HX: Evaporative Emission (EVAP) Monitor and System

HX: Introduction

HX1 CHECK FOR DTCS

Are DTCs P0442, P0443, P0446, P0451, P0452, P0453, P0455, P0456, P0457, P0460, P0461, P0462, P0463, P1443, P1450, P1451, or P260F present?

Yes	No
For DTCs P0442 or P0456, GO to HX55. For DTC P0443, GO to HX2. For DTCs P0446 or P1451, GO to HX31. For DTC P0451, GO to HX48. For DTC P0452, GO to HX19. For DTC P0453, GO to HX24. For DTCs P0455 or P0457, GO to HX49. For DTC P0460, GO to HX40. For DTCs P0461 through P0463, GO to HX37. For DTC P1443, GO to HX52. For DTC P1450, GO to HX9. For DTC P260F, GO to HX58.	For a check fuel cap indicator always on, GO to HX46. For a check fuel cap indicator never on, GO to HX47. For an inoperative fuel gauge, GO to HX38. For all other symptoms without DTCs, GO to HX14. For all others, GO to Section 4, Diagnostic Trouble Code (DTC) Charts and Descriptions.

HX2 DTC P0443: CHECK THE PCM OUTPUT TO EVAP CANISTER PURGE VALVE

- Key in OFF position.
- EVAPCP Valve connector disconnected.
- Connect a non-powered test lamp between the EVAPCP and VPWR circuits at the EVAP canister purge valve harness connector.
- Key ON, engine OFF.
- Enter output test mode. Refer to Section 2, Output Test Mode (OTM).
- Command the outputs ON.
- Command the outputs OFF.
- Exit output test mode.

Does the test lamp turn on and off when the output(s) is commanded on and off?

Yes	No
For Ford GT, GO to HX4 . For all others, GO to HX3 .	GO to HX5 .

HX3 CHECK THE EVAP CANISTER PURGE VALVE SOLENOID RESISTANCE

- Key in OFF position.
- EVAPCP Valve connector disconnected.
- Measure the resistance between:

(+) EVAPCP Valve Connector, Component Side	(-) EVAPCP Valve Connector, Component Side
EVAPCP - Pin 2	VPWR - Pin 1

Is the resistance between 2.5 - 7 ohms?

Yes	No
Unable to duplicate or identify the concern at this time. GO to Pinpoint Test Z .	INSTALL a new EVAPCP valve. REFER to the Workshop Manual Section 303-13, Evaporative Emissions. CLEAR the DTCs. REPEAT the self-test.

HX4 CHECK THE EVAP CANISTER PURGE VALVE (VACUUM DIAPHRAGM) SOLENOID RESISTANCE

- Key in OFF position.
- EVAPCP Valve connector disconnected.
- Measure the resistance between:

(+) EVAPCP Valve Connector, Component Side	(-) EVAPCP Valve Connector, Component Side
EVAPCP - Pin 2	VPWR - Pin 1

Is the resistance between 30 - 50 ohms?

Yes	No
Unable to duplicate or identify the concern at this time. GO to Pinpoint Test Z .	INSTALL a new EVAPCP valve. REFER to the Workshop Manual Section 303-13, Evaporative Emissions. CLEAR the DTCs. REPEAT the self-test.

HX5 CHECK THE VPWR VOLTAGE TO THE EVAP CANISTER PURGE VALVE

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

(+) EVAPCP Valve Connector, Harness Side	(-) Vehicle Battery
VPWR - Pin 1	Negative terminal

Is the voltage greater than 10 V?

Yes	No
GO to HX6 .	REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.

HX6 CHECK THE EVAP CANISTER PURGE VALVE CIRCUIT FOR AN OPEN IN THE HARNESS

- Key in OFF position.
- PCM connector disconnected.
- Measure the resistance between:

(+) PCM Connector, Harness Side	(-) EVAPCP Valve Connector, Harness Side
EVAPCP	EVAPCP - Pin 2

Is the resistance less than 5 ohms?

Yes	No
GO to HX7 .	REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.

HX7 CHECK THE EVAP CANISTER PURGE VALVE CIRCUIT FOR A SHORT TO PWRGND IN THE HARNESS

- Diagnostic tool connector disconnected.
- Measure the resistance between:

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

Is the resistance greater than 10K ohms?

Yes	No
GO to HX8 .	REPAIR the short circuit to GND. CLEAR the DTCs. REPEAT the self-test.

HX8 CHECK THE EVAP CANISTER PURGE VALVE CIRCUIT FOR A SHORT TO

VOLTAGE IN THE HARNESS

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

(+) EVAPCP Valve Connector, Harness Side	(-)
EVAPCP - Pin 2	Ground

Is the voltage less than 1 V?

