# 2005    3.8L (L26) *with* *Air Injection Reaction  ( A.I.R. )*

## 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 |
|---|---|---|---|---|---|---|
| Crankshaft Position (CKP)-Camshaft Position (CMP) Correlation Bank 1 Sensor A | P0016 | This DTC checks  the CAM/CRANK signal correlation | Cam pulse occurred outside the $2^{nd}$ and $6^{th}$ medium resolution window | • If PCM State is run or crank and medium resolution and low  resolution signals are correct and no Cam or Crank faults exist. | Medium resolution interrupt | DTC Type B |
| O2S Heater Control Circuit Bank 1 Sensor 1 | P0030 | This DTC checks the Heater Output Driver circuit for electrical integrity | Output state shorted or open | • Ignition switch is in crank or run<br>• 9 volts < Ignition Voltage < 18 volts | 15 failures out of 20 samples<br><br>Frequency:<br>100ms loop<br>Continuous | DTC Type B |
| O2S Heater Control Circuit Bank 1 Sensor 2 | P0036 | This DTC checks the Heater Output Driver circuit for electrical integrity | Output state shorted or open | • Ignition switch is in crank or run<br>• 9 volts < Ignition Voltage < 18 volts | 15 failures out of 20 samples<br><br>Frequency:<br>100ms loop<br>Continuous | DTC Type B |
| HO2S Heater Resistance Bank 1 Sensor 1 | P0053 | Detects an oxygen sensor heater having an incorrect or out of range resistance value. | Calculated Heater resistance > 9.3 Ω or < 3.13 Ω | • Coolant – IAT < 8ºC<br>• Engine Soak Time > 10 Hours<br>• -30ºC < Coolant Temp < 45ºC | Once per valid cold start. | DTC Type B |
| HO2S Heater Resistance Bank 1 Sensor 2 | P0054 | Detects an oxygen sensor heater having an incorrect or out of range resistance value. | Calculated Heater resistance > 22.17 Ω or < 8.82 Ω | • Coolant – IAT < 8ºC<br>• Engine Soak Time > 10 Hours<br>• -30ºC < Coolant Temp < 45ºC | Once per valid cold start. | DTC Type B |
| MAP/MAF – Throttle Position Correlation | P0068 | Indicates that measured engine airflow does not match estimated engine airflow as established by the TP Sensor. | MAP based airflow – TP Sensor estimated airflow > 165 mg/cyl AND MAF based airflow – TP Sensor estimated airflow > 165 mg/cyl AND [(MAF failure or MAP failure) OR (NO Throttle DTC AND NO PCM-TACM serial data DTC)] | • Engine running = true.<br>• Ignition on > 2 seconds<br>• RPM > 600<br>• No Throttle Actuation DTC's.<br>• No PCM-TACM Serial Data DTC.<br>• Both TPS Circuit DTC's are not set.<br>• No PCM Processor DTC's<br>• No TACM Processor DTC | Both fail counters are incremented by 2 for every error and decrement by 1 for every pass; both thresholds are 32; both fail counters must exceed threshold to set DTC.<br><br>Frequency:<br>18.75 ms loop<br>Continuous | DTC Type A |

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| Mass Airflow (MAF) Sensor Performance | P0101 | This DTC determines if the MAF sensor is not within the normal operating range. | (Calculated Flow - Measured Flow) > cal<br><br>table lookup as a function of calculated flow | • No MAF circuit DTC's failing<br>• No MAP DTC's failing<br>• No TP Sensor DTC's  failing<br>• No EVAP DTC's  failing<br>• No EGR DTC's  failing<br>• No TAC System DTC faults<br>• No ECT DTC's failing<br>• No IAT DTC's failing<br>• PCM State = RUN<br>• Traction Control = Not Active<br>• EGR Flow Diag. – Not Active<br>• EGR $\leq$ 100%<br>• EGR DC $\leq$ 100%<br>• EVAP Canister Purge Valve Duty Cycle $\leq$ 100%<br>• Delta MAP $\leq$ 5.195313 kPa<br>• Delta TP Sensor $\leq$ 15 %<br>• Engine Vacuum $\leq$ 80 kPa<br>• TP Sensor $\leq$ 100%<br>• 9 volts $\leq$ Ignition Voltage $\leq$ 18 volts<br>• If ignition voltage $\leq$ 11.5 volts then undefaulted MAF must be $\leq$ 40 gps<br>• Enable Criteria Stable Time $\geq$ 2 seconds | 320 test failures in a 400 test sample<br><br>Frequency:<br>100 ms loop<br>Continuous | DTC Type B |
| Mass Air Flow (MAF) Sensor Circuit Low | P0102 | This  DTC detects a continuous short to  low or open in either the signal circuit or the MAF sensor. | MAF sensor signal $\leq$ 1200 Hz | • Engine Run Time $\geq$ 0 seconds<br>• RPM $\geq$ 50<br>• System Voltage $\geq$ 8 volts<br>• Ignition is in crank or run<br>• Indicated Throttle Position $\geq$3.496094 percent rotation (Vehicles with Electronic Throttle Control)<br>• Enable Criteria Stable Time $\geq$ 0.5 seconds | 395 test failures in a 400 test sample<br><br>1 sample on every reference pulse | DTC Type B |

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|---|---|---|---|---|---|---|
| Mass Air Flow (MAF) Sensor Circuit High | P0103 | This DTC detects a continuous short to high in either the signal circuit or the MAF sensor. | MAF sensor signal $\geq$ 11500 Hz | • Engine Run Time $\geq$ 0 seconds<br>• RPM $\geq$ 50<br>• System Voltage $\geq$ 8 volts<br>• Ignition is in crank or run<br>• Indicated Throttle Position $\geq$3.496094 percent rotation (Vehicles with Electronic Throttle Control)<br>• Enable Criteria Stable Time $\geq$ 0.5 seconds | 395 test failures in a 400 test sample<br><br>1 sample on every reference pulse | DTC Type B |
| Manifold Absolute Pressure (MAP) Sensor Circuit Low | P0107 | This DTC detects a continuous short to low or open in either the signal circuit or the MAP sensor. | MAP sensor signal < 1.95% | • No TP Sensor DTC's failing<br>• No TAC system DTC's failing<br>• [(TP Sensor $\geq$ 0 & Engine Speed $\leq$1000) or (TP Sensor $\geq$ 10% & Engine Speed > 1000)] | 175 test failures in a 200 test sample<br><br>Continuous:<br>12.5 ms loop if engine is not running<br>every reference pulse below 3200 rpm when engine is running<br>every other reference pulse above 3200 rpm when engine is running | DTC Type B |
| Manifold Absolute Pressure (MAP) Sensor Circuit High | P0108 | This DTC detects a continuous short to high in either the signal circuit or the MAP sensor. | MAP sensor signal > 86.21% | • No TP Sensor DTC's failing<br>• No TAC system DTC's failing<br>• Controller State = RUN<br>• Engine Run Time based on power up coolant temperature:<br>> 1 sec at $\geq$ 30°C<br>>30 sec at 15°C<br>> 45 sec at 0°C<br>>90 sec at –15°C<br>> 120 sec at -30° C; time is interpolated between temperature points<br>• [(TP Sensor < 2% & Engine Speed $\leq$ 1500) or (TP Sensor < 10% & Engine Speed > 1500)] | 175 test failures in a 200 test sample<br><br>Continuous:<br>12.5 ms loop if engine is not running<br>every reference pulse below 3200 rpm when engine is running<br>every other reference pulse above 3200 rpm when engine is running | DTC Type B |

