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2023 Ford Mustang Mach-E Service and Repair Manual

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PCM (powertrain control module) P013B:00	O2 Sensor Slow Response - Lean to Rich (Bank 1, Sensor 2): No Sub Type Information	Sets when the PCM (powertrain control module) detects the measured value is slower than the threshold value. During a deceleration fuel shut-off event, the PCM (powertrain control module) monitors how quickly the HO2S (heated oxygen sensor) bank 1, sensor 2 switches from lean to rich. The measured rate of the lean to rich switch is compared to a calibrated fault threshold value. The measured rate of the lean to rich switch is compared to a calibrated fault threshold value. Check for leaks in the exhaust system.
PCM (powertrain control module) P013C:00	O2 Sensor Slow Response - Rich to Lean (Bank 2, Sensor 2): No Sub Type Information	Sets when the PCM (powertrain control module) detects the measured response rate is slower than the threshold value. This monitor is highly sensitive to exhaust leaks near the rear HO2S (heated oxygen sensor) . The heated oxygen sensor monitor measures the response rate of the rear HO2S (heated oxygen sensor) to a rich to lean transition. This monitor is highly sensitive to exhaust leaks near the rear HO2S (heated oxygen sensor) . Check for leaks in the exhaust system.
PCM (powertrain control module) P013E:00	O2 Sensor Delayed Response - Rich to Lean (Bank 1 Sensor 2): No Sub Type Information	Sets when the PCM (powertrain control module) , after three consecutive intrusive attempts, the cannot force the signal greater than the calibrated rich value. Also, if the signal voltage remains greater than the lean value after a calibrated amount of time with the fuel injectors off, a counter is incremented. This DTC (diagnostic trouble code) also sets when after three consecutive occurrences the signal is not less than the calibrated lean value. During a deceleration fuel shut-off event, the PCM (powertrain control module) monitors the HO2S (heated oxygen sensor) bank 1, sensor 2 signal to determine if the signal is stuck in range. The PCM (powertrain control module) expects the signal to exceed a calibrated rich or lean value within a calibrated amount of time. If the signal voltage remains less than the rich value after a number of occurrences, the PCM (powertrain control module) intrusively controls the fuel system rich over increasing time periods in an attempt to force the signal to greater than the calibrated rich value. Check for leaks in the exhaust system. Check for an intermittent HO2S12 or HO2S22 signal.
PCM (powertrain	O2 Sensor Circuit No Activity Detected (Bank	Sets when the PCM (powertrain control module) is unable to detect movement in the sensor signal while the air to fuel ratio is

PCM (powertrain control module) P0158:00	O2 Sensor Circuit High Voltage (Bank 2 Sensor 2): No Sub Type Information	Sets when the PCM (powertrain control module) detects an over voltage condition is present on the HO2S (heated oxygen sensor) bank 2, sensor 2 circuit.
PCM (powertrain control module) P0159:00	O2 Sensor Circuit Slow Response (Bank 2 Sensor 2): No Sub Type Information	Sets when the PCM (powertrain control module) detects it is at the allowable limit or has exceeded an allowable length of time for fuel trim modification, without detecting an acceptable rate of voltage change. The HO2S (heated oxygen sensor) monitor tracks the rate of voltage change during the rise and fall of the HO2S (heated oxygen sensor) bank 2, sensor 2 signal. When the rate of voltage change is less than a calibrated value, the PCM (powertrain control module) begins to modify the fuel trim attempting to increase the HO2S (heated oxygen sensor) voltage switch rate.
PCM (powertrain control module) P0161:00	O2 Sensor Heater Circuit (Bank 2 Sensor 2): No Sub Type Information	Sets when the PCM (powertrain control module) detects an open or short from the universal HO2S (heated oxygen sensor) bank 2, sensor 2 heater circuit.
PCM (powertrain control module) P2270:00	O2 Sensor Signal Stuck Lean - Bank 1, Sensor 2: No Sub Type Information	Sets when the PCM (powertrain control module) detects the HO2S (heated oxygen sensor) bank 1, sensor 2 signal is less than the calibrated rich value during the current key cycle and, after three consecutive intrusive events, the signal cannot be forced greater than the calibrated rich value. Check for leaks in the exhaust system. Check for an intermittent HO2S12 signal.
PCM (powertrain control module) P2271:00	O2 Sensor Signal Stuck Rich - Bank 1, Sensor 2: No Sub Type Information	Sets when the PCM (powertrain control module) detects the HO2S (heated oxygen sensor) bank 1, sensor 2 signal is greater than the calibrated lean value during the current key cycle and, after three consecutive intrusive events, the signal cannot be forced less than the calibrated lean value. Check for leaks in the exhaust system. Check for an intermittent HO2S12 signal.

