# ENGINE DIAGNOSTIC PARAMETERS

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| SENSED PARAMETER | FAULT CODE | MONITOR STRATEGY DESCRIPTION | MALFUNCTION CRITERIA AND THRESHOLD VALUES | SECONDARY PARAMETERS AND ENABLE CONDITIONS | TIME LENGTH AND FREQUENCY | MIL ILLUM. TYPE |
|---|---|---|---|---|---|---|
| Camshaft Sensor Misinstalled | **P0016** | 1X Signal<br>This diagnostic will determine if the Cam sensor and cam timing have been installed correctly | Cam signal falling edge out of phase ±65 degrees from cam falling edge. | Engine is running – run flag is true<br>No crank position sensor circuit or performance DTC's<br>No Fault Pending CAM Circuit DTC's | 4 test failures within a 5 test sample size.<br><br>Time necessary to complete sample: Varies with engine speed<br><br>1 Sample = 1 cam pulse. | DTC Type B |
| B1S1 Oxygen Sensor Heater Circuit (ODM) | **P0030** | This DTC checks the Heater Output Driver circuit for electrical integrity | Output state shorted or open | Output driver commanded on<br>Ignition switch is in crank or run<br>11 volts < Ignition Voltage < 18 volts<br>RPM > 425 | 100 failures out of 120 samples<br><br>Frequency:<br>250ms loop<br>Continuous | DTC Type B |
| B1S2 Oxygen Sensor Heater Circuit (ODM) | **P0036** | This DTC checks the Heater Output Driver circuit for electrical integrity | Output state shorted or open | Output driver commanded on<br>Ignition switch is in crank or run<br>11 volts < Ignition Voltage < 18 volts<br>RPM > 425 | 100 failures out of 120 samples<br><br>Frequency:<br>250ms loop<br>Continuous | DTC Type B |
| B2S1 Oxygen Sensor Heater Circuit (ODM) | **P0050** | This DTC checks the Heater Output Driver circuit for electrical integrity | Output state shorted or open | Output driver commanded on<br>Ignition switch is in crank or run<br>11 volts < Ignition Voltage < 18 volts<br>RPM > 425 | 100 failures out of 120 samples<br><br>Frequency:<br>250ms loop<br>Continuous | DTC Type B |
| B2S2 Oxygen Sensor Heater Circuit (ODM) | **P0056** | This DTC checks the Heater Output Driver circuit for electrical integrity | Output state shorted or open | Output driver commanded on<br>Ignition switch is in crank or run<br>11 volts < Ignition Voltage < 18 volts<br>RPM > 425 | 100 failures out of 120 samples<br><br>Frequency:<br>250ms loop<br>Continuous | 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 < 65 kPa<br>Difference between measured MAF and estimated MAF < 75 grams/sec | Engine running<br>No PCM processor, throttle actuation DTCs<br>Both TPS circuits DTCs are set | 187.5 msec<br><br>Continuous in the main processor | DTC Type A |

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|---|---|---|---|---|---|---|
| MASS AIR FLOW SYSTEM PERFORMANCE (RATIONALITY) | **P0101** | This DTC determines if the MAF sensor is stuck within the normal operating range | (Measured Flow – Modeled air Flow) Filtered > 12<br>AND<br>(Measured Manifold Air Pressure – Manifold Model 2 pressure)Filtered > 15 | Engine rpm =>450 and <= 6800<br><br>MAP sensor high/low DTC's not active<br><br>EGR DTC's P0401,.P0405, and P1404 not active<br>MAF sensor high/low DTC's not active<br>Crank sensor DTC's not active<br>Engine Coolant DTC's not active<br>Intake Air Temp. DTC's not active<br>Engine Coolant > 70 deg C and < 125 deg C<br>Intake Air Temp > -7 deg C and < 125 deg C | Continuous<br><br>The Mass Air Flow reading and Mass Air Flow calculation are performed during the same 12.5 ms loop | DTC Type B |
| MASS AIR FLOW SENSOR CIRCUIT LOW FREQUENCY | **P0102** | Detects a continuous short to low or a open in either the signal circuit or the MAF sensor | LOW FREQUENCY TEST:<br>MAF ≤ 10 Hz | LOW FREQUENCY TEST<br>Engine Running<br><br>Engine Speed ≥ 300 RPM<br>System Voltage ≥ 8 volts<br>The above must be present for a period of time greater than 3 seconds | LOW FREQUENCY TEST:<br>30 test failures in a 40 test sample.<br><br>1 sample per 100 ms<br><br>Test is run at every reading of the Mass Air Flow sensor frequency | DTC Type B |
| MASS AIR FLOW SENSOR CIRCUIT HIGH FREQUENCY | **P0103** | Detects a continuous short to high in either the signal circuit or the MAF sensor | HIGH FREQUENCY TEST:<br>MAF ≥ 13500 Hz | HIGH FREQUENCY TEST:<br>Engine Running<br><br>Engine Speed ≥ 300 RPM<br>System Voltage ≥ 8 volts<br>The above must be present for a period of time greater than 3 seconds | HIGH FREQUENCY TEST:<br>18 test failures in a 24 test sample.<br><br>1 sample per 100 ms<br><br>Test is run at every reading of the Mass Air Flow sensor frequency | DTC Type B |

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|---|---|---|---|---|---|---|
| MAP SENSOR RANGE/ PERFORMANCE (RATIONALITY) | **P0106** | This DTC determines if the MAP sensor is stuck within the normal operation range | (Measured MAP - Manifold Model 1 pressure) filtered > 15 AND<br>(Measured MAP – Manifold Model 2 pressure) filtered > 15 | Engine rpm =>450 and <= 6800<br>MAP sensor high/low DTC's not active<br>EGR DTC's P0401,.P0405, and P1404 not active<br>MAF sensor high/low DTC's not active<br>Crank sensor DTC's not active<br>Engine Coolant DTC's not active<br>Intake Air Temp. DTC's not active<br>Engine Coolant > 70 deg C and < 125 deg C<br>Intake Air Temp > -7 deg C and < 125 deg C | Continous<br><br>The MAP reading and the Manifold Model calculations are performed in the same LoRes loop | DTC Type B |
| MANIFOLD ABSOLUTE PRESSURE SENSOR CIRCUIT LOW | **P0107** | This DTC detects a continuous short to low or open in either the signal circuit or the MAP sensor. | Raw MAP < .06volts ( 3 counts) | TP sensor DTC's not active<br>Engine Running<br>Throttle Position is ≥ 0% when engine speed is ≤ 800 RPM<br>Or<br>Throttle Position is ≥ 12.5 % when engine speed is > 800 RPM<br>No 5v ref. DTC's | 320 test failures in a 400 test sample.<br><br>1 sample/100 ms | DTC Type B |
| MANIFOLD ABSOLUTE PRESSURE 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 | Raw MAP > 4.89 Volts (250 counts) | Cold Start Run Time – Table value in seconds based on Powerup Coolant Temperature<br><u>Run Test</u><br>TP sensor DTC's not active<br>Engine Running<br>Throttle Position is ≤ 0.996094 % when engine speed is ≤ 1200 RPM<br>Or<br>Throttle Position is ≤ 20 % when engine speed is > 1200 RPM | 320 test failures in a 400 test sample.<br><br>1 sample/100 ms | DTC Type B |
| INTAKE AIR TEMP SENSOR CIRCUIT LOW (HIGH TEMP) | **P0112** | This DTC detects a continuous short to ground in the IAT signal circuit or the IAT sensor | Raw IAT < 25 ohms | VS sensor DTC's not active<br>Vehicle speed ≥ 40 kph<br>ECT sensor DTC's not active<br>Engine run time > 45 seconds<br>Coolant Temperature < 125°C | 25 test failures in a 50test sample<br><br>1 sample/sec | DTC Type B |

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| INTAKE AIR TEMP SENSOR CIRCUIT HIGH (LOW TEMP) | **P0113** | This DTC detects a continuous open or short to high in the IAT signal circuit or the IAT sensor | Raw IAT > 200,000 ohms | MAF sensor DTC's not active<br>ECT sensor DTC's not active<br>VS sensor DTC's not active<br>Coolant Temperature > 60 °C<br>Mass Air Flow < 15 g/s<br>Vehicle Speed < 11 kph<br>Engine run time > 120 seconds | 25 test failures in a 50 test sample.<br><br>1 sample/sec | DTC Type B |
| ENGINE COOLANT TEMP SENSOR RATIONALITY (HIGH-SIDED) | **P0116** | Detects coolant temp sensor stuck in mid range | ECT – IAT > 15°C | Soak time > 10 hours<br>IAT > 7°C<br>IAT drop < 3°C<br>Vehicle Speed > 24 kph for 400 seconds | Immediate when enable conditions are met | DTC Type B |
| ENGINE COOLANT TEMP SENSOR CIRCUIT LOW (HIGH TEMP) | **P0117** | This DTC detects a continuous short to ground in the ECT signal circuit or the ECT sensor. | Raw ECT < 50 ohms | Engine run time > 60 seconds<br>Or<br>Engine run time < 60 seconds<br>IAT < 0° C | 45 test failures in a 50 test sample.<br><br>1 sample/sec | DTC Type B |
| ENGINE COOLANT TEMP SENSOR CIRCUIT HIGH (LOW TEMP) | **P0118** | Circuit Continuity<br>This DTC detects a continuous short to high or open in the ECT signal circuit or the ECT sensor. | Raw IAT > 200,000 ohms | Engine run time > 60 seconds<br>Or<br>Engine run time < 60 seconds<br>IAT > 0° C | 45 test failures in a 50 test sample.<br><br>1 sample/sec<br><br>Continuous | DTC Type B |
| Throttle Position (TP) Sensor 1 Circuit | **P0120** | Detects a continuous or intermittent short or open in TP sensor #1 circuit | 0.275 V > TPS > 4.725 V | Ignition in unlock/accessory, run or crank<br>System voltage>5.23 V<br>No PCM processor, 5 V reference DTCs | 20/40 counts; 10 counts continuous; 12.5 msec /count in the motor processor | DTC Type A |
| TP SENSOR CIRCUIT PERFORMANCE (RATIONALITY) | **P0121** | The DTC determines if a TPS sensor is stuck within the normal operating range | (The calculated throttle residual from the MAF model and the Manifold Model) filtered > 150 | Engine rpm =>450 and <= 6800<br>MAP sensor high/low DTC's not active<br>EGR DTC's P0401,.P0405, and P1404 not active<br>MAF sensor high/low DTC's not active<br>Crank sensor DTC's not active<br>Engine Coolant DTC's not active<br>Intake Air Temp. DTC's not active<br>Engine Coolant > 70 deg C and < 125 deg C<br>Intake Air Temp > -7 deg C and < 125 deg C | Continous<br><br>Calculations are performed every 12.5 ms | DTC Type B |

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|---|---|---|---|---|---|---|
| Throttle Position (TP) Sensor 1 Circuit Lo | **P0122** | Detects a continuous or intermittent OOR lo TPS | TPS < 0.275 V | Ignition in unlock/accessory, run or crank<br>System voltage>5.23 V<br>No PCM processor, 5 V reference DTCs | 20/40 counts; 10 counts continuous; 12.5 msec /count in the motor processor | DTC Type A |
| Throttle Position (TP) Sensor 1 Circuit Hi | **P0123** | Detects a continuous or intermittent OOR lo TPS | TPS > 4.725 V | Ignition in unlock/accessory, run or crank<br>System voltage>5.23 V<br>No PCM processor, 5 V reference DTCs | 20/40 counts; 10 counts continuous; 12.5 msec /count in the motor processor | DTC Type A |
| COOLANT TEMPERATURE BELOW STAT 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<br>For –7°C < IAT < 10°C, Target = 45°C<br>For IAT > 10°C, Target = 75°C | 12 gps < Airflow < 50 gps<br>Avg airflow > 5gps<br>Engine runtime <1370seconds before test completes<br>Engine runtime > 120 seconds<br>IAT > -7°C<br>Vehicle speed > 5 mph for 1.5 miles<br>ECT at startup < 70°C<br><br>No ECT, Throttle, IAT, VSS, MAF or MAP faults | Once per trip<br><br>Time based on flow | DTC Type B |
| (B1S1) HEATED OXYGEN SENSOR CIRCUIT LOW | **P0131** | Circuit Continuity Detects a HO2S voltage stationary lean (low signal voltage) condition. | Oxygen sensor voltage < 200 mV<br><br><OR><br><br>In PE<br>Oxygen sensor voltage < 360 mV | Closed Loop Fuel Control.<br>TPS: 3-70%<br>Fuel > 10%<br>10 V < System Voltage < 18 V<br><br>.992 < Equivalence Ratio < 1.0136<br>All valves of active cylinders enabled<br>Above conditions met for 2 sec<br>No , , Throttle, IAT , Injector, Coolant, Air Flow, Purge Control, , MAP Fuel Composition or Engine Protect faults active.<br>Traction Control not active<br><br>Power Enrichment active 1 sec<br>Fuel > 10%<br><br>10 V < System Voltage < 18V<br>Engine runtime > 30 sec<br>No Throttle, IAT, Injector, Coolant, Air Flow, Purge Control, , MAP, Fuel Composition or Engine Protect faults active.<br>Traction Control not active | 310 failures out of 330 samples. Sensor monitored for 5 sets of samples. After 5 sets of failures, related sensors checked for same failure. If related sensor also failing, then no action is taken.<br><br>100 ms/sample<br>Continuous<br><br>95 failures out of 100 samples<br><br>100 ms/sample<br>Continuous | DTC Type B |