Yes	No
GO to HX62 .	REPAIR the short circuit to PWR. CLEAR the DTCs. REPEAT the self-test.

HX9 DTC P1450: CHECK FOR VISUAL CAUSES OF EXCESSIVE FUEL TANK VACUUM

Note: If the CV solenoid and the fuel tank assemblies are not accessible during this step, refer to the Workshop Manual Sections 303-13, Evaporative Emissions and 310-01, Fuel Tank and Lines for removal instructions.

- Check for kinks or bends in the fuel vapor hoses/tubes (EVAPCP outlet tube and EVAP canister tube).
- Visually inspect the EVAP canister inlet port, CV solenoid filter, and canister vent hose assembly for contamination or debris.
- Check the CV solenoid filter for blockage or contamination.

Is a concern present?

Yes	No
REMOVE any contamination or debris around the fuel vapor hose/tubes and CV solenoid assembly. REMOVE kinks or bends in the EVAPCP outlet tube, EVAP canister tube, and canister vent hose assembly. CLEAR the DTCs. For repair verification, CARRY OUT the evaporative emission leak check monitor repair verification drive cycle. REFER to Section 2, On Board Diagnostic (OBD) Drive Cycle .	GO to HX10 .

HX10 CHECK THE FUEL TANK PRESSURE SENSOR VOLTAGE WITH THE FUEL FILLER CAP REMOVED

- Remove the fuel filler cap.

- Key ON, engine OFF.
- Access the PCM and monitor the FTP V PID.

Is the voltage between 2.4 - 2.8 V?

Yes	No
GO to HX14 .	GO to HX11 .

HX11 CHECK FOR ANY OTHER DTCS

- Check for other 3-wire sensor DTCs (KOEO, KOER, or continuous memory) present with the DTC P1450.

Are any other DTCs present?

Yes	No
DISREGARD the current diagnostic trouble code (DTC) at this time. DIAGNOSE the next DTC. GO to Section 4, Diagnostic Trouble Code (DTC) Charts and Descriptions .	GO to HX12 .

HX12 CHECK THE VREF VOLTAGE TO THE FTP SENSOR

- Key in OFF position.
- FTP Sensor connector disconnected.
- Key ON, engine OFF.
- Measure the voltage between:

(+) FTP Sensor Connector, Harness Side	(-) FTP Sensor Connector, Harness Side
VREF	SIGRTN

Is the voltage between 4 - 6 V?

Yes	No
INSTALL a new FTP sensor. REFER to the Workshop Manual Section 303-13, Evaporative Emissions. CLEAR the DTCs. For repair verification, CARRY OUT the evaporative emission leak check monitor repair verification drive cycle. REFER to Section 2, On Board Diagnostic (OBD) Drive Cycle .	GO to HX13 .

HX13 CHECK THE VREF AND SIGRTN CIRCUIT FOR AN OPEN IN THE HARNESS

- Key in OFF position.
- PCM connector disconnected.
- Measure the resistance between:

(+) PCM Connector, Harness Side	(-) FTP Sensor Connector, Harness Side
VREF	VREF
SIGRTN	SIGRTN

Are the resistances less than 5 ohms?

Yes	No
GO to HX62 .	REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.

HX14 CHECK IF THE ENGINE IDLES

- Key ON, engine running.

Does the engine stall or is it unable to maintain idle?

Yes	No
GO to HX15 .	GO to HX16 .

HX15 CHECK THE EVAP SYSTEM FOR A STUCK OPEN VALVE

- Key in OFF position.
- Disconnect the fuel vapor to intake manifold line at the EVAPCP valve and cap the line at the EVAPCP valve.
- Key ON, engine running.

Does the engine stall or is it unable to maintain idle?

Yes	No
The EVAP system is not the cause of the symptom. RETURN to Section 3 , Symptom Charts for further direction.	INSTALL a new EVAPCP valve. REFER to the Workshop Manual Section 303-13, Evaporative Emissions. CLEAR the DTCs. REPEAT the self-test.

HX16 CHECK FOR BLOCKAGE IN THE FUEL TANK VENT SYSTEM

Note: The CV is normally open and venting to the atmosphere.

- Access the PCM and monitor the EVAPPDC, EVMV, FTP V and EVAPCV PIDs.
- While monitoring the FTP PID, ramp open the EVAPCP valve by incrementally commanding the

EVAPPDC PID to a 100% duty cycle (or EVMV PID to a 1,000 mA).

Does the FTP sensor voltage drop below 2 volts when the EVAPCP valve is commanded fully open?

Yes	No
CHECK for blockage in the vapor line to the CV solenoid. CHECK the CV solenoid filter for blockage or contamination. CHECK the carbon canister for blockage. If OK, INSTALL a new CV solenoid. REFER to the Workshop Manual Section 303-13, Evaporative Emissions. CLEAR the DTCs. REPEAT the self-test.	GO to HX17 .

