

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE (S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
Intake Camshaft Position Actuator Solenoid Control Circuit Bank 1	P0010	This DTC checks the circuit for electrical integrity during operation.	The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match.	Output driver commanded on Ignition switch is in crank or run 9 volts < Ignition Voltage < 18 volts	20 failures out of 25 samples 250ms loop continuous	DTC Type B
Intake Camshaft Position System Performance Bank 1	P0011	Detects a VVT system error by comparing the desired and actual cam positions when VVT is activated	Camshaft position error [absolute value of (desired position - actual position)] > 8° (All Table Positions)  Table is a function of Engine RPM and Oil Temperature	Engine is running VVT is enabled Desired camshaft position > 0 Δ Desired Camshaft position < 7.5° for 2.0 seconds (Table is a function of Engine RPM and Oil Temperature) System voltage ≥ 11 volts Power Take Off (PTO) not active DTCs not active for the following sub-systems: Cam sensors Crank sensors Cam to crank rationality Cam phase output drivers	320 fail counts out of 800 sample counts  100ms loop Continuous	DTC Type B
Crankshaft Position (CKP)-Camshaft Position (CMP) Correlation Bank 1 Sensor A	P0016	Detects cam to crank misalignment by monitoring if cam sensor pulse occurs during the incorrect crank position	Four cam sensor pulses more than +/- 9 crank degrees away from nominal position in crank degrees in one cam revolution.	<ul style="list-style-type: none"> <li>No 5 volt reference, camshaft position sensor circuit, or crankshaft position sensor circuit DTCs set</li> <li>Engine speed &lt; 1200 RPM</li> <li>Engine is spinning</li> <li>Crankshaft position signal is in sync.</li> <li>Cam phase state is learned or default</li> </ul>	25 failures out of 35 samples  Frequency: 1x per cam rotation Continuous	DTC Type B
O2S Heater Control Circuit Bank 1 Sensor 1	P0030	This DTC checks the Heater Output Driver circuit for electrical integrity	Voltage low during driver open state (indicates short-to-ground or open circuit) or voltage high during driver closed state (indicates short to voltage).	<ul style="list-style-type: none"> <li>Ignition switch is in crank or run</li> <li>11 volts &lt; Ignition Voltage &lt; 18 volts</li> <li>RPM &gt; 0</li> </ul>	20 failures out of 25 samples  Frequency: 250ms loop Continuous	DTC Type B
O2S Heater Control Circuit Bank 1 Sensor 2	P0036	This DTC checks the Heater Output Driver circuit for electrical integrity	Voltage low during driver open state (indicates short-to-ground or open circuit) or voltage high during driver closed state (indicates short to voltage).	<ul style="list-style-type: none"> <li>Ignition switch is in crank or run</li> <li>11 volts &lt; Ignition Voltage &lt; 18 volts</li> <li>RPM &gt; 0</li> </ul>	20 failures out of 25 samples  Frequency: 250ms loop Continuous	DTC Type B
O2S Heater Control Circuit Bank 2 Sensor 1	P0050	This DTC checks the Heater Output Driver circuit for electrical integrity	Voltage low during driver open state (indicates short-to-ground or open circuit) or voltage high during driver closed state (indicates short to voltage).	<ul style="list-style-type: none"> <li>Ignition switch is in crank or run</li> <li>11 volts &lt; Ignition Voltage &lt; 18 volts</li> <li>RPM &gt; 0</li> </ul>	20 failures out of 25 samples  Frequency: 250ms loop Continuous	DTC Type B
HO2S Heater Resistance Bank 1 Sensor 1	P0053	Detects an oxygen sensor heater having an incorrect or out of range resistance value.	3.1309 Ω < Calculated Heater resistance < 9.3106 Ω	<ul style="list-style-type: none"> <li>Coolant – IAT &lt; 8°C</li> <li>Engine Soak Time &gt; 28800 Seconds</li> <li>-30 °C &lt; Coolant Temp &lt; 45°C</li> <li>Coolant Fault = Not Active</li> <li>Ignition Off Fault = Not Active</li> <li>Intake Air Temp Fault = Not Active</li> <li>Ignition Voltage &lt; 18 volts</li> </ul>	Once per valid cold start.	DTC Type B

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HO2S Heater Resistance Bank 1 Sensor 2	P0054	Detects an oxygen sensor heater having an incorrect or out of range resistance value.	8.8203 Ω < Calculated Heater resistance < 21.1699 Ω	<ul style="list-style-type: none"> <li>Coolant – IAT &lt; 8°C</li> <li>Engine Soak Time &gt; 28800 Seconds</li> <li>-30 °C &lt; Coolant Temp &lt; 45°C</li> <li>Coolant Fault = Not Active</li> <li>Ignition Off Fault = Not Active</li> <li>Intake Air Temp Fault = Not Active</li> <li>Ignition Voltage &lt; 18 volts</li> </ul>	Once per valid cold start.	DTC Type B
O2S Heater Control Circuit Bank 2 Sensor 2	P0056	This DTC checks the Heater Output Driver circuit for electrical integrity	Output state shorted or open Voltage low during driver open state (indicates short-to-ground or open circuit) or voltage high during driver closed state (indicates short to voltage).	<ul style="list-style-type: none"> <li>Ignition switch is in crank or run</li> <li>11 volts &lt; Ignition Voltage &lt; 18 volts</li> <li>RPM &gt; 0</li> </ul>	20 failures out of 25 samples  Frequency: 250ms loop Continuous	DTC Type B
HO2S Heater Resistance Bank 2 Sensor 1	P0059	Detects an oxygen sensor heater having an incorrect or out of range resistance value.	3.1309 Ω < Calculated Heater resistance < 9.3106 Ω	<ul style="list-style-type: none"> <li>Coolant – IAT &lt; 8°C</li> <li>Engine Soak Time &gt; 28800 Seconds</li> <li>-30 °C &lt; Coolant Temp &lt; 45°C</li> <li>Coolant Fault = Not Active</li> <li>Ignition Off Fault = Not Active</li> <li>Intake Air Temp Fault = Not Active</li> <li>Ignition Voltage &lt; 18 volts</li> </ul>	Once per valid cold start.	DTC Type B
HO2S Heater Resistance Bank 2 Sensor2	P0060	Detects an oxygen sensor heater having an incorrect or out of range resistance value.	8.8203 Ω < Calculated Heater resistance < 21.1699 Ω	<ul style="list-style-type: none"> <li>Coolant – IAT &lt; 8°C</li> <li>Engine Soak Time &gt; 28800 Seconds</li> <li>-30 °C &lt; Coolant Temp &lt; 45°C</li> <li>Coolant Fault = Not Active</li> <li>Ignition Off Fault = Not Active</li> <li>Intake Air Temp Fault = Not Active</li> <li>Ignition Voltage &lt; 18 volts</li> </ul>	Once per valid cold start.	DTC Type B
MAP/MAF/Throttle Position Correlation	P0068	Detect when manifold absolute pressure and measured airflow do not match estimated engine airflow as established by the TPS	Difference between measured MAP and estimated MAP < X kPa Difference between measured MAF and estimated MAF < Y grams/sec  X, Y depend on throttle position, and maximum of X, and Y are 40kPa, 75gram/sec.	Engine running No PCM processor, throttle actuation DTCs Both TPS circuits DTCs are set	187.5 msec  Continuous in the main processor	DTC Type A
Mass Airflow (MAF) Sensor Performance	P0101	This DTC determines if the MAF sensor is stuck within the normal operating range	(Measured Flow – Modeled air Flow) Filtered > 15 AND (Measured Manifold Air Pressure – Manifold Model 2 pressure) Filtered > 20	Engine rpm =>400 and <= 8192 MAP sensor high/low DTCs not active MAF sensor high/low DTCs not active Crank sensor DTCs not active Engine Coolant DTCs not active Intake Air Temp. DTCs not active Engine Coolant > 70 deg C and < 125 deg C Intake Air Temp > -7 deg C and < 125 deg C	Continuous  The Mass Air Flow reading and Mass Air Flow calculation are performed during the same 12.5 ms loop	DTC Type B

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Mass Air Flow (MAF) Sensor Circuit Low	P0102	Detects a continuous short to low or a open in either the signal circuit or the MAF sensor	MAF $\leq$ 1200 Hz	Engine Running > 0 seconds  Engine Speed $\geq$ 50 RPM System Voltage $\geq$ 8 volts The above must be present for a period of time greater than 0.5 seconds	395 test failures in 400 test samples  1 sample every Lo Res event	DTC Type B
Mass Air Flow (MAF) Sensor Circuit High	P0103	Detects a continuous short to high in either the signal circuit or the MAF sensor	MAF $\geq$ 11500 Hz	Engine Running > 0 seconds  Engine Speed $\geq$ 50 RPM System Voltage $\geq$ 8 volts The above must be present for a period of time greater than 0.5 seconds	395 test failures in 400 test samples  1 sample every Lo Res event	DTC Type B
Manifold Absolute Pressure (MAP) Sensor Performance	P0106	This DTC determines if the MAP sensor is stuck within the normal operation range	(Measured MAP - Manifold Model 1 pressure) filtered > 20 AND (Measured MAP - Manifold Model 2 pressure) filtered > 20	Engine rpm $\Rightarrow$ 40 and $\leq$ 8192 MAP sensor high/low DTCs not active MAF sensor high/low DTCs not active Crank sensor DTCs not active Engine Coolant DTCs not active Intake Air Temp. DTCs not active Engine Coolant > 70 deg C and < 125 deg C Intake Air Temp > -7 deg C and < 125 deg C	Continuous  The MAP reading and the Manifold Model calculations are performed in the same LoRes loop	DTC Type B
Manifold Absolute Pressure (MAP) Sensor Circuit Low	P0107	This DTC detects a continuous short to low or open in either the signal circuit or the MAP sensor.	MAP voltage < 1% of Vref (0.05 volts)	TP sensor DTCs not active Engine Running $\leq$ 400 RPM Throttle Position is $\geq$ 0% when engine speed is $\leq$ 1000 RPM Or Throttle Position is $\geq$ 12.5 % when engine speed is > 1000 RPM No 5v ref. DTCs	320 test failures in 400 test samples  1 sample/12.5 ms	DTC Type B
Manifold Absolute Pressure (MAP) Sensor Circuit High	P0108	This DTC detects an open sensor ground or continuous short to high in either the signal circuit or the MAP sensor	MAP voltage > 98% of Vref (4.9 volts)	Cold Start Run Time – Table value in seconds based on Powerup Coolant Temperature <b>Run Test</b> TP sensor DTCs not active Engine Running Throttle Position is $\leq$ 1 % when engine speed is $\leq$ 1200 RPM Or Throttle Position is $\leq$ 20 % when engine speed is > 1200 RPM	320 test failures in 400 test samples  1 sample/12.5 ms	DTC Type B
Intake Air Temperature (IAT) Sensor Circuit Low	P0112	This DTC detects a continuous short to ground in the IAT signal circuit or the IAT sensor	Raw IAT < 25 ohms	VS sensor DTCs not active ECT sensor DTCs not active Engine run time > 10 seconds Coolant Temperature < 150°C	50 test failures in 63 test samples  1 sample/100 msec	DTC Type B
Intake Air Temperature (IAT) Sensor Circuit High	P0113	This DTC detects a continuous open or short to high in the IAT signal circuit or the IAT sensor	Raw IAT > 1,800,000 ohms	MAF sensor DTCs not active ECT sensor DTCs not active VS sensor DTCs not active Engine run time > 10 seconds	50 test failures in 63 test samples  1 sample/100 msec	DTC Type B

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Engine Coolant Temperature (ECT) Sensor Performance	P0116	Detects coolant temp sensor stuck in mid range	A failure will be reported if any of the following occur:  ECT at powerup > IAT at powerup by an IAT based table lookup value after a minimum 10-hour soak (fast fail).  ECT at powerup > IAT at powerup by 20°C after a minimum 8-hour soak and a block heater has not been detected.  ECT at powerup > IAT at powerup by 20°C after a minimum 8 hour soak and the time spent cranking the engine without starting is greater than 5 seconds with the fuel level being above a minimum level of 10%.	No VSS DTCs No IAT DTCs No ECT sensor shorted DTCs ECM/PCM Internal Engine Off Timer Performance DTC not active Non-volatile memory failure has not been detected on power-up. Engine off time > 8 hours Test run this trip = false Test aborted this trip = false  Block heater detection: ECT at powerup > IAT at powerup by 20°C Powerup IAT > -7°C Vehicle driven a minimum of 450 seconds above 15 kph and IAT drops more than 5° C from powerup IAT.	1 failure  500 ms loop	DTC Type B
Engine Coolant Temperature (ECT) Sensor Circuit Low	P0117	This DTC detects a continuous short to ground in the ECT signal circuit or the ECT sensor.	Raw ECT < 25 ohms	Engine run time > 10 seconds Or IAT ≤ 50° C	5 test failures in 6 test samples  1 sample/sec	DTC Type B
Engine Coolant Temperature (ECT) Sensor Circuit High	P0118	Circuit Continuity This DTC detects a continuous short to high or open in the ECT signal circuit or the ECT sensor.	Raw IAT > 1,800,000 ohms	Engine run time > 10 seconds Or IAT ≥ 0° C	4 test failures in 6 test samples  1 sample/sec  Continuous	DTC Type B
Throttle Position (TP) Sensor 1 Circuit	P0120	Detects a continuous or intermittent short or open in TP sensor #1 circuit	0.35 V > TPS > 4.58 V	Ignition in unlock/accessory, run or crank System voltage > 5.23 V No PCM processor, 5 V reference DTCs	79/159 counts; 55 counts continuous; 3.125 msec /count in the ECM main processor  19/39 counts or 13 counts continuous; 12.5 msec/count in the MHC processor	DTC Type A
Throttle Position (TP) Sensor 1 Performance	P0121	The DTC determines if a TPS sensor is stuck within the normal operating range	Filtered throttle error > 350 kPa/grams per second	Engine rpm =>400 and <= 8192 MAP sensor high/low DTCs not active MAF sensor high/low DTCs not active Crank sensor DTCs not active Engine Coolant DTCs not active Intake Air Temp. DTCs not active Engine Coolant > 70 deg C and < 125 deg C Intake Air Temp > -7 deg C and < 125 deg C	Continuous  Calculations are performed every 12.5 ms	DTC Type B

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Throttle Position (TP) Sensor 1 Circuit Low	P0122	Detects a continuous or intermittent OOR lo TPS	TPS < 0.35 V	Ignition in unlock/accessory, run or crank System voltage>5.23 V No PCM processor, 5 V reference DTCs	79/159 counts; 55 counts continuous; 3.125 msec /count in the ECM main processor  19/39 counts or 13 counts continuous; 12.5 msec/count in the MHC processor	DTC Type A
Throttle Position (TP) Sensor 1 Circuit High	P0123	Detects a continuous or intermittent OOR lo TPS	TPS > 4.58 V	Ignition in unlock/accessory, run or crank System voltage>5.23 V No PCM processor, 5 V reference DTCs	79/159 counts; 55counts continuous; 3.125 msec /count in the ECM main processor  19/39 counts or 13 counts continuous; 12.5 msec/count in the MHC processor	DTC Type A
Engine Coolant Temperature (ECT) Below Thermostat Regulating Temperature	P0128	Under driving conditions, target coolant temperature should be achieved based on amount of cumulative airflow ingested, and based on startup coolant temperature	A table defines maximum cumulative airflow based on startup coolant temperature and IAT at which target coolant temperature must have been reached Target = 69°C	<ul style="list-style-type: none"> <li>• 1 grams /second &lt; Airflow &lt; 30 grams/second</li> <li>• Average airflow &gt; 11 grams/second</li> <li>• Engine runtime &lt; 1370seconds before test completes</li> <li>• Engine runtime &gt; 120 seconds</li> <li>• IAT &gt; -7°C</li> <li>• Vehicle speed &gt; 40 kph for 0.8 kilometers</li> <li>• Startup ECT&lt;64</li> <li>• No ECT, Throttle, IAT, VSS, MAF or MAP faults</li> </ul>	Once per trip  Time based on flow	DTC Type B