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| (B1S1) HEATED OXYGEN SENSOR CIRCUIT HIGH | **P0132** | Circuit Continuity Detects a HO2S voltage stationary rich (high signal voltage) condition. | Oxygen sensor voltage > 1050 mV<br><br><OR><br><br>In DFCO<br>Oxygen sensor voltage > 540 mV | Closed Loop Fuel Control.<br>TPS: 3-70%<br>Fuel > 10%<br>10 V < System Voltage < 18V<br><br>.992 < Equivalence Ratio < 1.0136<br>All valves of active cylinders enabled<br>Above conditions met for 2 sec<br>No, Throttle, IAT, Injector, Coolant, Air Flow, Purge Control, , MAP, Fuel Composition or Engine Protect faults active.<br>Traction Control not active<br><br>Decel Fuel Cut Off active 2 sec<br>Fuel > 10%<br>10 V < System Voltage < 18 V<br><br>Engine runtime > 30 sec<br>No, Throttle, IAT, Injector, Coolant, Air Flow, Purge Control, , MAP, Fuel Composition or Engine Protect faults active.<br>Traction Control not active | 310 failures out of 330 samples. Sensor monitored for 5 sets of samples. After 5 sets of failures, related sensors checked for same failure. If related sensor also failing, then no action is taken.<br><br>100 ms/sample<br>Continuous<br><br>45 failures out of 50 samples<br><br>100 ms/sample<br>Continuous | DTC Type B |
| (B1S1) HEATED OXYGEN SENSOR CIRCUIT SLOW RESPONSE | **P0133** | Detects slow symmetrical rich to lean or lean to rich HO2S signal transition rates. | The oxygen sensor transitions between 250 – 625 mV.<br><br>HO2S sensor average transition time:<br>L/R > 400 ms<br>R/L > 400 ms | Closed Loop Fuel Control<br>Engine runtime > 160 sec<br>1000 < RPM < 3000<br>15 < Air Flow < 55g/s.<br>10 V < System Voltage < 18V<br>TPS > 5%<br>Fuel > 10%<br>ECT > 55 °C<br>CCP > 0<br><br>0 ºC < Predicted Oxygen Sensor Temp < 2048 ºC<br>Above conditions met for 1 sec<br>DTC's P0131, P0132, P0134 and P0135 not set<br>No Throttle, IAT, Injector, Coolant, Air Flow, Purge Control, Misfire, MAP, Fuel Composition or Engine Protect faults active.<br>Traction Control not active<br>Automatic transmissions in drive | 60 sec<br><br>Once per trip. | DTC Type B |

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| (B1S1) HEATED OXYGEN SENSOR CIRCUIT NO ACTIVITY | **P0134** | Circuit Continuity Detects a HO2S circuit open. | 350 mV < B1S1 voltage < 550 mV | Engine runtime > 300 sec<br>10 V < System Voltage < 18V<br><br>No, Throttle, IAT, Injector, Coolant, Air Flow, Purge Control, , MAP, Engine Protection or Fuel Composition faults active.<br>Traction Control not active | 570 failures out of 600 samples<br><br>100 ms/sample<br>Continuous. | DTC Type B |
| (B1S1) HEATED OXYGEN SENSOR HEATER CIRCUIT | **P0135** | Current Monitor: Detects a malfunctioning HO2S heater circuit by monitoring the current through the circuit<br>AND<br>Out-Of-Range (OOR) Resistance: Detects an oxygen sensor heater having an incorrect or (OOR) resistance value. | Current Monitor: 0.25 A < Heater Current < 3.125 A<br>AND<br><br>(OOR): -4.21 < Limit Part Error < 2.48<br><br>NOTE: If the P0135 DTC sets for an OOR fault, then the Current Monitor test for this sensor will be disabled, until another pass or fail decision is made. (This eliminates the scenario in which a OOR fail and then a Current Monitor pass would prevent illumination of the MIL.) | Current Monitor: 10 V < System Voltage < 18 V<br>Coolant > 50 ºC<br>3 g/s < Airflow < 40 g/s<br>Device control not active<br>Engine runtime > 120 sec<br>500 < RPM < 3000<br><br>No, Throttle, IAT, Injector, Coolant, Air Flow, Purge Control, , MAP, Engine Protect or Fuel Composition faults active.<br>Traction Control not active<br><br>AND (OOR):<br>Coolant – IAT < 8ºC<br>Engine Soak Time > 10 Hours<br>-30ºC < Coolant Temp < 45ºC | Current Monitor: 8 failures out of 10 samples<br><br>Frequency:<br>2 times per key cycle<br><br>AND (OOR): Once per valid cold start. | DTC Type B |

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| (B1S2) HEATED OXYGEN SENSOR POSD | **P0136** | Detects post sensors that are stuck in range, outside of the open or shorted regions. | Stage1 - Passive Test:<br>During the ignition cycle the O2 signal must exceed the upper bound of the post O2 PID control window set at 710mV, and also drop below 349mV, which is the minimum lean voltage used by the Idle Catalyst diagnostic.<br><br>Stage2 - Intrusive Test:<br>If the Stage1 test has not reported a pass during the first 810 seconds, then an 8% lean and/or rich fueling change will be commanded to force the signal to cross the appropriate threshold as described above. The DTC will set if the sensor has not responded to the intrusive rich or lean test after 60 seconds. | Stage1 – Passive Test:<br>Engine runtime > 2 sec<br><br>Stage2 – Intrusive Test:<br>Closed Loop Fuel Control<br>Engine runtime > 810 sec<br>5 < Airflow < 100 g/s<br>10 V < System Voltage < 18V<br>500 < Engine Speed < 5000 RPM<br>15 < Vehicle speed < 82 mph<br>0.96< Short Term Integrator < 1.04<br>Above conditions met for 1 sec<br>No, Throttle, IAT, Injector, Coolant, Air Flow, Purge Control, or MAP faults active.<br><br>Lean test: Pre sensors must drop below 300mV<br>Rich test: Pre sensors must exceed 600mV<br><br>Stage2 test order: Lean then Rich | DTC will set if Stage2 test length exceeds 60 sec.<br><br>Maximum of 25 Stage2 attempts (aborts).<br><br>Once per trip | DTC Type B |

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| (B1S2) HEATED OXYGEN SENSOR CIRCUIT LOW | **P0137** | Circuit Continuity Detects a HO2S voltage stationary lean (low signal voltage) condition. | Oxygen sensor voltage < 80 mV<br><br><OR><br><br>Oxygen sensor voltage < 420 mV | Closed Loop Fuel Control.<br>TPS: 3-70%<br>Fuel > 10%<br>10 V < System Voltage < 18 V<br><br>.992 < Equivalence Ratio < 1.0136<br>All valves of active cylinders enabled<br>Above conditions met for 2 sec<br>No, Throttle, IAT, Injector, Coolant, Air Flow, Purge Control, MAP, Engine Protect or Fuel Composition faults active.<br>Traction Control not active<br><br>Power Enrichment active 2 sec<br>Fuel > 10%<br>10 V < System Voltage < 18V<br><br>Engine runtime > 30 sec<br>No, Throttle, IAT, Injector, Coolant, Air Flow, Purge Control, MAP, Engine Protect or Fuel Composition faults active.<br>Traction Control not active | 380 failures out of 400 samples Sensor monitored for 5 sets of samples. After 5 sets of failures, related sensors checked for same failure. If related sensor also failing, then no action is taken.<br><br>100 ms/sample<br>Continuous<br><br>95 failures out of 100 samples<br><br>100 ms/sample<br>Continuous | DTC Type B |

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| (B1S2) HEATED OXYGEN SENSOR CIRCUIT HIGH | **P0138** | Circuit Continuity Detects a HO2S voltage stationary rich (high signal voltage) condition. | Oxygen sensor voltage > 950 mV<br><br><OR><br><br>Oxygen sensor voltage > 480 mV | Closed Loop Fuel Control.<br>TPS: 3-70%<br>Fuel > 10%<br>10 V < System Voltage < 18 V<br><br>.992 < Equivalence Ratio < 1.0136<br>All valves of active cylinders enabled<br>Above conditions met for 2 sec<br>No, Throttle, IAT, Injector, Coolant, Air Flow, Purge Control, , MAP, Engine Protect or Fuel Composition faults active.<br>Traction Control not active<br><br>Decel Fuel Cut Off active 10 sec<br>Fuel > 10%<br><br>10 V < System Voltage < 18 V<br>Engine runtime > 30 sec<br>No, Throttle, IAT, Injector, Coolant, Air Flow, Purge Control, , MAP, Engine Protect or Fuel Composition faults active.<br>Traction Control not active | 380 failures out of 400 samples. Sensor monitored for 5 sets of samples. After 5 sets of failures, related sensors checked for same failure. If related sensor also failing, then no action is taken.<br><br>100 ms/sample<br>Continuous<br><br>45 failures out of 50 samples.<br><br>100 ms/samples<br>Continuous | DTC Type B |

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| (B1S2) HEATED OXYGEN SENSOR CIRCUIT NO ACTIVITY | **P0140** | Circuit Continuity Detects a HO2S circuit open. | 410 mV < B1S2 voltage < 490 mV<br><br>Or<br><br>Post O2 sensor fast pass<br><br>B1S2 > 550 mV<br>B1S2 < 350 mV | Engine runtime > 300 sec<br>Closed Loop Fuel Control.<br>10 V < System Voltage < 18 V<br><br>5% Δ TPS within 1 sec, 6 times<br>DTC P0141 not set<br>No, Throttle, IAT, Injector, Coolant, Air Flow, Purge Control, , MAP, Engine Protect or Fuel Composition faults active.<br>Traction Control not active<br><br>10 V < System Voltage < 18 V<br><br>Engine runtime < 200 sec<br>DTC P0141 not set<br>No, Throttle, IAT, Injector, Coolant, Air Flow, Purge Control, MAP, Engine Protect or Fuel Composition faults active.<br>Traction Control not active | 1450 failures out of 1500 samples.<br><br>100 ms/sample<br>Once per trip<br><br>550 more passing samples than failing samples.<br><br>100 ms/sample<br>Once per trip | DTC Type B |
| (B1S2) HEATED OXYGEN SENSOR HEATER CIRCUIT | **P0141** | Current Monitor: Detects a malfunctioning HO2S heater circuit by monitoring the current through the circuit<br>AND<br>Out-Of-Range (OOR) Resistance: Detects an oxygen sensor heater having an incorrect or (OOR) resistance value. | Current Monitor: 0.25 A < Heater Current < 1.375A<br>AND<br><br>(OOR): -7.50 < Limit Part Error < 4.57<br><br>NOTE: If the P0141 DTC sets for an OOR fault, then the Current Monitor test for this sensor will be disabled, until another pass or fail decision is made. (This eliminates the scenario in which a OOR fail and then a Current Monitor pass would prevent illumination of the MIL.) | Current Monitor: 10 V < System Voltage < 18 V.<br>Coolant > 50 ºC<br>3 g/s < Airflow < 40 g/s<br>Device control not active<br>Engine runtime > 120 sec<br>500 < RPM < 3000<br><br>No, Throttle, IAT, Injector, Coolant, Air Flow, Purge Control, , MAP, Engine Protect or Fuel Composition faults active.<br>Traction Control not active<br>AND (OOR):<br>Coolant – IAT < 8ºC<br>Engine Soak Time > 10 Hours<br>-30ºC < Coolant Temp < 45ºC | Current Monitor: 8 failures out of 10 samples<br><br>Frequency:<br>2 times per key cycle<br><br>AND (OOR): Once per valid cold start. | DTC Type B |

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|---|---|---|---|---|---|---|
| (B2S1) HEATED OXYGEN SENSOR CIRCUIT LOW | **P0151** | Circuit Continuity Detects a HO2S voltage stationary lean (low signal voltage) condition. | Oxygen sensor voltage < 200 mV<br><br><OR><br><br>In PE<br>Oxygen sensor voltage < 360 mV | Closed Loop Fuel Control.<br>TPS: 3-70%<br>Fuel > 10%<br>10 V < System Voltage < 18 V<br><br>.992 < Equivalence Ratio < 1.0136<br>All valves of active cylinders enabled<br>Above conditions met for 2 sec<br>No, Throttle, IAT, Injector, Coolant, Air Flow, Purge Control, , MAP, Engine Protect or Fuel Composition faults active.<br>Traction Control not active<br><br>Power Enrichment active 1 sec<br>Fuel > 10%<br><br>10 V < System Voltage < 18 V<br>Engine runtime > 30 sec<br>No, Throttle, IAT, Injector, Coolant, Air Flow, Purge Control, , MAP, Fuel Composition or Engine Protect faults active.<br>Traction Control not active | 310 failures out of 330 samples. Sensor monitored for 5 sets of samples. After 5 sets of failures, related sensors checked for same failure. If related sensor also failing, then no action is taken.<br><br>100 ms/sample<br>Continuous<br><br>95 failures out of 100 samples<br><br>100 ms/sample<br>Continuous | DTC Type B |