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| Intake Air Temperature (IAT) Sensor Circuit Low | P0112 | This DTC determines if the IAT sensor is shorted low by checking for an IAT sensor output voltage below a threshold | IAT sensor signal < 0.703% | • No VSS DTC's failing<br>• No ECT DTC's failing<br>• Vehicle speed $\geq$ 25.00 mph<br>• Engine run time > 10  seconds<br>• ECT < 126.02°C | 175  test failures within 1200  test sample s<br><br>Frequency:<br>100 ms loop<br>Continuous | DTC Type B |
| Intake Air Temperature (IAT) Sensor Circuit High | P0113 | This DTC determines if the IAT sensor is shorted high or open by checking for an IAT sensor output voltage above a threshold | IAT sensor signal > 99% | • No ECT DTC's failing<br>• No VSS DTC's failing<br>• No MAF DTC's failing<br>• Vehicle speed < 15.00 mph<br>• Airflow < 10.00  g /s<br>• ECT $\geq$ 60.00 °C<br>• Engine run time> 180.00  seconds | 1100 test failures within a 1200.00  test sample<br><br>Frequency:<br>100 ms loop<br>Continuous | DTC Type B |
| Engine Coolant Temperature (ECT) Sensor Performance | P0116 | This DTC detects if the engine coolant sensor is biased high while in range. | A failure will be reported if any of the following occur:<br><br>ECT at powerup > IAT at powerup by 100°C after a minimum 8 hour soak (fast fail).<br><br>ECT at powerup > IAT at powerup by 15°C after a minimum 8 hour soak and a block heater has not been detected.<br><br>ECT at powerup > IAT at powerup by 15°C after a minimum 8 hour soak and the time spent cranking the engine without starting is greater than 5 seconds with the fuel level being above a minimum level of 10%. | • No VSS DTC's<br>• No IAT DTC's<br>• No ECT sensor shorted DTC's<br>• ECM/PCM Internal Engine Off Timer Performance DTC not active<br>• Non-volatile memory failure has not been detected on power-up.<br>• Engine off time > 480 minutes (8 hours)<br>• Test run this trip = false<br>• Test aborted this trip = false<br><br>Block heater detection:<br>- ECT at powerup > IAT at powerup by 15°C<br>- Powerup IAT > -7°C<br>- Vehicle driven a minumu of 300 seconds above 25 mph and IAT drops more than 7° C from powerup IAT. | Frequency:<br>Once per ignition cycle<br>100 ms loop | DTC Type B |

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|---|---|---|---|---|---|---|
| Engine Coolant Temperature (ECT) Sensor Circuit Low | P0117 | Thermistor Analog Voltage<br><br>This DTC detects if the engine coolant sensor's analog voltage falls below a minimum expected value | ECT sensor signal < 0.5078% | • Engine run time > 3.00 seconds OR<br>IAT $\leq$ 90°C | 240 test failures within a 250.00  test sample<br><br>Frequency:<br> 100 ms loop<br> Continuous | DTC Type B |
| Engine Coolant Temperature (ECT) Sensor Circuit High | P0118 | Thermistor Analog Voltage<br><br>This DTC detects if the engine coolant sensor's analog voltage exceeds a maximum expected value | ECT sensor signal  > 99.49% | • Engine run time > 30.00 seconds OR<br>IAT $\geq$ 0°C | 240 test failures within a 250.00  test sample<br><br>Frequency:<br>100 ms loop<br>Continuous | DTC Type B |

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| Throttle Position (TP) Sensor 1 Circuit | P0120 | 1) TACM indicates a continuous or intermittent short or open in either the signal circuit or the TP sensor #1. OR 2) TACM indicates an invalid minimum mechanical position for the TP sensor #1. OR 3) TACM indicates reference voltage out of range. | 1) Raw TP sensor signal < 0.376 V or > 4.506 V.<br><br>OR<br>2)TP sensor minimum mechanical stop voltage < 0.376 V  or > 0.714 V.<br><br>OR<br>3) Reference Voltage < 4.54 V or > 5.21 V. | • Ignition in Run or Crank.<br>• Ignition voltage > 5.23 V.<br>• Valid TACM - PCM serial data.<br>• No TACM processor DTC. | 1)  Counter increments by 4 for every error, decrements by 1 for every pass; threshold is 133.<br><br>Check runs every 3 ms.<br><br>2) One occurrence.<br><br>Check runs at power-up.<br><br>3a).  Continuous.  Counter increments by 1 for every error, decrements by 1 for every pass. Threshold is 10ms.  For reference voltage direct short to ground.<br><br>3b) Second continuous counter increments by 1 for every error and decrements by 1 for every pass, threshold is 1000 msec.  Verify A/D input on reference voltage to be 5volts +/- tolerance. | DTC Type A |
| Engine Coolant Temperature (ECT) Below Thermostat Regulating Temperature | P0128 | This DTC detects if the engine coolant temperature rises too slowly due to an ECT or cooling system fault | If actual accumulated airflow is > predicted accumulated airflow before engine coolant reaches 80.00 °C | • No MAF DTC's<br>• No MAP DTC's<br>• NoTPS DTC's<br>• No IAT DTC's<br>• No ECT DTC's<br>• No VSS DTC's<br>• Start up ECT < 75  °C<br>• Minimum Average Airflow > 1 gps<br>• Vehicle speed > 5 MPH for 0.50 miles<br>• 30.00  sec < Engine Run Time < 1800.00 sec<br>• IAT ≥  -7.03 °C<br>• ECT > -40 °C<br>• Maximum airflow added to actual accumulated airflow limited to 35 gps | 30 failures to set DTC<br><br>Frequency:<br>Once per ignition cycle 1 second loop | DTC Type B |

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| O2S Circuit Low Voltage Bank 1 Sensor 1 | P0131 | This DTC determines if the O2 sensor circuit is shorted to low by checking for a lean condition during steady throttle and PE. | O2 sensor voltage < 78.125 millivolts<br><br>or<br><br>O2 sensor voltage < 600.00 millivolts in PE mode | Common Enable Criteria<br>• No TP Sensor DTC's<br>• No MAP DTC's<br>• No ECT DTC's<br>• No MAF DTC's<br>• No IAT DTC's<br>• No Evap DTC's<br>• No Fuel Injector DTC's<br>• EGR flow diagnostic intrusive test = Not Active<br>• Catalyst monitor diagnostic intrusive test = Not Active<br>• Post Oxygen Sensor Diagnostic intrusive test= Not Active<br>• 9 volts < system voltage < 18.00 volts<br>• Device control = Not Active<br><br>Specific Enable Criteria<br>• $0.88 \leq$ Equivalence ratio $\leq 1.088$<br>• $4\% \leq$ throttle position $\leq 40.00\%$<br>• Fuel state = closed loop<br>• All fuel injectors = ON<br>• Traction Control = not active<br>• ECT < 131°C<br><br>All of the above met for at least 3 seconds<br><br>For PE Test<br>• All injectors = on<br>• Indication that closed loop fueling is ready<br>• Equivalence Ratio $\geq 1.088$<br>• Engine Run Time $\geq 300$ seconds<br>All of the above met for  at least 2 seconds | 155  test failures in a 170.00  test sample for 3.00 sets of samples<br><br>60.00 failures in a 75.00 test sample for PE mode<br><br>Frequency:<br>Continuous<br>100 ms loop | DTC Type B |

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| O2S Circuit High Voltage Bank 1 Sensor 1 | P0132 | This DTC determines if the O2 sensor or circuit is shorted to high by checking for a rich condition during steady throttle. | O2 sensor voltage > 889.76 millivolts | Common Enable Criteria<br>• No TP Sensor DTC's<br>• No MAP DTC's<br>• No ECT DTC's<br>• No MAF DTC's<br>• No IAT DTC's<br>• No Evap DTC's<br>• No Fuel Injector DTC's<br>• EGR flow diagnostic intrusive test = Not Active<br>• Catalyst monitor diagnostic intrusive test= Not Active<br>• Post Oxygen Sensor Diagnostic intrusive test = Not Active<br>• 9 volts < system voltage < 18.00 volts<br>• Device control = Not Active<br><br>Specific Enable Criteria<br>• $0.88 \le$ Equivalence Ratio $\le 1.088$<br>• $3.00 \% \le$ throttle position $\le 40.00 \%$<br>• Fuel_State = Closed loop<br><br>   All of the above met for at least 3 seconds | 100.00   test failures in a 125  test sample for 6.00 sets of samples<br><br>Frequency:<br>Continuous<br>100 ms loop | DTC Type B |

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|---|---|---|---|---|---|---|
| O2S Slow Response Bank 1 Sensor 1 | P0133 | This DTC determines if the O2 sensor response time is degraded | O2 Sensor Average Transition Time:<br><br>LRA > 130  ms<br>or<br> RLA > 160  ms | Common Enable Criteria<br>• No TP Sensor DTC's<br>• No MAP DTC's<br>• No ECT DTC's<br>• No MAF DTC's<br>• No IAT DTC's<br>• No Evap DTC's<br>• No Fuel Injector DTC's<br>• EGR flow diagnostic intrusive test = Not Active<br>• Catalyst monitor diagnostic intrusive test = Not Active<br>• Post Oxygen Sensor Diagnostic intrusive test = Not Active<br>• 9 volts < system voltage < 18.00 volts<br>• Device control = Not Active<br><br>Specific Enable Criteria<br>• O2 Heater on for $\geq$ 0 seconds<br>• Bank 1 Sensor1 circuit and heater and heater driver DTCs = Not Active<br>• Bank 2 Sensor 1 circuit and heater and heater driver DTCs = Not Active<br>• In one of the following four fueling cells: Purge off, normal; purge off, high flow; purge on, normal; purge oon, high flow<br>• Misfire DTC = Not Active<br>• ECT  > 65.00 °C<br>• Engine run time > 60.00 seconds<br>• EVAP Canister purge duty cycle $\geq$ 0.00 %<br>• 15.00   gps $\leq$ MAF $\leq$ 29.00   gps<br>• 1300.00  $\leq$ RPM $\leq$ 3000.00<br>• Throttle position $\geq$ 2.00 %<br>• Fuel state = closed loop<br>• Transmission (automatic) not in Park, Reverse or Neutral<br>• 1280 °C $\geq$ Calculated O2 temp $\geq$  -1280 °C<br>All of the above met for at least 2 seconds. | 90000.00 ms<br><br>Frequency:<br>Once per trip | DTC Type B |