HX17 CHECK THE EVAP SYSTEM FOR A STUCK OPEN VALVE

- Key ON, engine running.
- Access the PCM and control the EVAPPDC PID.
- Close the EVAPCP by commanding the EVAPPDC PID to 0% duty cycle or the EVMV PID to 0 mA.
- Access the PCM and control the EVAPCV PID.
- Close the CV solenoid by commanding the EVAPCV PID to ON (100% duty cycle).

Does the FTPV PID decrease, the engine RPM change, or the engine stall, as an indication that the EVAPCP valve is stuck open?

Yes	No
INSTALL a new EVAPCP valve. REFER to the Workshop Manual Section 303-13, Evaporative Emissions. CLEAR the DTCs. REPEAT the self-test.	GO to HX18 .

HX18 EVAP CANISTER PURGE VALVE TEST

- Key ON, engine running.
- Access the PCM and control the EVAPCV PID.
- Close the CV solenoid by commanding the EVAPCV PID to ON (100% duty cycle).
- Access the PCM and control the EVAPPDC PID.
- While monitoring the FTP PID, open the EVAPCP valve by commanding the EVAPPDC PID to a 100% duty cycle (or EVMV PID to a 1,000 mA).

Does the FTPV PID decrease, the engine RPM change, or the engine stall as an indication that the EVAPCP valve is opening?

Yes	No

For DTC P1450, unable to duplicate or identify the concern at this time. GO to Pinpoint Test Z . For all others, CHECK the EVAP system for leaks.	CHECK for blockages between the fuel tank, the EVAPCP valve, and the engine intake manifold. CHECK for obstructions in the EVAPCP valve diaphragm and ports. If OK, INSTALL a new EVAPCP valve. REFER to the Workshop Manual Section 303-13, Evaporative Emissions. CLEAR the DTCs. REPEAT the self-test.

HX19 DTC P0452: CHECK FOR FUEL TANK PRESSURE SENSOR CONNECTOR CONTAMINATION

- Key in OFF position.
- Visually check for liquid fuel contamination of the FTP sensor electrical connector.
- Check for a completely submerged FTP sensor (tank-mounted type only) in the liquid fuel. This can affect the correct FTP voltage reading.

Does the FTP sensor and its connector show any signs of fuel contamination?

Yes	No
REPAIR as necessary. ADJUST the fuel tank overfill. CLEAR the DTCs. REPEAT the self-test.	GO to HX20 .

HX20 CHECK FOR LOW FTP SENSOR VOLTAGE

Note: The FTP sensor voltage with no pressure/vacuum on the fuel tank is between 2.4 and 2.8 volts.

- Key ON, engine OFF.
- Access the PCM and monitor the FTP V PID.

Is the voltage less than 0.22 V?

Yes	No
GO to HX21 .	The concern that produced the DTC P0452 is intermittent. GO to Pinpoint Test Z .

HX21 CHECK THE OPPOSITE INDUCED HIGH FTP SENSOR SIGNAL

Note: If a diagnostic tool communication concern exists, immediately remove the jumper and follow the NO path in the RESULT/ACTION column.

- Key in OFF position.
- FTP Sensor connector disconnected.
- Connect a 5 amp fused jumper wire between the following:

Point A FTP Sensor Connector, Harness Side	Point B FTP Sensor Connector, Harness Side
VREF	FTP

- Key ON, engine OFF.
- Access the PCM and monitor the FTP V PID.

Is the voltage between 4 - 6 V?

Yes	No
INSTALL a new FTP sensor. REFER to the Workshop Manual Section 303-13, Evaporative Emissions. CLEAR the DTCs. REPEAT the self-test.	GO to HX22 .

HX22 CHECK THE VREF VOLTAGE TO THE FTP SENSOR

- Remove the jumper wire(s).
- Key ON, engine OFF.
- Measure the voltage between:

(+) FTP Sensor Connector, Harness Side	(-) FTP Sensor Connector, Harness Side
VREF	SIGRTN

Is the voltage between 4 - 6 V?

Yes	No
GO to HX23 .	GO to Pinpoint Test C .

HX23 CHECK THE FTP CIRCUIT(S) FOR A SHORT TO SIGRTN OR GND IN THE HARNESS

- Key in OFF position.
- PCM connector disconnected.
- Diagnostic tool connector disconnected.
- Measure the resistance between:

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

- Measure the resistance between:

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

Is the resistance greater than 10K ohms?

Yes	No
GO to HX62 .	REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.

HX24 DTC P0453: CHECK FOR HIGH FTP SENSOR VOLTAGE

Note: The FTP sensor voltage with no pressure/vacuum on the fuel tank is between 2.4 and 2.8 volts.