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|---|---|---|---|---|---|---|
| (B2S1) HEATED OXYGEN SENSOR CIRCUIT HIGH | **P0152** | Circuit Continuity Detects a HO2S voltage stationary rich (high signal voltage) condition. | Oxygen sensor voltage > 1050 mV<br><br><OR><br><br>In DFCO<br>Oxygen sensor voltage > 540 mV | Closed Loop Fuel Control.<br>TPS: 3-70%<br>Fuel > 10%<br>10 V < System Voltage < 18 V<br><br>.992 < Equivalence Ratio < 1.0136<br>All valves of active cylinders enabled<br>Above conditions met for 2 sec<br>NoThrottle, IAT, Injector, Coolant, Air Flow,, Purge Control, MAP, Engine Protect or Fuel Composition faults active.<br>Traction Control not active<br><br>Decel Fuel Cut Off active 2 sec<br>Fuel > 10%<br>10 V < System Voltage < 18 V<br><br>Engine runtime > 30 sec<br>NoThrottle, IAT, Injector, Coolant, Air Flow, Purge Control, MAP, Fuel Composition or Engine Protect faults active.<br>Traction Control not active | 310 failures out of 330 samples. Sensor monitored for 5 sets of samples. After 5 sets of failures, related sensors checked for same failure. If related sensor also failing, then no action is taken.<br><br>100 ms/sample<br>Continuous<br><br>45 failures out of 50 samples<br><br>100 ms/sample<br>Continuous | DTC Type B |
| (B2S1) HEATED OXYGEN SENSOR CIRCUIT SLOW RESPONSE | **P0153** | Detects slow symmetrical rich to lean or lean to rich HO2S signal transition rates. | The oxygen sensor transitions between 250 – 625 mV.<br><br>HO2S sensor average transition time:<br>L/R > 400 ms<br>R/L > 400 ms | Closed Loop Fuel Control<br>Engine runtime > 160 sec<br>1000 < RPM <3000<br>15 < Air Flow < 55 g/s<br>10 V < System Voltage < 18 V<br>TPS > 5%<br>Fuel > 10%<br>ECT > 55 °C<br>CCP > 0<br><br>0 ºC < Predicted Oxygen Sensor Temp < 2048 ºC<br>Above conditions met for 1 sec<br>DTC's P0151, P0152, P0154 and P0155 not set<br>No Throttle, IAT, Injector, Coolant, Air Flow, Purge Control, Misfire, MAP, Engine Protect or Fuel Composition faults active.<br>Traction Control not active<br>Automatic transmissions in drive | 60 sec<br><br>Once per trip. | DTC Type B |

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|---|---|---|---|---|---|---|
| (B2S1) HEATED OXYGEN SENSOR CIRCUIT NO ACTIVITY | **P0154** | Circuit Continuity Detects a HO2S circuit open. | 350 mV < B2S1 voltage < 550 mV | Engine runtime > 300 sec<br>10 V < System Voltage < 18 V<br><br>No Throttle, IAT, Injector, Coolant, Air Flow,, Purge Control, MAP, Engine Protect or Fuel Composition faults active.<br>Traction Control not active | 570 failures out of 600 samples.<br><br>100 ms/sample<br>Continuous | DTC Type B |
| (B2S1) HEATED OXYGEN SENSOR HEATER CIRCUIT | **P0155** | Current Monitor: Detects a malfunctioning HO2S heater circuit by monitoring the current through the circuit<br>AND<br>Out-Of-Range (OOR) Resistance: Detects an oxygen sensor heater having an incorrect or (OOR) resistance value | Current Monitor: 0.25 A < Heater Current < 3.125 A<br>AND<br><br>(OOR): -4.21 < Limit Part Error < 2.48<br><br>NOTE: If the P0155 DTC sets for an OOR fault, then the Current Monitor test for this sensor will be disabled, until another pass or fail decision is made. (This eliminates the scenario in which a OOR fail and then a Current Monitor pass would prevent illumination of the MIL.) | Current Monitor: 10 V < System Voltage < 18 V<br>Coolant > 50 ºC<br>3 g/s < Airflow < 40 g/s<br>Device control not active<br>Engine runtime > 120 sec<br>500 < RPM < 3000<br><br>No Throttle, IAT, Injector, Coolant, Air Flow,, Purge Control, MAP, Engine Protect or Fuel Composition faults active.<br>Traction Control not active<br>AND (OOR):<br>Coolant – IAT < 8ºC<br>Engine Soak Time > 10 Hours<br>-30ºC < Coolant Temp < 45ºC | Current Monitor: 8 failures out of 10 samples<br><br>Frequency:<br>2 times per key cycle<br><br>AND (OOR): Once per valid cold start. | DTC Type B |

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|---|---|---|---|---|---|---|
| (B2S2) HEATED OXYGEN SENSOR POSD | **P0156** | Detects post sensors that are stuck in range, outside of the open or shorted regions. | Stage1 - Passive Test:<br>During the ignition cycle the O2 signal must exceed the upper bound of the post O2 PID control window set at 710mV, and also drop below 349mV, which is the minimum lean voltage used by the Idle Catalyst diagnostic.<br><br>Stage2 - Intrusive Test:<br>If the Stage1 test has not reported a pass during the first 810 seconds, then an 8% lean and/or rich fueling change will be commanded to force the signal to cross the appropriate threshold as described above. The DTC will set if the sensor has not responded to the intrusive rich or lean test after 60 seconds. | Stage1 – Passive Test:<br>Engine runtime > 2 sec<br><br>Stage2 – Intrusive Test:<br>Closed Loop Fuel Control<br>Engine runtime > 810 sec<br>5 < Airflow < 100 g/s<br>10 V < System Voltage < 18V<br>500 < Engine Speed < 5000 RPM<br>15 < Vehicle speed < 82 mph<br>0.96< Short Term Integrator < 1.04<br>Above conditions met for 1 sec<br>No, Throttle, IAT, Injector, Coolant, Air Flow, Purge Control, or MAP faults active.<br><br>Lean test: Pre sensors must drop below 300mV<br>Rich test: Pre sensors must exceed 600mV<br><br>Stage2 test order: Lean then Rich | DTC will set if Stage2 test length exceeds 60 sec.<br><br>Maximum of 25 Stage2 attempts (aborts).<br><br>Once per trip | DTC Type B |
| (B2S2) HEATED OXYGEN SENSOR CIRCUIT LOW | **P0157** | Circuit Continuity Detects a HO2S voltage stationary lean (low signal voltage) condition. | Oxygen sensor voltage < 80 mV<br><br><OR><br><br>Oxygen sensor voltage < 420 mV | Closed Loop Fuel Control.<br>TPS: 3-70%<br>Fuel > 10%<br>10 V < System Voltage < 18 V<br><br>.992 < Equivalence Ratio < 1.0136<br>All valves of active cylinders enabled<br>Above conditions met for 2 sec<br>No Throttle, IAT, Injector, Coolant, Air Flow, Purge Control, MAP, Engine Protect or Fuel Composition faults active.<br>Traction Control not active<br><br>Power Enrichment active 2 sec<br>Fuel > 10%<br><br>10 V < System Voltage < 18 V<br>Engine runtime > 30 sec<br>No Throttle, IAT, Injector, Coolant, Air Flow, Purge Control, MAP, Engine Protect or Fuel Composition faults active.<br>Traction Control not active | 380 failures out of 400 samples. Sensor monitored for 5 sets of samples. After 5 sets of failures, related sensors checked for same failure. If related sensor also failing, then no action is taken.<br><br>100 ms/sample<br>Continuous<br><br>95 failures out of 100 samples.<br><br>100 ms/sample<br>Continuous | DTC Type B |

| SENSED PARAMETER | FAULT CODE | MONITOR STRATEGY DESCRIPTION | MALFUNCTION CRITERIA AND THRESHOLD VALUES | SECONDARY PARAMETERS AND ENABLE CONDITIONS | TIME LENGTH AND FREQUENCY | MIL ILLUM. TYPE |
|---|---|---|---|---|---|---|
| (B2S2) HEATED OXYGEN SENSOR CIRCUIT HIGH | **P0158** | Circuit Continuity Detects a HO2S voltage stationary rich (high signal voltage) condition. | Oxygen sensor voltage > 950 mV<br><br><OR><br><br>Oxygen sensor voltage > 480 mV | Closed Loop Fuel Control.<br>TPS: 3-70%<br>Fuel > 10%<br><br>.992 < Equivalence Ratio < 1.0136<br>All valves of active cylinders enabled<br>10 V < System Voltage < 18 V<br>Above conditions met for 2 sec<br>No Throttle, IAT, Injector, Coolant, Air Flow, Purge Control, MAP, Engine Protect or Fuel Composition faults active.<br>Traction Control not active<br><br>Decel Fuel Cut Off active 10 sec<br>Fuel > 10%<br><br>10 V < System Voltage < 18 V<br>Engine runtime < 30 sec<br>No Throttle, IAT, Injector, Coolant, Air Flow Purge Control, MAP, Engine Protect or Fuel Composition faults active.<br>Traction Control not active | 380 failures out of 400 samples. Sensor monitored for 5 sets of samples. After 5 sets of failures, related sensors checked for same failure. If related sensor also failing, then no action is taken.<br><br>100 ms/sample<br>Continuous<br><br>45 failures out of 50 samples.<br><br>100 ms/sample<br>Continuous | DTC Type B |
| (B2S2) HEATED OXYGEN SENSOR CIRCUIT NO ACTIVITY | **P0160** | Circuit Continuity Detects a HO2S circuit open. | 410 mV < B2S2 voltage < 490 mV<br><br>Or<br><br>Post O2 sensor fast pass<br><br>B2S2 > 550 mV<br>B2S2 < 350 mV | Engine runtime > 300 sec<br>Closed Loop Fuel Control.<br>10 V < System Voltage < 18 V<br><br>5% Δ TPS within 1 sec, 6 times<br>DTC P0161 not set<br>No Throttle, IAT, Injector, Coolant, Air Flow, Purge Control, MAP, Engine Protect or Fuel Composition faults active.<br>Traction Control not active<br><br>10 V < System Voltage < 18 V<br><br>Engine runtime < 200 sec<br>DTC P0161 not set<br>No, Throttle, IAT, Injector, Coolant, Air Flow, Purge Control, , MAP, Engine Protect or Fuel Composition faults active.<br>Traction Control not active | 1450 failures out of 1500 samples.<br><br>100 ms/sample<br><br>Once per trip<br><br>550 more passing samples than failing samples.<br><br>100 ms/sample<br><br>Once per trip | DTC Type B |

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|---|---|---|---|---|---|---|
| (B2S2) HEATED OXYGEN SENSOR HEATER CIRCUIT | **P0161** | Current Monitor:<br>Detects a malfunctioning HO2S heater circuit by monitoring the current through the circuit<br><br>AND<br>Out-Of-Range (OOR) Resistance: Detects an oxygen sensor heater having an incorrect or (OOR) resistance value | Current Monitor: 0.25 A < Heater Current < 1.375 A<br><br>AND<br><br>(OOR): -7.50 < Limit Part Error < 4.57<br><br>NOTE: If the P0161 DTC sets for an OOR fault, then the Current Monitor test for this sensor will be disabled, until another pass or fail decision is made. (This eliminates the scenario in which a OOR fail and then a Current Monitor pass would prevent illumination of the MIL.) | Current Monitor: 10 V < System Voltage < 18 V<br>Coolant > 50 ºC<br>3 g/s < Airflow < 40 g/s<br>Device control not active<br>Engine runtime > 120 sec<br>500 < RPM < 3000<br><br>No Throttle, IAT, Injector, Coolant, Air Flow, Purge Control, MAP, Engine Protect or Fuel Composition faults active.<br>Traction Control not active<br>AND (OOR):<br>Coolant – IAT < 8ºC<br>Engine Soak Time > 10 Hours<br>-30ºC < Coolant Temp < 45ºC | Current Monitor: 8 failures out of 10 samples<br><br>Frequency:<br>2 times per key cycle<br><br>AND (OOR): Once per valid cold start. | DTC Type B |
| BANK 1 FUEL TRIM SYSTEM LEAN | **P0171** | Determines if the fuel control system is in a lean condition | The normalized long term fuel trim<br>parameter > + 24 % | No Idle Air, Throttle, Purge control, Purge Circuit, Misfire, MAP, Oxygen Sensor, Fuel Injector, or Air flow, DTC's<br>BARO > 70 kPa<br>139°C > ECT > -40°C<br>250 g/s > MAF > 1 g/s<br>105 kPa > MAP > 15 kPa<br>152°C > IAT > -20°C<br>6500 rpm > Engine speed > 400 rpm<br>Closed Loop Reset (NOT) Active<br>VS < 132 kph<br>Fuel Level > 10% | Continuous | DTC Type B |

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|---|---|---|---|---|---|---|
| BANK 1 FUEL TRIM SYSTEM RICH | **P0172** | Determines if the fuel control system is in a rich condition | The normalized long term fuel trim parameter < -17%<br>and no excessive purge vapors present | No Idle Air, Throttle, Purge control, Purge Circuit, Misfire, MAP, Oxygen Sensor, Fuel Injector, or Air flow, DTC's<br>BARO > 70 kPa<br>139°C > ECT > -40°C<br>250 g/s > MAF > 1 g/s<br>105 kPa > MAP > 15 kPa<br>152°C > IAT > -20°C<br>6500 rpm > Engine speed > 400 rpm<br>Closed Loop Reset (NOT) Active<br>VS < 132 kph<br>Fuel Level > 10% | Continuous | DTC Type B |
| BANK 2 FUEL TRIM SYSTEM LEAN | **P0174** | Determines if the fuel control system is in a lean condition | The normalized long term fuel trim<br>parameter > + 24 % | No Idle Air, Throttle, Purge control, Purge Circuit, Misfire, MAP, Oxygen Sensor, Fuel Injector, or Air flow, DTC's<br>BARO > 70 kPa<br>139°C > ECT > -40°C<br>250 g/s > MAF > 1 g/s<br>105 kPa > MAP > 15 kPa<br>152°C > IAT > -20°C<br>6500 rpm > Engine speed > 400 rpm<br>Closed Loop Reset (NOT) Active<br>VS < 132 kph<br>Fuel Level > 10% | Continuous | DTC Type B |
| BANK 2 FUEL TRIM SYSTEM RICH | **P0175** | Determines if the fuel control system is in a rich condition | The normalized long term fuel trim parameter < -17%<br>and no excessive purge vapors present | No Idle Air, Throttle, Purge control, Purge Circuit, Misfire, MAP, Oxygen Sensor, Fuel Injector, or Air flow, DTC's<br>BARO > 70 kPa<br>139°C > ECT > -40°C<br>250 g/s > MAF > 1 g/s<br>105 kPa > MAP > 15 kPa<br>152°C > IAT > -20°C<br>6500 rpm > Engine speed > 400 rpm<br>Closed Loop Reset (NOT) Active<br>VS < 132 kph<br>Fuel Level > 10% | Continuous | DTC Type B |