- Exhaust leak
- High exhaust temperature
- Contaminated fuel
- HO2S (heated oxygen sensor) circuitry concern
- MAF (mass air flow) sensor (if equipped)
- HO2S (heated oxygen sensor) (9G444)
- PCM (powertrain control module) (12A650)

Pinpoint Test Steps available in the on-line Workshop Manual.

PINPOINT TEST DZ : UNIVERSAL HEATED OXYGEN SENSOR (HO2S)

WARNING

While conducting tests on a hot engine take all safety precautions to prevent skin contact with hot engine components. Failure to follow these instructions may result in personal injury.

NOTE

Only diagnose the suspect universal HO2S indicated by the DTC.

Normal Operation and Fault Conditions

Refer to the DTC (diagnostic trouble code) Fault Trigger Conditions.

DTC Fault Trigger Conditions

DTC (diagnostic trouble code)	Description	Fault Trigger Condition
PCM (powertrain control module) P0030:00	HO2S Heater Control Circuit (Bank 1, Sensor 1): No Sub Type Information	Sets when PCM (powertrain control module) detects the sensor does not warm up to the required temperature in a calibrated amount of time. This DTC (diagnostic trouble code) also sets when the PCM (powertrain control module) is not able to maintain the required temperature after the sensor is warm. The PCM (powertrain control module) controls the heater ON and OFF duty cycle to maintain a calibrated temperature.
PCM (powertrain	Oxygen Sensor Signals Swapped	Sets when PCM (powertrain control module) detects no response from the universal HO2S (heated oxygen sensor) being tested. The

PCM (powertrain control module) P0132:00	O2 Sensor Circuit High Voltage (Bank 1 Sensor 1): No Sub Type Information	Sets when PCM (powertrain control module) detects an over voltage concern with one of the circuits used to determine the oxygen content in the exhaust gas.
PCM (powertrain control module) P0133:00	O2 Sensor Circuit Slow Response (Bank 1 Sensor 1): No Sub Type Information	Sets when PCM (powertrain control module) detects the oxygen sensor signal does not reach the predicted amplitude within a predetermined response time. The PCM (powertrain control module) monitors oxygen sensor response time by commanding a calibrated fuel control routine. This routine sets the air fuel ratio to a calibrated limit to produce a predictable oxygen sensor signal amplitude.
PCM (powertrain control module) P0134:00	O2 Sensor Circuit No Activity Detected (Bank 1 Sensor 1): No Sub Type Information	Sets when PCM (powertrain control module) is unable to detect movement in the sensor signal while the air to fuel ratio is oscillating. If the sensor signal value is not changing from the default value, the PCM (powertrain control module) commands an oscillating air to fuel ratio attempting to detect some movement in the signal value.
PCM (powertrain control module) P0135:00	O2 Sensor Heater Circuit (Bank 1 Sensor 1): No Sub Type Information	Sets when PCM (powertrain control module) detects an open or short circuit is detected or the heater current draw exceeds a calibrated limit.
PCM (powertrain control module) P0150:00	O2 Sensor Circuit (Bank 2 Sensor 1): No Sub Type Information	Sets when PCM (powertrain control module) detects a concern with one of the circuits used to determine the oxygen content in the exhaust gas.
PCM (powertrain control module) P0151:00	O2 Sensor Circuit Low Voltage (Bank 2 Sensor 1): No Sub Type Information	Sets when PCM (powertrain control module) detects a concern with one of the circuits used to determine the oxygen content in the exhaust gas. An engine stall condition or an extremely rich air to fuel ratio may set this DTC (diagnostic trouble code) . Diagnose any engine stall or rich air to fuel ratio concerns before diagnosing this DTC (diagnostic trouble code) . An engine stall condition or an extremely rich air to fuel ratio may set this DTC (diagnostic trouble code) . Diagnose any engine stall or rich air to fuel ratio concerns before diagnosing this DTC (diagnostic trouble code) .