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O2S Circuit Low Voltage Bank 1 Sensor 1	P0131	This DTC determines if the O2 sensor circuit is shorted to low.	O2 sensor voltage < 75 millivolts	<p><u>Common Enable Criteria</u></p> <ul style="list-style-type: none"> <li>No TP Sensor, MAP, ECT, MAF, IAT, Evap, Fuel Injector DTCs</li> <li>Catalyst monitor diagnostic Intrusive Test = Not Active</li> <li>Post Oxygen Sensor Diagnostic Intrusive Test = Not Active</li> <li>Traction Control, AIR, Fuel, Idle, EGR, and Engine Not Overspeed Intrusive Tests = Not Active</li> <li>10 volts &lt; system voltage &lt; 18 volts</li> <li>EGR, Idle, Fuel Inj., and AIR Device controls = Not Active</li> </ul> <p><u>Specific Enable Criteria</u></p> <ul style="list-style-type: none"> <li><math>0.88 \leq \text{Equivalence ratio} \leq 1.08</math></li> <li><math>2.499 \% \leq \text{throttle position} \leq 45.001 \%</math></li> <li>Fuel state = closed loop with no fault pending</li> <li>All fuel injectors = ON</li> <li>Traction Control = not active</li> </ul> <p>All of the above met for at least 3 seconds</p>	155 test failures in a 170-sample test for 3 consecutive tests  <u>Frequency:</u> Continuous 100 ms loop	DTC Type B
O2S Circuit High Voltage Bank 1 Sensor 1	P0132	This DTC determines if the O2 sensor or circuit is shorted to high.	O2 sensor voltage > 1050 millivolts to go fault pending  O2 sensor voltage > 925 millivolts to set DTC	<p><u>Common Enable Criteria</u></p> <ul style="list-style-type: none"> <li>No TP Sensor, MAP, ECT, MAF, IAT, Evap, Fuel Injector DTCs</li> <li>Catalyst monitor diagnostic Intrusive Test = Not Active</li> <li>Post Oxygen Sensor Diagnostic Intrusive Test = Not Active</li> <li>Traction Control, AIR, Fuel, Idle, EGR, and Engine Not Overspeed Intrusive Tests = Not Active</li> <li>10 volts &lt; system voltage &lt; 18 volts</li> <li>EGR, Idle, Fuel Inj., and AIR Device controls = Not Active</li> </ul> <p><u>Specific Enable Criteria</u></p> <ul style="list-style-type: none"> <li><math>0.88 \leq \text{Equivalence Ratio} \leq 1.08</math></li> <li><math>2.499 \% \leq \text{throttle position} \leq 45.001 \%</math></li> <li>Fuel State = Closed loop</li> </ul> <p>All of the above met for at least 3 seconds</p>	85 test failures in a 100 sample test for 6 consecutive tests  <u>Frequency:</u> Continuous 100 ms loop	DTC Type B

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O2S Slow Response Bank 1 Sensor 1	P0133	This DTC determines if the O2 sensor response time is degraded	Refer to "O2S Slow Response Bank 1 Sensor 1 (P0133), O2S Slow Response Bank 2 Sensor 1 (P0153) Pass/Fail Thresholds." in Lookup Tables section.	<p><u>Common Enable Criteria</u></p> <ul style="list-style-type: none"> <li>No TP Sensor, MAP, ECT, MAF, IAT, Evap, Fuel Injector DTCs</li> <li>Catalyst monitor diagnostic Intrusive Test = Not Active</li> <li>Post Oxygen Sensor Diagnostic Intrusive Test = Not Active</li> <li>Traction Control, AIR, Fuel, Idle, EGR, and Engine Not Overspeed Intrusive Tests = Not Active</li> <li>10 volts &lt; system voltage &lt; 18 volts</li> <li>EGR, Idle, Fuel Inj., and AIR Device controls = Not Active</li> </ul> <p><u>Specific Enable Criteria</u></p> <ul style="list-style-type: none"> <li>O2 Heater on for <math>\geq 40</math> seconds</li> <li>B1S1 DTCs = Not Active</li> <li>B1S1 learned heater resistance is valid</li> <li>Misfire DTC = Not Active</li> <li>ECT &gt; 65 °C</li> <li>IAT &gt; -40 °C</li> <li>Engine run time &gt; 60 seconds</li> <li>EVAP Canister purge duty cycle <math>\geq 0</math> %</li> <li>15 grams per second <math>\leq</math> MAF <math>\leq</math> 32 grams per second</li> <li>1300 <math>\leq</math> RPM <math>\leq</math> 3000</li> <li>Ethanol percentage &lt; 85.110 %</li> <li>Baro &gt; 69.801 kPa</li> <li>Throttle position <math>\geq 3.5</math> %</li> <li>Fuel Level &gt; 9.9976 %</li> <li>Fuel state = closed loop</li> <li>No fuel level data faults</li> <li>Transmission (automatic) not in Park, Reverse or Neutral</li> <li>Transmission gear selection is not defaulted</li> <li>Baro is not defaulted</li> </ul> <p>All of the above met for at least 1.5 seconds.</p>	90 seconds  <u>Frequency:</u> Once per trip	DTC Type B

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O2S Circuit Insufficient Activity Bank 1 Sensor 1	P0134	This DTC determines if the O2 sensor circuit is open.	380 millivolts < O2 sensor < 525 millivolts	<p><u>Common Enable Criteria</u></p> <ul style="list-style-type: none"> <li>No TP Sensor, MAP, ECT, MAF, IAT, Evap, Fuel Injector DTCs</li> <li>Catalyst monitor diagnostic Intrusive Test = Not Active</li> <li>Post Oxygen Sensor Diagnostic Intrusive Test = Not Active</li> <li>Traction Control, AIR, Fuel, Idle, EGR, and Engine Not Overspeed Intrusive Tests = Not Active</li> <li>10 volts &lt; system voltage &lt; 18 volts</li> <li>EGR, Idle, Fuel Inj., and AIR Device controls = Not Active</li> </ul> <p><u>Specific Enable Criteria</u></p> <ul style="list-style-type: none"> <li>Engine run time &gt; 124 seconds</li> <li>Ethanol percentage &gt; 85.1105 %</li> <li>No B1S1 heater related DTCs</li> </ul>	250 test failures in a 300 test samples  <u>Frequency:</u> Continuous for pre catalyst sensors 100 ms loop rate	DTC Type B
O2S Heater Performance Bank 1 Sensor 1	P0135	This DTC determines if the O2 sensor heater is functioning properly by monitoring the current through the heater circuit.	O2 sensor heater current is < 0.3125 amps or > 1.5 amps	<p><u>Common Enable Criteria</u></p> <ul style="list-style-type: none"> <li>No TP Sensor, MAP, ECT, MAF, IAT, Evap, Fuel Injector DTCs</li> <li>Catalyst monitor diagnostic Intrusive Test = Not Active</li> <li>Post Oxygen Sensor Diagnostic Intrusive Test = Not Active</li> <li>Traction Control, AIR, Fuel, Idle, EGR, and Engine Not Overspeed Intrusive Tests = Not Active</li> <li>10 volts &lt; system voltage &lt; 18 volts</li> <li>EGR, Idle, Fuel Inj., and AIR Device controls = Not Active</li> </ul> <p><u>Specific Enable Criteria</u></p> <ul style="list-style-type: none"> <li>Engine Run Time <math>\geq</math> 180 seconds</li> <li>ECT <math>\geq</math> 65° C</li> <li>500 <math>\leq</math> Engine Rpm <math>\leq</math> 3000</li> <li>4.9922 grams per second <math>\leq</math> Mass Airflow <math>\leq</math> 30.0078 grams per second</li> <li>O2 heater not in Device control</li> <li>B1S1 O2 heater resistance DTC not active</li> </ul> <p>All of the above met for at least 2 seconds</p>	8 test failures in 10 test samples  <u>Frequency:</u> 2 tests per trip 30 seconds delay between tests 1 second execution rate	DTC Type B



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O2S Circuit Low Voltage Bank 1 Sensor 2	P0137	This DTC determines if the O2 sensor circuit is shorted to low by checking for a lean condition during steady throttle.	O2 sensor voltage < 75 millivolts	<p><u>Common Enable Criteria</u></p> <ul style="list-style-type: none"> <li>No TP Sensor, MAP, ECT, MAF, IAT, Evap, Fuel Injector DTCs</li> <li>Catalyst monitor diagnostic Intrusive Test = Not Active</li> <li>Post Oxygen Sensor Diagnostic Intrusive Test = Not Active</li> <li>Traction Control, AIR, Fuel, Idle, EGR, and Engine Not Overspeed Intrusive Tests = Not Active</li> <li>10 volts &lt; system voltage &lt; 18 volts</li> <li>EGR, Idle, Fuel Inj., and AIR Device controls = Not Active</li> </ul> <p><u>Specific Enable Criteria</u></p> <ul style="list-style-type: none"> <li><math>0.88 \leq \text{Equivalence ratio} \leq 1.08</math></li> <li><math>2.499 \% \leq \text{throttle position} \leq 45.001 \%</math></li> <li>Fuel state = closed loop with no fault pending</li> <li>All fuel injectors = ON</li> <li>Traction Control = not active</li> </ul> <p>All of the above met for at least 3 seconds</p>	360 test failures in a 400-sample test for 3 consecutive tests  <u>Frequency:</u> Continuous 100 ms loop	DTC Type B
O2S Circuit High Voltage Bank 1 Sensor 2	P0138	This DTC determines if the O2 sensor or circuit is shorted to high	O2 sensor voltage > 1050 millivolts to go fault pending  O2 sensor voltage > 925 millivolts to set DTC	<p><u>Common Enable Criteria</u></p> <ul style="list-style-type: none"> <li>No TP Sensor, MAP, ECT, MAF, IAT, Evap, Fuel Injector DTCs</li> <li>Catalyst monitor diagnostic Intrusive Test = Not Active</li> <li>Post Oxygen Sensor Diagnostic Intrusive Test = Not Active</li> <li>Traction Control, AIR, Fuel, Idle, EGR, and Engine Not Overspeed Intrusive Tests = Not Active</li> <li>10 volts &lt; system voltage &lt; 18 volts</li> <li>EGR, Idle, Fuel Inj., and AIR Device controls = Not Active</li> </ul> <p><u>Specific Enable Criteria</u></p> <ul style="list-style-type: none"> <li><math>0.88 \leq \text{Equivalence ratio} \leq 1.08</math></li> <li><math>2.499 \% \leq \text{throttle position} \leq 45.001 \%</math></li> <li>Fuel state = closed loop with no fault pending</li> <li>All fuel injectors = ON</li> <li>Traction Control = not active</li> </ul> <p>All of the above met for at least 3 seconds</p>	420 test failures in a 480 sample test for 2 consecutive tests  <u>Frequency:</u> Continuous 100 ms loop	DTC Type B

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE (S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
O2S Circuit Insufficient Activity Bank 1 Sensor 2	P0140	This DTC determines if the O2 sensor circuit is open.	380 millivolts < O2 sensor < 525 millivolts for regular open test  350 millivolts to fail the fast pass open test (must fail the regular open test in order to fail the DTC; regular open test is run if fast pass is not run or if fast pass fails)	<u>Common Enable Criteria</u> <ul style="list-style-type: none"> <li>• No TP Sensor, MAP, ECT, MAF, IAT, Evap, Fuel Injector DTCs</li> <li>• Catalyst monitor diagnostic Intrusive Test = Not Active</li> <li>• Post Oxygen Sensor Diagnostic Intrusive Test = Not Active</li> <li>• Traction Control, AIR, Fuel, Idle, EGR, and Engine Not Overspeed Intrusive Tests = Not Active</li> <li>• 10 volts &lt; system voltage &lt; 18 volts</li> <li>• EGR, Idle, Fuel Inj., and AIR Device controls = Not Active</li> </ul> <u>Specific Enable Criteria</u> <ul style="list-style-type: none"> <li>• Engine run time &gt; 124 seconds</li> <li>• Ethanol percentage &gt; 85.1105%</li> <li>• No B1S2 heater related DTCs</li> <li>• PCM State = run</li> </ul> <u>Fast Pass:</u> <ul style="list-style-type: none"> <li>• Engine run time ≤ 90 seconds</li> </ul> (Fast pass cannot report a fail; if Fast pass fails, the regular open test is run)  <u>Regular Open Test</u> <ul style="list-style-type: none"> <li>• Engine run time &gt; 124 seconds</li> <li>• Fuel state = closed loop</li> </ul>	1080 test failures in a 1200 test samples  Minimum of 3 occurrences of a delta TP sensor ≥ 5.1971 % during diagnostic test  (sample counts – failure counts) < 180 within 90 seconds of engine run time to fail the fast pass test (regular open test is run when fast pass fails; to fail DTC the regular open test must fail)  <u>Frequency:</u> Once/trip for post catalyst sensors 100 ms loop	DTC Type B

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SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE (S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
O2S Heater Performance Bank 1 Sensor 2	P0141	This DTC determines if the O2 sensor heater is functioning properly by monitoring the current through the heater circuit.	O2 sensor heater current is < 0.2148 amps or > 0.9192 amps	<p><u>Common Enable Criteria</u></p> <ul style="list-style-type: none"> <li>• No TP Sensor, MAP, ECT, MAF, IAT, Evap, Fuel Injector DTCs</li> <li>• Catalyst monitor diagnostic Intrusive Test = Not Active</li> <li>• Post Oxygen Sensor Diagnostic Intrusive Test = Not Active</li> <li>• Traction Control, AIR, Fuel, Idle, EGR, and Engine Not Overspeed Intrusive Tests = Not Active</li> <li>• 10 volts &lt; system voltage &lt; 18 volts</li> <li>• EGR, Idle, Fuel Inj., and AIR Device controls = Not Active</li> </ul> <p><u>Specific Enable Criteria</u></p> <ul style="list-style-type: none"> <li>• Engine Run Time <math>\geq</math> 180 seconds</li> <li>• ECT <math>\geq</math> 65° C</li> <li>• 500 <math>\leq</math> Engine Rpm <math>\leq</math> 3000</li> <li>• 4.9922 grams per second <math>\leq</math> Mass Airflow <math>\leq</math> 30.0078 grams per second</li> <li>• O2 heater not in Device control</li> <li>• B1S2 O2 heater resistance DTC not active</li> </ul> <p>All of the above met for at least 2 seconds</p>	<p>8 test failures in 10 test samples</p> <p>Frequency: 2 tests per trip 30 seconds delay between tests 1 second execution rate</p>	DTC Type B

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE (S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
O2S Circuit Low Voltage Bank 2 Sensor 1	P0151	This DTC determines if the O2 sensor circuit is shorted to low	O2 sensor voltage < 75 millivolts	<p><u>Common Enable Criteria</u></p> <ul style="list-style-type: none"> <li>No TP Sensor, MAP, ECT, MAF, IAT, Evap, Fuel Injector DTCs</li> <li>Catalyst monitor diagnostic Intrusive Test = Not Active</li> <li>Post Oxygen Sensor Diagnostic Intrusive Test = Not Active</li> <li>Traction Control, AIR, Fuel, Idle, EGR, and Engine Not Overspeed Intrusive Tests = Not Active</li> <li>10 volts &lt; system voltage &lt; 18 volts</li> <li>EGR, Idle, Fuel Inj., and AIR Device controls = Not Active</li> </ul> <p><u>Specific Enable Criteria</u></p> <ul style="list-style-type: none"> <li><math>0.88 \leq \text{Equivalence ratio} \leq 1.08</math></li> <li><math>2.499 \% \leq \text{throttle position} \leq 45.001 \%</math></li> <li>Fuel state = closed loop with no fault pending</li> <li>All fuel injectors = ON</li> <li>Traction Control = not active</li> </ul> <p>All of the above met for at least 3 seconds</p>	155 test failures in a 170-sample test for 3 consecutive tests  <u>Frequency:</u> Continuous 100 ms loop	DTC Type B
O2S Circuit High Voltage Bank 2 Sensor 1	P0152	This DTC determines if the O2 sensor or circuit is shorted to high.	O2 sensor voltage > 1050 millivolts to go fault pending  O2 sensor voltage > 925 millivolts to set DTC	<p><u>Common Enable Criteria</u></p> <ul style="list-style-type: none"> <li>No TP Sensor, MAP, ECT, MAF, IAT, Evap, Fuel Injector DTCs</li> <li>Catalyst monitor diagnostic Intrusive Test = Not Active</li> <li>Post Oxygen Sensor Diagnostic Intrusive Test = Not Active</li> <li>Traction Control, AIR, Fuel, Idle, EGR, and Engine Not Overspeed Intrusive Tests = Not Active</li> <li>10 volts &lt; system voltage &lt; 18 volts</li> <li>EGR, Idle, Fuel Inj., and AIR Device controls = Not Active</li> </ul> <p><u>Specific Enable Criteria</u></p> <ul style="list-style-type: none"> <li><math>0.88 \leq \text{Equivalence Ratio} \leq 1.08</math></li> <li><math>2.499 \% \leq \text{throttle position} \leq 45.001 \%</math></li> <li>Fuel State = Closed loop</li> </ul> <p>All of the above met for at least 3 seconds</p>	85 test failures in a 100 sample test for 6 consecutive tests  <u>Frequency:</u> Continuous 100 ms loop	DTC Type B