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|---|---|---|---|---|---|---|
| Injector Control Circuit (Cylinders 1-8) (ODM) | **P0201 P0202 P0203 P0204 P0205 P0206 P0207 P0208** | Circuit Continuity Control circuit voltage is monitored during operation. It should be low during operation and near B+ when “off”. | The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match. | Engine speed > 400 rpm.<br>Ignition voltage > 10.0 volts, but < 18 volts | 5 seconds<br>Continuous. | DTC Type B |
| Throttle Position (TP) Sensor 2 Circuit | **P0220** | Detects a continuous or intermittent short or open in TP sensor #2 circuit | 0.275 V > TPS > 4.725 V | Ignition in Unlock/accessory, run, crank<br>System voltage > 5.23 V<br>No PCM processor, 5 V reference DTCs | 15/35 counts ; 10 counts continuous; 12.5 msec /count in the motor processor | DTC Type A |
| Throttle Position (TP) Sensor 2 Lo | **P0222** | Detects a continuous or intermittent short or open in TP sensor #2 circuit | TPS < 0.275 V | Ignition in Unlock/accessory, run, crank<br>System voltage > 5.23 V<br>No PCM processor, 5 V reference DTCs | 15/35 counts ; 10 counts continuous; 12.5 msec /count in the motor processor | DTC Type A |
| Throttle Position (TP) Sensor 2 Circuit Hi | **P0223** | Detects a continuous or intermittent short or open in TP sensor #2 circuit | TPS > 4.725 V | Ignition in Unlock/accessory, run, crank<br>System voltage > 5.23 V<br>No PCM processor, 5 V reference DTCs | 15/35 counts ; 10 counts continuous; 12.5 msec /count in the motor processor | DTC Type A |
| FUEL PUMP CONTROL CIRCUIT (ODM) | **P0230** | Circuit Continuity Control circuit voltage is monitored during operation. It should be high during operation and near 0 volts when “off”. | The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match. | Engine speed > 400 rpm.<br>Ignition voltage > 10.0 volts, but < 18 volts | 2.5 seconds<br>Continuous. | DTC Type B |

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|---|---|---|---|---|---|---|
| Random Misfire Detected<br><br>Cylinder 1 Misfire Detected<br><br>Cylinder 2 Misfire Detected<br><br>Cylinder 3 Misfire Detected<br><br>Cylinder 4 Misfire Detected<br><br>Cylinder 5 Misfire Detected<br><br>Cylinder 6 Misfire Detected<br><br>Cylinder 7 Misfire Detected<br><br>Cylinder 8 Misfire Detected | **P0300**<br><br>**P0301**<br><br>**P0302**<br><br>**P0303**<br><br>**P0304**<br><br>**P0305**<br><br>**P0306**<br><br>**P0307**<br><br>**P0308** | These DTC's will determine if a random or a cylinder specific misfire is occurring by monitoring crankshaft velocity. | Deceleration index<br>Vs<br>Engine speed<br>Vs<br>Load and Camshaft Position<br><br>Emission Failure Threshold = 1.25%<br><br>Catalyst Damage Threshold = 5% to 10.625% depending on engine speed and engine load | • Engine run time > 2 crankshaft revolutions.<br>• DTCs not active for VSS, CKP, TP, MAP, ECT, IAT, and MAF sensors.<br>• No engine protection faults.<br>• P0315 (Crankshaft Position System Variation Not Learned) not active or engine speed < 1000 RPM.<br>• Fuel cutoff not active.<br>• Power management is not active.<br>• Not an automatic transmission shift with a Throttle position>95%<br>• Brake torque management not active.<br>• Fuel level > 10% (disablement ends 500 after a low fuel level condition ceases, and fuel disable does not occur with a fuel sensor DTC).<br>• -7°C < ECT < 130°C.<br>• If ECT at startup < -7°C, then disable until ECT > 21°C.<br>• 425 RPM < Engine speed < 62 00 RPM.<br>• 9 volts < System voltage < 18 volts.<br>• + Throttle position delta < 15% per 100 ms.<br>• - Throttle position delta < 15% per 100 ms.<br>• Abnormal engine speed is not present.<br>• ABS rough road not detected.<br>• ABS is not active.<br>• Not an abusive engine speed condition Abusive engine speed = 7100 RPM. Abusive engine speed delay = 1250 cycles (Manual Trans only)<br>• 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 > zero torque cal (cal a function of engine speed and temperature), and 2) TPS > 1 or VSS < 30.<br>• Detectable engine speed and engine load region.<br>• Misfire Diag is not requesting to disable TCC when transmission is in hot mode.<br>• Crankshaft Ring Filter inactive (after a low level misfire, another misfire may not be detectable until crankshaft ringing ceases)<br>• DoD Transition (Disablement ends 7 cycles after transition into and out of Displacement on Demand) | Emission Exceedence = (5) failed 200 revolution blocks of 16. Failure reported with (1) Exceedence in 1st (16) 200 revolution block, or (4) Exceedences thereafter.<br><br>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.<br><br><u>Frequency:</u> Continuous | DTC Type B<br><br>(MIL Flashes with Catalyst Damaging Misfire) |

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|---|---|---|---|---|---|---|
| CRANKSHAFT POSITION SYSTEM VARIATION NOT LEARNED | **P0315** | Monitor for valid crankshaft error compensation factors | Factors are considered NOT valid if the factor sum is greater than 4.003997 or less than 3.996002 | OBD Manufacturer Enable Counter = 0 | 100 ms/test | DTC Type A |
| KNOCK SENSOR CIRCUIT | **P0325** | This diagnostic will detect a failed internal ECM component associated with knock control | 0.05 ≥ Knock Sensor Voltage ≥ 4.95 | Engine RPM ≥ 500<br>Engine run time > 10 sec<br><br>Air Per Cylinder > 0<br>PTO not active | 80 fails out of 100 samples<br><br>100ms sample rate<br>Continuous<br>. | DTC Type C |
| KNOCK SENSOR PERFORMANCE | **P0326** | This diagnostic checks for an overactive knock sensor caused by noisy engine components (e.g. lifters) | Fast Retard ≥ 12° | Engine RPM ≥ 500<br>MAP ≥ 55 kPa<br>PTO not active<br>No Throttle Faults | 80 fails out of 100 samples<br><br>100ms sample rate<br>Continuous | DTC Type C |
| KNOCK SENSOR 1 CIRCUIT LOW | **P0327** | Checks knock sensor and wiring based on delta noise levels | Delta Noise level < 0.60 | Engine RPM ≥ 500<br>Coolant temp ≥ 55° C<br>Engine run time ≥ 10 sec<br><br>Air Per Cylinder > 0 | 75 fails out of 100 samples<br><br>100ms sample rate<br>Continuous<br>. | DTC Type C |
| KNOCK SENSOR 2 CIRCUIT LOW | **P0332** | Checks knock sensor and wiring based on delta noise levels | Delta Noise level < 0.60 | Engine RPM > 500<br>Coolant temp ≥ 55° C<br>Engine run time ≥ 10 sec<br><br>Air Per Cylinder > 0 | 75 fails out of 100 samples<br><br>100ms sample rate<br>Continuous | DTC Type C |
| CRANKSHAFT POSITION SENSOR CIRCUIT | **P0335** | 4X signal<br>This diagnostic will detect if there is no output from the crankshaft position sensor or not enough output from the crankshaft position sensor. | No Pulses from the Crank Sensor for > 2 seconds during engine run or 3 seconds during engine crank.<br><br>Or<br><br>< 47 or > 49 Crank Pulses during one CAM Rotation = one failed test | Sensed mass airflow ≥ 5.0078 during engine run<br>No Cam Position Sensor DTC's<br><br>ECM state = READY or CRANK | Continous<br><br>Failure set in 2 or 3 seconds as discussed in malfunction criteria<br><br>Or<br><br>4 test failures in 5 test samples with 1 test = one CAM rotation | DTC Type B |

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|---|---|---|---|---|---|---|
| CRANKSHAFT POSITION SENSOR CIRCUIT RANGE/PERF. | **P0336** | 4X signal<br>This diagnostic will detect occurrences when engine position is no longer known or valid. | Engine Control system has resynced > 5 times in 10 seconds | ECM state = CRANK or RUN | Test runs every 10 seconds continuously. | DTC Type B |
| CAMSHAFT POSITION SENSOR CIRCUIT | **P0340** | 1X signal<br>This diagnostic will detect if there is no output from the Camshaft position sensor | < 1 Cam pulse in 3 seconds | ECM State = Crank or Run | Test runs every 3 seconds<br><br>Continous | DTC Type B |
| CAMSHAFT POSITION SENSOR CIRCUIT RANGE/PERF. | **P0341** | 1X Signal<br>This diagnostic will detect a missing or noisy CAM position sensor signal | < 99 CAM pulses or > 101 CAM pulses in 100 engine cycles<br><br>Or < 1 or >2 during the first Engine cycle after crank sync for Fast Event Based. | ECM State = Ready or Crank<br>Engine Crank state = InSync<br>Engine MedRes is not disabled<br>No Crank Position Sensor DTC's<br><br>No CAM Circuit DTC's for Fast Event Diagnostic. | 8 failures out of 10 samples<br>1 sample = 100 engine cycles<br>Continuous<br><br>Single failure during the first engine cycle after crank sync. | DTC Type B |
| IGNITION CONTROL #1 CIRCUIT | **P0351** | Monitor EST channel A (Cylinder 1) | EST line is Stuck Low, is open, or is Stuck High.<br>If engine speed is < 1500 RPM test failures (if applicable) and samples increment by 1 each time the diagnostic executes. If engine speed is ≥ 1500 RPM test failures (if applicable) and samples increment by 2 each time the diagnostic executes in order to report a failure faster | 10 Volts < Ignition Voltage < 18 Volts | 3 Failures out of 10<br><br>500 msec / test<br><br>Continuous | DTC Type B |

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|---|---|---|---|---|---|---|
| IGNITION CONTROL #1 CIRCUIT | **P0351** | Monitor EST channel B (Cylinder 1) | EST line is Stuck Low, is open, or is Stuck High.<br>If engine speed is < 1500 RPM test failures (if applicable) and samples increment by 1 each time the diagnostic executes. If engine speed is ≥ 1500 RPM test failures (if applicable) and samples increment by 2 each time the diagnostic executes in order to report a failure faster | 10 Volts < Ignition Voltage < 18 Volts | 30 Failures out of 100<br>500 msec / test<br>Continuous | DTC Type B |
| IGNITION CONTROL #2 CIRCUIT | **P0352** | Monitor EST channel B (Cylinder 2) | EST line is Stuck Low, is open, or is Stuck High.<br>If engine speed is < 1500 RPM test failures (if applicable) and samples increment by 1 each time the diagnostic executes. If engine speed is ≥ 1500 RPM test failures (if applicable) and samples increment by 2 each time the diagnostic executes in order to report a failure faster | 10 Volts < Ignition Voltage < 18 Volts | 30 Failures out of 100<br>500 msec / test<br>Continuous | DTC Type B |
| IGNITION CONTROL #3 CIRCUIT | **P0353** | Monitor EST channel C (Cylinder 3) | EST line is Stuck Low, is open, or is Stuck High.<br>If engine speed is < 1500 RPM test failures (if applicable) and samples increment by 1 each time the diagnostic executes. If engine speed is ≥ 1500 RPM test failures (if applicable) and samples increment by 2 each time the diagnostic executes in order to report a failure faster | 10 Volts < Ignition Voltage < 18 Volts | 30 Failures out of 100<br>500 msec / test<br>Continuous | DTC Type B |

## ENGINE DIAGNOSTIC PARAMETERS

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| SENSED PARAMETER | FAULT CODE | MONITOR STRATEGY DESCRIPTION | MALFUNCTION CRITERIA AND THRESHOLD VALUES | SECONDARY PARAMETERS AND ENABLE CONDITIONS | TIME LENGTH AND FREQUENCY | MIL ILLUM. TYPE |
|---|---|---|---|---|---|---|
| IGNITION CONTROL #4 CIRCUIT | **P0354** | Monitor EST channel D (Cylinder 4) | EST line is Stuck Low, is open, or is Stuck High.<br>If engine speed is < 1500 RPM test failures (if applicable) and samples increment by 1 each time the diagnostic executes. If engine speed is ≥ 1500 RPM test failures (if applicable) and samples increment by 2 each time the diagnostic executes in order to report a failure faster | 10 Volts < Ignition Voltage < 18 Volts | 30 Failures out of 100<br>500 msec / test<br>Continuous | DTC Type B |
| IGNITION CONTROL #5 CIRCUIT | **P0355** | Monitor EST channel E (Cylinder 5) | EST line is Stuck Low, is open, or is Stuck High.<br>If engine speed is < 1500 RPM test failures (if applicable) and samples increment by 1 each time the diagnostic executes. If engine speed is ≥ 1500 RPM test failures (if applicable) and samples increment by 2 each time the diagnostic executes in order to report a failure faster | 10 Volts < Ignition Voltage < 18 Volts | 30 Failures out of 100<br>500 msec / test<br>Continuous | DTC Type B |
| IGNITION CONTROL #6 CIRCUIT | **P0356** | Monitor EST channel F (Cylinder 6) | EST line is Stuck Low, is open, or is Stuck High.<br>If engine speed is <≥ 1500 RPM test failures (if applicable) and samples increment by 1 each time the diagnostic executes. If engine speed is ≥ 1500 RPM test failures (if applicable) and samples increment by 2 each time the diagnostic executes in order to report a failure faster | 10 Volts < Ignition Voltage < 18 Volts | 30 Failures out of 100<br>500 msec / test<br>Continuous | DTC Type B |

