

H: Fuel Control

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H1 CHECK FOR DIAGNOSTIC TROUBLE CODES (DTCS)

Are DTCs P0171, P0172, P0174, P0175, P2195, P2196, P2197, P2198, P2270, P2271, P2272, P2273, P2274, or P2275 present?

Yes	No
For DTCs P2270, P2271, P2272, P2273, P2274 or P2275, GO to H34 .	For all others, GO to Section 4, Diagnostic Trouble Code (DTC) Charts and Descriptions .
For DTCs P0171, P0174, P2195 or P2197, GO to H2 .	
For DTCs P0172, P0175, P2196 or P2198, GO to H7 .	

H2 DTCS P0171, P0174, P2195 OR P2197: LEAN SYSTEM DTCS

Note: Do not clear the DTCs or reset the keep alive memory (KAM).

- Access the PCM and record the engine coolant temperature (ECT) PID from the freeze frame data. The freeze frame data is used to recreate the concern.
- Carry out the PCM self-test.

Are any DTCs present other than the following: P0171, P0174, P2195 or P2197?

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 H3 .

H3 CARRY OUT A VISUAL INSPECTION ON THE INTAKE AIR SYSTEM AND ALL VACUUM HOSES

- Ignition OFF.
- Check the intake air system for leaks, obstructions, and damage.
- Inspect the entire length of all the vacuum hoses for:
 - proper connections
 - damage or cracks
 - damaged or cracked vacuum tees
- Verify the integrity of the positive crankcase ventilation (PCV) system.
- Verify the proper PCV valve part number.

Is a concern present?

Yes	No
GO to H6 .	GO to H4 .

H4 CHECK FOR THE PRESENCE OF A VACUUM LEAK

Note: Fuel trim values at idle are more sensitive to a vacuum leak. The vacuum leak (unmetered air) represents a larger portion of the total air flow at idle than at part throttle.

Note: The barometric pressure (BARO) PID is not a recommended PID to monitor when diagnosing a vacuum leak. Barometric pressure is calculated during high engine load, when the vacuum leak represents a small portion of the total air flow.

Note: When calculating the total fuel correction in the following steps, if LONGFT1 equals +13% and SHRTFT1 equals +23%, the total fuel correction for bank 1 equals +36%. If LONGFT2 equals +24% and SHRTFT2 equals -3% the total fuel correction for bank 2 equals +21%.

Note: If the freeze frame ECT PID is available, stabilize the engine at the temperature recorded by the freeze frame ECT PID. If the freeze frame ECT PID is not available, maintain the engine coolant temperature between 82°C - 101°C (180°F - 215°F) and the intake air temperature less than 46°C (115°F).

- Ignition ON, engine running.
- Access the PCM and monitor the ECT (TEMP), CHT (TEMP) and IAT (TEMP) PIDs.
- Access the PCM and monitor the LONGFT1 (PER), SHRTFT1 (PER), LONGFT2 (PER) and SHRTFT2 (PER) PIDs.
- Allow the engine to stabilize at the temperature necessary to recreate the concern.
- Mathematically add and record the LONGFT PID value to the SHRTFT PID value for each bank, for a total fuel correction at idle.
- Increase the engine speed to 3,500 RPM for 10 seconds. For vehicles with electronic throttle control (ETC), increase the engine speed to the maximum RPM without activating RPM limiting.
- Record the LONGFT1, SHRTFT1, LONGFT2, and SHRTFT2 PID values.
- Mathematically add and record the LONGFT PID value to the SHRTFT PID value for each bank, for a total fuel correction at 3,500 RPM or the maximum allowable RPM for vehicles with ETC.

Is the total fuel correction value difference, between idle and 3,500 RPM or the maximum allowable RPM for vehicles with ETC, less than 15 percent?