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE (S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
O2S Slow Response Bank 2 Sensor 1	P0153	This DTC determines if the O2 sensor response time is degraded	Refer to "O2S Slow Response Bank 1 Sensor 1 (P0133), O2S Slow Response Bank 2 Sensor 1 (P0153) Pass/Fail Thresholds." In Lookup Tables section.	<p><u>Common Enable Criteria</u></p> <ul style="list-style-type: none"> <li>• No TP Sensor, MAP, ECT, MAF, IAT, Evap, Fuel Injector DTCs</li> <li>• Catalyst monitor diagnostic Intrusive Test = Not Active</li> <li>• Post Oxygen Sensor Diagnostic Intrusive Test = Not Active</li> <li>• Traction Control, AIR, Fuel, Idle, EGR, and Engine Not Overspeed Intrusive Tests = Not Active</li> <li>• 10 volts &lt; system voltage &lt; 18 volts</li> <li>• EGR, Idle, Fuel Inj., and AIR Device controls = Not Active</li> </ul> <p><u>Specific Enable Criteria</u></p> <ul style="list-style-type: none"> <li>• O2 Heater on for <math>\geq 40</math> seconds</li> <li>• B2S1 DTCs = Not Active</li> <li>• B2S1 learned heater resistance is valid</li> <li>• Misfire DTC = Not Active</li> <li>• ECT &gt; 65 °C</li> <li>• IAT &gt; -40 °C</li> <li>• Engine run time &gt; 60 seconds</li> <li>• EVAP Canister purge duty cycle <math>\geq 0</math> %</li> <li>• 15 grams per second <math>\leq</math> MAF <math>\leq</math> 32 grams per second</li> <li>• 1300 <math>\leq</math> RPM <math>\leq</math> 3000</li> <li>• Ethanol percentage &lt; 85.110 %</li> <li>• Baro &gt; 69.801 kPa</li> <li>• Throttle position <math>\geq 3.5</math> %</li> <li>• Fuel Level &gt; 9.9976</li> <li>• Fuel state = closed loop</li> <li>• No fuel level data faults</li> <li>• Transmission (automatic) not in Park, Reverse or Neutral</li> <li>• Transmission gear selection is not defaulted</li> <li>• Baro is not defaulted</li> </ul> <p>All of the above met for at least 1.5 seconds.</p>	90 seconds  <u>Frequency:</u> Once per trip	DTC Type B

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE (S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
O2S Circuit Insufficient Activity Bank 2 Sensor 1	P0154	This DTC determines if the O2 sensor circuit is open.	380 millivolts < O2 sensor < 525 millivolts	<p><u>Common Enable Criteria</u></p> <ul style="list-style-type: none"> <li>No TP Sensor, MAP, ECT, MAF, IAT, Evap, Fuel Injector DTCs</li> <li>Catalyst monitor diagnostic Intrusive Test = Not Active</li> <li>Post Oxygen Sensor Diagnostic Intrusive Test = Not Active</li> <li>Traction Control, AIR, Fuel, Idle, EGR, and Engine Not Overspeed Intrusive Tests = Not Active</li> <li>10 volts &lt; system voltage &lt; 18 volts</li> <li>EGR, Idle, Fuel Inj., and AIR Device controls = Not Active</li> </ul> <p><u>Specific Enable Criteria</u></p> <ul style="list-style-type: none"> <li>Engine run time &gt; 124 seconds</li> <li>Ethanol percentage &gt; 85.1105 %</li> <li>No B2S1 heater related DTCs</li> </ul>	250 test failures in a 300 test samples  <u>Frequency:</u> Continuous for pre catalyst sensors 100 ms loop rate	DTC Type B
O2S Heater Performance Bank 2 Sensor 1	P0155	This DTC determines if the O2 sensor heater is functioning properly by monitoring the current through the heater circuit.	O2 sensor heater current is < 0.3125 amps or > 1.5 amps	<p><u>Common Enable Criteria</u></p> <ul style="list-style-type: none"> <li>No TP Sensor, MAP, ECT, MAF, IAT, Evap, Fuel Injector DTCs</li> <li>Catalyst monitor diagnostic Intrusive Test = Not Active</li> <li>Post Oxygen Sensor Diagnostic Intrusive Test = Not Active</li> <li>Traction Control, AIR, Fuel, Idle, EGR, and Engine Not Overspeed Intrusive Tests = Not Active</li> <li>10 volts &lt; system voltage &lt; 18 volts</li> <li>EGR, Idle, Fuel Inj., and AIR Device controls = Not Active</li> </ul> <p><u>Specific Enable Criteria</u></p> <ul style="list-style-type: none"> <li>Engine Run Time <math>\geq</math> 180 seconds</li> <li>ECT <math>\geq</math> 65° C</li> <li>500 <math>\leq</math> Engine Rpm <math>\leq</math> 3000</li> <li>4.9922 grams per second <math>\leq</math> Mass Airflow <math>\leq</math> 30.0078 grams per second</li> <li>O2 heater not in Device control</li> <li>B2S1 O2 heater resistance DTC not active</li> </ul> <p>All of the above met for at least 2 seconds</p>	8 test failures in 10 test samples  <u>Frequency:</u> 2 tests per trip 30 seconds delay between tests 1 second execution rate	DTC Type B

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE (S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
O2S Circuit Low Voltage Bank 2 Sensor 2	P0157	This DTC determines if the O2 sensor circuit is shorted to low by checking for a lean condition during steady throttle.	O2 sensor voltage < 75 millivolts	<p><u>Common Enable Criteria</u></p> <ul style="list-style-type: none"> <li>No TP Sensor, MAP, ECT, MAF, IAT, Evap, Fuel Injector DTCs</li> <li>Catalyst monitor diagnostic Intrusive Test = Not Active</li> <li>Post Oxygen Sensor Diagnostic Intrusive Test = Not Active</li> <li>Traction Control, AIR, Fuel, Idle, EGR, and Engine Not Overspeed Intrusive Tests = Not Active</li> <li>10 volts &lt; system voltage &lt; 18 volts</li> <li>EGR, Idle, Fuel Inj., and AIR Device controls = Not Active</li> </ul> <p><u>Specific Enable Criteria</u></p> <ul style="list-style-type: none"> <li><math>0.88 \leq \text{Equivalence ratio} \leq 1.08</math></li> <li><math>2.499 \% \leq \text{throttle position} \leq 45.001 \%</math></li> <li>Fuel state = closed loop with no fault pending</li> <li>All fuel injectors = ON</li> <li>Traction Control = not active</li> </ul> <p>All of the above met for at least 3 seconds</p>	360 test failures in a 400-sample test for 3 consecutive tests  <u>Frequency:</u> Continuous 100 ms loop	DTC Type B
O2S Circuit High Voltage Bank 2 Sensor 2	P0158	This DTC determines if the O2 sensor or circuit is shorted to high by checking for a rich condition during steady throttle.	O2 sensor voltage > 1050 millivolts to go fault pending  O2 sensor voltage > 925 millivolts to set DTC	<p><u>Common Enable Criteria</u></p> <ul style="list-style-type: none"> <li>No TP Sensor, MAP, ECT, MAF, IAT, Evap, Fuel Injector DTCs</li> <li>Catalyst monitor diagnostic Intrusive Test = Not Active</li> <li>Post Oxygen Sensor Diagnostic Intrusive Test = Not Active</li> <li>Traction Control, AIR, Fuel, Idle, EGR, and Engine Not Overspeed Intrusive Tests = Not Active</li> <li>10 volts &lt; system voltage &lt; 18 volts</li> <li>EGR, Idle, Fuel Inj., and AIR Device controls = Not Active</li> </ul> <p><u>Specific Enable Criteria</u></p> <ul style="list-style-type: none"> <li><math>0.88 \leq \text{Equivalence ratio} \leq 1.08</math></li> <li><math>2.499 \% \leq \text{throttle position} \leq 45.001 \%</math></li> <li>Fuel state = closed loop with no fault pending</li> <li>All fuel injectors = ON</li> <li>Traction Control = not active</li> </ul> <p>All of the above met for at least 3 seconds</p>	420 test failures in a 480-sample test for 2 consecutive tests  <u>Frequency:</u> Continuous 100 ms loop	DTC Type B

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE (S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
O2S Circuit Insufficient Activity Bank 2 Sensor 2	P0160	This DTC determines if the O2 sensor is open.	380 millivolts < O2 sensor < 525 millivolts for regular open test  350 millivolts to fail the fast pass open test (must fail the regular open test in order to fail the DTC; regular open test is run if fast pass is not run or if fast pass fails)	<u>Common Enable Criteria</u> <ul style="list-style-type: none"> <li>No TP Sensor, MAP, ECT, MAF, IAT, Evap, Fuel Injector DTCs</li> <li>Catalyst monitor diagnostic Intrusive Test = Not Active</li> <li>Post Oxygen Sensor Diagnostic Intrusive Test = Not Active</li> <li>Traction Control, AIR, Fuel, Idle, EGR, and Engine Not Overspeed Intrusive Tests = Not Active</li> <li>10 volts &lt; system voltage &lt; 18 volts</li> <li>EGR, Idle, Fuel Inj., and AIR Device controls = Not Active</li> </ul> <u>Specific Enable Criteria</u> <ul style="list-style-type: none"> <li>Engine run time &gt; 124 seconds</li> <li>Ethanol percentage &gt; 85.1105%</li> <li>No B2S2 heater related DTCs</li> <li>PCM State = run</li> </ul> <u>Fast Pass:</u> <ul style="list-style-type: none"> <li>Engine run time ≤ 90 seconds</li> </ul> (Fast pass cannot report a fail; if Fast pass fails, the regular open test is run)  <u>Regular Open Test</u> <ul style="list-style-type: none"> <li>Engine run time &gt; 124 seconds</li> <li>Fuel state = closed loop</li> </ul>	1080 test failures in 1200 test samples  Minimum of 3 occurrences of a delta TP sensor ≥ 5.1971 % during diagnostic test  (sample counts – failure counts) < 180 within 90 seconds of engine run time to fail the fast pass test (regular open test is run when fast pass fails; to fail DTC the regular open test must fail)  <u>Frequency:</u> Once/trip for post catalyst sensors 100 ms loop	DTC Type B



SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE (S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
O2S Heater Performance Bank 2 Sensor 2	P0161	This DTC determines if the O2 sensor heater is functioning properly by monitoring the current through the heater circuit.	O2 sensor heater current is < 0.2148 amps or > 0.9192 amps	<p><u>Common Enable Criteria</u></p> <ul style="list-style-type: none"> <li>• No TP Sensor, MAP, ECT, MAF, IAT, Evap, Fuel Injector DTCs</li> <li>• Catalyst monitor diagnostic Intrusive Test = Not Active</li> <li>• Post Oxygen Sensor Diagnostic Intrusive Test = Not Active</li> <li>• Traction Control, AIR, Fuel, Idle, EGR, and Engine Not Overspeed Intrusive Tests = Not Active</li> <li>• 10 volts &lt; system voltage &lt; 18 volts</li> <li>• EGR, Idle, Fuel Inj., and AIR Device controls = Not Active</li> </ul> <p><u>Specific Enable Criteria</u></p> <ul style="list-style-type: none"> <li>• Engine Run Time <math>\geq</math> 180 seconds</li> <li>• ECT <math>\geq</math> 65° C</li> <li>• 500 <math>\leq</math> Engine Rpm <math>\leq</math> 3000</li> <li>• 4.9922 grams per second <math>\leq</math> Mass Airflow <math>\leq</math> 30.0078 grams per second</li> <li>• O2 heater not in Device control</li> <li>• B2S2 O2 heater resistance DTC not active</li> </ul> <p>All of the above met for at least 2 seconds</p>	8 test failures in 10 test samples  Frequency: 2 tests per trip 30 seconds delay between tests 1 second execution rate	DTC Type B

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE (S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
Fuel System Too Lean Bank 1  Fuel System Too Lean Bank 2	P0171 &  P0174	Determines if the fuel control system is in a lean condition.	The EWMA of long term fuel trim (LTM) samples $\geq 1.195$  (Note: EWMA stands for "Exponentially Weighted Moving Average")  Notes: 1. At least 10 seconds of data must accumulate on each trip before the EWMA of LTM samples is considered usable and at least 35 seconds) of data in the current fuel trim cell must accumulate on each trip before the LTM for that cell is considered usable in the EWMA calculation.	<ul style="list-style-type: none"> <li>• No Misfire DTCs</li> <li>• No O2 Sensor DTCs</li> <li>• No EVAP DTCs</li> <li>• No Fuel Injector DTCs</li> <li>• No Fuel Temperature or Composition DTCs</li> <li>• No IAC, MAF, or MAP DTCs</li> <li>• No ECT DTCs</li> <li>• No EGR DTCs</li> <li>• No A.I.R. DTCs</li> <li>• No TP Sensor or TAC System DTCs</li> <li>• Engine speed &gt; 400 rpm but &lt; 7000 rpm</li> <li>• BARO &gt; 70 kPa</li> <li>• ECT &gt; -38°C but &lt; 150°C</li> <li>• MAP &gt; 10 kPa but &lt; 255 kPa</li> <li>• IAT &gt; -38 °C but &lt; 150°C</li> <li>• Mass Airflow &gt; 1.0g/s but &lt; 510 g/s</li> <li>• Vehicle speed &lt; 300 kph</li> <li>• Closed Loop Fueling</li> <li>• Long Term Fuel Trim Learning enabled</li> <li>• Not in Device Control</li> <li>• EGR Flow Diagnostic Intrusive Test = Not Active</li> <li>• Catalyst Monitor Diagnostic Intrusive Test = Not Active</li> <li>• Post O2 Diagnostic Intrusive Test = Not Active</li> <li>• Evap diagnostic is at any stage except the "tank pull down" portion of the test.</li> <li>• Fuel Level &gt; 10 % (must be &lt; 10% for at least 30 seconds to disable; default is to enable if fuel sender is broken)</li> </ul>	Frequency: Continuous 100 ms loop	DTC Type B

