECK THE EVR CIRCUIT FOR AN OPEN IN THE HARNESS

- PCM connector disconnected.
- Measure the resistance between:

(+) ESM Connector, Harness Side	(-) PCM Connector, Harness Side
EVR - Pin 1	EVR

Is the resistance less than 5 ohms?

Yes	No
GO to HH26 .	REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.

HH26 CHECK THE EVR CIRCUIT FOR A SHORT TO VOLTAGE IN THE HARNESS

- Ignition ON, engine OFF.
- Measure the voltage between:

(+) PCM Connector, Harness Side	(-) Vehicle Battery
EVR	Negative terminal

Is the voltage less than 1 V?

Yes	No
GO to HH27 .	REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.

HH27 CHECK THE EVR CIRCUIT FOR A SHORT TO GND IN THE HARNESS

- Ignition OFF.
- Measure the resistance between:

(+) PCM Connector, Harness Side	(-)
EVR	Ground

Is the resistance greater than 10K ohms?

Yes	No
GO to HH29 .	REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.

HH28 EGR DIAGNOSIS BY SYMPTOM: CHECK FOR EGR FLOW WITH THE EGR VACUUM REGULATOR VACUUM HOSE DISCONNECTED AND PLUGGED

Note: An increase in DPFEGR PID voltage at idle indicates EGR flow.

- Carry out the KOER self-test. Repair any other DTCs.
- Possible causes for EGR flow at idle with no related DTCs:
 - EGR valve not fully seating
 - EGR vacuum regulator solenoid vent restricted
 - Damaged EGR vacuum regulator solenoid

- Disconnect and plug the EGR vacuum regulator vacuum source hose.
- Ignition ON, engine OFF.
- Access the PCM and monitor the DPFEGR PID.
- Record the PID voltage.
- Ignition ON, engine running.
- With the engine at idle, observe the DPFEGR PID voltage. Compare to engine OFF voltage.

Is the idle DPFEGR PID voltage greater than 0.15 V when compared to the KOEO DPFEGR PID voltage?

Yes	No
<p>REMOVE and INSPECT the ESM for signs of contamination, unusual wear, carbon deposits, binding or other damage.</p> <p>REPAIR as necessary.</p> <p>If no concerns are present, INSTALL a new ESM.</p> <p>REFER to the Workshop Manual Section 303-08, Engine Emission Control.</p> <p>CLEAR the DTCs. REPEAT the self-test.</p>	<p>INSPECT the EGR vacuum regulator solenoid vent for blockage.</p> <p>To continue symptom diagnosis, REFER to Section 3, No Diagnostic Trouble Codes (DTCs) Present Symptom Charts.</p>

HH29 CHECK FOR CORRECT PCM OPERATION

- Disconnect all the PCM connectors.
- Visually inspect for:
 - pushed out pins
 - corrosion
- Connect all the PCM connectors and make sure they seat correctly.
- Carry out the PCM self-test and verify the concern is still present.

Is the concern still present?

Yes	No
<p>INSTALL a new PCM. REFER to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM), Programming the VID Block for a Replacement PCM.</p>	<p>The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>