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|---|---|---|---|---|---|---|
| O2S Circuit Insufficient Activity Bank 1 Sensor 1 | P0134 | This DTC determines if the O2 sensor is open. | 381.94  millivolts  < O2 sensor <  525.17 millivolts | Common Enable Criteria<br>• No TP Sensor DTC's<br>• No MAP DTC's<br>• No ECT DTC's<br>• No MAF DTC's<br>• No IAT DTC's<br>• No Evap DTC's<br>• No Fuel Injector DTC's<br>• EGR flow diagnostic intrusive test = Not Active<br>• Catalyst monitor diagnostic intrusive test = Not Active<br>• Post Oxygen Sensor Diagnostic intrusive test = Not Active<br>• 9 volts < system voltage < 18.00 volts<br>• Device control = Not Active<br><br>Specific  Enable  Criteria<br>Engine run time > 120.00  seconds | 250 test failures in a 300 test sample<br><br>Frequency:<br>Continuous for pre catalyst sensors<br>100 ms loop rate | DTC Type B |

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|---|---|---|---|---|---|---|
| O2S Heater Performance Bank 1 Sensor 1 | P0135 | Current Monitor: This DTC determines if the O2 sensor heater is functioning properly by monitoring the current through the heater circuit. | Current Monitor:The heater full on current is < 0.3125 amps or > 1.426 amps | Current Monitor: <br> Common Enable Criteria <br> • No TP Sensor DTC's <br> • No MAP DTC's <br> • No ECT DTC's <br> • No MAF DTC's <br> • No IAT DTC's <br> • No Evap DTC's <br> • No Fuel Injector DTC's <br> • EGR flow diagnostic intrusive test = Not Active <br> • Catalyst monitor diagnostic intrusive test = Not Active <br> • Post Oxygen Sensor Diagnostic intrusive test  = Not Active <br> • 9 volts < system voltage < 18.00 volts <br> • Device control = Not Active <br><br> Specific Enable_Criteria <br> • Engine Run Time $\geq$ 100 seconds <br> • ECT $\geq$ 65° C <br> • 600 $\leq$ Engine Rpm $\leq$ 3000 <br> • 4 gps $\leq$ Mass Airflow $\leq$ 30 gps <br> • O2 heater not in Device control <br> • O2 heater driver DTC not active <br><br>   All of the above met for at least 2 seconds | Current Monitor: <br><br> 17 test failures in 20 test samples <br><br> Frequency: <br> 5 tests per trip <br> 30 second delay between tests <br> 1 second execution rate | DTC Type B |

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| O2S Circuit Low Voltage Bank 1 Sensor 2 | P0137 | This DTC determines if the O2 sensor  circuit is shorted to low by checking for a lean condition during steady throttle. | O2 sensor voltage < 78.125 millivolts | Common Enable Criteria<br>• No TP Sensor DTC's<br>• No MAP DTC's<br>• No ECT DTC's<br>• No MAF DTC's<br>• No IAT DTC's<br>• No Evap DTC's<br>• No Fuel Injector DTC's<br>• EGR flow diagnostic intrusive test = Not Active<br>• Catalyst monitor diagnostic intrusive test = Not Active<br>• Post Oxygen Sensor Diagnostic intrusive test = Not Active<br>• 9 volts < system voltage < 18.00 volts<br>• Device control = Not Active<br><br>Specific Enable Criteria<br>• $0.88 \leq$ Equivalence ratio $\leq 1.088$<br>• $4 \% \leq$ throttle position $\leq 40.00 \%$<br>• Fuel state = closed loop<br>• All fuel injectors = ON<br>• Traction Control = not active<br>• ECT < 131°C<br><br>All of the above met for at least 3 seconds | 360  test failures in a 400 test sample for 3.00 sets of samples<br><br><br>Frequency:<br>Continuous<br>100 ms loop | DTC Type B |

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| O2S Circuit High Voltage Bank 1 Sensor 2 | P0138 | This DTC determines if the O2 sensor or circuit is shorted to high by checking for a rich condition during steady throttle. | O2 sensor voltage > 924.48 millivolts | Common Enable Criteria<br>• No TP Sensor DTC's<br>• No MAP DTC's<br>• No ECT DTC's<br>• No MAF DTC's<br>• No IAT DTC's<br>• No Evap DTC's<br>• No Fuel Injector DTC's<br>• EGR flow diagnostic = Not Active<br>• Catalyst monitor diagnostic = Not Active<br>• Post Oxygen Sensor Diagnostic = Not Active<br>• 9 volts < system voltage < 18.00 volts<br>• Device control = Not Active<br><br>Specific Enable Criteria<br>• 0.88 ≤ Equivalence Ratio ≤ 1.088<br>• 3.00 % ≤ throttle position ≤ 40.00 %<br>• Fuel_State = Closed loop<br><br>All of the above met for at least 3 seconds | 540  test failures in a 600 test sample for 2 sets of samples<br><br>Frequency:<br>Continuous<br>100 ms loop | DTC Type B |

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| O2S Circuit Insufficient Activity Bank 1 Sensor 2 | P0140 | This DTC determines if the O2 sensor is open. | 390.63  millivolts  < O2 sensor  < 520.83 millivolts for regular open test<br><br>381.94 millivolts < O2 sensor < 525.17 millivolts to fail the fast pass open test (must fail the regular open test in order to fail the DTC; regular open test is run if fast pass is not run or if fast pass fails) | Common Enable Criteria<br>• No TP Sensor DTC's<br>• No MAP DTC's<br>• No ECT DTC's<br>• No MAF DTC's<br>• No IAT DTC's<br>• No Evap DTC's<br>• No Fuel Injector DTC's<br>• EGR flow diagnostic = Not Active<br>• Catalyst monitor diagnostic = Not Active<br>• Post Oxygen Sensor Diagnostic = Not Active<br>• 9 volts < system voltage < 18.00 volts<br>• Device control = Not Active<br><br>Specific_Enable_Criteria<br>• O2S Heater Performance Bank 1 Sensor 2 not active<br>• O2S Heater Control Circuit Bank 1 Sensor 2 not active<br>• PCM State = run<br><br>Fast Pass:<br>• (Engine run time $\leq$ 90 seconds) OR (current start <> cold start)<br><br>Cold start determination:<br>  Powerup ECT < 35° C<br>  Powerup IAT < 35° C<br>  Powerup ECT – Powerup IAT < 6° C<br><br>(Fast pass cannot report a fail; if Fastpass fails, the regular open test is run)<br><br>Regular Open Test<br>• Engine run time > 120 seconds<br>• Predicted O2 temperature > 0° C<br>• Fuel state = closed loop<br>• Minimum of 3 occurrences of a delta TP sensor $\geq$ 8.0 % during diagnostic test | 1080 test failures in a 1200 test sample for regular open test<br><br>(sample counts – failure counts) < 180 within 90 seconds of engine run time to fail the fast pass test (regular open test is run when fast pass fails;  to fail DTC the regular open test must fail)<br><br>Frequency:<br><br>Once/trip for post catalyst sensors<br>100 ms loop | DTC Type B |

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|---|---|---|---|---|---|---|
| O2S Heater Performance Bank 1 Sensor 2 | P0141 | This DTC determines if the O2 sensor heater is functioning properly by monitoring the current through the heater circuit. | The heater full on current is < 0.2148438 amps or > 0.957031 amps | Current Monitor:<br>Common Enable Criteria<br>• No TP Sensor DTC's<br>• No MAP DTC's<br>• No ECT DTC's<br>• No MAF DTC's<br>• No IAT DTC's<br>• No Evap DTC's<br>• No Fuel Injector DTC's<br>• EGR flow diagnostic Intrusive Test = Not Active<br>• Catalyst monitor diagnostic Intrusive Test = Not Active<br>• Post Oxygen Sensor Diagnostic Intrusive Test = Not Active<br>• 9 volts < system voltage < 18.00 volts<br>• Device control = Not Active<br><br>Specific Enable_Criteria<br>• Engine Run Time $\geq$ 100 seconds<br>• ECT $\geq$ 65° C<br>• 600 $\leq$ Engine Rpm $\leq$ 3000<br>• 4 gps $\leq$ Mass Airflow $\leq$ 30 gps<br>• O2 heater not in Device control<br>O2 heater driver DTC not active<br><br>All of the above met for at least 2 seconds | Current Monitor:<br><br>17 test failures in 20 test samples<br><br>Frequency:<br>5 tests per trip<br>30 second delay between tests<br>1 second execution rate | DTC Type B |