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| SENSED PARAMETER | FAULT CODE | MONITOR STRATEGY DESCRIPTION | MALFUNCTION CRITERIA AND THRESHOLD VALUES | SECONDARY PARAMETERS AND ENABLE CONDITIONS | TIME LENGTH AND FREQUENCY | MIL ILLUM. TYPE |
|---|---|---|---|---|---|---|
| IGNITION CONTROL #7 CIRCUIT | **P0357** | Monitor EST channel G (Cylinder 7) | EST line is Stuck Low, is open, or is Stuck High.<br>If engine speed is < 1500 RPM test failures (if applicable) and samples increment by 1 each time the diagnostic executes. If engine speed is ≥ 1500 RPM test failures (if applicable) and samples increment by 2 each time the diagnostic executes in order to report a failure faster | 10 Volts < Ignition Voltage < 18 Volts | 30 Failures out of 100<br>500 msec / test<br>Continuous | DTC Type B |
| IGNITION CONTROL #8 CIRCUIT | **P0358** | Monitor EST channel H (Cylinder 8) | EST line is Stuck Low, is open, or is Stuck High.<br>If engine speed is < 1500 RPM test failures (if applicable) and samples increment by 1 each time the diagnostic executes. If engine speed is ≥ 1500 RPM test failures (if applicable) and samples increment by 2 each time the diagnostic executes in order to report a failure faster | 10 Volts < Ignition Voltage < 18 Volts | 30 Failures out of 100<br>500 msec / test<br>Continuous | DTC Type B |

| SENSED PARAMETER | FAULT CODE | MONITOR STRATEGY DESCRIPTION | MALFUNCTION CRITERIA AND THRESHOLD VALUES | SECONDARY PARAMETERS AND ENABLE CONDITIONS | TIME LENGTH AND FREQUENCY | MIL ILLUM. TYPE |
|---|---|---|---|---|---|---|
| CATALYTIC CONVERTER LOW OXYGEN STORAGE | **P0420** | Oxygen Storage. | OSC Time Difference ≥ 0.14453<br><br>OSC Time Difference = OSC Worst Pass Thresh - OSC Compensation Factor * (Post Cat O2 Resp Time - Pre Cat O2 Resp Time)<br><br>OSC Worst Pass Thresh = 1.675 sec | Trip Enable Criteria<br>No VSS, , Throttle, Purge control, Purge Circuit, Oxygen sensor, Misfire, IAT, MAP, Camel Mode, Injector, EST Control, Coolant, Crank sensor, Cam sensor, Air flow, IAC, or Fuel trim DTC's failing<br>Valid Idle Period Criteria<br>Engine Speed ≥ 750 rpm for minimum of 32 sec since end of last idle period<br>Vehicle Speed < 2 mph<br>RPM < 750<br>Test Enable Conditions<br>541 < Predicted Catalyst Temperature < 750<br><br>Predicted catalyst temperature > 541 for 120 sec, and throttle not < 2% for 180 sec<br>0.90 < Short term fuel trim <1.1 at start of idle<br>0.96 < Average Short term fuel trim < 1.04 during summing time to enable intrusive fuel control<br>Min engine runtime ≥ 600 sec<br>Barometric Pressure ≥ 70 kPa<br>-20 ≤ IAT ≤ 85°C<br>70°C ≤ ECT ≤ 125.5°C<br>0 < Idle Period ≤ 60 sec<br>Tests Attempted this trip ≤ 6<br>Tests Attempted this idle period < 1<br>-100 rpm ≤ (Engine Speed – Desired Speed) ≤ +200 rpm<br>AC Clutch is stable<br>Rapid Step Response Enable Criteria<br>OSC Time Difference Step ≥ 0.47363<br><br>OSC Time Difference ≥ 0.000 sec<br><br>All 2003 applications for small block trucks – use material burnoff delay algorithm. Diagnostic will not enable until the following has been met: predicted catalyst temperature ≥ 650°C for 1 hour (non-continuously). | 1 test attempted per valid idle period<br><br>Minimum of 1 test per trip.<br><br>Maximum of 6 tests per trip.<br><br>Maximum of 6 trips to detect failure when Rapid Step Response is enabled<br><br>frequency: 12.5 ms continuous | DTC Type A |

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| SENSED PARAMETER | FAULT CODE | MONITOR STRATEGY DESCRIPTION | MALFUNCTION CRITERIA AND THRESHOLD VALUES | SECONDARY PARAMETERS AND ENABLE CONDITIONS | TIME LENGTH AND FREQUENCY | MIL ILLUM. TYPE |
|---|---|---|---|---|---|---|
| CATALYTIC CONVERTER LOW OXYGEN STORAGE | **P0430** | Oxygen Storage. | OSC Time Difference ≥ 0.14257<br><br>OSC Time Difference = OSC Worst Pass Thresh - OSC Compensation Factor * (Post Cat O2 Resp Time - Pre Cat O2 Resp Time)<br><br>OSC Worst Pass Thresh = 1.69375 sec | Trip Enable Criteria<br>No VSS, EGR Control, , Throttle, Purge control, Purge Circuit, Oxygen sensor, Misfire, IAT, MAP, Camel Mode, Injector, EST Control, EGR Sensor, Coolant, Crank sensor, Cam sensor, Air flow, AIR, IAC, or Fuel trim DTC's failing<br>Valid Idle Period Criteria<br>Engine Speed ≥ 750 rpm for minimum of 32 sec since end of last idle period<br>Vehicle Speed < 2 mph<br>RPM < 750<br>Test Enable Conditions<br>538 < Predicted Catalyst Temperature < 750<br>Predicted catalyst temperature > 538 for 120 sec, and throttle not < 2% for 180 sec<br>0.90 < Short term fuel trim <1.1 at start of idle<br>0.96 < Average Short term fuel trim < 1.04 during summing time to enable intrusive fuel control<br>Min engine runtime ≥ 600 sec<br>Barometric Pressure ≥ 70 kPa<br>-20 ≤ IAT ≤ 85°C<br>70°C ≤ ECT ≤ 125.5°C<br>0 < Idle Period ≤ 60 sec<br>Tests Attempted this trip ≤ 6<br>Tests Attempted this idle period < 1<br>-100 rpm ≤ (Engine Speed – Desired Speed) ≤ +200 rpm<br>AC Clutch is stable<br>Rapid Step Response Enable Criteria<br>OSC Time Difference Step ≥ 0.46777<br>OSC Time Difference ≥ 0.000 sec<br><br>All 2003 applications for small block trucks – use material burnoff delay algorithm. Diagnostic will not enable until the following has been met: predicted catalyst temperature ≥ 650°C for 1 hour (non-continuously). | 1 test attempted per valid idle period<br><br>Minimum of 1 test per trip.<br><br>Maximum of 6 tests per trip.<br><br>Maximum of 6 trips to detect failure when Rapid Step Response is enabled<br><br>frequency: 12.5 ms continuous | DTC Type A |

# ENGINE DIAGNOSTIC PARAMETERS



| SENSED PARAMETER | FAULT CODE | MONITOR STRATEGY DESCRIPTION | MALFUNCTION CRITERIA AND THRESHOLD VALUES | SECONDARY PARAMETERS AND ENABLE CONDITIONS | TIME LENGTH AND FREQUENCY | MIL ILLUM. TYPE |
|---|---|---|---|---|---|---|
| Evaporative Emission (EVAP) System Small Leak Detected<br><br>(not Pontiac GTO) | **P0442** | This DTC will detect a small leak (>= 0.020") in the EVAP system between the fuel fill cap and the purge solenoid. The engine off natural vacuum method (EONV) is used. | SMALL LEAK TEST FAIL:<br>Engine Off Natural Vacuum (EONV) while the engine is off. The total pressure change achieved during the test is normalized against a target value that is based upon fuel level and ambient temperature. (value of 3.25" 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.<br><br>Fail threshold = 0.659973<br>Re-Pass threshold = 0.450012 | TEST ENABLE :<br>No MAP DTC's<br>No Thermostat Rationality DTC's<br>VS Sensor DTC's not active<br>No Fuel Tank Pressure Sensor DTC's<br>No EVAP Canister Purge Solenoid DTC's<br>No EVAP Canister Vent Solenoid DTC's<br>No Fuel Level DTC's<br>Coolant Sensor DTC's not active<br>IAT Sensor DTC's not active<br>EVAP Vacuum Sensor Performance DTC not active.<br>EVAP CCP stuck open DTC not active.<br>EVAP large leak DTC not active.<br>Ignition off timer DTC not active.<br>Fuel Level >15.0% but < 85.0%<br>Drive time >= 600 seconds.<br>Drive length >= 5 kilometers.<br>Coolant >= $70^{o}$C.<br>No fuel filling (fuel level increment >= 10%) During EONV test.<br>BARO > 74.0kPa<br>Estimated ambient temperature at end of drive > $2^{o}$C but < $32^{o}$C.<br><br>Estimate of Ambient Air Temperature Valid Conditions to be valid<br>1. Cold Start<br>Startup ECT < 30° C<br>Startup IAT > 4°C but < 30° C<br>Startup ∆°C(ECT-IAT) < 8°C if ECT > IAT<br>OR<br>2. Hot Restart<br>Sufficient drive length to get accurate estimate of ambient air temperature (at least a minimum of 3 minutes and 5 kilometers) | Once per cold start, during hot soak (up to 2500 sec.). Time since last complete test >= 17 hours if EWMA is passing, or >= 10 hours if EWMA is failing.<br>No more than 2 attempts per day. | DTC Type A EWMA<br><br>Average run length: 8.12 |

## ENGINE DIAGNOSTIC PARAMETERS



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|---|---|---|---|---|---|---|
| EVAP CANISTER PURGE SOLENOID VALVE CIRCUIT (ODM) | **P0443** | Circuit Continuity Control circuit voltage is monitored during operation. It should be low during operation and near B+ when "off". | The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match. | Ignition voltage > 10.0 volts, but < 18 volts | 5 seconds.<br><br>continuous. | DTC Type B |
| 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 > 12.00 “H2O for 5 seconds<br>BEFORE<br>Purge Volume > 6 liters<br><br>OR<br><br>Vented Vacuum < -2.5 in. H20 or Vented Vacuum > 5 in. H20 for 15 seconds<br><br>2 liters of fuel must be consumed after setting the DTC active the first time to set the DTC active the second time. | General Test Enable<br>No MAP DTC’s<br>No TP Sensor DTC’s<br>No VSS DTC’s<br>No IAT DTC’s<br>No ECT DTC’s<br>No Fuel Tank Pressure Sensor DTC’s<br>No Evap Canister Purge solenoid DTC’s<br>No EVAP Canister Vent Solenoid DTC’s<br>No Thermostat Rationality DTC’s<br>15 % < Fuel Level < 85. %<br>10.00 V < System Voltage < 18.00 V<br>4 °C < IAT < 30°C<br>ECT < 30 °C<br>BARO > 74.00 kPa (8000 ft) | Once per trip<br><br>Time is dependent on driving conditions<br><br>Max. before test abort is 1000 seconds | DTC Type B |
| EVAP VENT SOLENOID CONTROL CIRCUIT (ODM) | **P0449** | Circuit Continuity Control circuit voltage is monitored during operation. It should be low during operation and near B+ when “off”. | The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match. | Ignition voltage > 10.0 volts, but < 18 volts | 5 seconds<br>Continuous. | DTC Type B |

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|---|---|---|---|---|---|---|
| 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. | The tank vacuum sensor voltage is compared to a window about the nominal sensor voltage offset (~1.5 volts)<br><br>upper voltage threshold (voltage addition above the nominal voltage): 0.2 volts<br><br>lower voltage threshold (voltage subtraction below the nominal voltage): 0.2 volts<br><br>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 a 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.<br><br>Fail threshold = 0.72998<br>Re-Pass threshold = 0.400024 | 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 number of times that it executes can range from zero to two per engine-off period.<br><br>The length of the test is determined by the refueling rationality test which can take up to 600 seconds to complete. | DTC Type A EWMA<br><br>average run length: 6 |
| 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. | Fuel tank pressure sensor signal < 0.1 volts produces a failing sample. Otherwise, the sample is considered passing.<br><br>If 80 samples fail out of 100 samples total, then a fail will be reported to the DTC. | • 0.10 second delay after sensor power up for sensor warm-up<br>ECM State <> crank | Frequency:<br>Continuous<br>100ms loop | DTC Type B |

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|---|---|---|---|---|---|---|
| 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. | Fuel tank pressure sensor signal > 4.9 volts produces a failing sample. Otherwise, the sample is considered passing.<br><br>If 80 samples fail out of 100 samples total, then a fail will be reported to the DTC. | • 0.10 second delay after sensor power up for sensor warm-up<br>ECM state <> crank | <u>Frequency:</u><br>Continuous<br>100ms loop | DTC Type B |
| 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. | 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.<br><br>The abrupt change is defined as a change of 1.0 “H2O vacuum in the span of 1.0 seconds.<br><br>A refueling event is confirmed if the fuel level has a persistent change of 10.0 % for 30 seconds.<br><br>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.<br><br>The length of the test is determined by the refueling rationality test which can take up to 600 seconds to complete. | DTC Type A |