control module) P064E:00	Processor Performance - Bank 2: No Sub Type Information	module) monitors the application specific integrated circuit that controls and monitors the universal HO2S (heated oxygen sensor) bank 2, sensor 1. Check for other Diagnostic Trouble Codes (DTCs) and diagnose those first. Check for intermittent universal HO2S (heated oxygen sensor) wiring concerns. Check the universal HO2S (heated oxygen sensor) wiring between the PCM (powertrain control module) and the sensor for damage. Check for aftermarket performance products. Reprogram or update the calibration. Clear the Diagnostic Trouble Codes (DTCs), repeat the self-test.
PCM (powertrain control module) P1127:00	Exhaust Temperature Out of Range, O2 Sensor Tests Not Completed: No Sub Type Information	Sets when PCM (powertrain control module) detects the inferred exhaust temperature is below a minimum calibrated value. The DTC (diagnostic trouble code) P1127 is present if the exhaust is not hot. The HO2S (heated oxygen sensor) monitor uses an exhaust temperature model to determine when the universal HO2S (heated oxygen sensor) heaters are cycled ON. Monitor the universal HO2S (heated oxygen sensor) heater PIDs to determine the ON or OFF state. The DTC (diagnostic trouble code) P1127 is present if the exhaust is not hot.
PCM (powertrain control module) P1646:00	Linear O2 Sensor Control Chip (Bank 1): No Sub Type Information	Sets when PCM (powertrain control module) detects an internal circuit or communication concern.The PCM (powertrain control module) monitors the application specific integrated circuit that controls and monitors the universal HO2S (heated oxygen sensor) bank 1, sensor 1. Check for other Diagnostic Trouble Codes (DTCs) and diagnose those first. Check for other Diagnostic Trouble Codes (DTCs) and diagnose those first. Check for intermittent universal HO2S (heated oxygen sensor) wiring concerns. Check the universal HO2S (heated oxygen sensor) wiring between the PCM (powertrain control module) and the sensor for damage. Check for aftermarket performance products. Reprogram or update the calibration. Clear the Diagnostic Trouble Codes (DTCs), repeat the self-test.
PCM (powertrain control module) P1647:00	Linear O2 Sensor Control Chip (Bank 2): No Sub Type Information	Sets when PCM (powertrain control module) detects an internal circuit or communication concern. The PCM (powertrain control module) monitors the application specific integrated circuit that controls and monitors the universal HO2S (heated oxygen sensor) bank 2, sensor 1. Check for other Diagnostic Trouble Codes (DTCs) and diagnose those first. Check for intermittent universal HO2S (heated oxygen sensor) wiring concerns. Check the universal HO2S (heated oxygen sensor) wiring between the PCM (powertrain control

