

2001 Ford Mustang V6-3.8L VIN 4

Vehicle &gt; Technical Service Bulletins

## EMISSIONS/ENGINE CONTROLS - DRIVEABILITY DIAGNOSIS

**Related Links**

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## C1.) Heated Oxygen Sensor (HO2S) Monitor - Information

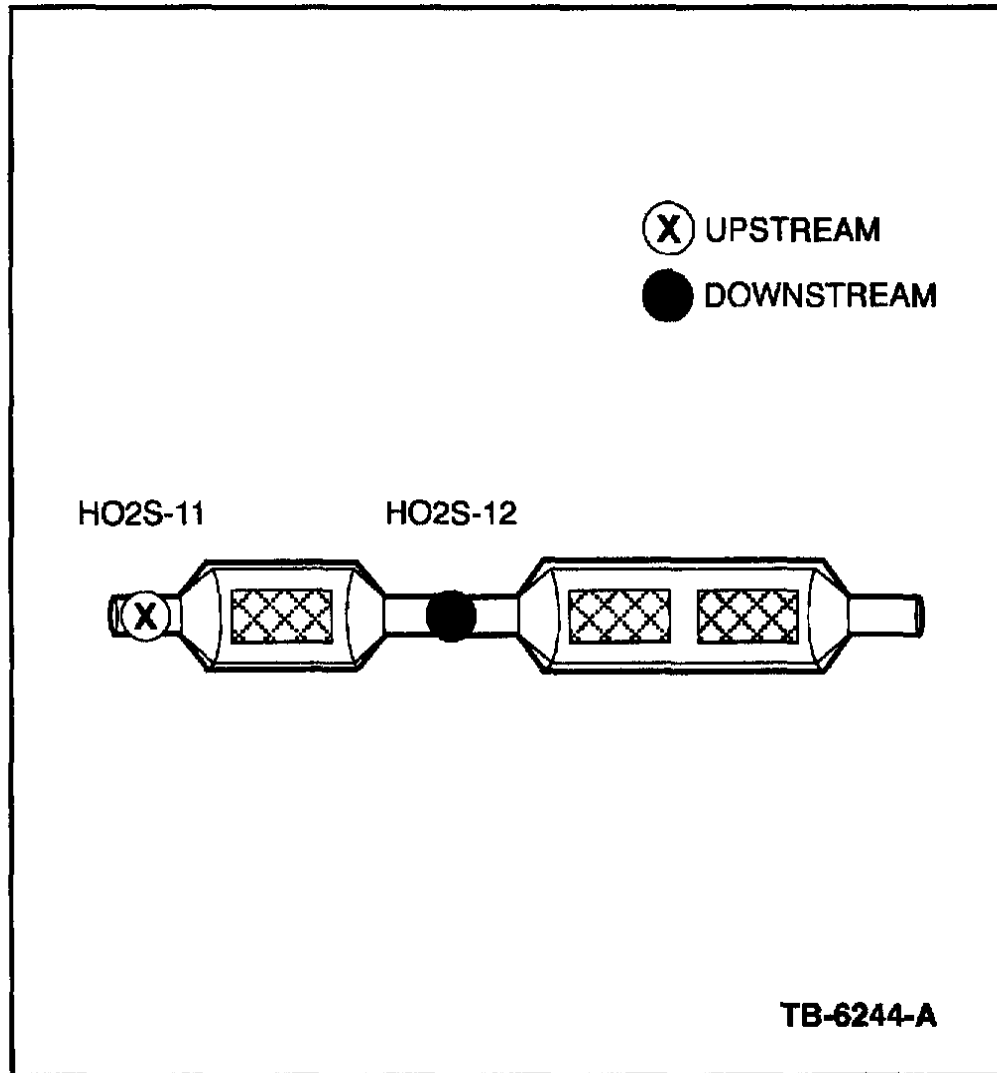


Figure 3

The H025 Monitor is an on-board strategy designed to monitor the HO2S sensors for a malfunction or deterioration that can affect emissions. Under specific conditions, the fuel control or upstream HO2S sensors (Figures 1 and 3) are checked for proper output voltage and response rate (the time it takes to switch from lean to rich or rich to lean). Downstream HO2S sensors (Figures 1 and 3) used for Catalyst Monitor are also monitored for proper output voltage. Input is required from the ECT or CHT, IAT, MAF, TP and CKP sensors to activate the H025 Monitor. The Fuel

System Monitor and Misfire Detection Monitor must also have completed successfully before the HO2S Monitor is enabled.