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|---|---|---|---|---|---|---|
| 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. | Purge volume > 9.00 liters BEFORE<br>Tank vacuum < 11 "$H_2O$<br><br>2 liters of fuel must be consumed after setting the DTC active the first time to set the DTC active the second time.<br><br><u>Weak Vacuum Follow-up Test</u><br>(fuel cap replacement test)<br>Weak Vacuum Test failed previous trip and this trip.<br>Passes if tank vacuum > 11 " $H_2O$.<br><br>Note: Weak Vacuum Follow-up Test can only report a pass. | <u>General Test Enable</u><br>• No MAP DTC's<br>• No TP Sensor DTC's<br>• No VSS DTC's<br>• No IAT DTC's<br>• No ECT DTC's<br>• No Fuel Tank Pressure Sensor DTC's<br>• No Evap Canister Purge solenoid DTC's<br>• No EVAP Canister Vent Solenoid DTC's<br>• No Thermostat Rationality DTC's<br>• 15 % < Fuel Level < 85. %<br>• 10.00 V < System Voltage < 18.00 V<br>• 4 °C < IAT < 30°C<br>• ECT < 30 °C<br>• BARO > 74.00 kPa (8000 ft)<br><br>Cold Start Test<br>• IAT < 30°C<br>• Cold temperature Δ(ECT-IAT): < 8 °C if ECT > IAT<br>• Cold Test Timer < 1000 seconds | Once per cold start<br><br>Time is dependent on driving conditions<br><br>Max. before test abort is 1000 seconds<br><br><u>Weak Vacuum Follow-up Test</u><br>On 2nd trip with large leak detected, the follow-up test is limited to 1300 seconds. Once the MIL is on, the follow-up test runs indefinitely. | DTC Type B |
| Fuel Level No Change, Stuck in Range Pirmary Tank | **P0461** | This DTC will detect a fuel sender stuck in range . | IF Delta Fuel Volume change less than 3 liters over a accumulated 200 Kilometers. OR If Primary is FULL and Secondary is EMPTY for > 200 kilometers. | No VSS DTC's set<br>Engine Running | Continous | DTC Type B |
| Fuel Level Stuck Low Primary Tank | **P0462** | This DTC will detect a fuel sender stuck out of range low | Fuel level Sender % of 5V range less than 10 % | runs continuously | 60 failures out of 100 samples<br>1 sample = 100 ms<br><br>Continous | DTC Type B |
| Fuel Level Stuck High Primary Tank | **P0463** | This DTC will detect a fuel sender stuck out of range high | Fuel level Sender % of 5V range > than 70% | runs continuously | 60 failures out of 100 samples<br>1 sample = 100 ms<br><br>Continous | DTC Type B |

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|---|---|---|---|---|---|---|
| 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.<br><br>The refuel event is defined as a change of 10.0 % fuel level during the engine-off test.<br><br>A refueling event is confirmed if the fuel level has a persistent change of 10.0 % for 30 seconds.<br><br>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.<br><br>The length of the test is determined by the refueling rationality test which can take up to 600 seconds to complete. | DTC Type A |
| PRIMARY COOLING FAN RELAY CONTROL CIRCUIT MALF (ODM) | **P0480** | Control circuit voltage is monitored during operation. It should be low during operation and near B+ when “off” | 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 400 rpm<br>Ignition voltage > 10 volts, but < 18 volts | 5 seconds<br><br>Continuous | DTC Type B<br><br>For use on vehicles with electric or EV fan |
| SECONDARY COOLING FAN RELAY CONTROL CIRCUIT MALF (ODM) | **P0481** | Control circuit voltage is monitored during operation. It should be low during operation and near B+ when “off”. | 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 400 rpm<br>Ignition voltage > 10 volts, but < 18 volts | 5 seconds<br><br>Continuous | DTC Type B<br><br>For use on vehicles with electric fan |

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|---|---|---|---|---|---|---|
| EV Cooling Fan System Performance Error | **P0483** | Detects an unacceptable error between the commanded fan RPM and the actual fan RPM | The difference between the commanded fan RPM and the actual fan RPM is > 1000 RPM. | No EV Cooling Fan Sensor Circuit DTC present.<br>Engine is running.<br>System voltage > 8.5 volts.<br>IAT > -7°C.<br>EV Fan is commanded on.<br>Commanded fan speed is stable for 10 seconds.<br>Engine RPM is < 3200 RPM<br>Engine speed not changing more than 250 RPM. | 100/125 counts<br>1 count/second<br><br>Continuous | DTC Type B<br><br>For use on vehicles with EV fan |
| EV Cooling Fan Overspeed Problem | **P0493** | Indicates that the EV Cooling fan is in an overspeed condition | EV Cooling Fan sensor input is > 640 Hertz ( approx. 6400 fan RPM). | Engine is running | 2/2 counts<br>1 count/msec<br><br>Continuous | DTC Type A<br><br>For use on vehicles with EV fan |
| EV Cooling Fan Speed Too High | **P0495** | Detects that the EV Cooling Fan is spinning too fast when it has not been commanded on. | EV Cooling Fan RPM is > 1600 RPM. | Engine is running.<br>Engine RPM has been > 1750 RPM for > 115 seconds.<br>System voltage is > 8.5 volts<br>IAT > -7°C.<br>Engine speed is between 1400 and 3200 RPM.<br>EV Cooling Fan is not commanded on.<br><br>This diagnostic demonstrates on the Unified Cycle | 800/1000 counts<br>.1 sec/count<br><br>Continuous | DTC Type B<br><br>For use on vehicles with EV fan |

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|---|---|---|---|---|---|---|
| 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<br>Test time > 60 seconds (cold start) | General Test Enable<br>• No MAP DTC's<br>• No TP Sensor DTC's<br>• No VSS DTC's<br>• No IAT DTC's<br>• No ECT DTC's<br>• No Fuel Tank Pressure Sensor DTC's<br>• No EVAP canister purge valve solenoid DTC's<br>• No EVAP Canister Vent Solenoid DTC's<br>• No Thermostat Rationality DTC's<br>• 15 % < Fuel Level < 85. %<br>• 10.00 V < System Voltage < 18.00 V<br>• 4 °C < IAT < 30°C<br>• ECT < 30 °C<br>• BARO > 74.00 kPa (8000 ft)<br><br>Cold Start Test<br>• IAT < 30°C<br>• Cold temperature Δ(ECT-IAT): < 8 °C if ECT > IAT<br>• Cold Test Timer < 1000 seconds | Once per cold start.<br><br>Cold start: max time is 1000 seconds | DTC Type B |
| VEHICLE SPEED SENSOR LOW OUTPUT | **P0502** | This DTC detects a missing from the output speed sensor in a manual transmission vehicle. | Output speed sensor signal not detected | Manual VSS diagnostic enabled<br>No MAP DTC's set<br>No TPS DTC's set<br><br>No idle system DTC's set<br>1000< Engine speed <5000<br>5 % < throttle position < 100 %<br>68<engine torque(Nm)<8192 | No activity for 10sec while meeting enable criteria | DTC Type B<br><br>Manual Transmission Only |
| VEHICLE SPEED SENSOR SYSTEM PERFORMANCE | **P0503** | This DTC detects a intermittent signal from the output speed sensor in manual transmission vehicle | Output speed sensor signal erratic performance | Manual VSS diagnostic enabled<br>No MAP DTC's set<br>No TPS DTC's set<br>No idle system DTC's set<br>Positive rate change less than 150 counts per sample for at least 0.5 sec<br>Output speed > 300 counts for 6 sec | Rate of speed change (negative) exceeds fail criteria for 6 sec | DTC Type B<br><br>Manual Transmission Only |

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| SENSED PARAMETER | FAULT CODE | MONITOR STRATEGY DESCRIPTION | MALFUNCTION CRITERIA AND THRESHOLD VALUES | SECONDARY PARAMETERS AND ENABLE CONDITIONS | TIME LENGTH AND FREQUENCY | MIL ILLUM. TYPE |
|---|---|---|---|---|---|---|
| IDLE SYSTEM - LOW ENGINE SPEED | **P0506** | Determines if a low idle is a result of an engine mechanical problem. Low RPM is 100 RPM below desired | Idle > 100 RPM low from desired | Passive:<br>No MAF, MAP, IAT, ECT, TP, Injector, Fuel System, Misfire, , VSS or Purge DTC<br>Engine Run > 60 sec.<br>ECT ≥ 60 ° C<br>BARO > 65 kPa<br>IGN. voltage > 9 & < 18 volts<br>IAT > -10 ° C<br>TP < 1%<br>VS ≤ 1 MPH<br>Time > 5 seconds to fail.<br>> 8 seconds to pass | Passive:<br>Must be outside the fail criteria continuously for 5 seconds. Must be within pass criteria for 8 seconds continuously. | DTC Type B |
| IDLE SYSTEM - HIGH ENGINE SPEED | **P0507** | Determines if a high idle is a result of an engine mechanical problem. High RPM is 200 RPM above desired | Passive:<br>Idle > 200 RPM high from desired | Passive:<br>No MAF, MAP, IAT, ECT, TP, Injector, Fuel System, Misfire, , VSS or Purge DTC<br>Engine Run > 60 sec.<br>ECT ≥ 60 ° C<br>BARO > 65 kPa<br>IGN. voltage > 9 & < 18 volts<br>IAT > -10 ° C<br>TP < 1%<br>VS ≤ 1 MPH<br>Time > 5 seconds to fail.<br>> 8 seconds to pass | Passive:<br>Must be outside the fail criteria continuously for 5 seconds. Must be within pass criteria for 8 seconds continuously. | DTC Type B |
| Engine Oil Pressure Sensor Low | **P0522** | This DTC detects a continuous short to low or open in either the signal circuit or the Oil Pressure sensor. | Oil Pressure sensor voltage < .04 volts ( 3 counts) | Engine is running<br>System voltage is > 11 volts | 80/100 counts<br>100 msec / count<br>Continuous | DTC Type C<br><br>DTC Type B on vehicles with DoD |
| Engine Oil Pressure Sensor High | **P0523** | This DTC detects an open sensor ground or continuous short to high in either the signal circuit or the Oil Pressure sensor | Oil Pressure sensor voltage > 4.89 volts ( 250 counts) | Engine is running<br>System voltage is > 11 volts | 80/100 counts<br>100 msec / count<br>Continuous | DTC Type C<br><br>DTC Type B on vehicles with DoD |

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|---|---|---|---|---|---|---|
| EV Cooling Fan Sensor Circuit | **P0526** | Detects a continuous open or short condition with the EV Cooling Fan Sensor input circuit(s). | No EV Fan Sensor Circuit input activity is detected (fan speed < 4 RPM). | Engine is running<br>System voltage is > 8.5 volts | 900 /1200 counts<br>100 msec / count<br><br>Continuous | DTC Type B<br><br>For use on vehicles with EV fan |
| Brake Booster Pressure Sensor Performance | **P0556** | This DTC determines if the Brake Booster Vacuum sensor is stuck or skewed within the normal operating range by comparing the engine vacuum to the brake booster vacuum when the engine is producing a large amount of vacuum | The engine vacuum value is compared to the brake booster vacuum sensor value when the throttle has been below a calibrated value for a calibrated period of time.<br>When the throttle once again exceeds the calibrated value, the min and max vacuum sensor values are normalized and subtracted from a EWMA value of 1.<br>A properly operating vacuum sensor would have a normalized result of 1 or greater. If the normalized result is greater than 1 it is considered 1. The EWMA value would be 0 in a passing system<br><br>EWMA fail threshold > 0.69<br>EWMA re-pass threshold < 0.6 | System voltage is >11 & < 18 volts<br>Throttle position with idle ≤ 1%<br>Above condition present for > 3 seconds | 100 msec<br>Continuous | DTC Type B on vehicles with DoD |
| Brake Booster Pressure Sensor Low | **P0557** | This DTC detects a continuous short to low or open in either the signal circuit or the Brake Booster Vacuum sensor. | Brake Booster Vacuum sensor voltage < .04 volts ( 3 counts) | System voltage is >11 & < 18 volts | 320 / 400 counts<br>12.5 msec / count<br>Continuous | DTC Type B on vehicles with DoD |
| Brake Booster Pressure Sensor High | **P0558** | This DTC detects an open sensor ground or continuous short to high in either the signal circuit or the Brake Booster Vacuum sensor | Brake Booster Vacuum sensor voltage > 4.89 volts ( 250 counts) | System voltage is >11 & < 18 volts | 320 / 400 counts<br>12.5 msec / count<br>Continuous | DTC Type B on vehicles with DoD |