- Key ON, engine OFF.
- Access the PCM and monitor the FTP V PID.

Is the voltage greater than 4.5 V?

Yes	No
GO to HX25 .	The concern that produced the DTC P0453 is intermittent. GO to Pinpoint Test Z .

HX25 CHECK THE VOLTAGE BETWEEN THE VREF AND SIGRTN CIRCUITS AT THE FTP SENSOR VEHICLE HARNESS CONNECTOR

- Key in OFF position.
- FTP Sensor connector disconnected.
- Key ON, engine OFF.
- Measure the voltage between:

(+) FTP Sensor Connector, Harness Side	(-) FTP Sensor Connector, Harness Side
VREF	SIGRTN

Is the voltage between 4 - 6 V?

Yes	No
GO to HX26 .	GO to Pinpoint Test C .

HX26 CHECK THE FTP CIRCUIT FOR A SHORT TO VOLTAGE

- Measure the voltage between:

(+) FTP Sensor Connector, Harness Side	(-) Vehicle Battery
FTP	Negative terminal

Is the voltage less than 10 V?

Yes	No
GO to HX28 .	GO to HX27 .

HX27 CHECK THE FTP CIRCUIT FOR A SHORT TO VPWR IN THE HARNESS

- Key in OFF position.
- PCM connector disconnected.
- Key ON, engine OFF.
- Measure the voltage between:

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

Is the voltage greater than 10 V?

Yes	No
REPAIR the short circuit to PWR. CLEAR the DTCs. REPEAT the self-test.	GO to HX62 .

HX28 CHECK THE FTP CIRCUIT FOR AN OPEN IN THE HARNESS

- Key in OFF position.
- PCM connector disconnected.
- Measure the resistance between:

(+) PCM Connector, Harness Side	(-) FTP Sensor Connector, Harness Side
FTP	FTP

Is the resistance less than 5 ohms?

Yes	No
GO to HX29 .	REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.

HX29 CHECK THE FTP CIRCUIT FOR A SHORT TO VREF

- Measure the resistance between:

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

Is the resistance greater than 10K ohms?

Yes	No
GO to HX30 .	REPAIR the short circuit to VREF. CLEAR the DTCs. REPEAT the self-test.

HX30 CHECK THE OPPOSITE INDUCED LOW FTP SIGNAL

Note: If a diagnostic tool communication concern exists, immediately remove the jumper and follow the NO path in the Results/Action to Take column.

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

Point A FTP Sensor Connector, Harness Side	Point B FTP Sensor Connector, Harness Side
FTP	SIGRTN

- Key ON, engine OFF.
- Access the PCM and monitor the FTP V PID.

Is the voltage less than 0.1 V?

Yes	No
INSTALL a new FTP sensor. REFER to the Workshop Manual Section 303-13, Evaporative Emissions. CLEAR the DTCs. REPEAT the self-test.	GO to HX62 .

HX31 DTCS P0446 OR P1451: CHECK THE PCM OUTPUT TO THE CV SOLENOID

Note: For applications that use the engine off natural vacuum (EONV) EVAP leak check monitor, KAPWR provides voltage to the CV solenoid instead of VPWR.

- Key in OFF position.
- CV Solenoid connector disconnected.
- Connect a non-powered test lamp between:

(+) CV Solenoid Connector, Harness Side	(-) CV Solenoid Connector, Harness Side
VPWR	CANV
KAPWR	CANV

- Key ON, engine OFF.
- Enter output test mode. Refer to Section 2, Output Test Mode (OTM) .
- Command the outputs ON.
- Command the outputs OFF.
- Exit output test mode.

Does the test lamp turn on and off when the output(s) is commanded on and off?

Yes	No
GO to HX32 .	GO to HX33 .

HX32 CHECK THE CV SOLENOID RESISTANCE

Note: For applications that use the engine off natural vacuum (EONV) EVAP leak check monitor, KAPWR provides voltage to the CV solenoid instead of VPWR.

- Key in OFF position.
- Measure the resistance between:

(+) CV Solenoid Connector, Component Side	(-) CV Solenoid Connector, Component Side
KAPWR	CANV
VPWR	CANV

Are the resistances between 48 - 65 ohms?

Yes	No
Unable to duplicate or identify the concern at this time. GO to Pinpoint Test Z .	INSTALL a new CV solenoid. REFER to the Workshop Manual Section 303-13, Evaporative Emissions. CLEAR the DTCs. REPEAT the self-test.

HX33 CHECK THE VPWR VOLTAGE TO THE CV SOLENOID

Note: For applications that use the engine off natural vacuum (EONV) EVAP leak check monitor, KAPWR provides voltage to the CV solenoid instead of VPWR.

- Measure the voltage between:

(+) CV Solenoid Connector, Harness Side	(-)
KAPWR	Ground
VPWR	Ground

Are the voltages greater than 10 V?