Yes	No
<p>No vacuum leak is present.</p> <p>For DTCs P0171 or P0174, GO to H16.</p> <p>For E-Series 4.6L, E-Series 5.4L, Expedition, F-150, Flex, MKS, Navigator, Sable PZEV, Taurus PZEV, and Taurus X PZEV with DTCs P2195 or P2197, GO to H15.</p> <p>For all other vehicles with DTCs P2195 or P2197, GO to H9.</p>	<p>GO to H5.</p>

H5 LOCATE THE VACUUM LEAK

NOTICE: Do not clamp or pinch a hard plastic hose. Use a vacuum cap or equivalent to restrict the hose.

Note: Restricting the EVAP vapor hose while the EVAP emission canister is purging may shift the SHRTFT. Carry out a visual inspection as necessary.

Note: When monitoring for a decrease in the SHRTFT PIDs in the following steps, if SHRTFT1 equals +15% and the hose is restricted, SHRTFT1 decreases to -7%. The total decrease in the SHRTFT PIDs equals 22%.

- Locate the vacuum tees for the intake air and PCV systems.
- Access the PCM and monitor the SHRTFT1 (PER) and SHRTFT2 (PER) PIDs.
- Restrict the vacuum lines one at a time for 30 seconds. If a vacuum leak is present, the SHRTFT PID values decrease as the hose is restricted.

Is the decrease in the SHRTFT PIDs greater than 15 percent when one of the vacuum hoses is restricted?

Yes	No
GO to H6 .	INSPECT the intake air system for a vacuum leak in the intake manifold or intake gaskets. REPAIR as necessary. For repair verification, GO to H6 .

H6 VACUUM LEAK REPAIR VERIFICATION

Note: If the freeze frame ECT PID is available, stabilize the engine at the temperature recorded by the freeze frame ECT PID. If the freeze frame ECT PID is not available, maintain the engine coolant temperature between 82°C - 101°C (180°F - 215°F) and the intake air temperature less than 46°C (115°F).

- Access the PCM and monitor the SHRTFT1 (PER) and SHRTFT2 (PER) PIDs.
- Allow the engine to stabilize at the temperature necessary to recreate the concern.
- Record the SHRTFT1 and SHRTFT2 PID values.
- Ignition OFF.
- Repair the vacuum leak.
- Ignition ON, engine running.
- Allow the engine to stabilize at the temperature necessary to recreate the concern.
- Access the PCM and monitor the SHRTFT1 (PER) and SHRTFT2 (PER) PIDs.
- Compare the recorded SHRTFT PID values, prior to the vacuum leak repair, to the current SHRTFT PID values.

Is the decrease in the SHRTFT PIDs greater than 15 percent?

Yes	No
RESET the keep alive memory (KAM). REFER to Section 2, Resetting The Keep Alive Memory (KAM) . REPEAT the self-test.	A vacuum leak is still present. GO to H5 .

H7 DTCS P0172, P0175, P2196 OR P2198: RICH SYSTEM DTCS

Note: Do not clear the DTCs or reset the keep alive memory (KAM).

- Access the PCM and record the freeze frame data.
- Carry out the PCM self-test.

Are any DTCs present other than the following: P0172, P0175, P2196 or P2198?

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 H8 .

H8 INSPECT THE ENTIRE INTAKE AIR SYSTEM FOR DEBRIS, BLOCKAGE OR OTHER DAMAGE

- Check the intake air system for obstructions, restrictions, and damage.
- Check the throttle plate for obstructions or sludge.
- Check the air filter element and housing for blockage.

Is a concern present?

Yes	No
REPAIR as necessary. Clear the PCM DTCs. REPEAT the self-test.	For DTCs P0172 or P0175, GO to H16 . For E-Series 4.6L, E-Series 5.4L, Expedition, F-150, Flex, MKS, Navigator, Sable PZEV, Taurus PZEV, and Taurus X PZEV with DTCs P2196 or P2198, GO to H15 . For all other vehicles with DTCs P2196 or P2198, GO to H13 .