The HO2S sensor senses the oxygen content in the exhaust flow and outputs a voltage between zero and 1.0 volt. Lean of stoichiometric (air/fuel ratio of approximately 14.7:1 for gasoline engines), the HO2S will generate a voltage between zero and 0.45 volt. Rich of stoichiometric, the HO2S will generate a voltage between 0.45 and 1.0 volt.

^ The HO2S Monitor evaluates both the upstream (Fuel Control) and downstream (Catalyst Monitor) HO2S for proper function.

^ Once the HO2S Monitor is enabled, the upstream HO2S signal voltage amplitude and response frequency are checked. Excessive voltage is determined by comparing the HO2S signal voltage to a maximum calibratable threshold voltage.

^ A fixed frequency closed loop fuel control routine is executed and the upstream HO2S voltage amplitude and output response frequency are observed. A sample of the upstream HO2S signal is evaluated to determine if the sensor is capable of switching or has a slow response rate.

^ An HO2S heater circuit fault is determined by turning the heater on and off and looking for a corresponding change in the OSM and by measuring the current going through the heater circuit.

^ The MIL is activated after a fault is detected on two consecutive OBD II drive cycles.

The HO2S Monitor DTCs can be categorized as follows:

^ HO2S signal circuit malfunction - P0131, P0136, P0151, P0156

^ HO2S slow response rate - P0133, P0153

^ HO2S heater circuit malfunction - P0135, P0141, P0155, P0161

^ Downstream HO2S not running in on-demand self test - P1127

^ Swapped HO2S connectors - P1128 and P1129

^ HO2S lack of switching - P1130, P1131, P1132, P1150, P1151, P1152

^ HO2S lack of switching (sensor indicates lean) - P1137

^ HO2S lack of switching (sensor indicates rich) - P1138

HEATED OXYGEN SENSOR (HO2S) MONITOR - HO2S LACK OF SWITCHING		
Diagnostic Trouble Code	Description	Possible Causes
P1130 - Lack of HO2S-11 Switch, Fuel Trim at Limit	The HEGO Sensor is monitored for switching. The code will set when the HO2S fails to switch due to circuit or fuel at or exceeding a calibrated limit.	<p><b>Electrical:</b></p> <ul style="list-style-type: none"> <li>•Short to VPWR or VREF in harness or HO2S</li> <li>•HO2S circuit shorted to Ground</li> <li>•Water in harness connector</li> <li>•Open circuit</li> <li>•Corrosion or poor mating terminals and wiring</li> <li>•Damaged HO2S</li> <li>•Damaged PCM (other DTCs should be present)</li> </ul> <p><b>Fuel System:</b></p> <ul style="list-style-type: none"> <li>•Excessive fuel pressure (stuck fuel pressure regulator, restricted fuel return lines, etc.)</li> <li>•Leaking/contaminated fuel injectors or fuel pressure regulator</li> <li>•Low fuel pressure or running out of fuel (fuel pump concern, fuel supply line restrictions, low fuel level, etc.)</li> <li>•Vapor recovery system (stuck VMV, etc.)</li> </ul> <p><b>Induction System:</b></p> <ul style="list-style-type: none"> <li>•MAF contamination</li> <li>•Air leaks between MAF and throttle plate</li> <li>•PCV system / Other vacuum leaks</li> <li>•Improperly seated engine oil dipstick</li> </ul> <p><b>EGR System:</b></p> <ul style="list-style-type: none"> <li>•Leaking gasket</li> <li>•Stuck EGR valve / Leaking diaphragm or EVR</li> </ul> <p><b>Base Engine:</b></p> <ul style="list-style-type: none"> <li>•Oil overfill</li> <li>•Incorrect cylinder compression</li> <li>•Exhaust leaks before or near the HO2S</li> <li>•Secondary air stuck on</li> </ul>