Yes	No

GO to HX34 .	REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.

HX34 CHECK THE CANV CIRCUIT FOR AN OPEN IN THE HARNESS

- Key in OFF position.
- PCM connector disconnected.
- Measure the resistance between:

(+) PCM Connector, Harness Side	(-) CV Solenoid Connector, Harness Side
CANV	CANV

Is the resistance less than 5 ohms?

Yes	No
GO to HX35 .	REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.

HX35 CHECK THE CANV CIRCUIT FOR A SHORT TO PWRGND IN THE HARNESS

- Diagnostic tool connector disconnected.
- Measure the resistance between:

(+) CV Solenoid Connector, Harness Side	(-) Vehicle Battery
CANV	Negative terminal

Is the resistance greater than 10K ohms?

Yes	No
GO to HX36 .	REPAIR the short circuit to GND. CLEAR the DTCs. REPEAT the self-test.

HX36 CHECK THE CANV CIRCUIT FOR A SHORT TO VOLTAGE IN THE HARNESS

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

(+) CV Solenoid Connector, Harness Side	(-)
CANV	Ground

Is the voltage less than 1 V?

Yes	No

GO to HX62.	REPAIR the short circuit to PWR. CLEAR the DTCs. REPEAT the self-test.

HX37 DTCS P0461, P0462 OR P0463: CHECK THE INSTRUMENT CLUSTER MODULE FOR DTCS

- Key ON, engine OFF.
- Carry out the instrument cluster self-test.

Are any DTCs present?

Yes	No
REFER to the Workshop Manual Section 413-01, Instrument Cluster to continue diagnosis.	For Ranger, GO to HX38. For all others, GO to HX39.

HX38 CHECK THE FLI CIRCUIT VOLTAGE

- Access the PCM and monitor the FLI V PID.

Is the voltage between 0.25 - 4.5 V?

Yes	No
GO to HX40.	GO to HX41.

HX39 CHECK THE FLI PID

- Key ON, engine running.
- Access the PCM and monitor the FLI PID.

Does the FLI PID match the fuel gauge?

Yes	No
GO to HX40.	GO to HX62.

HX40 DTC P0460: CHECK FOR FUEL TANK FLOAT LEVEL RESPONSE

Note: A dual-container (saddle type) fuel tank has 2 fuel level sensors. The FLI PID in the PCM is the average value of both fuel level sensors. Some dual-container tanks may require the fuel level to be greater 3/4 full before the fuel level equalizes.

- Key ON, engine running.
- Access the PCM and monitor the FLI PID.
- Key in OFF position.

- If the fuel level is less than 1/4 (25% on FLI), add approximately 1/4 tank of fuel.
- If the fuel level is greater than 3/4 (75% on FLI), drain approximately 1/4 tank of fuel.
- Key ON, engine running.
- Access the PCM and monitor the FLI PID.

Does the FLI PID indicate a movement upward or downward as fuel is either added or drained?

Yes	No
Unable to duplicate or identify the concern at this time. GO to Pinpoint Test Z.	REFER to the Workshop Manual Section 413-01, Instrument Cluster to diagnose the incorrect fuel gauge indication symptom.

HX41 CHECK THE FLI CIRCUIT AT THE FP MODULE

- Key in OFF position.
- Instrument cluster connector disconnected. Refer to the Wiring Diagrams Manual for schematic and connector information.
- Gain access to the fuel pump connector or intermediate fuel pump connector.
- FP connector disconnected.
- Key ON, engine OFF.
- Measure the voltage between:

(+) FP Connector, Harness Side	(-) Vehicle Battery
FLI	Negative terminal

Is the voltage greater than 5 V?

Yes	No
GO to HX42.	GO to HX43.

HX42 CHECK THE FLI CIRCUIT FOR A SHORT TO VOLTAGE IN THE HARNESS

- Key in OFF position.
- PCM connector disconnected.
- Key ON, engine OFF.
- Measure the voltage between:

(+) FP Connector, Harness Side	(-) Vehicle Battery
FLI	Negative terminal

Is the voltage greater than 10 V?

Yes	No
REPAIR the short circuit to PWR. CLEAR the DTCs. REPEAT the self-test.	GO to HX62.

HX43 CHECK THE FLI CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS

- Key in OFF position.
- PCM connector disconnected.
- Measure the resistance between:

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

- Measure the resistance between:

(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side
FLI	CASE GND

Are the resistances greater than 10 K ohms?

Yes	No
GO to HX44 .	REPAIR the short circuit to GND. CLEAR the DTCs. REPEAT the self-test.