H9 CHECK THE HO2S AND SIGRTN CIRCUIT(S) FOR AN OPEN IN THE HARNESS

- Ignition OFF.
- Disconnect the HO2S related to the current DTC.
- PCM connector disconnected.
- Measure the resistance between:

(+) HO2S Connector, Harness Side	(-) PCM Connector, Harness Side
HO2S Signal	HO2S Signal
SIGRTN	SIGRTN

Are the resistances less than 5 ohms?

Yes	No
GO to H10 .	REPAIR the open circuit. Clear the PCM DTCs. REPEAT the self-test.

H10 CHECK THE HO2S CIRCUIT FOR A SHORT TO SIGRTN IN THE HARNESS

- Measure the resistance between:

(+) HO2S Connector, Harness Side	(-) HO2S Connector, Harness Side
HO2S Signal	SIGRTN

Is the resistance greater than 10K ohms?

Yes	No
GO to H11 .	REPAIR the short circuit. Clear the PCM DTCs. REPEAT the self-test.

H11 CHECK THE HO2S CIRCUIT FOR A SHORT TO GROUND IN THE HARNESS

- Measure the resistance between:

(+) HO2S Connector, Harness Side	(-)
HO2S Signal	Ground

Is the resistance greater than 10K ohms?

Yes	No
GO to H12 .	REPAIR the short circuit. Clear the PCM DTCs. REPEAT the self-test.

H12 HO2S CIRCUIT TEST (WITH LEAN DTCS)

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

Point A HO2S Connector, Harness Side	Point B HO2S Connector, Harness Side
HO2S Signal	VPWR

- Ignition ON, engine OFF.
- Access the PCM and monitor the HO2S Signal PID.

Is the voltage greater than 1.3 V?

Yes	No
GO to H16 .	GO to H44 .

H13 HO2S CIRCUIT TEST (WITH RICH DTCS)

- Disconnect the HO2S related to the current DTC.
- Ignition ON, engine OFF.
- Access the PCM and monitor the HO2S Signal PID.

Is the voltage less than 0.2 V?

Yes	No
GO to H16 .	GO to H14 .

H14 CHECK THE HO2S CIRCUIT FOR A SHORT TO THE VPWR OR HEATER IN THE HARNESS

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

(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side
HO2S Signal	HO2S Heater

HO2S Signal

VPWR

Are the resistances greater than 10K ohms?

Yes	No
GO to H44 .	REPAIR the short circuit. Clear the PCM DTCs. REPEAT the self-test.

H15 CHECK THE UO2SPC CIRCUIT FOR AN OPEN IN THE HARNESS

Note: Only the suspect UO2S needs to be diagnosed.

- Ignition OFF.
- Universal HO2S-Front connector disconnected.
- PCM connector disconnected.
- Measure the resistance between:

(+) Universal HO2S-Front Connector, Harness Side	(-) PCM Connector, Harness Side
UO2SPC - Pin 1	UO2SPC

Is the resistance less than 5 ohms?

Yes	No
GO to H16 .	REPAIR the open circuit. Clear the PCM DTCs. REPEAT the self-test.

H16 CHECK THE FUEL PRESSURE



WARNING: WHEN CHECKING THE FUEL SYSTEM REMEMBER THAT THE FUEL SYSTEM MAY STILL BE PRESSURIZED WHEN THE ENGINE IS SWITCHED OFF. ALWAYS FOLLOW THE INSTRUCTIONS RELATED TO FUEL SYSTEM PRESSURE RELIEF. ALL FUEL HANDLING SAFETY PRECAUTIONS MUST BE OBSERVED. FAILURE TO FOLLOW THESE INSTRUCTIONS MAY RESULT IN PERSONAL INJURY.

Note: For vehicle specific fuel pressure ranges, refer to the Fuel System Specification Chart in pinpoint test HC.