HEATED OXYGEN SENSOR (HO2S) MONITOR - HO2S LACK OF SWITCHING		
Diagnostic Trouble Code	Description	Possible Causes
<b>P1131</b> - Lack of HO2S-11 Switch, Indicates Lean	When an HO2S sensor indicates lean at the end of a test, the system is trying to correct for an over-lean condition. The code is set when the fuel control system no longer detects switching for a calibrated amount of time.	See Possible Causes for DTC P1130
<b>P1132</b> - Lack of HO2S-11 Switch, Indicates Rich	When an HO2S sensor indicates rich at the end of a test, the system is trying to correct for an over-rich condition. The code is set when the fuel control system no longer detects switching for a calibrated amount of time.	See Possible Causes for DTC P1130
<b>P1137</b> - Lack of HO2S-12 Switch, Sensor Indicates Lean	The downstream HO2S sensors are forced rich and lean and monitored by the PCM. The code is set if the PCM does not detect the output of the HO2S in a calibrated amount of time.	<ul style="list-style-type: none"> <li>•Pinched, shorted or corroded wiring and pins</li> <li>•Crossed sensor wires</li> <li>•Exhaust leaks</li> <li>•Contaminated or damaged sensor</li> </ul>
<b>P1138</b> - Lack of HO2S-12 Switch, Sensor Indicates Rich	Same as DTC P1137, but indicating rich.	See Possible Causes for DTC P1137
<b>P1150</b> - Lack of HO2S-21 Switch, Fuel Trim at Limit	Same as DTC P1130, but opposite bank.	See Possible Causes for DTC P1130
<b>P1151</b> - Lack of HO2S-21 Switch, Indicates Lean	Same as DTC P1131, but opposite bank.	See Possible Causes for DTC P1130
<b>P1152</b> - Lack of HO2S-21 Switch, Indicates Rich	Same as DTC P1132, but opposite bank.	See Possible Causes for DTC P1130

HEATED OXYGEN SENSOR (HO2S) MONITOR - HO2S SLOW RESPONSE RATE		
Diagnostic Trouble Code	Description	Possible Causes
P0133 - HO2S Sensor Circuit Slow Response (HO2S-11)	The HO2S monitor checks the HO2S sensor frequency and amplitude. If during testing, the frequency and amplitude were to fall below a calibrated limit, the code will set.	<p><b>Electrical:</b></p> <ul style="list-style-type: none"> <li>•Shorted/open wiring</li> <li>•PCM</li> </ul> <p><b>Induction System:</b></p> <ul style="list-style-type: none"> <li>•MAF sensor (On 4-cylinder engines, if P0133 is present, this could be caused by a MAF issue - on 6- and 8-cylinder engines, this could only be a MAF issue if P0133 and P0153 are both present)</li> <li>•Inlet air leaks (unmetered air)</li> </ul> <p><b>Fuel Concerns:</b></p> <ul style="list-style-type: none"> <li>•Poor fuel quality</li> </ul> <p><b>Base Engine:</b></p> <ul style="list-style-type: none"> <li>•Exhaust leaks (upstream or near HO2S)</li> </ul> <p><b>HO2S Concerns:</b></p> <ul style="list-style-type: none"> <li>•Contaminated HO2S sensor (contamination from the use of silicone-based cleaners and sealants, leaded fuel, excessive oil consumption, etc.)</li> <li>•Deteriorating HO2S sensor</li> </ul>
P0153 - HO2S Sensor Circuit Slow Response (HO2S-21)	Same as DTC P0133, but Bank 2.	See Possible Causes for DTC P0133