HX44 CHECK THE FLI CIRCUIT FOR AN OPEN IN THE HARNESS

- Measure the resistance between:

(+) PCM Connector, Harness Side	(-) Instrument Cluster Connector, Harness Side
FLI	FLI

- Measure the resistance between:

(+) PCM Connector, Harness Side	(-) FP Connector, Harness Side
FLI	FLI

Are the resistances less than 5 ohms?

Yes	No
GO to HX45 .	REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.

HX45 CHECK THE CASE GROUND CIRCUIT FOR AN OPEN IN THE HARNESS

- Measure the resistance between:

(+) PCM Connector, Harness Side	(-) FP Connector, Harness Side
CASE GND	CASE GND

- Measure the resistance between:

(+) PCM Connector, Harness Side	(-) Instrument Cluster Connector, Harness Side
CASE GND	GND

Are the resistances less than 5 ohms?

Yes	No
REFER to the Workshop Manual Section 413-01, Instrument Cluster to diagnose the instrument cluster. If OK, GO to HX62 .	REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.

HX46 CHECK FUEL CAP INDICATOR ALWAYS ON WITHOUT DTCS

- PCM connector disconnected.
- Key ON, engine OFF.

Is the check fuel cap indicator off with the PCM disconnected?

Yes	No
GO to HX62 .	The PCM has not caused the check fuel cap indicator to turn on. REFER to the Workshop Manual Section 413-01, Instrument Cluster to diagnose an always on check fuel cap indicator.

HX47 CHECK FUEL CAP INDICATOR NEVER ON WITHOUT DTCS

- Key in OFF position.
- Instrument cluster connector disconnected. Refer to the Wiring Diagrams Manual for schematic and connector information.
- PCM connector disconnected.
- Measure the resistance between:

(+) PCM Connector, Harness Side	(-) Instrument Cluster Connector, Harness Side
FCIL	FCIL

Is the resistance less than 5 ohms?

Yes	No
REFER to the Workshop Manual Section 413-01, Instrument Cluster to diagnose a never on check fuel cap indicator.	REPAIR the open circuit. VERIFY the repair by turning the key to the ON position. (The indicator turns off in 3 seconds).

If the instrument cluster is OK, GO to HX62 .	CLEAR the DTCs. REPEAT the self-test.

HX48 DTC P0451: CHECK THE FTP SENSOR FOR CORRECT OPERATION

- Key in OFF position.
- Remove the fuel filler cap.
- Key ON, engine OFF.
- Access the PCM and monitor the FTP PID.

Is the pressure between -0.42 and 0.42 kPa (-1.7 and 1.7 in-H2O)?

Yes	No
CHECK for kinks or bends in the fuel vapor hoses/tubes between the fuel tank and dust separator. CHECK the EVAP canister ports and canister vent hose assembly for contamination or debris. CHECK the dust separator for blockage. REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test.	INSTALL a new FTP sensor. REFER to the Workshop Manual Section 303-13, Evaporative Emissions. CLEAR the DTCs. REPEAT the self-test.

HX49 DTCS P0455 OR P0457: CHECK THE FUEL FILLER CAP

Note: Many EVAP leaks are caused by a loose or damaged fuel filler cap. If the fuel filler cap is suspect during visual inspection, do not disturb the fuel filler cap until the repair verification method is complete. If the repair verification method fails, reposition or install a new fuel filler cap and repeat the test. This action isolates the fuel filler cap from the rest of the EVAP system as a potential concern.

- Visually inspect the fuel filler cap without initially disturbing it.
  - Verify the fuel filler cap tether is visible and free to move.
  - Check for missing or loose fuel filler cap.
  - Check the fuel filler cap for damage.

Is a concern present with the proper installation of the fuel filler cap?

Yes	No
For repair verification, CARRY OUT the Smoke Machine PHASE 1 - Leak Verification Pressure Test. CONNECT or INSTALL a new fuel filler cap. GO to HX55 .	GO to HX50 .

HX50 CHECK FOR FLI DTCS

- Key ON, engine OFF.
- Check for self-test DTCs.

Are DTCs P0460, P0461, P0462 or P0463 present?

Yes	No
DISREGARD the current diagnostic trouble code (DTC) at this time. DIAGNOSE the next DTC. GO to Section 4, Diagnostic Trouble Code (DTC) Charts and Descriptions .	GO to HX51 .

HX51 CHECK THE OPERATION OF THE FUEL GAUGE

Note: A fuel gauge that always indicates a fuel level less than a 1/2 tank or always a full tank, may be caused by an FLI concern.

- Check operation of the fuel gauge.

Is the fuel gauge functioning properly?

Yes	No
GO to HX52 .	CHECK the functionality of the FLI circuit. RETURN to Section 3 , Symptom Charts for further direction.