- Remove the jumper wire(s).
- HO2S connector connected.
- Relieve the fuel pressure. Refer to the Workshop Manual Section 310-00, Fuel System for the Fuel System Pressure Release procedure.
- Mechanical fuel pressure gauge connected.
- Pressurize the fuel system. Refer to the Workshop Manual Section 310-00, Fuel System for the Fuel System Pressure Release procedure to pressurize the fuel system.
- Ignition ON, engine running.
- Allow the fuel pressure to stabilize.
- Ignition OFF.
- Ignition ON, engine running.
- Access the PCM and control the FP (NUM) PID.
- Run the fuel pump to obtain maximum fuel pressure.

Is the fuel pressure within range for the vehicle being diagnosed?

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Yes	No
GO to H17 .	GO to Pinpoint Test HC .

H17 CHECK THE FUEL SYSTEM FOR PRESSURE STABILITY - FAST LEAKDOWN

Note: When the fuel pump is commanded off, the fuel pressure may substantially decrease and then stabilize.

Note: During output state control, the fuel pump stays commanded on for only about 5 seconds.

- Ignition OFF.
- Ignition ON, engine OFF.
- Access the PCM and control the FP (NUM) PID.
- Run the fuel pump to obtain maximum fuel pressure.
- Command the fuel pump off.
- Allow the fuel pressure to stabilize.
- Record the stabilized reading.
- Monitor the fuel pressure for 10 seconds.

Does the fuel pressure remain within 34 kPa (5 psi) of the recorded reading after 10 seconds?

Yes	No
GO to H19 .	GO to H18 .

H18 CHECK FOR AN EXTERNAL FUEL LEAK

- Inspect the fuel tank, lines, and filler pipe for a fuel leak.

Is a concern present?

Yes	No
REPAIR as necessary. REFER to the fuel system WARNING information at the beginning of Pinpoint Test HC. GO to Pinpoint Test HC . Clear the PCM DTCs. REPEAT the self-test.	GO to H26 .

H19 CHECK THE FUEL SYSTEM FOR PRESSURE STABILITY - SLOW LEAKDOWN

- Continue to monitor the fuel pressure for 1 minute.

Does the fuel pressure remain within 34 kPa (5 psi) of the recorded reading (MRFS) or greater than 275 kPa (40 psi) (ERFS) after 1 minute?

Yes	No
GO to H20 .	GO to HC13 .

H20 CHECK THE SEPARATION LEVEL OF THE ETHANOL/WATER MIXTURE AND GASOLINE IN THE FUEL

Note: This step requires the use of a locally obtained 200 ml beaker and a 25 ml graduated cylinder.

Note: After approximately 3 minutes of standing, the ethanol and water mixes together and settles to the bottom of the 25 ml graduated cylinder. The gasoline rises to the top.

- Fill the 200 ml beaker with 5 ml of clean water.
- Use the pressure relief valve on the mechanical fuel gauge to drain 22 ml of fuel into an approved clean container.
- Pour 20 ml of fuel from the approved clean container into the 25 ml graduated cylinder.
- Add enough water from the 200 ml beaker to the 25 ml graduated cylinder to bring the total volume of liquid to 24 ml.
- Insert a stopper plug in the opening of the 25 ml graduated cylinder.
- Firmly hold the stopper in place and shake the 25 ml graduated cylinder to mix the water and fuel.
- Allow the liquid to stand and separate for approximately 3 minutes.
- Record the separation level from the 25 ml graduated cylinder where the ethanol/water mixture and gasoline meet.

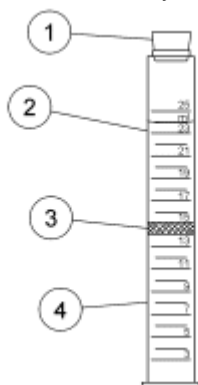
Did the ethanol/water mixture and gasoline separate?

Yes	No
GO to H21 .	COMPLETE all steps before continuing. The ethanol/water mixture will separate from the gasoline. If the fuel does not appear to separate, then the fuel is either 100% ethanol or a mixture of ethanol and water.