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|---|---|---|---|---|---|---|
| Fuel Trim System Lean Bank 1 | P0171 | Determines if the system is in a lean condition. | The  average of long term fuel trim  samples (LTM average) $\geq$ 1.1641<br><br>Note:<br>The LTM average is weighted 50% idle cell purge on or purge off (last idle cell driven in), and 50% normal cell purge on. | • No TP Sensor DTC's<br>• No TAC System DTC's<br>• No Misfire DTC's<br>• No IAC DTC's<br>• No Fuel Injector DTC's<br>• No MAF DTC's<br>• No O2 sensor DTC's<br>• No MAP DTC's<br>• No EGR DTC's<br>• No EVAP DTC's<br>• No AIR DTC's<br>• Engine speed >  0  rpm but < 6000 rpm<br>• BARO > 70.00 kPa<br>• ECT > --38.51$^o$C but < 126.02°C<br>• MAP > 25.0 kPa but < 199.00 kPa<br>• IAT > -18°C but < 139.88°C<br>• Airflow > 1.0 g/s but < 511.00 g/s<br>• Vehicle speed < 82.00 mph<br>• Closed Loop Fueling<br>• Long Term Fuel Trim Learning enabled<br>• Not in Device Control<br>• EGR Flow Diagnostic Intrusive Test = Not Active<br>• Catalyst Monitor Diagnostic Intrusive Test = Not Active<br>• Post O2 Diagnostic Intrusive Test = Not Active<br>• Evap diagnostic is at any stage except the "tank pull down" portion of the test.<br>• At least 60 seconds have been spent in the last idle cell and 60 seconds have been spent in the purge on normal cell .<br>• Fuel Level > 10 % (must be < 10% for 10 seconds to disable; default is to enable if fuel sender is broken) | 50.00 test failures<br><br><br>Frequency:<br>Continuous<br>100 ms loop | 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 |
|---|---|---|---|---|---|---|
| Fuel Trim System Rich Bank 1 | P0172 | Determines if the system is in a rich condition. | The average of long term fuel trim (LTM) samples ≤ 0.76563<br><br>Once the above occurs, the purge is ramped off to determine if excess purge is present or if the system is truly failing.  Therefore, in addition to the above,  one of the following must also occur:<br><br>The snapshot value of the long term fuel trim of the idle purge off cell < 0.76<br>Or<br>The snapshot value of the long term fuel trim of the normal purge off cell < 0.76<br>Or<br>The snapshot value of the long term fuel trim of the high flow purge off cell  < 0.76.<br><br>Snapshots of the long term modifier values of the learned cells in the idle, normal, or high flow cells (all purge off), are separated by a 10-second purge off time interval; a minimum of 80 seconds total accumulated time must be spent in any one cell before a snapshot can occur in that cell.<br>Note:<br>1.   If the intrusive portion of the test does not fail, the intrusive portion of the diagnostic will be delayed for 300 seconds. During this delay, fuel trim will pass if the EVAP canister vapors are cleaned out and the long term modifier average increases above 0.76563<br>2.   The LTM average is weighted 50% idle cell purge on or purge off (last idle cell driven in), and 50% normal cell purge on | • No TP Sensor DTC's<br>• No TAC System DTC's<br>• No Misfire DTC's<br>• No IAC DTC's<br>• No Fuel Injector DTC's<br>• No MAF DTC's<br>• No O2 sensor DTC's<br>• No MAP DTC's<br>• No EGR DTC's<br>• No EVAP DTC's<br>• No AIR DTC's<br>• Engine speed >  0 rpm but < 6000 rpm<br>• BARO > 70.00 kPa<br>• ECT > --38.51°C but < 126.02°C<br>• MAP > 25.0 kPa but < 199.00 kPa<br>• IAT > -18 °C but < 139.88°C<br>• Airflow > 1.0 g/s but < 511.00 g/s<br>• Vehicle speed < 82.00 mph<br>• Closed Loop Fueling<br>• Long Term Fuel Trim Learning enabled<br>• Not in Device Control<br>• EGR Flow Diagnostic Intrusive Test = Not Active<br>• Catalyst Monitor Diagnostic Intrusive Test = Not Active<br>• Post O2 Diagnostic Intrusive Test = Not Active<br>• Evap diagnostic is at any stage except the "tank pull down" portion of the test.<br>Intrusive Enable Criteria<br>• At least 60 seconds have been spent in the last idle cell and 60 seconds have been spent in the purge on normal cell.<br>• Average of long term fuel trim samples ≤ 0.76563 for 10 seconds<br>• RPM > 0<br>• 1 gps < Mass Airflow < 511 gps<br>• Must be in the last idle cell entered, normal purge on cell, or the high flow purge on cell, for at least 2 consecutive seconds.<br>•  VSS > 12  mph<br>Temporary Intrusive Test Disable criteria<br>• If during intrusive test, leave Excess Purge Test cell (idle, normal, or high flow purge off) for 5 consecutive seconds.<br>• If have been intrusive for longer than 40 | If  rich  fail counter is ≥ 3 Before rich non-fail counter  ≥ 2, diagnostic fails.<br><br>Frequency:<br>Continuous<br>100 ms loop | 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 |
|---|---|---|---|---|---|---|
| Injector 1 Control Circuit | P0201 | This DTC checks the Fuel Injectors for electrical integrity | Output state is shorted or open | • Ignition switch is in crank or run<br>• 9 < Ignition Voltage < 18<br>• Injector commanded on > 0.5 seconds | 15 failures out of 20 samples<br><br>Frequency:<br>Continuous<br>100 ms loop | DTC Type B |
| Injector 2 Control Circuit | P0202 | This DTC checks the Fuel Injectors for electrical integrity | Output state is shorted or open | • Ignition switch is in crank or run<br>• 9 < Ignition Voltage < 18<br>• Injector commanded on > 0.5 seconds | 15 failures out of 20 samples<br><br>Frequency:<br>Continuous<br>100 ms loop | DTC Type B |
| Injector 3 Control Circuit | P0203 | This DTC checks the Fuel Injectors for electrical integrity | Output state is shorted or open | • Ignition switch is in crank or run<br>• 9 < Ignition Voltage < 18<br>• Injector commanded on > 0.5 seconds | 15 failures out of 20 samples<br><br>Frequency:<br>Continuous<br>100 ms loop | DTC Type B |
| Injector 4 Control Circuit | P0204 | This DTC checks the Fuel Injectors for electrical integrity | Output state is shorted or open | • Ignition switch is in crank or run<br>• 9 < Ignition Voltage < 18<br>• Injector commanded on > 0.5 seconds | 15 failures out of 20 samples<br><br>Frequency:<br>Continuous<br>100 ms loop | DTC Type B |
| Injector 5 Control Circuit | P0205 | This DTC checks the Fuel Injectors for electrical integrity | Output state is shorted or open | • Ignition switch is in crank or run<br>• 9 < Ignition Voltage < 18<br>• Injector commanded on > 0.5 seconds | 15 failures out of 20 samples<br><br>Frequency:<br>Continuous<br>100 ms loop | DTC Type B |
| Injector 6 Control Circuit | P0206 | This DTC checks the Fuel Injectors for electrical integrity | Output state is shorted or open | • Ignition switch is in crank or run<br>• 9 < Ignition Voltage < 18<br>• Injector commanded on > 0.5 seconds | 15 failures out of 20 samples<br><br>Frequency:<br>Continuous<br>100 ms loop | DTC Type B |

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|---|---|---|---|---|---|---|
| Throttle Position (TP) Sensor 2 Circuit | P0220 | 1) TACM indicates a continuous or intermittent short or open in either the signal circuit or the TP sensor #2.<br><br>OR<br><br>2) TACM indicates an invalid minimum mechanical position for the TP sensor #2.<br><br>OR<br><br>3) TACM indicates reference voltage out of range. | 1) Raw TP sensor signal < 0.282 V or > 4.60 V.<br><br><br>OR<br><br>2) TP sensor minimum mechanical stop voltage < 0.282 V  or > 0.813V<br><br><br>OR<br><br>3) 4.54 V < Reference voltage < 5.21 V | • Ignition in Run or Crank.<br>• Ignition voltage > 5.23 V.<br>• Valid TACM - PCM serial data.<br>• No TACM processor DTC. | 1) Counter increments by 4 for every error, decrements by 1 for every pass; threshold is 133.<br><br>Check runs every 3 ms.<br><br><br>2) One occurrence.<br><br>Check runs at power-up.<br><br><br>3) Continuous.  Counter increments by 1 for every error, decrements by 1 for every pass. Threshold is 10ms.  For Reference voltage direct short to ground. | DTC Type A |