HX52 DTC P1443: EVAPORATIVE EMISSION SYSTEM VISUAL INSPECTION

- Key in OFF position.
- Visually inspect for:
  - EVAP system lines/hoses (check for proper connections, damage or blockage)
  - loose fuel vapor hose/tube connections to the EVAP system components
  - the vacuum line from the input vacuum port to the intake manifold on the EVAPCP valve (the control vacuum solenoid part of the valve) is removed
  - blocked vacuum hose between the EVAPCP valve and the engine intake manifold
  - damaged fuel tank or fuel filler pipe

Are there any concerns found during the visual inspection?

Yes	No
REPAIR as necessary. For repair verification, CARRY OUT the Smoke Machine PHASE 1 - Leak Verification Pressure Test. GO to HX55 .	GO to HX53 .

HX53 CHECK THE FUEL TANK PRESSURE SENSOR VOLTAGE WITH THE FUEL FILLER CAP REMOVED

- Remove the fuel filler cap.
- Key ON, engine OFF.
- Access the PCM and monitor the FTP V PID.

Is the voltage between 2.4 - 2.8 V?

Yes	No
CONNECT the fuel filler cap. GO to HX54 .	INSTALL a new FTP sensor. REFER to the Workshop Manual Section 303-13, Evaporative Emissions. REPEAT the test and VERIFY the results. For repair verification, CARRY OUT the Smoke Machine PHASE 1 - Leak Verification Pressure Test. GO to HX55 .

HX54 EVAP CANISTER PURGE VALVE TEST

Note: The EVAPCP valve PID name may vary by the vehicle. Use the EVAPPDC or EVMV PID to control the EVAPCP valve.

- Key ON, engine running.
- Access the PCM and monitor the EVAPCV, EVAPPDC, EVMV and FTP V PIDs.
- Close the CV solenoid by commanding the EVAPCV PID to ON (100% duty cycle).
- While monitoring the FTP PID, open the EVAPCP by commanding the EVAPPDC PID to a 100% duty cycle (or EVMV PID to a 1,000 mA).

Does the FTPV PID decrease, the engine RPM change, or the engine stall as an indication that the EVAPCP valve is opening?

Yes	No
GO to HX55 .	INSTALL a new EVAPCP valve. REFER to the Workshop Manual Section 303-13, Evaporative Emissions. REPEAT the test and VERIFY the results. For repair verification, CARRY OUT the Smoke Machine PHASE 1 - Leak Verification Pressure Test. GO to HX55 .

HX55 DTCS P0442 OR P0456: HOOK UP THE SMOKE MACHINE (ROTUNDA VACUTEC)

CAUTION: Removing the Schrader valve from the test port permanently damages the valve.

Note: The smoke and air flow from the smoke machine will not pass through liquid fuel. Liquid fuel may be present in the fuel tank filler pipe.

Note: Some vehicles are not equipped with an evaporative emission test port. Use a suitable hose adapter in the following diagnostic procedures.

- Key in OFF position.
- Connect the smoke machine power cables to the vehicle battery. Check to see that the smoke machine power indicator lamp is on, indicating a good battery contact.
- For vehicles equipped with an evaporative emission test port:
  - Locate the evaporative emission test port and remove the green cap. The cap is located on or close to the EVAPCP valve.
  - Install the EVAP test port adapter (provided with the Vacutec Smoke Machine) to the test port.
- For vehicles not equipped with an evaporative emission test port:
  - Disconnect the fuel vapor to intake manifold line at the EVAPCP valve and cap the line.
  - Connect a suitable hose adapter to the fuel vapor to intake manifold connection at the EVAPCP valve.

Is the smoke machine hook up complete?

Yes	No
For leak detection, GO to HX56 . For leak repair verification, GO to HX57 .	REFER to the smoke machine operator manual for additional instructions and for helpful tips.

HX56 CARRY OUT SMOKE MACHINE PHASE 2 - LEAK DETECTION SMOKE TEST

Note: If the leak is not detected from the top, check the EVAP system for leaks from under the vehicle.
- Check the EVAP hoses, EVAPCP valve, CV solenoid, EVAP canister, fuel tank, fuel filler pipe, around the fuel tank area, and at the fuel filler cap.
- Wiggle the components and connections to simulate road bumps while looking for signs of leaking smoke.

If the leak is in the fuel filler neck between the check valve and the fuel filler cap, smoke under pressure may not reach the leak. If leaking smoke is not found, a thorough visual inspection of the fuel filler neck and fuel filler cap should be done.