H21 CALCULATE THE PERCENTAGE OF ETHANOL IN THE FUEL

Note: Use the illustration as an example for calculating the percentage of ethanol in the following steps. If the separation level is at 14 ml the calculation becomes; 14 minus 4, then multiply by 5 to equal 50. The percentage of ethanol in the fuel is 50%.

- Ignition OFF.
- Take the recorded separation level from the previous step and subtract the amount of water added.
- Multiply the new value by 5. This new value is the percentage of ethanol in the fuel.



N0048579

Item Number	Description
1	Stopper
2	Gasoline
3	Separation Point at 14 ml
4	Ethanol/Water Mixture

- Record the calculated percentage of ethanol in the fuel.

Is any ethanol present in the fuel?

Yes	No
For flex fuel vehicles, GO to H22 .	GO to H26 .
For all others, GO to H25 .	

H22 COMPARE THE FF_INF PID TO THE CALCULATED PERCENTAGE OF ETHANOL

Note: When determining if the FF_INF PID value is within 50% of the calculated percentage of ethanol, if the calculated percentage of ethanol value is 40% then the PID value should be between 0 - 90%. The PID value cannot be less than zero.

- Ignition ON, engine OFF.
- Access the PCM and monitor the FF_INF (PER) PID.
- Compare the FF_INF PID to the calculated percentage of ethanol.

Is the FF_INF PID value within 50% of the calculated percentage of ethanol?

Yes	No
GO to H26 .	GO to H23 .

H23 RESET THE PERCENT ETHANOL PARAMETER IN THE PCM

Note: Certain customer fueling practices such as only fueling with small amounts of fuel or repeatedly switching between gasoline and an ethanol blend greater than E15 may prevent the PCM from learning the correct ethanol content in the fuel.

- Reset the keep alive memory (KAM). Refer to Section 2, [Resetting The Keep Alive Memory \(KAM\)](#).
- Ignition ON, engine running.
- Access the PCM and monitor the FF_LRND (NUM) PID.
- Drive the vehicle approximately 11.3 km (7 miles) or until the FF_LRND PID indicates yes.

Is the PID state YES?

Yes	No
GO to H24 .	GO to H44 .

H24 COMPARE THE UPDATED FF_INF PID TO THE CALCULATED PERCENTAGE OF ETHANOL

- Ignition OFF.
- Ignition ON, engine OFF.
- Access the PCM and monitor the FF_INF (PER) PID.

Is the FF_INF PID value within 50% of the calculated percentage of ethanol?

Yes	No
RETURN the vehicle to the customer. ADVISE the customer of the correct fueling practices when	A fuel system concern may be present, which

using flex fuel. REFER to the Owner's Literature for additional information. ADVISE the customer to continue to use the same fuel for the next 2-3 refuels. This practice helps to verify the PCM is learning the correct percentage of ethanol in the fuel.

prevents the PCM from learning the correct percentage of ethanol in the fuel,

GO to [HC13](#).

H25 DETERMINE IF THE PERCENTAGE OF ETHANOL IN THE FUEL IS LESS THAN 25%

- Check the recorded calculated percentage of ethanol in the fuel.

Is the calculated percentage of ethanol in the fuel less than 25%?

Yes	No
GO to H26 .	REPAIR as necessary. ADVISE the customer of the correct fuel type required for this vehicle. REFER to the Owner's Literature for additional information. Clear the PCM DTCs. REPEAT the self-test.

H26 CHECK THE FUEL INJECTOR FLOW AND LEAKAGE

- Ignition OFF.
- PCM connector connected.
- Check the fuel injectors for leakage and flow rate using the injector flow tester or other method such as inspecting the intake manifold for fuel.

Are the test results satisfactory?