PCM (powertrain control module) P2099:00	Post Catalyst Fuel Trim System Too Rich Bank 2: No Sub Type Information	Sets when PCM (powertrain control module) detects the correction value is greater than a calibrated limit. The PCM (powertrain control module) monitors the correction value from the HO2S (heated oxygen sensor) bank 2, sensor 2 as part of the fore-aft oxygen sensor control routine.
PCM (powertrain control module) P2237:00	O2 Sensor Positive Current Control Circuit/Open - Bank 1, Sensor 1: No Sub Type Information	Sets when PCM (powertrain control module) detects a concern with the circuit used to determine the oxygen content in the exhaust gas.
PCM (powertrain control module) P2240:00	O2 Sensor Positive Current Control Circuit/Open - Bank 2, Sensor 1: No Sub Type Information	Sets when PCM (powertrain control module) detects a concern with the circuit used to determine the oxygen content in the exhaust gas.
PCM (powertrain control module) P2243:00	O2 Sensor Reference Voltage Circuit/Open - Bank 1, Sensor 1: No Sub Type Information	Sets when PCM (powertrain control module) detects a concern with the circuit used to determine the oxygen content in the exhaust gas.
PCM (powertrain control module) P2247:00	O2 Sensor Reference Voltage Circuit/Open - Bank 2, Sensor 1: No Sub Type Information	Sets when PCM (powertrain control module) detects a concern with the circuit used to determine the oxygen content in the exhaust gas.
PCM (powertrain control module) P2251:00	O2 Sensor Negative Current Control Circuit/Open - Bank 1, Sensor 1:	Sets when PCM (powertrain control module) detects a concern with the circuit used to determine the oxygen content in the exhaust gas.

PCM (powertrain control module) P2630:00	O2 Sensor Positive Current Trim Circuit Low Bank 2, Sensor 1: No Sub Type Information	Sets when PCM (powertrain control module) detects the resistance value from the universal HO2S (heated oxygen sensor) is too high. A resistor is installed in the universal HO2S (heated oxygen sensor) connector for part to part variance. The PCM (powertrain control module) determines the value of this resistor by taking multiple measurements of the resistor during each ignition ON event. The PCM (powertrain control module) uses this value in order to compensate for the variance in the pumping current signal.
PCM (powertrain control module) P2631:00	O2 Sensor Positive Current Trim Circuit High Bank 2, Sensor 1: No Sub Type Information	Sets when PCM (powertrain control module) detects a concern with the circuit used to determine the oxygen content in the exhaust gas.

Possible Sources

- HO2S (heated oxygen sensor) circuitry concern
- Exhaust leak
- Intake air leak
- Engine not operating long enough before carrying out the KOER (key on, engine running) self-test
- MAF (mass air flow) sensor (if equipped)
- HO2S (heated oxygen sensor) (9Y460)
- PCM (powertrain control module) (12A650)

Pinpoint Test Steps available in the on-line Workshop Manual.

PINPOINT TEST H : FUEL CONTROL

WARNING

While conducting tests on a hot engine take all safety precautions to prevent skin contact with hot engine components. Failure to follow these instructions may result in personal injury.

Normal Operation and Fault Conditions

Refer to the DTC (diagnostic trouble code) Fault Trigger Conditions.

DTC Fault Trigger Conditions

module) P1138:00	Sub Type Information	oxygen sensor) bank 1, sensor 2 is forced rich and lean and monitored by the PCM (powertrain control module) .
PCM (powertrain control module) P1157:00	Lack Of HO2S22 Switches - Sensor Indicates Lean: No Sub Type Information	Sets when PCM (powertrain control module) detects no output of the HO2S22 in a calibrated amount of time. The HO2S (heated oxygen sensor) bank 2, sensor 2 is forced rich and lean and monitored by the PCM (powertrain control module) .
PCM (powertrain control module) P1158:00	Lack Of HO2S22 Switches - Sensor Indicates Rich: No Sub Type Information	Sets when PCM (powertrain control module) detects no output of the HO2S22 in a calibrated amount of time. The HO2S (heated oxygen sensor) bank 2, sensor 2 is forced rich and lean and monitored by the PCM (powertrain control module) .
PCM (powertrain control module) P2195:00	O2 Sensor Signal Biased/Stuck Lean - Bank 1, Sensor 1: No Sub Type Information	Sets when PCM (powertrain control module) detects the fuel control system is not switching for a calibrated amount of time. A HO2S (heated oxygen sensor) bank 1, sensor 1 indicating lean at the end of a test is trying to correct for an over lean condition.
PCM (powertrain control module) P2196:00	O2 Sensor Signal Biased/Stuck Rich - Bank 1, Sensor 1: No Sub Type Information	Sets when PCM (powertrain control module) detects the fuel control system is not switching for a calibrated amount of time. A HO2S (heated oxygen sensor) bank 1, sensor 1 indicating rich at the end of a test is trying to correct for an over rich condition.
PCM (powertrain control module) P2197:00	O2 Sensor Signal Biased/Stuck Lean - Bank 2, Sensor 1: No Sub Type Information	Sets when PCM (powertrain control module) detects the fuel control system is not switching for a calibrated amount of time. A universal HO2S (heated oxygen sensor) bank 2, sensor 1 indicating lean at the end of a test is trying to correct for an over lean condition.
PCM (powertrain control module) P2198:00	O2 Sensor Signal Biased/Stuck Rich - Bank 2, Sensor 1: No Sub Type Information	Sets when PCM (powertrain control module) detects the fuel control system is not switching for a calibrated amount of time. A universal HO2S (heated oxygen sensor) bank 2, sensor 1 indicating rich at the end of a test is trying to correct for an over rich condition.
PCM (powertrain	Bank 1 Air-Fuel Ratio Imbalance:	Sets when PCM (powertrain control module) detects the air to fuel ratio difference per cylinder is greater than a calculated amount. The