- Position the control lever located on the smoke machine to SMOKE.
- Remove the fuel filler cap.
- Connect the smoke supply hose (black hose) nozzle tip into the EVAP service port or suitable hose adapter.
- Key ON, engine OFF.
- Access the PCM and control the EVAPCV PID.
- Close the CV solenoid by commanding the EVAPCV PID to ON (100% duty cycle). The CV solenoid reopens after 9 minutes of continuous operation.
- For vehicles not equipped with an evaporative emission test port:
  - Press the remote starter button on the smoke machine and verify the connection at the EVAPCP valve is correct and not leaking

    - Open the EVAPCP valve by commanding the EVAPPDC PID to 100% duty cycle or EVMV PID to 1,000 mA
- Press the remote starter button on the smoke machine. Smoke is then introduced into the EVAP system. If smoke does not exit the fuel filler neck after the system is pressurized, command the EVAPCV PID open to allow air to purge the CV solenoid. Once smoke is seen at the CV solenoid, command the EVAPCV PID close.
    - Secure the fuel filler cap once smoke is observed exiting the fuel tank neck area.
    - Continue to introduce smoke into the system for 60 seconds to obtain pressure.
    - Press and release the remote starter button in intervals of approximately 15 seconds on and 15 seconds off while checking for exiting smoke.
    - Use the halogen spotlight provided with the smoke machine to follow the EVAP system path and look for smoke exiting at the source of the leak(s).

Is the source of the EVAP leak located?

Yes	No
REPAIR as necessary. CONNECT all the disconnected components. For repair verification, CARRY OUT the Smoke Machine PHASE 1 - Leak Verification Pressure Test. GO to HX57 .	The test passed. CONNECT all the disconnected components. CARRY OUT the Smoke Machine PHASE 1 - Leak Verification Pressure Test. GO to HX57 .

HX57 CARRY OUT THE SMOKE MACHINE PHASE 1 - LEAK VERIFICATION PRESSURE TEST

- Position the control lever located on the smoke machine to METER.
- Calibrate the smoke machine flowmeter using the 0.020 (DTC P0456) or 0.040 (DTC P0442) standard as follows:
    - Insert the air supply hose (transparent hose) nozzle tip into the appropriate EVAP system standard located on the front of the smoke machine.
    - Press the remote starter button on the smoke machine. Observe the position of the flowmeter indicator ball.
    - Position the flowmeter red pointer flag so that it aligns with the measurement of the indicator ball.
    - Release the button and remove the air supply hose nozzle tip from the EVAP system standard.
- Connect the air supply hose (transparent hose) nozzle tip into the EVAP test port or suitable hose adapter.
- Key ON, engine OFF.
- Access the PCM and control the EVAPCV PID.
- Close the CV solenoid by commanding the EVAPCV PID to ON (100% duty cycle).
- For vehicles not equipped with an evaporative emission test port, open the EVAPCP valve by commanding the EVAPPDC PID to 100% duty cycle or EVMV PID to 1,000 mA.
- Press the remote starter button on the smoke machine. Notice that the ball in the flowmeter is all the way at the top. This indicates the system is being pressurized.
- Continue to press the remote starter button until the ball stops descending. Once the ball stops descending, observe if it is above or below the red pointer flag. If the measurement is below the indicator flag, the system has passed the pressure test. If the measurement is above the indicator flag, the EVAP system has an unacceptable leak.

Does the EVAP system pass the smoke machine leak verification pressure test?

Yes	No
The test passed and no concerns are present. CLEAR the DTCs. REPEAT the self-test.	GO to HX56 .

HX58 DTC P260F: CHECK FOR THE PRESENCE OF ANY MODULE COMMUNICATION CONCERNS

- Key ON, engine OFF.
- Check for self-test DTCs in all of the vehicle modules.

Are any communication concerns or communication DTCs present?

Yes	No
For communication concerns in the PCM, DISREGARD the current diagnostic trouble code (DTC) at this time. DIAGNOSE the next DTC. GO to Section 4, Diagnostic Trouble Code (DTC) Charts and Descriptions . For communication concerns in other modules, REFER to the applicable Workshop Manual Section to diagnose the communication DTC.	GO to HX59 .

HX59 CHECK THE PERFORMANCE OF THE PROCESSOR

- Key in OFF position.
- Disconnect the battery and wait for 1 minute.
- Connect the battery.
- Key ON, engine running.
- Allow the engine idle to stabilize.
- Access the PCM and monitor the FTP PID.

Is the pressure equal to 0 kPa (0 psi)?

Yes	No
GO to HX61 .	GO to HX60 .

HX60 CHECK FOR SELF-TEST DTC P260F

- Idle the engine for 2 minutes.
- Carry out the self-test.

Is DTC P260F present?

Yes	No
GO to HX61 .	RETURN the vehicle to the customer.

HX61 CHECK THE PCM FOR THE LATEST CALIBRATION

- Program the PCM to the latest calibration.
- Key ON, engine running.
- Idle the engine for 2 minutes.
- Carry out the self-test.

Is DTC P260F present?

Yes	No
GO to HX62 .	RETURN the vehicle to the customer.

HX62 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
INSTALL a new PCM. REFER to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM) .	The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.