Yes	No
For DTCs P0171, P0174, P2195 or P2197, GO to HC3 . For all others, GO to H27 .	INSTALL a new fuel injector. REFER to the Workshop Manual Section 303-04, Fuel Charging and Controls. RESET the keep alive memory (KAM). REFER to Section 2, Resetting The Keep Alive Memory (KAM) . REPEAT the self-test.

H27 CHECK THE FUNCTIONALITY OF MASS AIR FLOW (MAF) SENSOR

Note: A MAF PID value of less than 0.6 volt may indicate an incorrectly installed air cleaner or a leak in the air inlet system.

- Ignition ON, engine running.
- Allow the engine to stabilize at the correct operating temperature.
- Access the PCM and monitor the MAF (VOLT) PID.
- Check that the MAF PID at idle and NEUTRAL is not greater than 30% of the normal MAF listed in [Section 6](#), Reference Values or not greater than 1.3 volts.

Is the PID value within the expected range?

Yes	No

GO to [H28](#).

To continue diagnosis of the MAF/IAT sensor,

GO to Pinpoint Test [DC](#).

H28 CARRY OUT A VISUAL INSPECTION

- Ignition OFF.
- Universal HO2S-Front connector disconnected.
- For all others,
- HO2S connector disconnected.
- Visually inspect for:
 - pinched, shorted, and corroded wiring and pins
 - oil or water contamination
 - crossed sensor wires
 - Damaged or contaminated HO2S sensor

Is a concern present?

Yes	No
REPAIR as necessary. Clear the PCM DTCs. REPEAT the self-test.	For Crown Victoria, Edge, E-series 6.8L, Explorer, Focus, Fusion, F-Super Duty, Grand Marquis, Milan, MKX, MKZ, Mustang, Ranger, or Town Car with DTC P2195 or P2197, GO to H29 . For Crown Victoria, Edge, E-series 6.8L, Explorer, Focus, Fusion, F-Super Duty, Grand Marquis, Milan, MKX, MKZ, Mustang, Ranger, or Town Car with DTC P2196 or P2198, GO to H30 . For all others, GO to Pinpoint Test Z .

H29 CHECK THE HO2S OUTPUT VOLTAGE

- HO2S connector disconnected.
- Measure the voltage between:

(+) HO2S Connector, Component Side	(-) HO2S Connector, Component Side
HO2S Signal	SIGRTN

- Increase the engine speed to 2,000 RPM for 3 minutes.
- Carry out the PCM KOER self-test.
- Monitor the signal voltage during the self-test.

Is the voltage greater than 0.5 volt at any time during the self-test?

Yes	No
GO to H32 .	INSTALL a new HO2S. REFER to the Workshop Manual Section 303-14, Electronic Engine Controls. RESET the keep alive memory (KAM). REFER to Section 2, Resetting The Keep Alive Memory (KAM) . REPEAT the self-test.

H30 ATTEMPT TO RETRIEVE DTC P2195 OR P2197

- HO2S connector disconnected.
- Connect a 5 amp fused jumper wire between the following:

Point A HO2S Connector, Harness Side	Point B Vehicle Battery
HO2S Signal	Negative terminal

- Carry out the PCM self-test.

Are DTCs P2195 or P2197 present?

Yes	No
GO to H31 .	GO to H44 .

H31 HO2S VOLTAGE CHECK

- Ignition OFF.
- Remove the jumper wire(s).
- HO2S connector disconnected.
- Ignition ON, engine running.
- Increase the engine speed to 2,000 RPM for 30 seconds.
- Measure the voltage between:

(+) HO2S Connector, Component Side	(-) HO2S Connector, Component Side
HO2S Signal	SIGRTN

- Carry out the PCM KOER self-test.
- Monitor the signal voltage during the self-test.

Is the voltage less than 0.4 volt at any time during the self-test?

Yes	No
GO to H32 .	INSTALL a new HO2S. REFER to the Workshop Manual Section 303-14, Electronic Engine Controls. RESET the keep alive memory (KAM). REFER to Section 2, Resetting The Keep Alive Memory (KAM) . REPEAT the self-test.