PCM (powertrain control module) P219F:00	Cylinder 4 Air-Fuel Ratio Imbalance: No Sub Type Information	Sets when PCM (powertrain control module) detects the minimal air to fuel ratio difference in cylinder 4 is greater than a calculated amount. The air to fuel ratio imbalance torque monitor is designed to detect minimal differences in the air to fuel ratio between cylinders. This DTC (diagnostic trouble code) may be caused by other systems related to cylinder 4. Diagnose any other cylinder 1 related Diagnostic Trouble Codes (DTCs) first. The CKP (crankshaft position) sensor signal is very sensitive to electrical noise.Check the routing of the CKP (crankshaft position) sensor wiring harness.
PCM (powertrain control module) P21A0:00	Cylinder 5 Air-Fuel Ratio Imbalance: No Sub Type Information	Sets when PCM (powertrain control module) detects the minimal air to fuel ratio difference in cylinder 5 is greater than a calculated amount. The air to fuel ratio imbalance torque monitor is designed to detect minimal differences in the air to fuel ratio between cylinders. This DTC (diagnostic trouble code) may be caused by other systems related to cylinder 5. Diagnose any other cylinder 1 related Diagnostic Trouble Codes (DTCs) first. The CKP (crankshaft position) sensor signal is very sensitive to electrical noise.Check the routing of the CKP (crankshaft position) sensor wiring harness.
PCM (powertrain control module) P21A1:00	Cylinder 6 Air-Fuel Ratio Imbalance: No Sub Type Information	Sets when PCM (powertrain control module) detects the minimal air to fuel ratio difference in cylinder 6 is greater than a calculated amount. The air to fuel ratio imbalance torque monitor is designed to detect minimal differences in the air to fuel ratio between cylinders. This DTC (diagnostic trouble code) may be caused by other systems related to cylinder 6. Diagnose any other cylinder 1 related Diagnostic Trouble Codes (DTCs) first. The CKP (crankshaft position) sensor signal is very sensitive to electrical noise.Check the routing of the CKP (crankshaft position) sensor wiring harness.
PCM (powertrain control module) P2270:00	O2 Sensor Signal Stuck Lean - Bank 1, Sensor 2: No Sub Type Information	Sets when PCM (powertrain control module) does not detect the output of the HO2S12 in a calibrated amount of time. The HO2S (heated oxygen sensor) bank 1, sensor 2 is forced rich and lean and monitored by the PCM (powertrain control module) . Check for leaks in the exhaust system. Check for an intermittent HO2S12 signal.
PCM (powertrain control	O2 Sensor Signal Stuck Rich - Bank 1, Sensor 2: No Sub Type Information	Sets when PCM (powertrain control module) does not detect the output of the HO2S in a calibrated amount of time. The HO2S (heated oxygen sensor) bank 1, sensor 2 is forced rich and lean and