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|---|---|---|---|---|---|---|
| Engine 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 | P0300<br><br>P0301<br><br>P0302<br><br>P0303<br><br>P0304<br><br>P0305<br><br>P0306 | These  DTC 's will determine if a random misfire 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 = 1.0%<br><br>Catalyst Damage Threshold = 5% Misfire<br>depending on engine speed and engine load | • DTCs not active for VSS, CKP, CMP, TP, MAP, ECT,  MAF, TAC system sensors.<br>• P0315 (Crankshaft Position System Variation Not Learned) not active or engine speed < 1200.<br>• Any Fuel cutoff not active.<br>• Power management is not active.<br>• Brake torque management not active.<br>• Fuel level > 10% (disablement ends 500 engine cycles, after a low fuel level condition ceases, and fuel disable does not occur with a fuel sensor DTC).<br>• -6.99 °C < ECT < 126.02 ° C.<br>• If ECT at startup < -6.99 °C, then disable until ECT > 21.09 °C.<br>• 475.00 RPM < Engine speed < 5600.00 RPM.<br>• 9.00 volts < System voltage < 18 volts.<br>• + Throttle position delta < 100 % per 50 ms.<br>• -  Throttle position delta < 100 % per 50 ms.<br>• Abnormal engine speed is not present.<br>• ABS rough road not detected.<br>• Excessive drive wheel slip is not detected (enablement occurs if {Non Drive Wheel Speed > 255 MPH} or {Drive Wheel Speed - Non Drive Wheel Speed > 255 MPH} and {wheel speed data is valid})<br>• ABS is not active, TCS is not active.<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 2) TP Sensor > 1.4% or VSS < 20 MPH.<br>• Detectable engine speed and engine load region.<br>• EGR Intrusive test not active.<br>• CMP sensor is in sync with CKP sensor.<br>• Automatic transmission is not shifting or automatic transmission is shifting and TPS ≤ 95%<br>• PRNDL indication did not change (not used).<br>• Misfire Diagnosis is not requesting to disable TCC when transmission is in hot mode. | 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 (this number is 1 in this application).  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 (CASE) | P0315 | Determines if the Crankshaft Position System Variation has not been learned. | Sum of Compensation Factors are ≤ 2.997  or  ≥ 3.0043 | • Manufacturers Enable Counter must be zero. | 0.50 seconds<br><br>Frequency:<br>Continuous<br>100 ms loop | DTC Type A |
| Knock Sensor (KS) Circuit Bank 1 | P0325 | This diagnostic will detect a failed internal PCM component associated with knock control | Output voltage is high and stays relatively constant | Enable Conditions<br>• No VSS DTC's<br>• No TP Sensor DTC's<br>• No TAC System DTC's<br>• No ECT DTC's<br>• No Crank Sensor DTC's<br>• No CMP Sensor DTC's<br>• No MAF DTC's<br>• Engine running longer than 30 seconds<br>• Ignition voltage  ≥ 9 volts<br>• Throttle position  ≥  10.00 %<br>• ECT ≥  60.00 °C<br>• Engine speed between 1000 & 2500 RPM<br>• Cylinder air mass  ≥ 40.00  %<br>•  Ignition Control Spark retard ≤  15.01 degrees<br><br>Determine Fault Region<br>• (Instantaneous voltage – average voltage is too small; delta from average ≤ .03125 OR<br>Average voltage – instantaneous voltage is too small; delta from average ≤ 0.03125)<br>AND the average voltage ≥ 4.8 volts | Frequency:<br>Every combustion event<br>Continuous<br><br>260 test failures out of 300 samples | DTC Type B |

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|---|---|---|---|---|---|---|
| Knock Sensor (KS) Circuit Low Frequency Bank 1 | P0327 | This diagnostic will detect a wiring fault with knock sensor 1 | Output voltage amplitude is low and stays relatively constant | Enable Conditions<br>• No VSS DTC's<br>• No TP Sensor DTC's<br>• No TAC System DTC's<br>• No ECT DTC's<br>• No Crank Sensor DTC's<br>• No CMP Sensor DTC's<br>• No MAF DTC's<br>• Engine running longer than 30 seconds<br>• Ignition voltage $\geq$ 9 volts<br>• Throttle position $\geq$ 10.00 %<br>• ECT $\geq$ 60.00 °C<br>• Engine speed between 1000 & 2500 RPM<br>• Cylinder air mass $\geq$ 40.00 %<br>•  Ignition Control Spark retard $\leq$ 15.01 degrees<br><br>Determine Fault Region<br>• (Instantaneous voltage – average voltage is too small; delta from average $\leq$ .03125 OR<br>Average voltage – instantaneous voltage is too small; delta from average $\leq$ 0.03125)<br>AND the average voltage < 4.8 volts | Every combustion event<br><br>Continuous<br><br>260 test failures out of 300 samples | DTC Type B |

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|---|---|---|---|---|---|---|
| Knock Sensor (KS) Circuit Low Frequency Bank 2 | P0332 | This diagnostic will detect a wiring fault with knock sensor 2 | Output voltage amplitude is low an stays relatively constant | Enable Conditions<br>• No VSS DTC's<br>• No TP Sensor DTC's<br>• No TAC System DTC's<br>• No ECT DTC's<br>• No Crank Sensor DTC's<br>• No CMP Sensor DTC's<br>• No MAF DTC's<br>• Engine running longer than 30 seconds<br>• Ignition voltage $\geq$ 9 volts<br>• Throttle position $\geq$ 10.00 %<br>• ECT $\geq$ 60.00 °C<br>• Engine speed between 1000 & 2500 RPM<br>• Cylinder air mass $\geq$ 40.00 %<br>•  Ignition Control Spark retard $\leq$ 15.01 degrees<br><br>Determine Fault Region<br>• (Instantaneous voltage – average voltage is too small; delta from average $\leq$ .03125 OR<br>Average voltage – instantaneous voltage is too small; delta from average $\leq$ 0.03125)<br>AND the average voltage < 4.8 volts | Every combustion event<br><br>Continuous<br><br>260 test failures out of 300 samples | DTC Type B |
| Crankshaft Position (CKP) Sensor A Circuit | P0335 | This diagnostic determines whether a fault exists with crank position sensor circuit signal | If 6 low res pulses have been seen and 0 med res pulses have been seen AND 1 cam has been seen and 0 med res pulses have been seen. | • Engine run time > 3 seconds | Low res interrupt - for low res check<br><br>100 ms - for cam check<br><br>40 failures out of 50 samples | DTC Type B |

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|---|---|---|---|---|---|---|
| Crankshaft Position (CKP) Sensor A Performance | P0336 | This diagnostic determines whether a performance fault exists with crank position sensor signal | If 6 low res pulses have been seen and a number of med res pulses other than 0 or 36 have been seen AND 1 cam has been seen and a number of med res pulses other than 0 or 36 have been seen. | • Engine run time > 3 seconds | Low res interrupt - for low res check<br>100 ms - for cam check<br><br>40 failures out of 50 samples | DTC Type B |
| Camshaft Position (CMP) Sensor Circuit Bank 1 Sensor A | P0340 | 1X Signal<br><br>This diagnostic will detect if a fault exists on the camshaft position sensor signal. | If 36 med res pulses have been seen and 0 cam pulses have been seen AND 6 low res pulses have been seen and 0 cam pulses have been seen. | • Engine run time > 3 seconds<br>• Engine Speed > 100<br>• Cam pulse seen OR 6 low res pulses seen<br>• The engine run time criteria is not required if PCM State is crank. | Med res interrupt - for med res check<br>Low res interrupt - for low res check<br>40 failures out of 50 samples | DTC Type B |
| Camshaft Position (CMP) Sensor Performance Bank 1 Sensor A | P0341 | 1X Signal<br><br>This diagnostic will detect if the CMP Sensor signal. Performance is correct | If 36 med res pulses have been seen and 2 or more cam pulses have been seen AND 6 low res pulses have been seen and 2 or more cam pulses have been seen. | • Engine run time > 3 seconds<br>• Engine Speed > 100<br>• Cam pulse seen OR 6 low res pulses seen | Med res interrupt - for med res check<br>Low res interrupt - for low res check<br>40 failures out of 50 samples | DTC Type B |
| Ignition Coil Circuit | P0350 | This diagnostic detects an open or short on the Electronic Spark Timing (EST) output circuits. | Fault is detected | • Engine is running or cranking | 90 failure out of 100 samples<br><br>Frequency:<br>Continuous<br>100 ms loop<br><br>Once the fault logic detects a failure, the diagnostic is turned off for the rest of the trip. | DTC Type B |
| Crankshaft Position (CKP) Sensor B Circuit | P0385 | This diagnostic determines whether a circuit fault exists with the low res sensor signal | If 36 med res pulses have been seen and 0 low res pulses have been seen AND 1 cam pulse has been seen and 0 low res pulses have been seen. | • Engine run time > 3 seconds<br>Engine Speed > 100<br>Cam pulse seen OR 6 low res pulses seen | Med res interrupt - for med res check<br>100 ms - for cam check<br>L36, L67: 80 failures out of 100 samples<br>L26, L32: 40 failures out of 50 samples | DTC Type B |