HEATED OXYGEN SENSOR (HO2S) MONITOR - HO2S SIGNAL CIRCUIT MALFUNCTION		
Diagnostic Trouble Code	Description	Possible Causes
<b>P0131</b> - HO2S Sensor Circuit Out of Range Low Voltage (HO2S-11)	The HO2S sensor is monitored for a negative voltage known as Characteristic Shift Downward (CSD). If the sensor is switching from 0 volts to -1 volts during testing and DTC P0131 is present, the PCM will be in FMEM.	<b>Electrical:</b> <ul style="list-style-type: none"> <li>•Contaminated HO2S sensor or connector (coolant, water, silicone, fuel, oil, etc.)</li> <li>•Chafed/damaged wiring</li> <li>•Crossed HO2S signal/signal return wiring</li> <li>•PCM</li> </ul>
<b>P0136</b> - HO2S Sensor Circuit Malfunction (HO2S-12)	The downstream HO2S sensor(s) are continuously checked for maximum and minimum voltages. The code will set when the voltages fail to meet the calibrated limits.	<ul style="list-style-type: none"> <li>•Disconnected sensor</li> <li>•Pinched, shorted, corroded wiring or pins</li> <li>•Crossed sensor wires</li> <li>•Exhaust leaks</li> <li>•Contaminated or damaged sensor</li> <li>•Chafed/damaged wiring</li> </ul>
<b>P0151</b> - HO2S Sensor Circuit Out of Range Low Voltage (HO2S-21)	Same as DTC P0131, but Bank 2.	See Possible Causes for DTC P0131
<b>P0156</b> - HO2S Sensor Circuit Malfunction (HO2S-22)	Same as DTC P0136, but Bank 2.	See Possible Causes for DTC P0136

HEATED OXYGEN SENSOR (HO2S) MONITOR - HO2S SIGNAL CIRCUIT MALFUNCTION		
Diagnostic Trouble Code	Description	Possible Causes
<b>P0135</b> - HO2S Sensor Heater Circuit Malfunction (HO2S-11)	During testing, the HO2S heaters are checked for opens/shorts and excessive current draw. The code will set when current draw exceeds a maximum calibrated limit or falls below a minimum calibrated limit and/or an open or short is detected.	<ul style="list-style-type: none"> <li>•Blown fuse</li> <li>•Short to VPWR in harness or HO2S</li> <li>•Water in harness connector</li> <li>•Open VPWR or GND circuit</li> <li>•Low battery voltage</li> <li>•Poor electrical connections from PCM to HO2S sensor</li> <li>•HO2S heater</li> <li>•PCM</li> </ul>
<b>P0141</b> - HO2S Sensor Heater Circuit Malfunction (HO2S-12)	Same as DTC P0135, but downstream Bank 1.	See Possible Causes for DTC P0135
<b>P0155</b> - HO2S Sensor Heater Circuit Malfunction (HO2S-21)	Same as DTC P0135, but Bank 2.	See Possible Causes for DTC P0135
<b>P0161</b> - HO2S Sensor Heater Circuit Malfunction (HO2S-22)	Same as DTC P0141, but downstream Bank 2.	See Possible Causes for DTC P0135

HEATED OXYGEN SENSOR (HO2S) MONITOR - EXHAUST TEMPERATURE OUT OF RANGE, O2 SENSOR TEST NOT COMPLETED		
Diagnostic Trouble Code	Description	Possible Causes
<b>P1127</b> - Exhaust Not Warm Enough, Downstream Sensor Not Tested	The HEGO monitor uses an exhaust temperature model to determine when the HO2S heaters can safely be turned on. The code is set when the inferred exhaust temperature is below a minimum calibrated value.	<ul style="list-style-type: none"> <li>•Engine not operating long enough prior to performing KOER self-test</li> <li>•Exhaust temperature not warm enough</li> <li>•Pre-existing P0135, P0141, P0155, P0161</li> </ul>

HEATED OXYGEN SENSOR (HO2S) MONITOR - SWAPPED HO2S CONNECTOR		
Diagnostic Trouble Code	Description	Possible Causes
<b>P1128</b> - Upstream Oxygen Sensors Swapped from Bank 1 (HO2S-11) to Bank 2 (HO2S-21)	The HEGO monitor checks and determines if the HO2S signal response for a KOER fuel shift corresponds to the correct engine bank. The code is set when the expected HO2S response is seen on the opposite bank.	<ul style="list-style-type: none"> <li>•Crossed HO2S harness connectors - Bank to Bank (upstream)</li> <li>•Crossed HO2S wiring at 104-pin PCM connector or at the HO2S connectors</li> </ul>
<b>P1129</b> - Downstream Oxygen Sensors Swapped from Bank 1 (HO2S-12) to Bank 2 (HO2S-22)	Same as DTC P1128, but downstream.	See Possible Causes for DTC P1128

## C2.)Heated Oxygen Sensor (HO2S) Monitor - Diagnostic Trouble Codes