DW: Heated Oxygen Sensor (HO2S)

DW: Introduction

DW1 CHECK FOR DIAGNOSTIC TROUBLE CODES (DTCS)

Are DTCs P0040, P0041, P0053, P0054, P0055, P0059, P0060, P0132, P0133, P0135, P0138, P0139, P013A, P013C, P013E, P0141, P0144, P0147, P014A, P0152, P0153, P0155, P0158, P0159, P0161, or P1127 present?

Yes	No
For DTCs P0040 or P0041, GO to DW2. For DTCs P0053, P0054, P0055, P0059 or P0060, GO to DW14. For DTCs P0132, P0138, P0144, P0152 or P0158, GO to DW20. For DTCs P0133 or P0153, GO to DW3. For DTCs P0135, P0139, P0141, P0147, P0155, P0159 or P0161, GO to DW9. For DTCs P013A, P013C, P013E or P014A, GO to DW25. For DTC P1127, GO to DW19.	For all others, GO to Section 4, Diagnostic Trouble Code (DTC) Charts and Descriptions.

DW2 KOER DTCS P0040 AND P0041: CROSSED SENSOR WIRES

- Ignition OFF.
- Check the vehicle repair history.
- Verify the HO2S connectors are connected to the correct engine bank.

Is a concern present?

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

DW3 CONTINUOUS MEMORY DTCS P0133 AND P0153: CARRY OUT THE KOER SELF-TEST

- Engine at normal operating temperature.
- Carry out the PCM KOER self-test.

Are DTCs P0040, P0041 or P1127 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 DW4 .

DW4 CHECK THE HO2S RESPONSE TEST RESULTS

- Ignition ON, engine OFF.
- Access the diagnostic monitoring test results for the HO2S11 and HO2S21. Refer to Section 2, Diagnostic Monitoring Test Results Mode 6 .

Is the indicated value greater than the minimum threshold?

Yes	No
Clear the PCM DTCs. GO to DW3 .	GO to DW5 .

DW5 CHECK FOR UNMETERED AIR LEAKS

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

- 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

Are any air leaks present?

Yes	No
REPAIR the source of the air leak. RESET the keep alive memory (KAM). REFER to Section 2, Resetting The Keep Alive Memory (KAM) . REPEAT the self-test.	GO to DW6 .

DW6 CHECK THE HO2S CIRCUIT CONTINUITY

Note: HO2S is displayed as O2S on the scan tool.

- HO2S connector disconnected.
- Check the connector (both halves) for any water contamination.
- 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 V?

Yes	No
INSTALL a new HO2S. REFER to the Workshop Manual Section 303-14, Electronic Engine Controls. CHANGE the engine oil and oil filter. RESET the keep alive memory (KAM). REFER to Section 2, Resetting The Keep Alive Memory (KAM) . REPEAT the self-test.	GO to DW7 .

DW7 CHECK THE HO2S CIRCUIT(S) FOR AN OPEN IN THE HARNESS

Note: A vehicle hoist may be required to access the HO2S harness.

- Ignition OFF.
- Remove the jumper wire(s).
- Visually inspect the HO2S harness for exposed wiring, water contamination, corrosion, and proper assembly.
- PCM connector disconnected.
- Measure the resistance between:

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

Are the resistances less than 5 ohms?

Yes	No
GO to DW8 .	REPAIR the open circuit. Clear the PCM DTCs. REPEAT the self-test.

DW8 CHECK THE HO2S CIRCUIT FOR A SHORT TO VPWR IN THE HARNESS

- Measure the resistance between:

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

Is the resistance greater than 10K ohms?

Yes	No
GO to DW9 .	GO to DW12 .

DW9 DTCS P0135, P0139, P0141, P0147, P0155, P0159 OR P0161: CHECK FOR A SOURCE OF POTENTIAL HO2S CONTAMINATION

- Investigate the following items as potential sources of HO2S contamination:
  - use of unapproved silicon sealers
  - fuel contaminated by silicon additives
  - excessive oil consumption
  - glycol leaking internally in the engine
  - lead-contaminated fuel
  - short drive cycles in cold weather
  - use of unapproved cleaning agents

Is a concern present?

Yes	No
REPAIR the source of the contamination. CHANGE the engine oil and oil filter. RESET the keep alive memory (KAM). REFER to Section 2, Resetting The Keep Alive Memory (KAM) . REPEAT the self-test.	GO to DW10 .

DW10 VISUALLY INSPECT THE HO2S HARNESS

- PCM connector connected.
- Visually inspect the HO2S harness for exposed wiring, water contamination, corrosion, and proper assembly.

Is a concern present?

Yes	No
REPAIR as necessary. Clear the PCM DTCs. REPEAT the self-test.	For DTCs P0139 or P0159, GO to DW11 . For all others, GO to DW12 .

DW11 CHECK THE EXHAUST SYSTEM FOR LEAKS AND MODIFICATIONS

- Check for leaks in the exhaust system.
- Visually inspect the vehicle for aftermarket accessories and performance modifications.

Is a concern present?

Yes	No
REPAIR as necessary. Clear the PCM DTCs. REPEAT the self-test.	GO to DW28 .

DW12 CHECK THE HO2S AND SIGRTN CIRCUITS FOR AN OPEN IN THE HARNESS

Note: Verify the harness pins are in the proper location.

- Measure the resistance between:

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

Are the resistances less than 5 ohms?

Yes	No
GO to DW13 .	REPAIR as necessary. Clear the PCM DTCs. REPEAT the self-test.