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|---|---|---|---|---|---|---|
| Crankshaft Position (CKP) Sensor B Performance | P0386 | This diagnostic determines whether a performance fault exists with the low res sensor  signal | If 36 med res pulses have been seen and a number of low res pulses other than 0 or 6 have been seen AND 1 cam pulse has been seen and a number of low res pulses other than 0 or 6 have been seen. | • Engine run time > 3 seconds<br>• Engine Speed > 100<br>• Cam pulse seen OR 6 low res pulses seen | Med res interrupt - for med res check<br>100 ms - for cam check<br>40 failures out of 50 samples | DTC Type B |

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|---|---|---|---|---|---|---|
| Exhaust Gas Recirculation (EGR) Flow Insufficient (Quick Test) | P0401 | During a closed throttle decel condition, the EGR valve is normally closed.  This diagnostic opens the valve to a pre-determined position, and the change in MAP is computed.  This change in MAP correlates to the flow rate of the EGR system. | With EGR valve open, the peak + MAP $\Delta$ is monitored over a period of time.  This value is compared with a threshold from Engine Speed vs BARO table and the difference computed. The result is statistically filtered (EWMA) and compared to a decision limit. DTC is set when the filtered result exceeds the decision limit of 0.7324 kPa. | Test Enables<br>No fuel injector DTCs set, No CKP DTCs set, No TP sensor DTC's set, No MAP DTC's set, No VSS DTC's set,  No ETC DTC's set, No 5 volt reference DTC's set, No IAT sensor DTC's set<br>No ECT sensor DTC's set, No IAC DTC's set, No EGR Pintle Position DTC set, No Misfire DTC's set<br>No MAF DTC's set, No CPP (Clutch) DTC's set,<br>Not in device control,<br>EGR valve icing not occurring, EGR Engine run time expired, Not in Power Enrichment,<br>ECT > 75° C<br>ECT < 151.9531° C<br>BARO > 70 kPa (10,000 Ft)<br>BARO data is valid<br>IAT < 100° C<br>IAT > -6.99° C<br>Ignition Voltage < 18 volts<br>Ignition Voltage > 11 volts<br>Transmission is in 3rd, 4th or 5th gear<br>Decel Fuel Cutoff is either inactive (mode 0) or at a commanded spark value of 0 (mode 2) for at least 6.25 ms.<br>Vehicle speed < 70 MPH<br>Vehicle Speed > 28 MPH<br>Throttle Position is  < 0.9%<br>A/C clutch status is unchanged for 1 second.<br>Transmission status is unchanged for 1.5 seconds.<br>Throttle Area Delta < 100 %<br> Stability Mode Enables<br>EGR Position < 1%<br>1000 RPM < Engine Speed < 1500 RPM<br>MAP $\Delta$ <  1.201 kpa<br>17  kpa < Compensated MAP < 43  kpa<br>Throttle Area Delta < 100%<br>Difference between desired & actual airflow < 1.2 Grams/sec.<br>Intrusive Mode Enables<br>Vehicle Speed $\Delta$  <  3 MPH<br>+ RPM $\Delta$ < 100 RPM<br>- RPM $\Delta$ < 200 RPM<br>Max EGR Position > 75 %<br>Max EGR Position < 95 % | Test Time<br>800 ms<br><br>Frequency<br>6.26 ms loop<br><br>Once per trip (typically)<br><br>Rapid Step Response feature will initiate multiple tests:<br>IF the difference between the current EWMA and the current map difference  is > 2.305 kPa AND current map difference is > 0.796 kPa<br>THEN<br>6  tests may be run per trip until 36 tests have been completed<br><br>Fast Initial Response feature will initiate multiple tests upon code clear or a non-volatile memory failure:<br>Several tests per trip will run until 16  tests have been completed. | DTC Type A |

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|---|---|---|---|---|---|---|
| Exhaust Gas Recirculation (EGR) Solenoid Control Circuit | P0403 | This DTC checks the Linear EGR circuit for electrical integrity | Output state invalid | • Ignition switch is in crank or run<br>• 9 volts < Ignition Voltage < 18 volts | 20.00 seconds OR chip protection logic indicates a short failure 1 time<br><br>Frequency:<br>Continuous<br>100 ms loop<br><br>Chip protection logic:<br>5 failures out of 10 samples indicate a short<br><br>Frequency of this logic is 12.5 ms loop Continuous<br><br>Once the chip protection logic detects 5 failures out of 10 samples, the driver is turned off for the rest of the trip. | DTC Type B |
| Exhaust Gas Recirculation (EGR) Open Position Performance | P0404 | This diagnostic detects if the pintle position error is too large | Pintle position error [absolute value of (desired position - actual position)]  >  15  % | 5 Volt reference DTC's not active<br>Engine is running<br>Off-board device not active<br>Pintle cleaning not active<br>P0401 not intrusive<br>Ignition voltage ≥ 11 volts<br>EGR valve icing or over temperature not occurring<br>EGR is enabled<br>Desired EGR position > 0%<br>Δ Desired EGR position < 30.00 % for 1 sec. | Frequency:<br>1200 fail counts out of 1400 sample counts<br><br>100ms loop<br>Continuous | DTC Type B |