H32 CARRY OUT A THOROUGH WIGGLE TEST ON THE HO2S HARNESS

- Ignition OFF.
- HO2S connector connected.
- Ignition ON, engine running.
- Engine at normal operating temperature.
- Access the PCM and monitor the HO2S Signal PID.
- Wiggle, shake, and bend small sections of the wiring harness while working from the sensor to the PCM.

While monitoring the HO2S PID, does the HO2S stop switching?

Yes	No
ISOLATE the concern and REPAIR as necessary. Clear the PCM DTCs. REPEAT the self-test.	GO to H33 .

H33 TEST DRIVE THE VEHICLE WHILE MONITORING THE HO2S PID FOR SWITCHING

- Access the PCM and monitor the HO2S Signal PID.
- Access the PCM and monitor the FUELSYS (NUM) PID.
- Start the engine and let idle until the vehicle goes into the closed loop fuel condition.
- Drive the vehicle in a manner consistent with the freeze frame data in an attempt to simulate the original concern.

Does the HO2S PID switch?

Yes	No
GO to DC28 .	INSTALL a new HO2S. REFER to the Workshop Manual Section 303-14, Electronic Engine Controls. RESET the keep alive memory (KAM). REFER to Section 2, Resetting The Keep Alive Memory (KAM) . REPEAT the self-test.

H34 DTCS P2270, P2272, P2271, P2273, P2274 OR P2275: HO2S LACK OF SWITCHES STUCK LEAN OR RICH

Note: Address all continuous memory ignition and misfire DTCs before any KOER HO2S DTCs.

- Ignition OFF.
- Visually inspect for:
 - pinched, shorted, and corroded wiring and pins
 - oil or water contamination
 - crossed sensor wires
 - contaminated or damaged sensor

Is a concern present?

Yes	No
REPAIR as necessary. Clear the PCM DTCs. REPEAT the self-test.	For KOER DTCs P2270, P2271, P2272, P2273, P2274 or P2275, GO to H36 . For continuous memory DTCs P2270, P2271, P2272, P2273, P2274 or P2275, GO to H35 .

H35 CHECK FOR KOER DTCS

- Ignition ON, engine OFF.
- Clear the PCM DTCs.
- Ignition ON, engine running.

- Run the engine at approximately 2,000 RPM. Maintain the engine speed for 3 minutes.
- Carry out the PCM self-test.

Are DTCs P2270, P2271, P2272, P2273, P2274 or P2275 present?

Yes	No
GO to H36 .	Unable to duplicate or identify the concern at this time. GO to Pinpoint Test Z .

H36 CHECK THE HO2S SIGNAL LEVEL TOO HIGH

Note: Fuel calculations can be affected by unmetered air leaks.

- Ignition OFF.
- Carefully inspect the following areas for potential air leaks:
 - hoses connecting to the mass air flow (MAF) sensor assembly
 - hoses connecting to the throttle body
 - intake manifold gasket leaks
 - PCV system
 - the vacuum lines are disconnected
 - improperly seated engine oil dipstick, tube or oil fill cap
 - exhaust leaks at flanges and gaskets
- With the vehicle in NEUTRAL, position it on a hoist. Refer to 100-02 Jacking and Lifting for the locations of the lifting points.
- Visually inspect for:
 - exhaust leaks at flanges and gaskets
 - HO2S not tightened to specification
 - physical exhaust system concerns
 - aftermarket exhaust
 - punctures or cracks in the catalyst

Is a concern present?

Yes	No
REPAIR as necessary. Clear the PCM DTCs. REPEAT the self-test.	GO to H37 .

H37 CHECK FOR SHORTS BETWEEN CIRCUITS IN THE HO2S HARNESS

- PCM connector disconnected.
- Disconnect the HO2S harness connector.
- Measure the resistance between:

(+) PCM Connector, Harness Side	(-) Vehicle Battery
HO2S Signal	Negative terminal

- Measure the resistance between:

(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side
HO2S Signal	SIGRTN

HO2S Signal	VPWR
HO2S Signal	HO2S Heater

Are the resistances greater than 10K ohms?