DW13 CARRY OUT THE KOEO ON DEMAND SELF-TEST

- Ignition ON, engine OFF.
- Carry out the PCM KOEO self-test.

Are DTCs P0135, P0141, P0147, P0155 or P0161 present?

Yes	No
GO to DW14 .	GO to DW15 .

DW14 DTCS P0053, P0054, P0055, P0059 AND P0060: CHECK FOR VPWR IN THE HARNESS

Note: If DTCs P0053, P0054, P0055, P0059, or P0060 are present, test their related circuits individually.

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

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

Is the voltage greater than 10 V?

Yes	No
GO to DW15 .	REPAIR the open circuit. CHECK the fuses. Clear the PCM DTCs. REPEAT the self-test.

DW15 CHECK THE HO2S HEATER FOR SHORTS IN THE HARNESS

Note: If DTCs P0053, P0054, P0055, P0059, or P0060 are present, test their related circuits individually.

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

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

- Measure the resistance between:

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

Are the resistances greater than 10K ohms?

Yes	No
GO to DW16 .	REPAIR the short circuit. Clear the PCM DTCs. REPEAT the self-test.

DW16 CHECK THE HO2S HEATER CIRCUIT FOR AN OPEN IN THE HARNESS

- Measure the resistance between:

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

Is the resistance less than 5 ohms?

Yes	No
GO to DW17 .	REPAIR the open circuit. Clear the PCM DTCs. REPEAT the self-test.

DW17 CHECK THE INTERNAL RESISTANCE OF THE HO2S HEATER

- Measure the resistance between:

(+) HO2S Connector, Component Side	(-) HO2S Connector, Component Side
HO2S Heater	VPWR

Is the resistance between 3 - 30 ohms?

Yes	No
GO to DW18 .	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.

DW18 CHECK THE HO2S HEATER CIRCUIT FOR AN INTERNAL SHORT TO SIGRTN OR

GND

- Measure the resistance between:

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

- Measure the resistance between:

(+) HO2S Connector, Component Side	(-) Vehicle Battery
HO2S Heater	Negative terminal

Is the resistance greater than 10K ohms?

Yes	No
GO to DW28 .	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.

DW19 KOER DTC P1127: EXHAUST TEMPERATURE OUT OF RANGE

Note: Address all other DTCs before proceeding.

- Ignition ON, engine running.
- Engine at normal operating temperature.
- Access the PCM and monitor the HTR11 (NUM) and HTR21 (NUM) PIDs.

Are the PID states ON?

Yes	No
CARRY OUT the KOER self-test.	RUN the engine until the PID indicates ON. CARRY OUT the KOER self-test.

DW20 DTCS P0132, P0138, P0144, P0152 AND P0158: VISUALLY INSPECT THE HO2S HARNESS

Note: Disconnect the suspect HO2S harness connector. Only the suspect HO2S needs to be diagnosed.

- Ignition OFF.
- HO2S connector disconnected.
- Visually inspect the HO2S harness.
  - check the connector (both halves) for contamination
  - make sure the connector pins are fully seated

Is a concern present?

Yes	No

REPAIR as necessary. Clear the PCM DTCs. REPEAT the self-test.	GO to DW21 .

DW21 CHECK THE HO2S SIGNAL LEVEL TOO HIGH

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

Is the voltage less than 1.1 V?

Yes	No
GO to DW22 .	GO to DW23 .

DW22 CARRY OUT A THOROUGH WIGGLE TEST ON THE HO2S HARNESS

- Ignition OFF.
- Ignition ON, engine OFF.
- Access the PCM and monitor the HO2S Signal PID.
- Carry out a thorough wiggle test on the HO2S harness.

Does the voltage change during the wiggle test?

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

DW23 CHECK THE HO2S SIGNAL FOR A SHORT TO VPWR INSIDE THE SENSOR

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

Is the voltage less than 1.1 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 DW24 .

DW24 CHECK THE HO2S CIRCUIT FOR A SHORT TO VPWR IN THE HARNESS

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

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

Is any voltage present?

Yes	No
REPAIR the short circuit. Clear the PCM DTCs. REPEAT the self-test.	GO to DW28 .

DW25 DTC P013A, P013C, P013E, P014A: CHECK FOR OTHER SELF-TEST DTCS

Are any DTCs present other than P013A, P013C, P013E, or P014A?

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 DW26 .

DW26 CHECK FOR EXHAUST SYSTEM AND FUEL SELECTION CONCERNS

- Inspect the exhaust system for the following:
  - leaks, cracks, or punctures
  - aftermarket accessories and performance modifications
  - exhaust leaks at the HO2S
- Verify with the customer that flex fuel is not being used on a non-flex fuel vehicle.

Is a concern present?

Yes	No
REPAIR as necessary. Clear the PCM DTCs. REPEAT the self-test.	For DTCs P013A or P013C, 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) . For all others, GO to DW27 .

DW27 CHECK FOR AN INTERMITTENT HO2S SIGNAL

- Ignition ON, engine OFF.
- Access the PCM and monitor the O2S12 (VOLT) and O2S22 (VOLT) PIDs.
- Wiggle, shake, and bend small sections of the wiring harness while working from the sensor to the PCM.

Is a concern present?

Yes	No
	INSTALL a new HO2S. REFER to the Workshop

REPAIR as necessary. Clear the PCM DTCs. REPEAT the self-test.	Manual Section 303-14, Electronic Engine Controls. RESET the keep alive memory (KAM). REFER to Section 2, Resetting The Keep Alive Memory (KAM) .

DW28 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.