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|---|---|---|---|---|---|---|
| System Voltage Low | **P0562** | This DTC is a check tto determine if the current system voltage is below the minimum required voltage for proper ECM operation | System voltage < 6.5 volts | Ignition is “ON”<br>Engine speed > 1000 RPM | 5 fail counts / 6 sample counts<br>1 count per second | DTC Type C |
| System Voltage High | **P0563** | This DTC is a check tto determine if the current system voltage is above the maximum allowed voltage for proper ECM operation | System voltage > 18 volts | Ignition is “ON” | 5 fail counts / 6 sample counts<br>1 count per second | DTC Type C |
| ECM – FLASH EEPROM CHECKSUM ERROR | **P0601** | Indicates that ECM is unable to correctly read data from the flash memory. | Calculated checksum does not match expected checksum for the program. | Ignition in Run or Crank. | One occurrence.<br><br>Check is performed at power-up and every 60 seconds thereafter. | DTC Type A |
| ECM – PROGRAMMING ERROR | **P0602** | Indicates that the ECM is not flashed. | ECM not flashed. | Ignition on. | 1 test failure<br>100 ms after ECM powered-up | DTC Type A |
| ECM NVM Integrity | **P0603** | Indicates that the ECM has encountered a Long Term Memory Reset | Calculated checksum does not match expected checksum for the program | Ignition on. | 1 test failure<br>100 ms after ECM powered-up | DTC Type B |
| ECM RAM FAILURE | **P0604** | Indicates that ECM is unable to correctly write and read data to and from RAM | Data read does not match data written | Ignition in Run or Crank | One occurrence.<br><br>Check is performed at power-up and every 60 seconds thereafter. | DTC Type A |

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|---|---|---|---|---|---|---|
| PCM Processor<br><br>Processor Performance Check - Throttle limiting Fault (motor processor)<br>Processor Performance Check - ETC software is not executed in proper order<br>Processor Performance Check<br>Processor Performance Check - SPI failed<br>Processor Performance Check - motor processor state of health (Main)<br>Processor Performance Check - Learn Corruption Fault (Main&motor processor)<br>Processor Performance Check - Learn Corruption Fault MAIN & motor processor<br>Processor Performance Check - motor processor state of health (Main)<br>Processor Performance Check - MAIN state of health (motor processor) | **P0606** | Indicates that the ECM has detected an ETC internal processor integrity fault | Motor processor desired throttle limiting occurring<br>ETC software is not executed in proper order<br>Software tasks loops > schedule tasks loop<br>Loss of SPI communication from the motor processor<br>1.5 msec < Average motor processor state of health toggle > 2.5 msec<br>TPS or APPS minimum learned values fail compliment check<br>TPS or APPS minimum learned values fail range check<br>Motor processor integrity check error occurs<br>Motor processor integrity check error of main processor occurs | Ignition in unlock/accessory, run or crank<br>System voltage>5.23 V | 99 counts continuous, 2 msec/count in the motor processor<br>1 count continuous; 12.5 msec/count in the main processor<br>Error > 3 counts; 100 msec/count in the main processor<br>160/400 counts or 15 counts continuous; 39 counts continuous @ initialization., 12.5 msec/count in the main processor<br>3 counts continuous; 50 msec/count in the main processor<br>100 msec in the main processor<br>10 msec in the main processor<br>4 counts continuous, 50 msec /count in the main processor<br>2 count continuous, 12.5 msec/count in the main motor processor | DTC Type A |

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|---|---|---|---|---|---|---|
| Control Module Accelerator Pedal Position (APP) System Performance | **P060D** | Verify the PCM´s ability to detect a short between the APPS 1 & 2 circuits<br><br>Verify that the indicated accelerator pedal position calculation is correct | APPS #2 signal voltage > 2.05V<br><br>Difference between Main processor indicated accelerator pedal position and motor processor indicated accelerator pedal position > 5% | Ignitions in unlock/ accessory and run, not during TPS minimum learn active during intrusive portion of diagnostic execution<br>System voltage > 5.23 V<br>No PCM processor DTC<br><br>Ignition in unlock, accessory, run or crank<br>System voltage > 5.23 V<br>No PCM processor DTC | 2 counts; 156.25 msec w/immediate retest on an error, performed in the main processor<br><br>99 counts continuous; 12.5 msec/count in the motor processor | DTC Type A |
| Control Module Throttle Position (TP) System Performance | **P060E** | Verify the PCM´s ability to detect a short between the TPS 1 & 2 circuits<br><br>Verify that the throttle control system position sensor short diagnostic is functioning | TPS #2 Signal voltage>2.05 V<br><br>No detection of the sensor short diagnostic active state | System voltage > 5.23 V<br>No PCM processor DTC<br>Ignition in unlock/accessory or run, not during TPS minimum learn active during intrusive portion of diagnostic execution | 2 counts; 156.25 msec w/immediate retest on an error, performed in the main processor<br><br>No sensor short diagnostic activity for 498 msec; detected by the motor processor | DTC Type A |
| 5 Volt Reference 1 Circuit | **P0641** | Detects a continuous or intermittent short on the #1 5 V sensor reference circuit | Vref1 voltage -Vcc voltage > 0.125 V<br><br>OR<br><br>Vcc voltage -Vref1 voltage > 0.175 V | Ignition in unlock/accessory, run or crank<br>System voltage > 5.23 V<br>No ECM processor DTCs | 20/40 counts or 200 msec continuous; 12.5 msec/count in main processor<br><br>125/250 counts or 99 counts continuous; 2 msec/count in motor processor | DTC Type A |
| Malfunction Indicator Lamp Control Circuit MALF (ODM) | **P0650** | Control circuit voltage is monitored during operation. It should be low during operation and near B+ when “off”. | The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match. | Ignition voltage > 10.0 volts, but < 18 volts | 5 seconds.<br><br>Continuous. | DTC Type B<br>No MIL |

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|---|---|---|---|---|---|---|
| 5 Volt Reference 2 Circuit | **P0651** | Detects a continuous or intermittent short on the #2 5 V sensor reference circuit | Vref2 voltage -Vcc voltage> 0.125 V<br><br>OR<br><br>Vcc voltage –Vref2 voltage > 0.175 V | Ignition in unlock/accessory, run or crank<br>System voltage > 5.23 V<br>No ECM processor DTCs | 20/40 counts or 200 msec continuous; 12.5 msec/count in main processor<br><br>125/250 counts or 99 counts continuous; 2 msec/count in main processor | DTC Type A |
| Powertrain Relay Control (ODM) | **P0685** | Control circuit voltage is monitored during operation. It should be low during operation and near B+ when “off” | The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match | Ignition is “ON” | 5 seconds<br>Continuous. | DTC Type B |
| Powertrain Relay Feedback Circuit Low | **P0689** | This DTC is a check to determine if the Powertrain relay is functioning properly | Powertrain relay feedback voltage is < 10 volts | Ignition is “ON” | 5 fail counts / 6 sample counts<br>1 count per second | DTC Type B |
| Powertrain Relay Feedback Circuit High | **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”<br>OR<br>The Powertrain relay feedback voltage is > 2 volts when it has been commanded “OFF” for longer than 2 seconds | | 5 fail counts / 6 sample counts<br>1 count per second | DTC Type B |
| TCM MIL REQUEST | **P0700** | Monitors the TCM MIL request line to determine when the TCM has detected a MIL illuminating fault. | The TCM MIL request line is active<br>for more than 1 second. | Ignition on time > 7 seconds<br>Ignition voltage > 11V | Continuous<br><br>100 msec | DTC Type A |

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|---|---|---|---|---|---|---|
| Skip Shift Solenoid Circuit - ODM | **P0803** | Control circuit voltage is monitored during operation. It should be low during operation and near B+ when “off”. | The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match. | Engine is running | 5 seconds.<br><br>Continuous. | DTC Type B (Manual Only) |
| CLUTCH SWITCH CIRCUIT | **P0833** | Clutch switch state is monitored during vehicle operation. | The PCM detects that a clutch switch state transition has not occurred when the vehicle speed has gone from 0 KPH above a threshold value and back to 0 KPH. | No VSS codes present<br>VSS > 38 kph | 7 test failures in a 8 test sample size<br><br>100ms<br><br>Continuous | DTC Type B (Manual Only) |
| PRNDL SWITCH INPUT HIGH | **P0851** | Check for PRNDL switch malfunction | Park or neutral is indicated if:<br>Engine RPM > 1000<br>TPS > 5.5%<br>Torque > 75 Nm<br>VSS > 32 kph<br>Failcounts: 200/250 samples | Ignition voltage >6 and < 18 V<br>No Vehicle speed DTC(s)<br>No TP DTC(s)<br>No Engine Torque DTC(s) | Stuck in PN 2 seconds<br><br>Continuous Monitor<br>12.5 msec | DTC Type C |

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|---|---|---|---|---|---|---|
| Inlet Airflow System Performance | **P1101** | This DTC detects flaws with all Inlet Airflow sensors suggesting a major inlet flow problem. | (Measured Flow – Modeled air Flow) Filtered > 12<br>or<br>(Measured MAP - Manifold Model 1 pressure) filtered > 15 and<br>(Measured MAP – Manifold Model 2 pressure) filtered > 15 and<br>(The calculated throttle residual from the MAF model and the Manifold Model) filtered > 150<br><br>For DoD applications also can set as follows:<br>Manifold model 2 Lag – Manifold model 2 Lag in DoD > 10 and Manifold model 2 Lag < -10 while in DoD | Engine rpm =>450 and <= 6800<br>MAP sensor high/low DTC's not active<br>EGR DTC's P0401,.P0405, and P1404 not active<br>MAF sensor high/low DTC's not active<br>Crank sensor DTC's not active<br>Engine Coolant DTC's not active<br>Intake Air Temp. DTC's not active<br>Engine Coolant > 70 deg C and < 125 deg C<br>Intake Air Temp > -7 deg C and < 125 deg C | Continous<br><br>Evaluated every 12.5 ms | DTC Type B |
| HO2S SYSTEM - TOO FEW R/L OR L/R SWITCHES (B1S1) | **P1133** | Detects sensors that are initially slow to respond to changes in commanded A/F (but have normal transition times) by monitoring the number of R/L and L/R switches. | S/T: The oxygen sensor switches between 250 – 625 mV.<br>H/C: The oxygen sensor crosses above and back below 500 mV, or below and back above 400 mV<br><br>Number of switches:<br>ST < 1<br>HC < 18 | Closed Loop Fuel Control<br>Engine runtime > 160 sec<br>1000 < RPM < 3000<br>15 < Air Flow < 55 g/s.<br>TPS > 5%<br>10 V < System Voltage < 18 V<br>Fuel > 10%<br>ECT > 55 °C<br>CCP > 0<br><br>0 ºC < Predicted Oxygen Sensor Temp < 2048 ºC<br>Above conditions met for 1 sec<br>DTC's P0131, P0132, P0134 and P0135 not set<br>No AIR, EGR, Throttle, IAT, Injector, Coolant, Air Flow, Purge Control, Misfire, MAP, Engine Protect or Fuel Composition faults active. | 60 sec<br><br>Once per trip. | DTC Type B |

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|---|---|---|---|---|---|---|
| HO2S TRANSITION TIME DIFFERENCE (B1S1) | **P1134** | Detects slow asymmetrical faults by monitoring the difference between R/L and L/R average response times. | The oxygen sensor transitions between 250 – 625 mV.<br><br>HO2S sensor average transition time difference (R/L minus L/R):<br><br>Max +240 ms<br>Min -210 ms | Closed Loop Fuel Control<br>Engine runtime > 160 sec<br>1000 < RPM < 3000<br>15 < Air Flow < 55 g/s.<br>TPS > 5%<br>10 V < System Voltage < 18 V<br>Fuel > 10%<br>ECT > 55 °C<br>CCP > 0<br><br>0ºC < Predicted Oxygen Sensor Temp < 2048 ºC<br>Above conditions met for 1 sec<br>DTC's P0131, P0132, P0134 and P0135 not set<br>No AIR, EGR, Throttle, IAT, Injector, Coolant, Air Flow, Purge Control, Misfire, MAP, Engine Protect or Fuel Composition faults active. | 60 sec<br><br>Once per trip. | DTC Type B |
| HO2S SYSTEM - TOO FEW R/L AND L/R SWITCHES (B2S1) | **P1153** | Detects sensors that are initially slow to respond to changes in commanded A/F (but have normal transition times) by monitoring the number of R/L and L/R switches. | S/T: The oxygen sensor switches between 250 – 625 mV.<br>H/C: The oxygen sensor crosses above and back below 500 mV, or below and back above 400 mV<br><br>Number of switches:<br>S/T < 1<br>H/C < 18 | Closed Loop Fuel Control<br>Engine runtime > 160 sec<br>1000 < RPM < 3000<br>15 < Air Flow < 55 g/s.<br>10 V < System Voltage < 18 V<br>TPS > 5%<br>Fuel > 10%<br>ECT > 55 °C<br>CCP > 0<br><br>0ºC < Predicted Oxygen Sensor Temp < 2048 ºC<br>Above conditions met for 1 sec<br>DTC's P0151, P0152, P0154 and P0155 not set<br>No AIR, EGR, Throttle, IAT, Injector, Coolant, Air Flow, Purge Control, Misfire, MAP, Engine Protect or Fuel Composition faults active. | 60 sec<br><br>Once per trip. | DTC Type B |

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|---|---|---|---|---|---|---|
| HO2S TRANSITION TIME DIFFERENCE (B2S1) | **P1154** | Detects slow asymmetrical faults by monitoring the difference between R/L and L/R average response times | The oxygen sensor transitions between 250 – 625 mV.<br><br>HO2S sensor average transition time difference (R/L minus L/R):<br><br>Max +240 ms<br>Min -210ms | Closed Loop Fuel Control<br>Engine runtime > 160 sec<br>1000 < RPM < 3000<br>15 < Air Flow < 55 g/s.<br>TPS > 5%<br>10 V < System Voltage < 18 V<br>Fuel > 10%<br>ECT > 55 °C<br>CCP > 0<br><br>0 ºC < Predicted Oxygen Sensor Temp < 2048 ºC<br>Above conditions met for 1 sec<br>DTC's P0131, P0132, P0134 and P0135 not set<br>No AIR, EGR, Throttle, IAT, Injector, Coolant, Air Flow, Purge Control, Misfire, MAP, Engine Protect or Fuel Composition faults active. | 60 sec<br><br>Once per trip. | DTC Type B |
| ENGINE PROTECTION MODE ACTIVE | **P1258** | Monitor for engine protection mode active. | Coolant temperature >= 129.4°C for more than 10 seconds. | No coolant sensor DTC's. | Set immediately upon engine protection mode active. | DTC Type A |
| ABS Rough Road Malfunction | **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 | none | 40 failures out of 80samples | DTC Type C<br><br>(DTC sets when a P0300 is active) |
| ABS System Rough Road Detection Communication Fault | **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 | none | 40 failures out of 80samples | DTC Type C<br><br>(DTC sets when a P0300 is active) |