Yes	No
GO to H38 .	REPAIR the short circuit. Clear the PCM DTCs. REPEAT the self-test.

H38 CHECK THE HO2S CIRCUIT FOR AN OPEN IN THE HARNESS

- Measure the resistance between:

(+) PCM Connector, Harness Side	(-) HO2S Connector, Harness Side
HO2S Heater	HO2S Heater
VPWR	VPWR
HO2S Signal	HO2S Signal
SIGRTN	SIGRTN

Are the resistances less than 5 ohms?

Yes	No
GO to H39 .	REPAIR the open circuit. Clear the PCM DTCs. REPEAT the self-test.

H39 CHECK THE HO2S CIRCUIT VOLTAGE

- PCM connector connected.
- HO2S connector connected.
- Ignition ON, engine running.
- Access the PCM and monitor the HO2S Signal PID.

Is the voltage greater than 1.5 V?

Yes	No
For partial zero emission vehicle (PZEV), GO to H42 . For all others, GO to H41 .	GO to H40 .

H40 CHECK THE HO2S CIRCUIT VOLTAGE

- Ignition OFF.
- PCM connector connected.
- HO2S connector disconnected.
- Connect a 5 amp fused jumper wire between the following:

Point A HO2S Connector, Harness Side	Point B HO2S Connector, Harness Side
HO2S Signal	VPWR

- Ignition ON, engine OFF.
- Access the PCM and monitor the HO2S Signal PID.

Is the voltage greater than 1.5 V?

Yes	No
INSTALL a new HO2S. REFER to the Workshop Manual Section 303-14, Electronic Engine Controls. RESET the keep alive memory (KAM). REFER to Section 2, Resetting The Keep Alive Memory (KAM) . REPEAT the self-test.	GO to H44 .

H41 CHECK FOR OVER VOLTAGE IN THE PCM

- Ignition OFF.
- HO2S connector disconnected.
- Ignition ON, engine OFF.
- Measure the voltage between:

(+) HO2S Connector, Harness Side	(-) Vehicle Battery
SIGRTN	Negative terminal
HO2S Signal	Negative terminal

Are the voltages less than 1.5 V?

Yes	No
INSTALL a new HO2S. REFER to the Workshop Manual Section 303-14, Electronic Engine Controls. RESET the keep alive memory (KAM). REFER to Section 2, Resetting The Keep Alive Memory (KAM) . REPEAT the self-test.	GO to H44 .

H42 CHECK THE HO2S CIRCUIT FOR A SHORT TO VPWR IN THE HARNESS

- Ignition OFF.
- PCM connector disconnected.
- HO2S connector disconnected.
- Measure the resistance between:

(+) PCM Connector, Harness Side	(-) HO2S Connector, Harness Side
HO2S Signal	VPWR

Is the resistance greater than 10K ohms?

Yes	No
GO to H43 .	REPAIR the short circuit. Clear the PCM DTCs.

REPEAT the self-test.

H43 CHECK THE HO2S CIRCUIT VOLTAGE

- PCM connector connected.
- HO2S connector disconnected.
- Connect a 5 amp fused jumper wire between the following:

Point A HO2S Connector, Harness Side	Point B HO2S Connector, Harness Side
HO2S Signal	VPWR

- Ignition ON, engine running.
- Access the PCM and monitor the HO2S Signal PID.

Is the voltage greater than 1.5 V?

Yes	No
INSTALL a new HO2S. REFER to the Workshop Manual Section 303-14, Electronic Engine Controls. RESET the keep alive memory (KAM). REFER to Section 2, Resetting The Keep Alive Memory (KAM) . REPEAT the self-test.	GO to H44 .

H44 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.
- 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) , Programming the VID Block for a Replacement PCM.	The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