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE (S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
Fuel System Too Rich Bank 1  Fuel System Too Rich Bank 2	P0172 &  P0175	Determines if the fuel control system is in a rich condition.	<p>The EWMA of long term fuel trim (LTM) samples <math>\leq 0.75</math></p> <p>Once the above occurs, purge is ramped off to determine if excess purge is the cause. Therefore, the following must also occur to report a failure:</p> <p>The EWMA of LTM samples with purge off <math>\leq 0.710</math> during 3 of 5 intrusive segments.</p> <p>General Notes:</p> <ol style="list-style-type: none"> <li>At least 10 seconds of data must accumulate on each trip before the EWMA of LTM samples is considered usable and at least 35 seconds of data in the current fuel trim cell must accumulate on each trip before the LTM for that cell is considered usable in the EWMA calculation.</li> </ol> <p>Intrusive Notes:</p> <ol style="list-style-type: none"> <li>Segments can last up to 60 seconds, and are separated by the smaller of a 20 second purge-on time or enough time to purge 6 grams of vapor.</li> <li>A maximum of 5 completed segments are allowed for each intrusive test, and up to 20 intrusive attempts allowed per trip.</li> <li>After an intrusive test report is completed, another intrusive test cannot occur for 300 seconds to allow sufficient time to purge excess vapors from the canister. During this period, fuel trim will pass if the EWMA of LTM samples <math>\geq 0.75</math> for at least 10 seconds, indicating that the canister has been purged. Performing intrusive tests too frequently may also affect EVAP and FTP emissions, and the execution frequency of other diagnostics.</li> </ol>	<ul style="list-style-type: none"> <li>No Misfire DTCs</li> <li>No O2 Sensor DTCs</li> <li>No EVAP DTCs</li> <li>No Fuel Injector DTCs</li> <li>No Fuel Temperature or Composition DTCs</li> <li>No IAC, MAF, or MAP DTCs</li> <li>No ECT DTCs</li> <li>No EGR DTCs</li> <li>No A.I.R. DTCs</li> <li>No TP Sensor or TAC System DTCs</li> <li>Engine speed <math>&gt; 400</math> rpm but <math>&lt; 7000</math> rpm</li> <li>BARO <math>&gt; 70</math> kPa</li> <li>ECT <math>&gt; -38^{\circ}\text{C}</math> but <math>&lt; 150^{\circ}\text{C}</math></li> <li>MAP <math>&gt; 10</math> kPa but <math>&lt; 255</math> kPa</li> <li>IAT <math>&gt; -38^{\circ}\text{C}</math> but <math>&lt; 150^{\circ}\text{C}</math></li> <li>Mass Airflow <math>&gt; 1.0</math> g/s but <math>&lt; 510</math> g/s</li> <li>Vehicle speed <math>&lt; 300</math> kph</li> <li>Closed Loop Fueling</li> <li>Long Term Fuel Trim Learning enabled</li> <li>Not in Device Control</li> <li>EGR Flow Diagnostic Intrusive Test = Not Active</li> <li>Catalyst Monitor Diagnostic Intrusive Test = Not Active</li> <li>Post O2 Diagnostic Intrusive Test = Not Active</li> <li>Evap diagnostic is at any stage except the "tank pull down" portion of the test.</li> </ul> <p>Intrusive Enable Criteria</p> <ul style="list-style-type: none"> <li>The EWMA of long term fuel trim (LTM) samples <math>\leq 0.75</math></li> <li>RPM <math>&gt; 400</math></li> <li>Mass Airflow <math>&gt; 1.0</math> g/s but <math>&lt; 510</math> g/s</li> <li>MAP <math>&gt; 18</math> kPa but <math>&lt; 255</math> kPa</li> </ul> <p>Temporary Intrusive Test Inhibit Criteria</p> <ul style="list-style-type: none"> <li>If intrusive test segment exceeds 60 consecutive seconds. (In this case, purge valve is opened for the smaller of 20 seconds or enough time to purge 6 grams vapor)</li> </ul>	<p>If rich fail counter is <math>\geq 3</math> before pass counter <math>\geq 3</math>, diagnostic fails.</p> <p><u>Frequency:</u> Continuous 100 ms loop</p>	DTC Type B

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE (S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
Injector 1 Control Circuit	P0201	This DTC checks the circuit for electrical integrity during operation.	The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match.	Engine running 18 volts > Ignition voltage > 9 volts Condition stable > 5 seconds	20 failures out of 25 samples 250ms loop continuous	DTC Type B
Injector 2 Control Circuit	P0202	This DTC checks the circuit for electrical integrity during operation.	The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match.	Engine running 18 volts > Ignition voltage > 9 volts Condition stable > 5 seconds	20 failures out of 25 samples 250ms loop continuous	DTC Type B
Injector 3 Control Circuit	P0203	This DTC checks the circuit for electrical integrity during operation.	The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match.	Engine running 18 volts > Ignition voltage > 9 volts Condition stable > 5 seconds	20 failures out of 25 samples 250ms loop continuous	DTC Type B
Injector 4 Control Circuit	P0204	This DTC checks the circuit for electrical integrity during operation.	The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match.	Engine running 18 volts > Ignition voltage > 9 volts Condition stable > 5 seconds	20 failures out of 25 samples 250ms loop continuous	DTC Type B
Injector 5 Control Circuit	P0205	This DTC checks the circuit for electrical integrity during operation.	The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match.	Engine running 18 volts > Ignition voltage > 9 volts Condition stable > 5 seconds	20 failures out of 25 samples 250ms loop continuous	DTC Type B
Injector 6 Control Circuit	P0206	This DTC checks the circuit for electrical integrity during operation.	The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match.	Engine running 18 volts > Ignition voltage > 9 volts Condition stable > 5 seconds	20 failures out of 25 samples 250ms loop continuous	DTC Type B
Throttle Position (TP) Sensor 2 Circuit	P0220	Detects a continuous or intermittent short or open in TP sensor #2 circuit	0.35 V > TPS > 4.59 V	Ignition in Unlock/accessory, run, crank System voltage > 5.23 V No PCM processor, 5 V reference DTCs	79/159 counts; 55 counts continuous; 3.125 msec /count in the motor processor  19/39 counts or 13 counts continuous; 12.5 msec/count in the MHCprocess79	DTC Type A
Throttle Position (TP) Sensor 2 Circuit Low	P0222	Detects a continuous or intermittent short or open in TP sensor #2 circuit	TPS < 0.35 V	Ignition in Unlock/accessory, run, crank System voltage > 5.23 V No PCM processor, 5 V reference DTCs	79/159 counts; 55 counts continuous; 3.125 msec /count in the ECM main processor  19/39 counts or 13 counts continuous; 12.5 msec/count in the MHC processor	DTC Type A

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SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE (S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
Throttle Position (TP) Sensor 2 Circuit High	P0223	Detects a continuous or intermittent short or open in TP sensor #2 circuit	TPS > 4.59 V	Ignition in Unlock/accessory, run, crank System voltage > 5.23 V No PCM processor, 5 V reference DTCs	79/159 counts; 55 counts continuous; 3.125 msec /count in the ECM main processor  19/39 counts or 13 counts continuous; 12.5 msec/count in the MHC processor	DTC Type A
Fuel Pump Primary Circuit	P0230	This DTC checks the circuit for electrical integrity during operation.	The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match.	Engine speed > 425 rpm. Ignition voltage > 9 volts, but < 18 volts	20 failures out of 25 samples 250ms loop continuous	DTC Type B

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE (S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
Random Misfire Detected	P0300	These DTCs will determine if a random or a cylinder specific misfire is occurring by monitoring crankshaft velocity.	Deceleration index Vs Engine speed	<ul style="list-style-type: none"> <li>• Engine run time &gt; 2 crankshaft revolutions.</li> <li>• DTCs not active for VSS, CKP, TP, MAP, ECT, IAT, and MAF sensors.</li> <li>• No engine protection faults.</li> <li>• P0315 (Crankshaft Position System Variation Not Learned) not active or engine speed &lt; 1200 RPM.</li> <li>• Fuel cutoff not active.</li> <li>• Power management is not active.</li> <li>• Not an automatic transmission shift with a Throttle position &gt; 95%</li> <li>• Brake torque management not active.</li> <li>• Fuel level &gt; 10% (disablement ends 500 after a low fuel level condition ceases, and fuel disable does not occur with a fuel sensor DTC).</li> <li>• -7°C &lt; ECT &lt; 123 °C.</li> <li>• If ECT at startup &lt; -7°C, then disable until ECT &gt; 21°C.</li> <li>• 525 RPM &lt; Engine speed &lt; 6000 RPM.</li> <li>• 9 volts &lt; System voltage &lt; 18 volts.</li> <li>• + Throttle position delta &lt; 15% per 100 ms.</li> <li>• - Throttle position delta &lt; 15% per 100 ms.</li> <li>• Abnormal engine speed is not present.</li> <li>• ABS rough road not detected.</li> <li>• ABS is not active.</li> <li>• Not an abusive engine speed condition Abusive engine speed = 6900 RPM. Abusive engine speed delay = 1250 cycles (Manual Trans only)</li> <li>• Positive and zero torque (except the CARB approved 3000 rpm to redline triangle). Positive and zero torque is detected when both is true: 1) engine load &gt; zero torque cal (cal a function of engine speed and temperature), and 2) TPS &gt; 1 or VSS &lt; 48 KPH.</li> <li>• Detectable engine speed and engine load region.</li> <li>• Misfire Diag. is not requesting to disable TCC when transmission is in hot mode.</li> <li>• Crankshaft Ring Filter inactive (after a low level misfire, another misfire may not be detectable until crankshaft ringing ceases)</li> </ul>	Emission Exceedence = (5) failed 200 revolution blocks of 16. Failure reported with (1) Exceedence in 1st (16) 200-revolution block, or (4) Exceedences thereafter.  1st Catalyst Exceedence = Number of 200 revolution blocks as data supports for catalyst damage. 2nd and subsequent Catalyst Exceedences = (1) 200 revolution block with catalyst damage. Failure reported with (3) Exceedences in FTP, or (1) Exceedence outside FTP.  <u>Frequency:</u> Continuous	DTC Type B  (MIL Flashes with Catalyst Damaging Misfire)
Cylinder 1 Misfire Detected	P0301		Load and Camshaft Position			
Cylinder 2 Misfire Detected	P0302		Emission Failure Threshold = 1.00%			
Cylinder 3 Misfire Detected	P0303		Catalyst Damage Threshold = 5%.			
Cylinder 4 Misfire Detected	P0304					
Cylinder 5 Misfire Detected	P0305					
Cylinder 6 Misfire Detected	P0306					

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE (S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
Crankshaft Position System Variation Not Learned (CASE)	P0315	Determines if the Crankshaft Position System Variation has not been learned.	Sum of Compensation Factors $\leq$ 2.997009 or $\geq$ 3.004302	OBD Manufacturer Enable Counter = 0	Frequency: Continuous 100 ms loop	DTC Type A
Knock Sensor (KS) Circuit Bank 1	P0325	This diagnostic will detect a failed internal ECM component associated with knock control	$0.00878 \geq$ Knock Sensor Voltage $\geq$ 5	For short lo Engine RPM $\geq$ 1500 For short hi Engine RPM $\geq$ 2000 Air Per Cylinder > 50 grams PTO not active	60 fails out of 80 samples  100ms sample rate Continuous	DTC Type B
Knock Sensor (KS) Performance Bank 1	P0326	This diagnostic checks for an overactive knock sensor caused by noisy engine components (e.g. lifters)	Fast Retard $\geq$ 15°	Engine RPM $\geq$ 800 MAP $\geq$ 0 kPa PTO not active No Throttle Faults	60 fails out of 80 samples  100ms sample rate Continuous	DTC Type B
Knock Sensor (KS) Circuit Low Frequency Bank 1	P0327	Checks knock sensor and wiring based on delta noise level	Delta Noise Level < 6dB	Engine RPM $\geq$ 1500 Coolant temp $\geq$ 60° C Engine run time $\geq$ 30 sec	60 fails out of 80 samples  100ms sample rate Continuous	DTC Type B
Knock Sensor (KS) Circuit Low Frequency Bank 2	P0332	Checks knock sensor and wiring based on delta noise level	Delta Noise Level < 6dB	Engine RPM > 2000 Coolant temp $\geq$ 60° C Engine run time $\geq$ 30 sec	60 fails out of 80 samples  100ms sample rate Continuous	DTC Type B
Crankshaft Position (CKP) Sensor A Circuit	P0335	This diagnostic determines whether a fault exists with crank position sensor signal	1. No crankshaft position sensor pulses received for 4 seconds 2. No crankshaft position sync 3. No crankshaft position sensor pulses received	1. Engine cranking and either CMP pulses being received or MAF > 3 grams per second 2. Engine is spinning and no 5V reference DTCs set 3. Engine is spinning and no 5V reference or cam position sensor DTCs set	1. Continuous - 12.5 ms  2. Continuous - 12.5 ms 3. Continuous - 12.5 ms 2 test failures out of 10 samples	DTC Type B
Crankshaft Position (CKP) Sensor A Performance	P0336	This diagnostic determines whether a performance fault exists with crank position sensor signal	1. Twenty crank resyncs occur within 25 seconds 2. 51 > number of crank pulses received in one engine revolution >65	1. Engine speed > 450 RPM  2. Engine is spinning and no 5V reference or cam position sensor DTCs set	1. Continuous – 4 test failures  2. Continuous – 8 test failures out of 10 samples	DTC Type B
Camshaft Position (CMP) Sensor Circuit Bank 1 Sensor A	P0340	This diagnostic will detect if a fault exists on the camshaft position sensor signal.	1. No Cam pulses received during first 12 MEDRES events 2. No Cam pulses received for 100 engine cycles 3. No Cam pulses received 4. No Cam pulses received	1. Crank is synchronized and no 5V ref DTCs set 2. Crank is synchronized and no 5V ref DTCs set 3. Engine is cranking and either crank pulses are received or MAF > 3 grams per second 4. Engine is spinning and no 5V ref DTCs set	1. Continuous  2. Continuous – 8 test failures out of 10 samples 3. Continuous – 4 seconds 4. Continuous – 1.5 seconds	DTC Type B

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE (S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
Camshaft Position (CMP) Sensor Performance Bank 1 Sensor A	P0341	Detects cam sensor performance malfunctions by monitoring for the incorrect number of cam sensor pulses in a given number of crank sensor pulses	1. 4 > number of cam pulses received in 12 MEDRES events > 4 (automatic trans) or 8 (manual trans) 2. 398 > number of cam pulses received in 100 engine cycles > 402	1. Crank is synchronized and no 5V ref DTCs set  2. Crank is synchronized and no 5V ref DTCs set  Footnote: MEDRES events typically occur twice per cylinder event.	1. Continuous  2. Continuous – 8 test failures out of 10 samples	DTC Type B
Ignition Coil 1 Control Circuit	P0351	This DTC checks the circuit for electrical integrity during operation. EST channel A (Cylinder 1 and 4)	The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match.	Ignition voltage > 9.0 volts, but < 18 volts	50 Failures out of 63 samples  100 msec / sample  Continuous	DTC Type B
Ignition Coil 2 Control Circuit	P0352	This DTC checks the circuit for electrical integrity during operation. EST channel B (Cylinder 2 and 5)	The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match.	Ignition voltage > 9.0 volts, but < 18 volts	50 Failures out of 63 samples  100 msec / sample  Continuous msec / sample	DTC Type B
Ignition Coil 3 Control Circuit	P0353	This DTC checks the circuit for electrical integrity during operation. EST channel C (Cylinder 3 and 6)	The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match.	Ignition voltage > 9.0 volts, but < 18 volts	50 Failures out of 63 samples  100 msec / sample  Continuous	DTC Type B



SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE (S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
Catalyst System Low Efficiency Bank 1	P0420	Oxygen Storage	OSC time difference $\geq 0.13965$ (EWMA filtered)  OSC time difference = OSC worst pass threshold - OSC compensation factor * (post cat O2 Resp time - pre cat O2 Resp time)  OSC worst pass thresh = 2.51875 seconds	<u>General Enable</u> <ul style="list-style-type: none"> <li>No EVAP, PTO not active, TAC system, MAF, CAM, ECT, CKP, EGR, BARO, AIR, EST, Fuel Injector, Fuel Trim, Idle Air, MAP, IAT, Misfire, O2 Sensor, TP Sensor, VSS or Engine Overtemp Protection Mode DTCs</li> <li>IAT &gt; -20° C</li> <li>Green Converter Delay = not active</li> </ul> <u>Valid Idle Period Criteria</u> <ul style="list-style-type: none"> <li>Engine speed <math>\geq 1100</math> RPM for a minimum of 24 seconds since end of last idle period.</li> <li>Engine Speed &lt; 1100 RPM</li> <li>Engine run time <math>\geq 300</math> seconds.</li> <li>Vehicle Speed <math>\leq 5.5</math> kph</li> <li>FASD and/ or POS Diagnostic Intrusive Test and/ or AIR Diagnostic Intrusive Test not Active</li> <li>Tests attempted this trip <math>\leq 18.00</math></li> </ul> <u>Idle conditions Met Criteria</u> <p>General Enable met; Valid Idle Period met</p> <ul style="list-style-type: none"> <li><math>0.9 \leq</math> short term fuel trim <math>\leq 1.1</math></li> <li><math>\Delta</math> short term fuel trim since valid idle conditions met <math>\leq 2</math></li> <li>Predicted catalyst temp <math>\geq 550^\circ\text{C}</math> for at least 70 seconds with a closed throttle time <math>\leq 80</math> seconds consecutively (closed throttle <math>\Rightarrow</math> TPS &lt; 1.9989%)</li> <li>Closed loop fueling</li> <li>Long term fuel trim learning enabled</li> <li>Barometric pressure &gt; 70 kPa</li> <li><math>70^\circ\text{C} \leq</math> ECT <math>\leq 123^\circ\text{C}</math></li> <li>System voltage &gt; 10.7 volts</li> <li><math>0 &lt;</math> Idle period <math>\leq 60</math> seconds <math>\Rightarrow</math> Idle time is incremented if: Vehicle Speed <math>\leq 5.5</math> kph and Throttle Position <math>\leq 1.9989\%</math></li> <li>IAT &lt; 250°C</li> <li>PRNDL is in Drive Range</li> </ul> <u>Test Enable Conditions; must hold true from after idle conditions are met to end of test</u> <ul style="list-style-type: none"> <li>4 grams per second <math>\leq</math> MAF <math>\leq 16</math> grams per second</li> <li>CCP DC Multiplier <math>\leq 1</math></li> <li>Tests attempted this idle period &lt; 1</li> <li>Predicted catalyst temperature <math>\leq 840</math>degC</li> </ul> <u>Engine Fueling Criteria at Beginning of Idle Period</u> <ul style="list-style-type: none"> <li>Must be met from between 4 and 7 seconds after idle conditions have been met for at least 4 seconds</li> <li>Number of pre-O2 switches <math>\geq 4</math></li> <li><math>0.96 \leq</math> average short term fuel trim <math>\leq 1.04</math></li> </ul>	1 test attempted per valid idle period  Minimum of 1 test per trip  Maximum of 6 tests per trip  <u>Frequency:</u> <ul style="list-style-type: none"> <li>12.5 ms Continuous</li> </ul> <b>Rapid Step Response feature will initiate multiple tests:</b> If the difference between current EWMA value and the current OSC time difference $\geq 0.96289$ seconds and OSC time difference $\geq 0.00$ seconds Maximum of 6 tests per trip. Maximum of 18 tests to detect failure when rapid step response is enabled.  <u>Green Converter Delay Criteria</u> <ul style="list-style-type: none"> <li>The diagnostic will not be enabled until the next ignition cycle after the following has been met: Predicted catalyst temperature <math>\geq 500^\circ\text{C}</math> for 3600 seconds non-continuously. (Note that all other enable criteria must be met on the next ignition cycle for the test to run on that ignition cycle)</li> <li>Note: this feature is only enabled when the vehicle is new and cannot be enabled in service</li> </ul>	DTC Type A

Comment [G1]:

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE (S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
Catalyst System Low Efficiency Bank 2	P0430	Oxygen Storage	OSC time difference $\geq 0.16992$ (EWMA filtered)  OSC time difference = OSC worst pass threshold - OSC compensation factor * (post cat O2 Resp time - pre cat O2 Resp time)  OSC worst pass thresh = 1.45 seconds	<u>General Enable</u> <ul style="list-style-type: none"> <li>No EVAP purge solenoid fault, PTO not active, TAC system, MAF, CAM, ECT, CKP, EGR, BARO, AIR, EST, Fuel Injector, Fuel Trim, Idle Air, MAP, IAT, Misfire, O2 Sensor, TP Sensor, VSS or Engine Overtemp Protection Mode DTCs</li> <li>IAT &gt; -20° C</li> <li>Green Converter Delay = not active</li> </ul> <u>Valid Idle Period Criteria</u> <ul style="list-style-type: none"> <li>Engine speed <math>\geq 1100</math> RPM for a minimum of 24 seconds since end of last idle period.</li> <li>Engine Speed &lt; 1100 RPM</li> <li>Engine run time <math>\geq 300</math> seconds.</li> <li>Vehicle Speed <math>\leq 5.5</math> kph</li> <li>FASD and/ or POS Diagnostic Intrusive Test and/ or AIR Diagnostic Intrusive Test not Active</li> <li>Tests attempted this trip <math>\leq 18.00</math></li> </ul> <u>Idle conditions Met Criteria</u> <p>General Enable met; Valid Idle Period met</p> <ul style="list-style-type: none"> <li><math>0.9 \leq</math> short term fuel trim <math>\leq 1.1</math></li> <li><math>\Delta</math> short term fuel trim since valid idle conditions met <math>\leq 2</math></li> <li>Predicted catalyst temp <math>\geq 540^\circ\text{C}</math> for at least 70 seconds with a closed throttle time <math>\leq 80</math> seconds consecutively (closed throttle <math>\Rightarrow</math> TPS &lt; 1.9989%)</li> <li>Closed loop fueling</li> <li>Long term fuel trim learning enabled</li> <li>Barometric pressure &gt; 70 kPa</li> <li><math>70^\circ\text{C} \leq</math> ECT <math>\leq 123^\circ\text{C}</math></li> <li>System voltage &gt; 10.7 volts</li> <li><math>0 &lt;</math> Idle period <math>\leq 60</math> seconds  <math>\Rightarrow</math> Idle time is incremented if: Vehicle Speed <math>\leq 5.5</math> kph and Throttle Position <math>\leq 1.9989\%</math></li> <li>IAT &lt; 250° C</li> <li>PRNDL is in Drive Range</li> </ul> <u>Test Enable Conditions; must hold true from after idle conditions are met to end of test</u> <ul style="list-style-type: none"> <li>4 grams per second <math>\leq</math> MAF <math>\leq 16</math> grams per second</li> <li>CCP DC Multiplier <math>\leq 1</math></li> <li>Tests attempted this idle period &lt; 1</li> <li>Predicted catalyst temperature <math>\leq 840</math> degC</li> </ul> <u>Engine Fueling Criteria at Beginning of Idle Period</u> <ul style="list-style-type: none"> <li>Must be met from between 4 and 7 seconds after idle conditions have been met for at least 4 seconds</li> <li>Number of pre-O2 switches <math>\geq 4</math></li> <li><math>0.96 \leq</math> average short term fuel trim <math>\leq 1.04</math></li> </ul>	1 test attempted per valid idle period  Minimum of 1 test per trip  Maximum of 6 tests per trip  <u>Frequency:</u> <ul style="list-style-type: none"> <li>12.5 ms Continuous</li> </ul> <b>Rapid Step Response feature will initiate multiple tests:</b> If the difference between current EWMA value and the current OSC time difference $\geq 2.4$ seconds and OSC time difference $\geq 0.00$ seconds Maximum of 6 tests per trip. Maximum of 18 tests to detect failure when rapid step response is enabled.  <u>Green Converter Delay Criteria</u> <ul style="list-style-type: none"> <li>The diagnostic will not be enabled until the next ignition cycle after the following has been met: Predicted catalyst temperature <math>\geq 500^\circ\text{C}</math> for 3600 seconds non-continuously. (Note that all other enable criteria must be met on the next ignition cycle for the test to run on that ignition cycle)</li> <li>Note: this feature is only enabled when the vehicle is new and cannot be enabled in service</li> </ul>	DTC Type A

Comment [G2]:

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE (S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
Evaporative Emission (EVAP) System Small Leak Detected (EONV)	P0442	This DTC will detect a small leak ( $\geq 0.020$ ) in the EVAP system between the fuel fill cap and the purge solenoid.	<p><b><u>SMALL LEAK TEST FAIL:</u></b> Engine Off Natural Vacuum (EONV) The total pressure change achieved during the test is normalized against a target value that is based upon fuel level and ambient temperature. (values range from 1.00" water to 3.00" water). The normalized value is entered into EWMA (with 0= perfect pass and 1=perfect fail). Once EWMA exceeds the fail threshold, the DTC light is illuminated. The DTC light can be turned off if the EWMA falls below the re-pass threshold for 3 consecutive trips.</p> <p>Malibu Maxx and G6 Fail threshold = 0.60 Re-Pass threshold = 0.35</p>	<p><b><u>TEST ENABLE:</u></b> VS Sensor DTCs not active No Fuel Tank Pressure Sensor DTCs No EVAP Canister Purge Solenoid DTCs No EVAP Canister Vent Solenoid DTCs Coolant Sensor DTCs not active IAT Sensor DTCs not active EVAP Vacuum Sensor Performance DTC not active. EVAP CCP stuck open DTC not active. EVAP large leak DTC not active. Ignition off timer DTC not active. Fuel Level <math>&gt;15.0\%</math> but <math>&lt; 85.0\%</math> No thermostat rationality DTCs No Fuel level DTCs</p> <p style="text-align: center;"><u>Valid Cold Start</u></p> <p>Startup ECT <math>&gt; 4^{\circ}\text{C}</math> but <math>&lt; 30^{\circ}\text{C}</math> Startup IAT <math>&gt; 4^{\circ}\text{C}</math> but <math>&lt; 30^{\circ}\text{C}</math> Startup <math>\Delta^{\circ}\text{C}</math> (ECT-IAT) <math>&lt; 8^{\circ}\text{C}</math> if ECT <math>&gt;</math> IAT Estimated ambient temperature at end of drive <math>&gt; 2^{\circ}\text{C}</math> but <math>&lt; 32^{\circ}\text{C}</math>. Drive time <math>\geq 600</math> seconds. Drive length <math>\geq 8.3</math> km. Coolant <math>\geq 70^{\circ}\text{C}</math>. Fuel level change <math>&lt; 10\%</math> during EONV test. BARO <math>&gt; 74.0\text{kPa}</math></p> <p>OR</p> <p style="text-align: center;"><u>Hot Restart</u></p> <p>Sufficient drive length to get accurate estimate of ambient air temperature. (EONV_EstAmbientAirTemp_Valid must equal true) Estimated ambient temperature at end of drive <math>&gt; 2^{\circ}\text{C}</math> but <math>&lt; 32^{\circ}\text{C}</math>. Drive time <math>\geq 600</math> seconds. Drive length <math>\geq 8.3</math> km. Coolant <math>\geq 70^{\circ}\text{C}</math>. Fuel level change <math>&lt; 10\%</math> during EONV test. BARO <math>&gt; 74.0\text{kPa}</math></p>	Once per cold start, during hot soak (up to 2500 sec.). Time since last complete test $\geq 17$ hours if EWMA is passing, or $\geq 10$ hours if EWMA is failing. No more than 2 attempts per day.	DTC Type A EWMA  Average run length: 8
Evaporative Emission (EVAP) Purge Solenoid Control Circuit	P0443	This DTC checks the circuit for electrical integrity during operation.	The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match.	Ignition voltage $> 9.0$ volts, but $< 18$ volts	20 Failures out of 25 samples  250 msec / sample Continuous	DTC Type B

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE (S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
Evaporative Emission (EVAP) Vent System Performance	P0446	This DTC will determine if a restriction is present in the vent solenoid, vent filler, vent hose or EVAP canister	Tank Vacuum > 10.00 "H2O for 5 seconds BEFORE Purge Volume > 6 liters  OR  Vented Vacuum < -2.5 in. H2O or Vented Vacuum > 5 in. H2O for 15 seconds  2 liters of fuel must be consumed after setting the DTC active the first time to set the DTC active the second time.	<u>General Test Enable</u> <ul style="list-style-type: none"> <li>• No MAP DTCs</li> <li>• No TP Sensor DTCs</li> <li>• No VSS DTCs</li> <li>• No IAT DTCs</li> <li>• No ECT DTCs</li> <li>• No Fuel Tank Pressure Sensor DTCs</li> <li>• No Evap Canister Purge solenoid DTCs</li> <li>• No EVAP Canister Vent Solenoid DTCs</li> <li>• No Thermostat Rationality DTCs</li> <li>• 15 % &lt; Fuel Level &lt; 85. %</li> <li>• 10.00 V &lt; System Voltage &lt; 18.00 V</li> <li>• 4 °C &lt; Startup IAT &lt; 30°C</li> <li>• Startup ECT &lt; 30 °C</li> <li>• BARO &gt; 74.00 kPa (8000 ft)</li> </ul>	Once per trip  Time is dependent on driving conditions  Max. before test abort is 1000 seconds	DTC Type B
Evaporative Emission (EVAP) Vent Solenoid Control Circuit	P0449	This DTC checks the circuit for electrical integrity during operation.	The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match.	Ignition voltage > 9.0 volts, but < 18 volts	20 failures out of 25 samples 250 msec /test  Continuous.	DTC Type B

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE (S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
Fuel Tank Pressure (FTP) Sensor Circuit Performance	P0451	The DTC will be set if the fuel tank vacuum sensor is out of range when it tries to re-zero prior to the phase-1 or phase-2 portions of the engine-off natural vacuum small leak test.	<p>The tank vacuum sensor voltage is compared to a window about the nominal sensor voltage offset (-1.5 volts)</p> <p>Upper voltage threshold (voltage addition above the nominal voltage): 0.2 volts</p> <p>Lower voltage threshold (voltage subtraction below the nominal voltage): 0.2 volts</p> <p>The difference between tank vacuum sensor voltage and the nominal offset voltage is then normalized against the appropriate threshold listed above to produce a ratio between 0.0 and 1.0. This normalized re-zero ratio is then filtered with an EWMA (with 0= perfect pass and 1=perfect fail). Once EWMA exceeds the fail threshold, the DTC light is illuminated. The DTC light can be turned off if the EWMA falls below the re-pass threshold for 3 consecutive trips.</p> <p>Fail threshold = 0.730 Re-Pass threshold = 0.400</p>	This test will execute whenever the engine-off natural vacuum small leak test (P0442) executes	<p>This test is executed during an engine-off natural vacuum small leak test. The number of times that it executes can range from zero to two per engine-off period.</p> <p>The length of the test is determined by the refueling rationality test that can take up to 600 seconds to complete.</p>	<p>DTC Type A</p> <p>Average run length: 6</p>
Fuel Tank Pressure (FTP) Sensor Circuit Low Voltage	P0452	This DTC will detect a fuel tank pressure sensor signal that is too low out of range.	<p>Fuel tank pressure sensor signal &lt; 0.1 volts produces a failing sample. Otherwise, the sample is considered passing.</p> <p>If 80 samples fail out of 100 samples total, then a fail will be reported to the DTC.</p>	<ul style="list-style-type: none"> <li>0.10 second delay after sensor power up for sensor warm-up</li> <li>PCM State &lt;&gt; crank</li> </ul>	<p><u>Frequency:</u> Continuous 100ms loop</p>	DTC Type B
Fuel Tank Pressure (FTP) Sensor Circuit High Voltage	P0453	This DTC will detect a fuel tank pressure sensor signal that is too high out of range.	<p>Fuel tank pressure sensor signal &gt; 4.90 volts produces a failing sample. Otherwise, the sample is considered passing.</p> <p>If 80 samples fail out of 100 samples total, then a fail will be reported to the DTC.</p>	<ul style="list-style-type: none"> <li>0.10 second delay after sensor power up for sensor warm-up</li> <li>PCM state &lt;&gt; crank</li> </ul>	<p><u>Frequency:</u> Continuous 100ms loop</p>	DTC Type B