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|---|---|---|---|---|---|---|
| Exhaust Gas Recirculation (EGR) Position Sensor A Circuit Low Voltage | P0405 | This diagnostic detects if the pintle position feedback circuit is open or shorted to ground | EGR feedback sensor signal < 4.0% of 5 volt reference voltage | 5 Volt reference DTC's not active<br>Engine is running<br>Off-board device not active<br>Pintle cleaning not active<br>P0401 not intrusive<br>Ignition voltage $\geq$ 11 volts<br>EGR valve icing or over temperature not occurring. | Frequency:<br>50 fail counts out of 55 sample counts<br><br>100ms loop<br>Continuous | DTC Type B |
| Exhaust Gas Recirculation (EGR) Position Sensor A Circuit High Voltage | P0406 | This diagnostic detects if the pintle position feedback circuit is shorted to high voltage or the 5V return is open. | EGR feedback sensor signal > 94.7% of 5 volt reference voltage | 5 Volt reference DTC's not active<br>Engine is running<br>Off-board device not active<br>Pintle cleaning not active<br>P0401 not intrusive<br>Ignition voltage $\geq$ 11 volts<br>EGR valve icing or over temperature not occurring. | 3600 fail counts out of 4000<br>sample counts<br><br>100ms loop<br>Continuous | DTC Type B |
| AIR System Incorrect Flow | P0411 | Detects an AIR system insufficient flow condition.<br><br>This test is run during the phase 1 (pump on, control valve open) portion of the Secondary Air Injection Diagnostic (SAI D). | AIR normalized pressure error > 3.5 kPa (higher than predicted pressure) during SAID phase 1 test<br>OR<br>AIR normalized pressure error < -4.2 kPa (lower than predicted pressure) during SAID phase 1 test | No active AIR pressure sensor circuit DTCs set.<br>No active AIR pressure sensor performance DTCs set.<br>No active MAP sensor DTCs set.<br>No active AIR pump relay circuit DTC set.<br>No active AIR control valve relay circuit DTC set.<br>No active MAF sensor DTCs set.<br>No active 5 volt reference DTCs set.<br>No active IAT sensor DTCs set.<br>No active ECT sensor DTCs set.<br>No active Misfire DTCs set.<br>No active catalyst monitor DTCs set.<br>No active fuel injector DTCs set.<br>No active EST DTCs set.<br>No active DTC P0606 set.<br>AIR pressure sensor circuit fault pending = False.<br>AIR operation is allowed this start.<br>BARO > 65 kPa.<br>3 g/sec < Mass Air Flow < 26 g/sec.<br>18 volts > System voltage > 10 volts. | SAID phase 1 conditional test weight > 7 seconds<br><br>Conditional test weight is based on Baro, Mass air flow & System voltage.<br><br>Once per trip where AIR pump operation is requested at startup. | 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 |
|---|---|---|---|---|---|---|
| AIR Solenoid Relay Control Circuit | P0412 | This DTC checks the output driver for electrical integrity | Output state is invalid | • Ignition switch is in crank or run<br>• 9 < Ignition Voltage < 18<br>• Pump  must be commanded on >0.5 seconds | 15 failure out of 20 samples<br>OR<br>chip protection logic indicates a short failure 1 time<br><br>Frequency:<br>Continuous<br>100 ms loop<br><br>Chip protection logic:<br>5 failures out of 10 samples indicate a short<br><br>Frequency of this logic is 12.5 ms loop<br>Continuous<br><br>Once the chip protection logic detects 5 failures out of 10 samples, the driver is turned off for the rest of the trip. | 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 |
|---|---|---|---|---|---|---|
| AIR Pump Relay Control Circuit | P0418 | This DTC checks the output driver for electrical integrity | Output state is shorted, open or over temperature | • Ignition switch is in crank or run<br>9< Ignition Voltage < 18 | 15 failure out of 20 samples for open or over temperature<br><br>chip protection logic indicates a short failure 1 time<br><br>Frequency:<br>Continuous<br>100 ms loop<br><br>Chip protection logic:<br>5 failures out of 10 samples indicate a short<br><br>Frequency of this logic is 12.5 ms loop<br>Continuous<br><br>Once the chip protection logic detects 5 failures out of 10 samples, the driver is turned off for the rest of the trip. | 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 |
|---|---|---|---|---|---|---|
| Catalyst System Low Efficiency Bank 1 | P0420 | Oxygen Storage | OSC time difference $\geq$ 0.179688 (EWMA filtered) <br><br> OSC time difference = OSC worst pass threshold - OSC compensation factor * (post cat O2 resp time - pre cat O2 resp time) <br><br> OSC worst pass thresh = 2.4875 seconds | General Enable <br> • No EVAP, TAC system, MAF, CAM, ECT, CKP, EGR, BARO, AIR, EST, Fuel Injector, Fuel Trim, Idle Air, MAP, IAT, Misfire, O2 Sensor, TP Sensor, VSS or Engine Overtemp Protection Mode DTC's <br> • IAT > -20° C <br> • Green Converter Delay Flag = Not Active <br> Valid Idle Period Criteria <br> • Engine speed $\geq$ 1100 RPM for a minimum of 30 seconds since end of last idle period. <br> • Engine Speed < 1100 RPM <br> • Engine run time $\geq$ 600 seconds. <br> • Vehicle Speed $\leq$ 2 mph <br> • Fuel Trim Intrusive Test and/ or  POS Diagnostic  Intrusive Test  and/or AIR Diagnostic Intrusive Test not Active <br> • Tests attempted this trip $\leq$ 6 <br> Idle conditions Met Criteria <br> General Enable met; Valid Idle Period met <br> • $0 \leq$ short term fuel trim $\leq 2$ <br> • Short term fuel trim since valid idle conditions met $\leq 2$ <br> • $530°C \leq$ predicted catalyst temperature $\leq 755°C$ for at least 30 seconds with a closed throttle time $\leq$ 80 seconds consecutively ( closed throttle $\Rightarrow$ TPS < 1.503906%) <br> • Closed loop fueling <br> • Long term fuel trim learning enabled <br> • Barometric pressure > 70 kPa <br> • $75°C \leq$ ECT $\leq 126.0156°C$ <br> • System voltage > 10.7 volts <br> • $0 <$ Idle period $\leq$ 60 seconds <br>   $\Rightarrow$ Idle time is incremented if:  Vehicle Speed $\leq$ 2 mph and Throttle Position $\leq$ 1.503906% <br> • IAT < 100°C <br> • PRNDL is in Drive Range <br> Test Enable Conditions; must hold true from 5 seconds after idle conditions are met to end of test <br> • Delta IAC $\geq$ 44.00906 steps <br> Delta RPM $\leq$ 275 <br> • 3 gps $\leq$ MAF $\leq$ 10 gps          CCP DC | 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> Frequency: <br> • 12.5 ms Continuous <br><br> Rapid Step Response feature will initiate multiple tests: <br> If the difference between current EWMA value and the current OSC time difference is $\geq$ 0.623047 seconds and <br> OSC time difference $\geq$ 0.00 seconds <br> Maximum of 6 tests per trip. <br> Maximum of  11 tests to detect failure when rapid step response is enabled. <br><br> Green Converter Delay Criteria <br> • The diagnostic will not be enabled until the next ignition cycle after the following has been met: Predicted catalyst temperature $\geq 500°$ C for 3600 seconds non-continuously.   (Note that all other enable criteria must be met on the next ignition cycle for the test to run on that ignition cycle) <br> • Note:  this feature is only enabled when the vehicle is new and | 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 |
|---|---|---|---|---|---|---|
| Evaporative Emission (EVAP) System Small Leak Detected (EONV) | P0442 | This DTC will detect a small leak (>= 0.020") in the EVAP system between the fuel fill cap and the purge solenoid. | SMALL LEAK TEST FAIL: Engine Off Natural Vacuum (EONV) The total pressure change achieved during the test is normalized against a target value that is based upon fuel level and ambient temperature. (values range from 1.85" water to 2.75" 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 = 0.630 Re-Pass threshold = 0.450 | TEST ENABLE : VS Sensor DTC's not active No Fuel Tank Pressure Sensor DTC's No EVAP Canister Purge Solenoid DTC's No EVAP Canister Vent Solenoid DTC's Coolant Sensor DTC's not active IAT Sensor DTC's not active EVAP Vacuum Sensor Performance DTC not active. EVAP CCP stuck open DTC not active. EVAP large leak DTC not active. Ignition off timer DTC not active. Fuel Level >15.0% but < 85.0% No thermostat rationality DTC's No Fuel level DTC's<br><br><br>Valid Cold Start Startup ECT > 4°C but < 30° C Startup IAT > 4°C but < 30° C Startup Δ°C(ECT-IAT) < 8°C if ECT > IAT Estimated ambient temperature at end of drive > 2°C but < 32°C. Drive time >= 600 seconds. Drive length >= 5.2 miles. Coolant >= 70°C. No fuel filling (fuel level increment >= 10%) During EONV test. BARO > 74.0kPa | 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. No more than 2 attempts per day. | DTC Type A EWMA<br><br>Average run length: 7 |

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|---|---|---|---|---|---|---|
| Evaporative Emission (EVAP) Purge Solenoid Control Circuit | P0443 | This DTC checks the Purge Solenoid Control Circuit for electrical integrity | Output state is invalid | • Ignition switch is in crank or run<br>• 11< Ignition Voltage < 18 | 15 failure out of 20 samples<br>OR<br>Chip protection logic indicates a short failure 1 time<br><br>Frequency:<br>Continuous<br>100 ms loop<br><br>Chip protection logic:<br>5 failures out of 10 samples indicate a short<br><br>Frequency of this logic is 12.5 ms loop<br>Continuous<br><br>Once the chip protection logic detects 5 failures out of 10 samples, the driver is turned off for the rest of the trip. | 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 > 10.00 "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 675 seconds | DTC Type B |

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|---|---|---|---|---|---|---|
| Evaporative Emission (EVAP) Vent Solenoid Control Circuit | P0449 | This DTC checks the output driver for electrical integrity | Output state is invalid | • Ignition switch is in crank or run<br>• 11< Ignition Voltage < 18 | 15 failures out of 20 samples<br><br>Frequency:<br>Continuous<br>100 ms loop | DTC Type B |
| 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 = 0.73<br>Re-Pass threshold = 0.40 | 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<br><br>Average run length:  6 |