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|---|---|---|---|---|---|---|
| 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 > 5 sec stability with no change in error sign, after 4 sec stable command. \|throttle error\| > 6% I(actuator) > 9A TPS1< 1.648V | 1-3. Ignition in run or crank [RPM>0 or ( RPM=0 and not in battery saver mode)]. No airflow actuation, throttle actuation DTCs Engine running = true or System voltage > 6.5 V<br><br>4. Minimum TPS learn active state | 249 counts continuous; 2 msec/count in the motor processor<br><br>99 counts continuous; 2 msec/count in the motor processor<br><br>50 counts continuous; 2 msec/count in the motor processor<br><br>99 counts continuous; 2 msec/count in the motor processor | DTC Type A |
| Powerdown NVM Integrity | **P1621** | Indicates that the NVM Error flag has not been cleared | Calculated checksum does not match expected checksum for the program | Ignition on. | 1 test failure 100 ms after ECM powered-up | DTC Type A |
| Ignition Correlation | **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. | 1.92 Sec in the secondary processor | DTC Type A |
| Fuel Level No Change, Stuck in Range Secondary Tank | **P2066** | This DTC will detect a fuel sender stuck in range | IF Delta Fuel Volume change less than 3 liters over a accumulated 200 kilometers OR If Primary is FULL and Secondary is EMPTY for > 200 kilometers Or If primary is less than 32 liters and secondary tank is greater than 7 liters for more than 2400 seconds. | Fuel level greater than 32 liters No VSS DTC's set Engine Running | Continous | DTC Type B<br><br>For use on vehicles with dual fuel tank |

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|---|---|---|---|---|---|---|
| Fuel Level Stuck Low Secondary Tank | **P2067** | This DTC will detect a fuel sender stuck out of range low | Fuel level Sender % of 5V range less than 10 % | Fuel Level greater than 32 liters runs continuously | 60 failures out of 100 samples<br>1 sample = 100 ms<br><br>Continous | DTC Type B<br><br>For use on vehicles with dual fuel tank |
| Fuel Level Stuck High Secondary Tank | **P2068** | This DTC will detect a fuel sender stuck out of range high | Fuel level Sender % of 5V range > than 70% | Fuel Level greater than 32 literes runs continuously | 60 failures out of 100 samples<br>1 sample = 100 ms<br><br>Continous | DTC Type B<br><br>For use on vehicles with dual fuel tank |
| Control Module Throttle Actuator Position Performance | **P2101** | Detect a throttle positioning error | Difference between measured throttle position and modeled throttle position > 6% | Ignition in run or crank<br>[RPM>0 or ( RPM=0 and not in battery saver mode)]<br>No airflow actuation, throttle actuation DTC.s<br><br>Engine running or<br>System voltage > 11 V | Positive error counter Increments by 1 if TP error > 6%;<br>decrements by 1 if 0% < TP error< 6%;<br>decrements by 1 if -6% < TP error < 0%;<br>Increments by 1 if TP error < -6%.<br><br>Negative error counter Increments by 1 if TP error< -6%;<br>decrements by 1 if -6%< TP error < 0%;<br>decrements by 1 if 0% < TP error < 6%; Increments by 1 if TP error > 6%.<br><br>Thresholds are 15<br><br>Check runs every 12.5 msec in the main processor | DTC Type A |

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|---|---|---|---|---|---|---|
| Accelerator Pedal Position (APP) Sensor 1 | **P2120** | Detect a continuous or intermittent short or open in the APP sensor #1 | 0.3625 V < Raw APP 1 < 2.6V | Ignition in unlock/accessory, run or crank<br>System voltage >5.23 V<br>No PCM processor, 5 V reference DTCs | 20/40 counts or 10 counts continuous; 12.5 msec/count in the main processor<br><br>92/217 counts or 67 counts continuous; 2 msec/count in the motor processor | DTC Type A |
| Accelerator Pedal Position (APP) Sensor 1 Lo | **P2122** | Detect a continuous or intermittent short or open in the APP sensor #1 | Raw APP 1 < 0.3625V | Ignition in unlock/accessory, run or crank<br>System voltage >5.23 V<br>No PCM processor, 5 V reference DTCs | 20/40 counts or 10 counts continuous; 12.5 msec/count in the main processor<br><br>92/217 counts or 67 counts continuous; 2 msec/count in the motor processor | DTC Type A |
| Accelerator Pedal Position (APP) Sensor 1 Hi | **P2123** | Detect a continuous or intermittent short or open in the APP sensor #1 | Raw APP 1 > 2.6V | Ignition in unlock/accessory, run or crank<br>System voltage >5.23 V<br>No PCM processor, 5 V reference DTCs | 20/40 counts or 10 counts continuous; 12.5 msec/count in the main processor<br><br>92/217 counts or 67 counts continuous; 2 msec/count in the motor processor | DTC Type A |
| Accelerator Pedal Position (APP) Sensor 2 | **P2125** | Detect a continuous or intermittent short or open in the APP sensor #2 | 0.3625 V < Raw APP 1 < 4.225V | Ignition in unlock/accessory, run or crank<br>System voltage >5.23 V<br>No PCM processor, 5 V reference DTCs | 20/40 counts or 10 counts continuous; 12.5 msec/count in the main processor<br><br>92/217 counts or 67 counts continuous; 2 msec/count in the motor processor | DTC Type A |

| SENSED PARAMETER | FAULT CODE | MONITOR STRATEGY DESCRIPTION | MALFUNCTION CRITERIA AND THRESHOLD VALUES | SECONDARY PARAMETERS AND ENABLE CONDITIONS | TIME LENGTH AND FREQUENCY | MIL ILLUM. TYPE |
|---|---|---|---|---|---|---|
| Accelerator Pedal Position (APP) Sensor 2 Lo | **P2127** | Detect a continuous or intermittent short or open in the APP sensor #2 | Raw APP 2 < 0.3625 V | Ignition in unlock/accessory, run or crank<br>System voltage >5.23 V<br>No PCM processor, 5 V reference DTCs | 20/40 counts or 10 counts continuous; 12.5 msec/count in the main processor<br><br>92/217 counts or 67 counts continuous; 2 msec/count in the motor processor | DTC Type A |
| Accelerator Pedal Position (APP) Sensor 2 Hi | **P2128** | Detect a continuous or intermittent short or open in the APP sensor #2 | Raw APP 2 > 4.225V | Ignition in unlock/accessory, run or crank<br>System voltage >5.23 V<br>No PCM processor, 5 V reference DTCs | 20/40 counts or 10 counts continuous; 12.5 msec/count in the main processor<br><br>92/217 counts or 67 counts continuous; 2 msec/count in the motor processor | DTC Type A |
| 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) <<br>6.44% offset at min. throttle position with an increasing to 10% at max. throttle position | Ignition in unlock/accessory, run or crank<br>System voltage >5.23 V<br>No PCM processor, TPS circuit DTCs | 15/35 counts or 12 counts continuous; 12.5 msec/count in the main processor<br><br>92/217 counts or 67 counts continuous; 2 msec/count in the motor 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<br><br>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) <<br>5% offset at min. throttle position with an increasing to 10% at max. throttle position | Ignition in unlock/accessory, run or crank<br>System voltage >5.23 V<br>No PCM processor, APP sensor, 5 V reference DTCs<br><br>Ignition in unlock/accessory, run or crank<br>System voltage >5.23 V<br>No PCM processor DTCs | 15/35 counts or 12 counts continuous, 12.5 msec/count in the main processor<br><br>92/217 counts or 80 counts continuous, 2 msec/count in the motor processor<br><br>2 counts 156.25 msec w/ immediate test on an error, performed in the main processor | DTC Type A |

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|---|---|---|---|---|---|---|
| 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) <<br>5% offset at min. throttle position with an increasing to 10% at max. throttle position | Ignition in unlock/accessory, run or crank<br>System voltage >5.23 V<br>No PCM processor, TPS circuit DTCs | 15/35 counts or 12 counts continuous; 12.5 msec/count in the main processor<br><br>92/217 counts or 67 counts continuous; 2 msec/count in the motor 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<br><br>Detect a short between APP sensors #1 and #2 circuits. | Difference between (5V-raw learned min. APPS#2 voltage)*2 and (raw learned min. APPS#1 voltage) > 0.25 V at min throttle position to 0.5 V at max throttle position<br><br>Difference between APP#1 and APP#2 < 1 V | Ignition in unlock/accessory, run or crank<br>System voltage >5.23 V<br>No PCM processor, APP sensor, 5 V reference DTCs<br><br>Ignition in unlock/accessory, run or crank<br>System voltage >5.23 V<br>No PCM processor DTCs | 15/35 counts or 12 counts continuous, 12.5 msec/count in the main processor<br><br>92/217 counts or 80 counts continuous, 2 msec/count in the motor processor<br><br>2 counts 156.25 msec w/ immediate test on an error, performed in the main processor | DTC Type A |
| Throttle Actuator System<br>Sudden Airflow Detected | **P2172** | This DTC determines if a gross high airflow exists during idle conditions | Engine Speed > 1500 RPM above desired idle RPM | No MAF, MAP, IAT, ECT, TP, Injector, Fuel System, Misfire, , VSS or Purge DTC<br>Baro > 60 kPa<br>Engine Coolant Temp > 60° C<br>Engine Run Time > 10 seconds<br>Intake Air Temp > -40° C<br>Idle conditions present > 2 seconds | 100 msec loop rate<br>20 fail counts out of 30 sample counts | DTC Type B |
| Minimum Throttle Position Not Learned | **P2176** | TP minimum learning not completed | TPS > 0.77 V | Minimum TPS learn active state<br>Stable throttle position reading for 40 msec<br>Ignition in run or crank<br><br>No TPS circuit DTCs | 3 secs | DTC Type A |

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|---|---|---|---|---|---|---|
| Minimum Throttle Position Not Learned | **P2176** | TP minimum learning not completed | TPS > 0.82 V | Minimum TPS learn active state<br>Stable throttle position reading for 40 msec<br>Ignition in run or crank<br><br>No TPS circuit DTCs | 3 secs | DTC Type A |
| SOAK TIMER (IGNITION OFF TIMER) | **P2610** | Monitor soak timer for proper increments in positive time at correct rate | 1) Initial soak timer value is not between 0 to 5 seconds<br>2) After initial 4.0 second delay, the soak timer does not increase by 1 second increments<br>3) Each 1 second increment of the soak timer is not within 1.0 +/- 0.2 seconds<br>4) The soak timer value decrements by any amount<br>5) The soak timer does not increment for 1.5 seconds | ECM is powered down<br>DTC sets on next key cycle if failure detected<br>-7°C ≤ IAT ≤ 75°C | Every key down<br>12.5ms loop rate<br>8 failures out of 10 samples | DTC Type B |
| Fuel Pump 2 Flow Insufficient | **P2636** | DTC monitors that enough fuel is transferred from the secondary fuel tank to the primary fuel tank | If Primary Tank < 32 litres and secondary tank > 7 liters for more than 2400 seconds | Engine Running | Continous | DTC Type C<br>No Light |
| Cylinder 1 Deac Solenoid Open | **P3401** | Control circuit voltage is monitored during operation. It should be low during operation and near B+ when “off”.q | The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match. | Engine speed > 400 RPM<br>Ignition voltage > 10.0 volts, but < 18 volts | 5 seconds<br><br>Continuous | DTC Type B<br><br>\|DoD Applications only |
| Cylinder 4 Deac Solenoid Open | **P3425** | Control circuit voltage is monitored during operation. It should be low during operation and near B+ when “off”. | The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match. | Engine speed > 400 RPM<br>Ignition voltage > 10.0 volts, but < 18 volts | 5 seconds<br><br>Continuous | DTC Type B<br><br>\|DoD Applications only |
| Cylinder 6 Deac Solenoid Open | **P3441** | Control circuit voltage is monitored during operation. It should be low during operation and near B+ when “off”. | The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match. | Engine speed > 400 RPM<br>Ignition voltage > 10.0 volts, but < 18 volts | 5 seconds<br><br>Continuous | DTC Type B<br><br>\|DoD Applications only |

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|---|---|---|---|---|---|---|
| Cylinder 7 Deac Solenoid Open | **P3449** | Control circuit voltage is monitored during operation. It should be low during operation and near B+ when “off”. | The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match. | Engine speed > 400 RPM<br>Ignition voltage > 10.0 volts, but < 18 volts | 5 seconds<br><br>Continuous | DTC Type B<br><br>\|DoD Applications only |
| ECM TO TCM MODULE SERIAL DATA CIRCUIT | **U0101** | Detects when we stop receiving data from the TCM | Monitor one periodic message from the TCM and will set the code if the periodic message is not received within 2.5 times the transmit period for that message | Power Mode = RUN<br>9<Ignition voltage<16 for >3 Seconds | 3.5 Sec<br><br>Continuous | DTC Type B |