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE (S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
Fuel Tank Pressure (FTP) Sensor Circuit Intermittent	P0454	This DTC will detect intermittent tank vacuum sensor signals that would have caused the engine-off natural vacuum small leak test to abort due to an apparent re-fueling event.	<p>If an abrupt change in tank vacuum is detected the engine-off natural vacuum test is aborted due to an apparent refueling event. Subsequent to the abort, a refueling rationality test is executed to confirm that a refueling event occurred. If a refueling is confirmed, then the test sample is considered passing. Otherwise, the sample is considered failing indicating an intermittent signal problem.</p> <p>The abrupt change is defined as a change of 1.0 "H2O vacuum in the span of 1.0 seconds.</p> <p>A refueling event is confirmed if the fuel level has a persistent change of 10.0 % for 30 seconds.</p> <p>The test will report a failure if 2 out of 3 samples are failures.</p>	This test will execute whenever the engine-off natural vacuum small leak test (P0442) executes	<p>This test is executed during an engine-off natural vacuum small leak test. The test can only execute once per engine-off period.</p> <p>The length of the test is determined by the refueling rationality test that can take up to 600 seconds to complete.</p>	DTC Type A
Evaporative Emission (EVAP) System Large Leak Detected	P0455	This DTC will detect a weak vacuum condition (large leak or purge blockage) in the Evap system.	<p>Purge volume &gt; 15.00 liters BEFORE</p> <p>Tank vacuum &lt; 7 inH2O</p> <p>2 liters of fuel must be consumed after setting the DTC active the first time to the DTC active the second time.</p> <p><u>Weak Vacuum Follow-up Test</u> Weak Vacuum Test failed previous trip and this trip. Passes if tank vacuum &gt; 7 in. H2O.</p> <p>Note: Weak vacuum Follow-up Test can only report a pass.</p>	<p><u>General Test Enable</u></p> <ul style="list-style-type: none"> <li>• No MAP DTCs</li> <li>• No TP Sensor DTCs</li> <li>• No VSS DTCs</li> <li>• No IAT DTCs</li> <li>• No ECT DTCs</li> <li>• No Fuel Tank Pressure Sensor DTCs</li> <li>• No Evap Canister Purge solenoid DTCs</li> <li>• No EVAP Canister Vent Solenoid DTCs</li> <li>• No Thermostat Rationality DTCs</li> <li>• 15 % &lt; Fuel Level &lt; 85. %</li> <li>• 10.00 V &lt; System Voltage &lt; 18.00 V</li> <li>• 4 °C &lt; IAT &lt; 30°C</li> <li>• ECT &lt; 30 °C</li> <li>• BARO &gt; 74.00 kPa (8000 ft)</li> </ul> <p><u>Cold Start Test</u></p> <ul style="list-style-type: none"> <li>• Startup IAT &lt; 30°C</li> <li>• Startup temperature Δ (ECT-IAT): &lt; 150 °C if IAT&gt;ECT &lt; 8 °C if ECT &gt; IAT</li> <li>• Cold Test Timer &lt; 1000 seconds</li> </ul>	<p>Once per cold start</p> <p>Time is dependent on driving conditions</p> <p>Max. before test abort is 1000 seconds</p>	DTC Type B

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE (S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
Fuel Level Sensor 1 Stuck in Range	P0461	This DTC will detect a fuel sender stuck in range.	If 220 km distance is traveled without a 2 liter change in fuel level	PCM state <> crank	Frequency: Continuous 100ms loop	DTC Type B
Fuel Level Sensor 1 Circuit Low Voltage	P0462	This DTC will detect a fuel sender stuck out of range low.	Fuel level sensor signal < 9% reference voltage produces a failing sample. Otherwise, the sample is considered passing.  If 60 samples fail out of 100 samples total, then a fail will be reported to the DTC.	PCM state <> crank	Frequency: Continuous 100ms loop	DTC Type B
Fuel Level Sensor 1 Circuit High Voltage	P0463	This DTC will detect a fuel sender stuck out of range high.	Fuel level sensor signal > 60% reference voltage produces a failing sample. Otherwise, the sample is considered passing.  If 60 samples fail out of 100 samples total, then a fail will be reported to the DTC	PCM state <> crank	Frequency: Continuous 100ms loop	DTC Type B
Fuel Level Sensor 1 Circuit Intermittent	P0464	This DTC will detect intermittent fuel level sensor signals that would have caused the engine-off natural vacuum small leak test to abort due to an apparent re-fueling event.	If a change in fuel level is detected the engine-off natural vacuum test is aborted due to an apparent refueling event. Subsequent to the abort, a refueling rationality test is executed to confirm that a refueling event occurred. If a refueling is confirmed, then the test sample is considered passing. Otherwise, the sample is considered failing indicating an intermittent signal problem.  The refuel event is defined as a change of 10.0 % fuel level during the engine-off test.  A refueling event is confirmed if the fuel level has a persistent change of 10.0 % for 30 seconds.  The test will report a failure if 2 out of 3 samples are failures.	This test will execute whenever the engine-off natural vacuum small leak test (P0442) executes	This test is executed during an engine-off natural vacuum small leak test. The test can only execute once per engine-off period.  The length of the test is determined by the refueling rationality test that can take up to 600 seconds to complete.	DTC Type A
Cooling Fan 1 Control Circuit	P0480	This DTC checks the circuit for electrical integrity during operation.	The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match	Engine speed greater than 425 rpm Ignition voltage > 9 volts, but < 18 volts	20 failures out of 25 samples 250msec /test  Continuous	DTC Type B

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE (S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
Cooling Fan 2 Control Circuit	P0481	This DTC checks the circuit for electrical integrity during operation.	The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match	Engine speed greater than 425 rpm Ignition voltage > 9 volts, but < 18 volts	20 failures out of 25 samples 250msec /test  Continuous	DTC Type B
Evaporative Emission (EVAP) System Flow During Non-Purge	P0496	This DTC will determine if the purge solenoid is leaking to engine manifold vacuum.	Tank Vacuum > 10 "H2O  for  5.00 sec BEFORE Test time > 90 seconds (cold start)	<u>General Test Enable</u> <ul style="list-style-type: none"> <li>• No MAP DTCs</li> <li>• No TP Sensor DTCs</li> <li>• No VSS DTCs</li> <li>• No IAT DTCs</li> <li>• No ECT DTCs</li> <li>• No Fuel Tank Pressure Sensor DTCs</li> <li>• No EVAP canister purge valve solenoid DTCs</li> <li>• No EVAP Canister Vent Solenoid DTCs</li> <li>• No Thermostat Rationality DTCs</li> <li>• 15 % &lt; Fuel Level &lt; 85. %</li> <li>• 10.00 V &lt; System Voltage &lt; 18.00 V</li> <li>• 4 °C &lt; Startup IAT &lt; 30°C</li> <li>• Startup ECT &lt; 30 °C</li> <li>• BARO &gt; 74.00 kPa (8000 ft)</li> </ul> <u>Cold Start Test</u> <ul style="list-style-type: none"> <li>• Startup IAT &lt; 30°C</li> <li>• Startup temperature Δ (ECT-IAT): &lt; 150 °C if IAT&gt;ECT &lt; 8 °C if ECT &gt; IAT</li> <li>• Cold Test Timer &lt; 1000 seconds</li> </ul>	Once per cold start.  Cold start: max time is 1000 seconds	DTC Type B
Vehicle Speed Sensor Circuit Low Voltage  (Manual transmission)	P0502	Detects the lack of activity on the VSS circuit	Transmission output speed ≤ 70 RPM	No TP or VSS intermittent DTCs TP ≥ 8 % 1500 RPM < Engine speed < 6500 RPM 50 Nm < Engine torque < 1492 Nm 9 V < System Voltage < 16 V	4.5 seconds  Continuous check	DTC Type B
Vehicle Speed Sensor Circuit Intermittent  (Manual transmission)	P0503	Detects an intermittent fault on the VSS circuit	Transmission output speed must drop by 420 RPM in 0.025 secs	Engine running Engine speed change < 500 RPM in 2 seconds 9 V < System Voltage < 16 V Time since last gear change > 6 seconds	3.25 seconds  Continuous 25 msec loop	DTC Type B
Idle Air Control (IAC) System - RPM Too Low	P0506	Determines if a low idle is a result of an engine mechanical problem	Idle Error from desired – Table value in RPM based on Coolant Temperature	No MAF, MAP, IAT, ECT, TP, Injector, Fuel System, Misfire, VSS or Purge DTC Engine Run > 1sec. Engine Speed error ≤ 50 RPM ECT ≥ -40 ° C BARO > 72 kPa IGN. voltage > 9 & < 18 volts IAT > -40 ° C Idle condition present	Must be outside the fail criteria continuously for three 8-second tests. Must be within pass criteria for 8 seconds continuously.	DTC Type B



SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE (S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
Idle Air Control (IAC) System - RPM Too High	P0507	Determines if a high idle is a result of an engine mechanical problem	Idle Error from desired – Table value in RPM based on Coolant Temperature	No MAF, MAP, IAT, ECT, TP, Injector, Fuel System, Misfire, VSS or Purge DTC Engine Run > 1sec. Engine Speed error ≤ 50 RPM ECT ≥ -40 °C BARO > 72 kPa IGN. voltage > 9 & < 18 volts IAT > -40 °C Idle condition present	Must be outside the fail criteria continuously for three 8-second tests. Must be within pass criteria for 8 seconds continuously.	DTC Type B
Control Module Read Only Memory (ROM)	P0601	This DTC will be stored if the calibration check sum is incorrect	Output state invalid	<ul style="list-style-type: none"> <li>PCM state = crank or run</li> <li>Ignition voltage ≥ 5 volts</li> </ul>	1 failure  <u>Frequency:</u> Runs continuously in the background	DTC Type A
Control Module Not Programmed	P0602	This DTC will be stored if the PCM is a service PCM that has not been programmed.	Output state invalid	<ul style="list-style-type: none"> <li>PCM state = crank or run</li> <li>PCM is identified through calibration as a Service PCM</li> </ul>	Test is run at Powerup  Test also runs: <u>Frequency:</u> 100ms loop Continuous	DTC Type A
Control Module Long Term Memory Reset	P0603	Non-volatile memory checksum error at controller power-up	Checksum at power-up does not match checksum at power-down		1 failure  Once at power-up	DTC Type A
Control Module Random Access Memory (RAM)	P0604	Indicates that PCM is unable to correctly write and read data to and from RAM	Data read does not match data written	Ignition in Run or Crank	5 failures  <u>Frequency:</u> Runs continuously in the background. The first test runs quickly (~ 1 second). Subsequent tests run at a slower rate.	DTC Type A

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE (S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
Control Module Processor	P0606	Indicates that the ECM has detected an ETC internal processor integrity fault	MHC processor detects throttle limiting fault  Software tasks loops > schedule tasks loop Loss of SPI communication from the motor processor 1.5 msec < Average motor processor state of health toggle > 2.5 msec TPS or APPS minimum learned values fail compliment check TPS or APPS minimum learned values fail range check Motor processor integrity check error occurs Motor processor integrity check error of main processor occurs	Ignition in unlock/accessory, run or crank System voltage>5.23 V	187.5 ms in the MHC processor  Error > 5 times of loop time; loop time are 12.5, 25,50,100 and 250 ms in the main processor  159/400 counts or 15 counts continuous; 39 counts continuous @ initialization.  4 counts/ 10 counts at initialization, 50 msec/count in the main processor, 487.5ms in MHC processor.  187.5ms continuouse/100 ms intermittent in the main processor 187.5ms continuouse/100 msec intermittent in the main processor	DTC Type A
Control Module Performance	P0607	Main & MHC state of health (SOH) discrete line is not toggling	Loss of discrete toggle for 500ms continuously	Ignition in unlock/accessory, run or crank System voltage>5.23 V No PCM processor, 5 V reference DTCs	500ms	DTC Type A
Control Module Accelerator Pedal Position Performance	P060D	Verify the PCM's ability to detect a short between the APPS 1 & 2 circuits  Verify that the indicated accelerator pedal position calculation is correct	APPS #2 signal voltage > 2.05V  Difference between Main processor indicated accelerator pedal position and MHC processor indicated accelerator pedal position > 2.5%	Ignitions in unlock/ accessory and run, not during TPS minimum learn active during intrusive portion of diagnostic execution System voltage > 5.23 V No PCM processor DTC  Ignition in unlock, accessory, run or crank System voltage > 5.23 V No PCM processor DTC	39 counts continuous; 12.5 msec/count in the MHC processor	DTC Type A
Control Module EEPROM Error	P062F	Indicates that the NVM Error flag has not been cleared	Last EEPROM write did not complete	Ignition on.	1 test failure Once on controller power-up	DTC Type A
5 Volt Reference 1 Circuit	P0641	Detects a continuous or intermittent short on the #1 5 V sensor reference circuit	Vref1 < 4.43 or > 4.65 v	Ignition in unlock/accessory, run or crank System voltage > 5.23 V No ECM processor DTCs	19/39 counts or 200 msec continuous; 12.5 msec/count in main /MHC processor	DTC Type A

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Malfunction Indicator Lamp (MIL) Control Circuit	P0650	This DTC checks the circuit for electrical integrity during operation.	The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match.	Ignition voltage > 9.0 volts, but < 18 volts	20 failures out of 25 samples 250ms loop continuous	DTC Type B  No MIL
5 Volt Reference 2 Circuit	P0651	Detects a continuous or intermittent short on the #2 5 V sensor reference circuit	V Vref2 < 4.43 or > 4.65 v	Ignition in unlock/accessory, run or crank System voltage > 5.23 V No ECM processor DTCs	19/39counts or 200 msec continuous; 12.5 msec/count in main/MHC processor	DTC Type A
Intake Manifold Tuning Valve Solenoid Control Circuit Bank 1	P0660	This DTC checks the circuit for electrical integrity during operation.	The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match.	Engine speed > 425 rpm. Ignition voltage > 9 volts, but < 18 volts	20 failures out of 25 samples 250ms loop continuous	DTC Type B
Control Module Power Relay Control Circuit	P0685	This DTC checks the circuit for electrical integrity during operation.	The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match.	Ignition voltage > 9 volts, but < 18 volts	20 failures out of 25 samples 250ms loop continuous	DTC Type B
Control Module Power Relay Feedback Circuit Low Voltage	P0689	This DTC is a check to determine if the powertrain relay is functioning properly	Powertrain relay feedback voltage is < 5volts	Powertrain relay commanded "ON" No Powertrain Relay Control output driver fault	5 fail counts / 6sample counts 1 count per second	DTC Type B
Control Module Power Relay Feedback Circuit High Voltage	P0690	This DTC is a check to determine if the Powertrain relay is functioning properly	Powertrain relay feedback voltage is > 18 volts when the relay is commanded "ON" OR The Powertrain relay feedback voltage is > 2 volts when it has been commanded "OFF" for longer than 1 seconds	Powertrain relay commanded "ON" No Powertrain Relay Control output driver fault	5 fail counts / 6 sample counts 1 count per second	DTC Type B
Transmission Control Module (TCM) Requested MIL Illumination	P0700	Monitors the TCM MIL request line to determine when the TCM has detected a MIL illuminating fault.	Transmission Emissions-Related DTC set	Time since power-up > 3 seconds	Continuous	DTC Type A  No MIL
Clutch Position Sensor Circuit Range/Performance  (Manual transmission)	P0806	This DTC determines if the Clutch Position Sensor is stuck within the normal operation range	Clutch Position Error is greater than 5%	No Clutch Pedal Position DTC active No VSS DTC active No Crank Sensor DTC active N/V ratio must match actual gear Vehicle in gear	25 msec/test  Continuous	DTC Type A
Clutch Position Sensor Circuit Low  (Manual transmission)	P0807	This DTC detects a continuous short to low or open in either the signal circuit or the Clutch position sensor.	Clutch Pedal Position < 0.0045% of Vref	Ignition Voltage > 9.0 volts Vref in range Engine not cranking	200 failures out of 250 samples  25msec / sample Continuous	DTC Type A

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Clutch Position Sensor Circuit High  (Manual transmission)	P0808	This DTC detects an open sensor ground or continuous short to high in either the signal circuit or the Clutch Pedal Position sensor	Clutch Pedal Position > 99.984% of Vref	Ignition Voltage > 9.0 volts Vref in range Engine not cranking	200 failures out of 250 samples  25msec / sample Continuous	DTC Type A
Clutch Pedal Position Not Learned  (Manual transmission)	P080A	Monitor for valid clutch pedal position learn factors	Factors are considered NOT valid if the fully released position factor is greater than 94% of Vref or less than 67% of Vref	OBD Manufacturer Enable Counter = 0 Clutch pedal position not learned	25msec / test	DTC Type B
Park/Neutral Position Switch Circuit Low Voltage  (Automatic transmission)	P0851	Check for P/N switch open malfunction (in Drive when indicating P/N)	Gear selector in Park or Neutral AND P/N switch is open	Ignition voltage $\geq 9$ and $\leq 18$ V No Transmission Serial Data DTC(s) Transmission Gear Selector Serial Data Message received and valid Engine Speed $\leq 8192$ RPM	254 failures out of 255 samples  Continuous Monitor 12.5 msec/ sample	DTC Type C
Park/Neutral Position Switch Circuit High Voltage  (Automatic transmission)	P0852	Check for P/N switch closed malfunction (in Park/Neutral when indicating Drive)	TPS > 10% Torque $\geq 75$ Nm VSS $\geq 10$ kph  P/N switch is closed	Ignition voltage $\geq 9$ and $\leq 18$ V Transmission Gear Selector Serial Data Message valid No Transmission Serial Data DTC(s) No Vehicle speed DTC(s) No Engine Torque DTC(s) No TP DTC(s) Engine Speed $\geq 400$ RPM	254 failures out of 255 samples  Continuous Monitor 12.5 msec / sample	DTC Type C
Intake Air Flow System Performance	P1101	This DTC determines if there are multiple air induction problems affecting airflow and/or manifold pressure.	Filtered Throttle Error > 350 kPa/grams per second And Filtered Manifold2 Error > 20 kPa And Filtered Pressure1 Error > 20 kPa  OR Filtered Airflow Error > 15 grams per second	Engine rpm $\Rightarrow 40$ and $\leq 8192$ MAP sensor high/low DTCs not active EGR circuit/performance DTCs not active MAF sensor high/low DTCs not active Crank sensor DTCs not active Engine Coolant DTCs not active Intake Air Temp. DTCs not active Engine Coolant > 70 deg C and < 125 deg C Intake Air Temp > -7 deg C and < 125 deg C	Continuous  Evaluated every 12.5 ms	DTC Type B

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE (S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
O2S Insufficient Switching Bank 1 Sensor 1	P1133	This DTC determines if the O2 sensor is no longer sufficiently switching.	Half cycle L/R switches < 40 OR Half cycle R/L switches < 40  OR Slope Time L/R switches < 4 OR Slope Time R/L switches < 4	<p><u>Common Enable Criteria</u></p> <ul style="list-style-type: none"> <li>• No TP Sensor, MAP, ECT, MAF, IAT, Evap, Fuel Injector DTCs</li> <li>• Catalyst monitor diagnostic Intrusive Test = Not Active</li> <li>• Post Oxygen Sensor Diagnostic Intrusive Test = Not Active</li> <li>• Traction Control, AIR, Fuel, Idle, EGR, and Engine Not Overspeed Intrusive Tests = Not Active</li> <li>• 10 volts &lt; system voltage &lt; 18 volts</li> <li>• EGR, Idle, Fuel Inj., and AIR Device controls = Not Active</li> </ul> <p><u>Specific Enable Criteria</u></p> <ul style="list-style-type: none"> <li>• O2 Heater on for <math>\geq 40</math> seconds</li> <li>• B1S1 DTCs = Not Active</li> <li>• B1S1 learned heater resistance is valid</li> <li>• Misfire DTC = Not Active</li> <li>• ECT &gt; 65 °C</li> <li>• IAT &gt; -40 °C</li> <li>• Engine run time &gt; 60 seconds</li> <li>• EVAP Canister purge duty cycle <math>\geq 0</math> %</li> <li>• 15 grams per second <math>\leq</math> MAF <math>\leq</math> 32 grams per second</li> <li>• 1300 <math>\leq</math> RPM <math>\leq</math> 3000</li> <li>• Ethanol percentage &lt; 85.110 %</li> <li>• Baro &gt; 69.801 kPa</li> <li>• Throttle position <math>\geq 3.5</math> %</li> <li>• Fuel Level &gt; 9.9976 %</li> <li>• Fuel state = closed loop</li> <li>• No fuel level data faults</li> <li>• Transmission (automatic) not in Park, Reverse or Neutral</li> <li>• Transmission gear selection is not defaulted</li> <li>• Baro is not defaulted</li> </ul> <p>All of the above met for at least 1.5 seconds.</p>	90 seconds  <u>Frequency:</u> Once per trip	DTC Type B

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O2S Insufficient Switching Bank 2 Sensor 1	P1153	This DTC determines if the O2 sensor is no longer sufficiently switching.	Half cycle L/R switches < 40 OR Half cycle R/L switches < 40  OR Slope Time L/R switches < 4 OR Slope Time R/L switches < 4	<p><u>Common Enable Criteria</u></p> <ul style="list-style-type: none"> <li>• No TP Sensor, MAP, ECT, MAF, IAT, Evap, Fuel Injector DTCs</li> <li>• Catalyst monitor diagnostic Intrusive Test = Not Active</li> <li>• Post Oxygen Sensor Diagnostic Intrusive Test = Not Active</li> <li>• Traction Control, AIR, Fuel, Idle, EGR, and Engine Not Overspeed Intrusive Tests = Not Active</li> <li>• 10 volts &lt; system voltage &lt; 18 volts</li> <li>• EGR, Idle, Fuel Inj., and AIR Device controls = Not Active</li> </ul> <p><u>Specific Enable Criteria</u></p> <ul style="list-style-type: none"> <li>• O2 Heater on for <math>\geq 40</math> seconds</li> <li>• B2S1 DTCs = Not Active</li> <li>• B2S1 learned heater resistance is valid</li> <li>• Misfire DTC = Not Active</li> <li>• ECT &gt; 65 °C</li> <li>• IAT &gt; -40 °C</li> <li>• Engine run time &gt; 60 seconds</li> <li>• EVAP Canister purge duty cycle <math>\geq 0</math> %</li> <li>• 15 grams per second <math>\leq</math> MAF <math>\leq</math> 32 grams per second</li> <li>• 1300 <math>\leq</math> RPM <math>\leq</math> 3000</li> <li>• Ethanol percentage &lt; 85.110 %</li> <li>• Baro &gt; 69.801 kPa</li> <li>• Throttle position <math>\geq 3.5</math> %</li> <li>• Fuel Level &gt; 9.9976 %</li> <li>• Fuel state = closed loop</li> <li>• No fuel level data faults</li> <li>• Transmission (automatic) not in Park, Reverse or Neutral</li> <li>• Transmission gear selection is not defaulted</li> <li>• Baro is not defaulted</li> </ul> <p>All of the above met for at least 1.5 seconds.</p>	90 seconds  <u>Frequency:</u> Once per trip	DTC Type B

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE (S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
Air Fuel Imbalance Bank 1	P1174	Determines if the air-fuel delivery system is imbalanced by monitoring the pre-catalyst O2 sensor voltage characteristics	<p>The Bank 1 AFIM Filtered Length Ratio (EWMA) variable exceeds a value of .851 (automatic transmission) or .897 (manual transmission).</p> <p>Notes:</p> <ol style="list-style-type: none"> <li>The AFIM Filtered Length Ratio is determined by calculating the difference between the measured O2 voltage length (accumulated O2 voltage over a 2.5 second period) and an emissions-correlated threshold value, divided by the threshold value. The resulting ratio is then filtered utilizing an Exponentially Weighted Moving Average (EWMA).</li> <li>The AFIM Filtered Length Ratio is initialized to 0.0 at the beginning of every trip.</li> <li>The first report is delayed for 100 seconds to allow time for the AFIM Filtered Length Ratio variable to saturate. This minimizes the possibility of reporting a pass before a potential failure could be detected.</li> </ol>	<ul style="list-style-type: none"> <li>No Misfire, Fuel Injector, A.I.R., or EVAP DTCs</li> <li>No ECT, MAF, MAP, or pre-cat O2 Sensor DTCs</li> <li>No Fuel Composition (Ethanol) DTCs</li> <li>Device Control = Not Active</li> <li>Intrusive Diagnostics = Not Active</li> <li>Engine Overspeed Protection = Not Active</li> <li>Reduced Power Mode (ETC DTC) = Not Active</li> <li>PTO = Not Active</li> <li>Traction Control = Not Active</li> <li>Fuel Control in A/F Closed Loop or Learn-Enabled</li> <li>System Voltage &lt; 10.0 V or &gt; 18.0 V for &gt; 4.0 seconds</li> <li>Engine Run Time &gt; 50 seconds</li> <li>ECT &gt; 10°C</li> <li>Engine speed &gt; 1000 rpm but &lt; 4000 rpm</li> <li>Mass Airflow &gt; 7 g/s but &lt; 400 g/s</li> <li>Percent Ethanol &lt; 85 %</li> <li>Delta O2 voltage during previous 12.5ms &gt; +/- 5 mV</li> <li>O2 sensor voltages crosses 450mV &gt; 4 times during current 2.5 second sample period</li> </ul>	<p>EWMA variable is updated after every 2.5 seconds of valid data.</p> <p><u>Frequency:</u> Continuous Monitoring of O2 voltage signal in 12.5ms loop</p>	DTC Type B

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE (S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
Air Fuel Imbalance Bank 2	P1175	Determines if the air-fuel delivery system is imbalanced by monitoring the pre-catalyst O2 sensor voltage characteristics	The Bank 2 AFIM Filtered Length Ratio (EWMA) variable exceeds a value of 1.078 (automatic transmission) or .764 (manual transmission).  Notes: 1. The AFIM Filtered Length Ratio is determined by calculating the difference between the measured O2 voltage length (accumulated O2 voltage over a 2.5 second period) and an emissions-correlated threshold value, divided by the threshold value. The resulting ratio is then filtered utilizing an Exponentially Weighted Moving Average (EWMA). 2. The AFIM Filtered Length Ratio is initialized to 0.0 at the beginning of every trip. 3. The first report is delayed for 100 seconds to allow time for the AFIM Filtered Length Ratio variable to saturate. This minimizes the possibility of reporting a pass before a potential failure could be detected.	<ul style="list-style-type: none"> <li>No Misfire, Fuel Injector, A.I.R., or EVAP DTCs</li> <li>No ECT, MAF, MAP, or pre-cat O2 Sensor DTCs</li> <li>No Fuel Composition (Ethanol) DTCs</li> <li>Device Control = Not Active</li> <li>Intrusive Diagnostics = Not Active</li> <li>Engine Overspeed Protection = Not Active</li> <li>Reduced Power Mode (ETC DTC) = Not Active</li> <li>PTO = Not Active</li> <li>Traction Control = Not Active</li> <li>Fuel Control in A/F Closed Loop or Learn-Enabled</li> <li>System Voltage &lt; 10 V or &gt; 18 V for &gt; 4 seconds</li> <li>Engine Run Time &gt; 50 seconds</li> <li>ECT &gt; 10°C</li> <li>Engine speed &gt; 1000 rpm but &lt; 4000 rpm</li> <li>Mass Airflow &gt; 7 g/s but &lt; 400 g/s</li> <li>Percent Ethanol &lt; 85 %</li> <li>Delta O2 voltage during previous 12.5ms &gt; +5/-5 mV</li> <li>O2 sensor voltages crosses 450mV &gt; 4 times during current 2.5 second sample period</li> </ul>	EWMA variable is updated after every 2.5 seconds of valid data.  <u>Frequency:</u> Continuous Monitoring of O2 voltage signal in 12.5ms loop	DTC Type B
Engine Coolant Over Temperature - Protection Mode Active	P1258	Monitor for engine protection mode active.	Coolant temperature $\geq 131^{\circ}\text{C}$ for more than 7 seconds.	No coolant sensor DTCs.	Set immediately upon engine protection mode active.	DTC Type A
Misfire Detected – Rough Road Data Not Available  (Manual transmission)	P1380	This diagnostic detects if the ABS controller is indicating a fault. When this occurs, misfire will STILL run.	ABS controller sends a message to ECM indicating that a failure has occurred in the ABS module	Engine Speed <7000 Engine Load < 60 % VSS > 8 KPH	40 failures out of 80samples	DTC Type C  (DTC sets when a P0300 is active)
Misfire Detected – No Communication with Brake Control Module  (Manual transmission)	P1381	This diagnostic detects if the rough road information is no longer being received from the ABS module. When this occurs, misfire will STILL run.	Serial data messages are lost	Engine Speed <7000 Engine Load < 60 % VSS > 8 KPH	40 failures out of 80samples	DTC Type C  (DTC sets when a P0300 is active)



SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE (S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
Cold Start Emissions Reduction System Fault  (Automatic transmission)	P1400	Model based test computes exhaust thermal energy from elevated idle speed and retarded spark advance. Detects if the cold start emission reduction system has failed resulting in the delivered thermal energy being out of range.	(Average desired accumulated exhaust energy - Average estimated accumulated exhaust energy) < -8 kJ/s OR (Average desired accumulated exhaust energy - Average estimated accumulated exhaust energy) > 0.37 kJ/s	<ul style="list-style-type: none"> <li>Cold start emission reduction strategy is active.</li> <li>Vehicle speed &lt; 2 kph.</li> <li>Throttle position &lt; 2%.</li> <li>Airflow per cylinder &gt; 40 mg.</li> <li>No DTCs set for the following systems: MAP, MAF, IAT, ECT, Misfire, Electronic Spark Timing, Crank sensor, Idle, Fuel Injection, ETC, VS sensor, 5 volt reference, Intake Flow Rationality, ECM Memory</li> </ul>	100 ms loop  Runs once per trip when the cold start emission reduction strategy is active.  Test completes after 15 seconds of accumulated qualified data.	DTC Type A
Throttle Actuator Control (TAC) Module Throttle Actuator Position Performance	P1516	Detect a throttle positioning error. Detect a throttle positioning error. Detect excessive current draw on the actuator circuit. Determine if the actuator has been miswired.	Throttle error  >=  2%  after > 4 sec stability with no change in error sign, after 4 sec stable command.  Throttle error  > 8.4% I (actuator) > 9A TPS1 < 1.648V	<p>1-3. Ignition in run or crank [RPM&gt;0 or (RPM=0 and not in battery saver mode)]. No airflow actuation, throttle actuation DTCs Engine running = true or System voltage &gt; 6.5 V</p> <p>4. Minimum TPS learn active state</p>	487.5 ms in the MHC processor  187.5ms in the MHC processor  100ms in the MHC processor  187.5ms in the MHC processor	DTC Type A
Ignition 1 Switch Circuit 2	P1682	Detect a continuous or intermittent OOC in the Run/Crank Ignition Voltage & ETC Run/Crank Ignition Voltage	Run/Crank – ETC Run/Crank  > 3 V	Ignition in unlock/accessory, run or crank System voltage >5.23 V & Powertrain Relay Commanded on.	15 counts, 12.5msec loop time, in main processor	DTC Type B
Intake Manifold Tuning Valve Stuck Open	P2070	This DTC check for valve stuck open in normal operation range	160 Hz ≥ Valve frequency outside normal range ≤ 140 Hz  OR Valve learn period ≥ 0.75sec and Engine running OR Number of learn attempts ≥ 5	Intake Manifold Tuning sensor present No powerup reset > 5 times 9 volts ≥ Ignition volt ≤ 18 volts Intake Manifold Tuning Valve self test completed and passed No IMTV DTC fault No Engine coolant DTC fault No IAT DTC fault No TP DTC fault No Engine Overtemperature DTC fault Engine running Engine Coolant – Table value in degrees C based on minimum induction air temperature current key-on Engine Load present 1000 ≤ Engine Speed ≤ 3600	12.5 ms Continuous	DTC Type B

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE (S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
Intake Manifold Tuning Valve Stuck Closed	P2071	This DTC check for valve stuck closed in normal operation range	Commanded valve position not = actual valve position	Intake Manifold Tuning sensor present No powerup reset > 5 times 9 volts $\geq$ Ignition volt $\leq$ 18 volts Intake Manifold Tuning Valve self test completed and passed No IMTV DTC fault No Engine coolant DTC fault No IAT DTC fault No TP DTC fault No Engine Overtemperature DTC fault Engine running Engine Coolant – Table value in degrees C based on minimum induction air temperature current key-on Engine Load present 1000 $\leq$ Engine Speed $\leq$ 3600	12.5 ms Continuous	DTC Type B
Intake Manifold Tuning Valve Position Sensor Circuit Low	P2077	This DTC detects a continuous short to low or open in either the signal circuit or the sensor.	95% $\leq$ valve position	9 volts $\geq$ Ignition volt $\leq$ 18 volts	12.5 ms Continuous	DTC Type B
Intake Manifold Tuning Valve Position Sensor Circuit High	P2078	This DTC detects an open sensor ground or continuous short to high in either the signal circuit or the sensor	Valve position $\leq$ 0.05%	9 volts $\geq$ Ignition volt $\leq$ 18 volts	12.5 ms Continuous	DTC Type B
Control Module Throttle Actuator Position Performance	P2101	Detect a throttle positioning error	Difference between measured throttle position and modeled throttle position > 8.4%	Ignition in run or crank [RPM>0 or (RPM=0 and not in battery saver mode)] No airflow actuation, throttle actuation DTCs  Engine running or System voltage > 11 V	Positive error counter Increments by 1 if TP error > 8.4%; Decrements by 1 if 0% < TP error < 8.4%; Decrements by 1 if -8.4% < TP error < 0%; Increments by 1 if TP error < -8.4%.  Negative error counter Increments by 1 if TP error < -8.4%; Decrements by 1 if -8.4% < TP error < 0%; decrements by 1 if 0% < TP error < 8.4%; Increments by 1 if TP error > 8.4%.  Thresholds are 15  Check runs every 12.5 msec in the main processor	DTC Type A

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE (S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
Throttle Closed Position Performance	P2119	Throttle unable to return to default after de-energizing	After throttle de-energizing, throttle is out of default range, 1.323-1.897 v for TPS#1, 1.223 – 1.997 v for TPS #2.	Ignition in unlock/accessory, run or crank System voltage >5.23 V Throttle de-energized	496.875 ms	DTC Type C
Accelerator Pedal Position (APP) Sensor 1 Circuit	P2120	Detect a continuous or intermittent short or open in the APP sensor #1	0.325 V < Raw APP 1 < 4.59V	Ignition in unlock/accessory, run or crank System voltage >5.23 V No PCM processor, 5 V reference DTCs	19/39counts or 13counts continuous; 12.5 msec/count in the main processor  19/39counts or 13counts continuous; 12.5 msec/count in the motor processor	DTC Type A
Accelerator Pedal Position (APP) Sensor 1 Circuit Low Voltage	P2122	Detect a continuous or intermittent short or open in the APP sensor #1	Raw APP 1 < 0.325V	Ignition in unlock/accessory, run or crank System voltage >5.23 V No PCM processor, 5 V reference DTCs	19/39counts or 13 counts continuous; 12.5 msec/count in the main processor  19/39counts or 13counts continuous; 12.5 msec/count in the motor processor	DTC Type A
Accelerator Pedal Position (APP) Sensor 1 Circuit High Voltage	P2123	Detect a continuous or intermittent short or open in the APP sensor #1	Raw APP 1 > 4.59V	Ignition in unlock/accessory, run or crank System voltage >5.23 V No PCM processor, 5 V reference DTCs	19/39counts or 13 counts continuous; 12.5 msec/count in the main processor  19/39 counts or 13counts continuous; 12.5 msec/count in the motor processor	DTC Type A
Accelerator Pedal Position (APP) Sensor 2 Circuit	P2125	Detect a continuous or intermittent short or open in the APP sensor #2	0.1625 V < Raw APP 1 < 2.295v	Ignition in unlock/accessory, run or crank System voltage >5.23 V No PCM processor, 5 V reference DTCs	19/39counts or 13counts continuous; 12.5 msec/count in the main processor  19/39 counts or 13counts continuous; 12.5 msec/count in the motor processor	DTC Type A
Accelerator Pedal Position (APP) Sensor 2 Circuit Low Voltage	P2127	Detect a continuous or intermittent short or open in the APP sensor #2	Raw APP 2 < 0.1625V	Ignition in unlock/accessory, run or crank System voltage >5.23 V No PCM processor, 5 V reference DTCs	19/39 counts or 13 counts continuous; 12.5 msec/count in the main processor  19/39 counts or 13 counts continuous; 12.5 msec/count in the motor processor	DTC Type A
Accelerator Pedal Position (APP) Sensor 2 Circuit High Voltage	P2128	Detect a continuous or intermittent short or open in the APP sensor #2	Raw APP 2 > 2.295V	Ignition in unlock/accessory, run or crank System voltage >5.23 V No PCM processor, 5 V reference DTCs	19/39 counts or 13 counts continuous; 12.5 msec/count in the main processor  19/39counts or 13 counts continuous; 12.5 msec/count in the motor processor	DTC Type A

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE (S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
Throttle Position (TP) Sensor 1-2 Correlation	P2135	Detects a continuous or intermittent correlation fault between TP sensors #1 and #2	Difference between (raw min. learned TPS#1 voltage-raw min. TPS#1 voltage) and (raw TPS#2 voltage - raw min. learned TPS#2 voltage) < 7% offset at min. throttle position with an increasing to 10% at max. throttle position	Ignition in unlock/accessory, run or crank System voltage >5.23 V No PCM processor, TPS circuit DTCs	79/159 counts or 63 counts continuous; 3.125 msec/count in the main processor  19/39 counts or 15 counts continuous; 12.5 msec/count in the MHC processor	DTC Type A
Accelerator Pedal Position (APP) Sensor 1-2 Correlation	P2138	Detect an invalid minimum mechanical position correlation between APP sensor #1 and #2  Detect a short between APP sensors #1 and #2 circuits.	Difference between (raw min. learned PPS#1 voltage-raw min. PPS#1 voltage) and (raw PPS#2 voltage - raw min. learned PPS#2 voltage) > 10% offset (0.5v) at min. throttle position with an increasing to 10% (0.5v) at max. throttle position  Difference between main side PPS and MHC side PPS >2.5% (0.125v).	Ignition in unlock/accessory, run or crank System voltage >5.23 V No PCM processor, APP sensor, 5 V reference DTCs  Ignition in unlock/accessory, run or crank System voltage >5.23 V No PCM processor DTCs	19/399 counts intermittent or 15 counts continuous, 12.5 msec/count in the main processor  19/39 counts intermittent or 15 counts continuous, 12.5 msec/count in the motor processor  2 counts 156.25 msec w/ immediate test on an error, performed in the main processor	DTC Type A
Minimum Throttle Position Not Learned	P2176	TP minimum learning not completed	TPS > 0.935V	Minimum TPS learn active state Stable throttle position reading for 40 msec Ignition in run or crank  No TPS circuit DTCs	1.8secs	DTC Type A
ECM/PCM Internal Engine Off Timer Performance	P2610	This DTC determines if the engine off timer does not meet specification	Phase 1: A failure will be reported if the following occurs 3 times: Ignition off timer < 1 sec OR Ignition off timer > 15 sec  Phase 2: A failure will be reported if any of the following occurs 8 times out of 10 test: <ul style="list-style-type: none"> <li>• Time since last ignition off timer increment &gt; 1.375 seconds</li> <li>• Current ignition off time &lt; old ignition off time</li> <li>• Time between ignition off timer increments &lt; 0.8</li> <li>• Time between ignition off timer increments &gt; 1.2</li> <li>• Current ignition off timer minus old ignition off timer ≠ 1.0</li> </ul>	ECM is powered down DTC sets on next key cycle if failure detected Test has not run during current key cycle -40°C ≤ IAT ≤ 125°C	Once every key down 12.5ms loop rate 8 failures out of 10 samples	DTC Type B

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE (S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
O2 Sensor Circuit Range/Performance Bank 1 Sensor 1	P2A00	This DTC determines if the O2 sensor voltage is not meeting the voltage criteria to enable closed loop fueling.	Closed loop fuel control O2 sensor Ready flag set to "Not Ready."  O2 sensor voltage must be > 550 millivolts or < 350 millivolts to set closed loop fuel O2 Ready flag. Once set to "Ready," the O2 sensor voltage cannot be > 350 millivolts and < 550 millivolts for > 2 seconds or the O2 Ready flag will be reset to "Not Ready."	<ul style="list-style-type: none"> <li>No TP Sensor, MAF, MAP, IAT, ECT, EVAP, Secondary Air, Injector DTCs</li> <li>No B1S1 or B2S1 O2 DTCs</li> <li>Engine Run Time <math>\geq</math> 100 seconds</li> <li>ECT <math>\geq</math> 75° C</li> <li>Engine Metal Overtemp = Not Active</li> <li>Traction Control = Not Active</li> <li>No default throttle action</li> <li>Not in Catalyst Protection Mode</li> <li>10 volts <math>\leq</math> Ignition Voltage <math>\leq</math> 18 volts</li> <li>500 <math>\leq</math> Engine Speed <math>\leq</math> 3000</li> <li>5 grams per second <math>\leq</math> Mass Airflow <math>\leq</math> 30 grams per second</li> <li>Not in Decel Fuel Cutoff Mode</li> <li>Not in Power Enrichment</li> <li>Predicted O2 temp <math>\geq</math> 0 °C</li> </ul> <p>All of the above met for 5 seconds.</p>	250 test failures in a 300 test sample  <u>Frequency:</u> Continuous 100ms loop	DTC Type B
O2 Sensor Circuit Range/Performance Bank 1 Sensor 2  (Intrusive test runs on unified cycle)	P2A01	This DTC determines if the post catalyst O2 sensor is stuck in a normal voltage range and thereby can no longer be used for post oxygen sensor fuel control or for catalyst monitoring. The diagnostic includes a passive (stage 1) test and an intrusive (stage 2) test. The stage 2 increases or reduces delivered fuel to achieve the required rich or lean threshold.	Post catalyst O2 sensor cannot achieve voltage $\geq$ 775 millivolts and voltage $\leq$ 250 millivolts	<p><u>Common Enable Criteria</u></p> <ul style="list-style-type: none"> <li>No O2 circuit, heater, response or heater driver DTCs active</li> <li>No TP Sensor, ETC, MAF, ECT, MAP, IAT, EVAP, Secondary Air, Fuel Injector DTCs</li> <li>Engine Runtime <math>\geq</math> 6 seconds</li> </ul> <p><u>Stage 2 Specific Enable Criteria:</u></p> <ul style="list-style-type: none"> <li>Stage 1 portion of test not passed</li> <li>No Fuel Trim or Misfire Dutch's active</li> <li>Engine Runtime &gt; 380 seconds</li> <li>1000 rpm <math>\leq</math> Engine Speed <math>\leq</math> 3000 rpm</li> <li>12 grams per second <math>\leq</math> Airflow <math>\leq</math> 45 grams per second</li> <li>33 kph <math>\leq</math> Vehicle Speed <math>\leq</math> 130 kph</li> </ul> <p>All of the above met for at least 2.5 seconds, and then:</p> <ul style="list-style-type: none"> <li>0.954 <math>\leq</math> Short term fuel trim <math>\leq</math> 1.046</li> <li>Fuel state = closed loop</li> <li>EVAP diagnostic not in control of purge</li> </ul>	<p><u>Stage 1:</u> Runs until pass or fail reporting.</p> <p><u>Stage 2:</u> Up to 12 seconds for each threshold</p> <p><u>Frequency:</u> Once per trip</p>	DTC Type B

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE (S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
O2 Sensor Circuit Range/Performance Bank 2 Sensor 1	P2A03	This DTC determines if the O2 sensor voltage is not meeting the voltage criteria to enable closed loop fueling.	Closed loop fuel control O2 sensor Ready flag set to "Not Ready."  O2 sensor voltage must be > 550 millivolts or < 350 millivolts to set closed loop fuel O2 Ready flag. Once set to "Ready," the O2 sensor voltage cannot be > 350 millivolts and < 550 millivolts for > 2 seconds or the O2 Ready flag will be reset to "Not Ready."	<ul style="list-style-type: none"> <li>No TP Sensor, MAF, MAP, IAT, ECT, EVAP, Secondary Air, Injector DTCs</li> <li>No B1S1 or B2S1 O2 DTCs</li> <li>Engine Run Time <math>\geq</math> 100 seconds</li> <li>ECT <math>\geq</math> 75° C</li> <li>Engine Metal Overtemp = Not Active</li> <li>Traction Control = Not Active</li> <li>No default throttle action</li> <li>Not in Catalyst Protection Mode</li> <li>10 volts <math>\leq</math> Ignition Voltage <math>\leq</math> 18 volts</li> <li>500 <math>\leq</math> Engine Speed <math>\leq</math> 3000</li> <li>5 grams per second <math>\leq</math> Mass Airflow <math>\leq</math> 30 grams per second</li> <li>Not in Decel Fuel Cutoff Mode</li> <li>Not in Power Enrichment</li> <li>Predicted O2 temp <math>\geq</math> 0 °C</li> </ul> <p>All of the above met for 5 seconds.</p>	250 test failures in a 300 test sample  <u>Frequency:</u> Continuous 100ms loop	DTC Type B
O2 Sensor Circuit Range/Performance Bank 2 Sensor 2  (Intrusive test runs on unified cycle)	P2A04	This DTC determines if the post catalyst O2 sensor is stuck in a normal voltage range and thereby can no longer be used for post oxygen sensor fuel control or for catalyst monitoring. The diagnostic includes a passive (stage 1) test and an intrusive (stage 2) test. The stage 2 increases or reduces delivered fuel to achieve the required rich or lean threshold.	Post catalyst O2 sensor cannot achieve voltage $\geq$ 775 millivolts and voltage $\leq$ 250 millivolts	<p><u>Common Enable Criteria</u></p> <ul style="list-style-type: none"> <li>No O2 circuit, heater, response or heater driver DTCs active</li> <li>No TP Sensor, ETC, MAF, ECT, MAP, IAT, EVAP, Secondary Air, Fuel Injector DTCs</li> <li>Engine Runtime <math>\geq</math> 6 seconds</li> </ul> <p><u>Stage 2 Specific Enable Criteria:</u></p> <ul style="list-style-type: none"> <li>Stage 1 portion of test not passed</li> <li>No Fuel Trim or Misfire Dutch's active</li> <li>Engine Runtime &gt; 380 seconds</li> <li>1000 rpm <math>\leq</math> Engine Speed <math>\leq</math> 3000 rpm</li> <li>12 grams per second <math>\leq</math> Airflow <math>\leq</math> 45 grams per second</li> <li>33 kph <math>\leq</math> Vehicle Speed <math>\leq</math> 130 kph</li> </ul> <p>All of the above met for at least 2.5 seconds, and then:</p> <ul style="list-style-type: none"> <li>0.954 <math>\leq</math> Short term fuel trim <math>\leq</math> 1.046</li> <li>Fuel state = closed loop</li> <li>EVAP diagnostic not in control of purge</li> </ul>	<p><u>Stage 1:</u> Runs until pass or fail reporting.</p> <p><u>Stage 2:</u> Up to 12 seconds for each threshold</p> <p><u>Frequency:</u> Once per trip</p>	DTC Type B

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE (S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
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**TABLE - O2S Slow Response Bank 1 Sensor 1 (P0133), O2S Slow Response Bank 2 Sensor 1 (P0153)**  
Lean-Rich Ave

Rich-Lean Ave	Seconds	0.000	0.024	0.036	0.048	0.060	0.072	0.084	0.096	0.108	0.120	0.132	0.144	0.156	0.168	0.180	0.192	2.000	
	0.000	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL
	0.036	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL
	0.048	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL
	0.060	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL
	0.072	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL
	0.084	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL
	0.096	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	FAIL	FAIL	FAIL	FAIL	FAIL
	0.108	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	FAIL	FAIL	FAIL	FAIL
	0.120	FAIL	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	FAIL	FAIL	FAIL
	0.132	FAIL	FAIL	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	FAIL	FAIL	FAIL
	0.144	FAIL	FAIL	FAIL	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	FAIL	FAIL	FAIL
	0.156	FAIL	FAIL	FAIL	FAIL	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	FAIL	FAIL	FAIL
	0.168	FAIL	FAIL	FAIL	FAIL	FAIL	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	FAIL	FAIL	FAIL
	0.180	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	FAIL	FAIL	FAIL
	0.192	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	FAIL	FAIL	FAIL
	0.204	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	PASS	PASS	PASS	PASS	PASS	PASS	PASS	FAIL	FAIL	FAIL
2.000	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	

Control Module Communication Bus Off (Automatic transmission)	U0073	Detects that a CAN serial data bus shorted condition has occurred to force the CAN device driver to enter a bus-off state.	CAN device driver has reported that it has entered a bus-off state.		5 seconds  Frequency: Continuous 1 second loop	DTC Type B
Lost Communication with TCM (Automatic transmission)	U0101	Detects that CAN serial data communication has been lost with the TCM.	Lost communication with the TCM while the ignition switch is in the RUN power mode.		12 seconds  Frequency: Continuous 1 second loop	DTC Type B