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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 |
|---|---|---|---|---|---|---|
| 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>• PCM State <> crank | Frequency: Continuous 100ms loop | DTC Type B |
| Fuel Tank Pressure (FTP) Sensor Circuit High Voltage | P0453 | This DTC will detect a fuel tank pressure sensor signal that is too high out of range. | Fuel tank pressure sensor  signal > 4.90 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>• PCM state <> crank | Frequency: Continuous 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 > 6.00  liters BEFORE Tank vacuum < 8  inH$_2$O<br><br>2 liters of fuel must be consumed after setting the DTC active the first time to the DTC active the second time.<br><br>Weak Vacuum Followup Test Weak Vacuum Test failed previous trip and this trip. Passes if tank vacuum > 8 in. H2O.<br><br>Note:  Weak vacuum Followup Test can only report a pass. | 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)<br><br>Cold Start Test<br>• IAT <  30°C<br>• Cold temperature Δ(ECT-IAT):<br>  <  150 °C if IAT>ECT<br>  < 8  °C if ECT > IAT<br>• Cold Test Timer < 675 seconds | Once per cold start<br><br>Time is dependent on driving conditions<br><br>Max. before test abort is 675 seconds | DTC Type B |
| Fuel Level Sensor Circuit Low | P0462 | This DTC will detect a fuel sender stuck out of range  low. | Fuel level A/D counts less than 28 A/D counts for 10 seconds | • runs continuously | | DTC Type B |
| Fuel Level Sensor Circuit High | P0463 | This DTC will detect a fuel sender stuck out of range high. | Fuel level A/D counts more than 133 A/D counts for 30 seconds | • runs continuously | | 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 |

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|---|---|---|---|---|---|---|
| Cooling Fan 1 Control Circuit | P0480 | This DTC checks the output driver for electrical integrity | Output state is invalid | • Ignition switch is in crank or run<br>• 9 < Ignition Voltage < 18<br>• Fan must be commanded on >0.5 seconds | 15 failure out of 20 samples<br>OR<br>chip protection logic indicates a short failure 1 time<br><br>Frequency:<br>Continuous<br>100 ms loop<br><br>Chip protection logic:<br>5 failures out of 10 samples indicate a short<br><br>Frequency of this logic is 12.5 ms loop<br>Continuous<br><br>Once the chip protection logic detects 5 failures out of 10 samples, the driver is turned off for the rest of the trip. | DTC Type B |

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|---|---|---|---|---|---|---|
| Cooling Fan 2 Control Circuit | P0481 | This DTC checks the output driver for electrical integrity | Output state is invalid | • Ignition switch is in crank or run<br>• 9 < Ignition Voltage < 18<br>• Fan must be commanded on >0.5 seconds | 15 failure out of 20 samples<br>OR<br>chip protection logic indicates a short failure 1 time<br><br>Frequency:<br>Continuous<br>100 ms loop<br><br>Chip protection logic:<br>5 failures out of 10 samples indicate a short<br><br>Frequency of this logic is 12.5 ms loop<br>Continuous<br><br>Once the chip protection logic detects 5 failures out of 10 samples, the driver is turned off for the rest of the trip. | DTC Type B |

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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 > 8 "H2O<br><br>for<br><br> 5.00 sec<br>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 ∆(ECT-IAT):<br>  <  150 °C if IAT>ECT<br>  < 8  °C if ECT > IAT<br>• Cold Test Timer < 675 seconds | Once per cold start.<br><br>Cold start: max time is 675 seconds | DTC Type B |

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|---|---|---|---|---|---|---|
| Idle Air Control (IAC) System - RPM Too Low | P0506 | This DTC will determine if a low idle exists. | RPM < (Desired RPM – a value from a look up table based on ECT)<br><br>ECT     value<br>-40     300<br>-28     300<br>-16     300<br>-4     300<br>8     300<br>20     300<br>32     100<br>44     100<br>56     100<br>68     100<br>80     100<br>92     100<br>104     100<br>116     100<br>128     100<br>140     100<br>152     100 | Test Enable:<br>• No EVAP Canister Purge Valve Stuck Open DTC<br>• No EVAP Canister Purge Solenoid Control Circuit DTC<br>• No ECT DTC's<br>• No Fuel Injector DTC's<br>• No EGR Flow or Sensor DTC's<br>• No TAC system DTC's<br>• No IAT DTC's<br>• No Fuel Trim DTC's<br>• No MAF DTC's<br>• No TP Sensor DTC's<br>• No Misfire DTC's<br>• No VSS DTC's<br>• No MAP DTC's<br>• ECT $\geq$ -40.00  °C<br>• System Voltage $\geq$  9.00  V but $\leq$ 18.00 V<br>• IAT $\geq$  -40.00 °C<br>• Engine run time $\geq$ 1.00 seconds<br>• BARO $\geq$ 60.00 kPa<br>• TP Sensor $\leq$ 0.25%<br>• VSS $\leq$ 3.00 MPH<br>• Catalyst Diagnostic Intrusive Test = not active<br>• EGR Flow Diagnostic Intrusive Test = not active<br>• Post O2 Diagnostic Intrusive Test = not active<br>• Transmission state hasn't changed in last 0.1 seconds<br>• Above met for a time $\geq$ 2 seconds to enable diagnostic. | 8.00 seconds per test<br><br>4 tests to fail; must leave enable criteria between each test<br><br><br>Frequency:<br>Continuous after enable 100ms loop | DTC Type B |

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|---|---|---|---|---|---|---|
| Idle Air Control (IAC) System - RPM Too High | P0507 | This DTC will determine if a high idle exists.<br><br>Results in Limited Authority Mode if vehicle has Electronic Throttle Control | RPM > (Desired RPM + value from look up table based on ECT)<br><br>ECT            value<br>-40            300<br>-28            300<br>-16            300<br>-4             300<br>8              300<br>20             300<br>32             200<br>44             200<br>56             200<br>68             175<br>80             175<br>92             175<br>104            175<br>116            175<br>128            175<br>140            175<br>152            175 | Test Enable:<br>• No EVAP  Purge Valve Stuck Open DTC<br>• No EVAP Canister Purge Solenoid Control Circuit DTC<br>• No ECT DTC's<br>• No Fuel Injector DTC's<br>• No EGR Flow or Sensor DTC's<br>• No TAC system DTC's<br>• No IAT DTC's<br>• No Fuel Trim DTC's<br>• No MAF DTC's<br>• No TP Sensor DTC's<br>• No Misfire DTC's<br>• No VSS DTC's<br>• No MAP DTC's<br>• ECT $\geq$ -40.00  °C<br>• System Voltage $\geq$  9.00  V but $\leq$ 18.00 V<br>• IAT $\geq$  -40.00 °C<br>• Engine run time $\geq$ 1.00 seconds<br>• BARO $\geq$ 60.00 kPa<br>• TP Sensor $\leq$ 0.25%<br>• VSS $\leq$ 3.00 MPH<br>• Catalyst Diagnostic Intrusive Test = not active<br>• EGR Flow Diagnostic Intrusive Test = not active<br>• Post O2 Diagnostic Intrusive Test = not active<br>• Transmission state hasn't changed in last 0.1 seconds<br>• Above met for a time $\geq$ 2 seconds to enable diagnostic. | 8.00 seconds per test<br><br>4 tests to fail; must leave enable criteria between each test<br><br><br>Frequency:<br>Continuous after enable 100ms loop | DTC Type A |
| Control Module Read Only Memory (ROM) | P0601 | This DTC will be stored if the calibration check sum is incorrect | Output state invalid | • PCM state = crank or run<br>• Ignition voltage $\geq$ 5 volts<br>• Engine speed < 5000 | 1 failure<br><br>Frequency:<br>50 ms loop Continuous | 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 |
|---|---|---|---|---|---|---|
| Control Module Not Programmed | P0602 | This DTC will be stored if the PCM is a service PCM that has not been programmed. | Output state invalid | • PCM state = crank or run<br>• PCM is identified through calibration as a Service PCM | Test is run at Powerup<br><br>Test also runs:<br>Frequency:<br>100ms loop<br>Continuous | DTC Type A |
| Control Module Random Access Memory (RAM) | P0604 | Indicates that PCM is unable to correctly write and read data to and from RAM | Data read does not match data written | Ignition in Run or Crank | 1) One failure at key-up initialization.  This check is on all GMPX RAM.<br><br>OR<br><br>2) Fault counter increments by 10 for every error, decrements by 1 for every pass; fail threshold = 20.  This check is on the Desired Throttle Position RAM location and runs 12.5 ms continuous<br><br>OR<br><br>3) Fault counter increments by 10 for every error, decrements by 1 for every pass; fail threshold = 20.  This check is on all GMPX RAM and runs 100 ms continuous | DTC Type A |
| ECM/PCM Processor | P0606 | Indicates that the PCM has detected a TACM internal processor integrity fault | TACM has process sequencing error, dual path consistency error, clock error, or computer is not operating properly | Ignition in Run/Crank or during key-off | Fault sets within 200 msec Runs every 18.75 msec | DTC Type A |
| 5 Volt Reference 1 Circuit | P0641 | This DTC detects if the 5 Volt supply is too high or too low | Voltage state invalid (Voltage > 4.7 volts or voltage < 4.39 volts) | • PCM state = run | Failed for 10.00 sec<br><br>Frequency:<br>100ms loop<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 |
|---|---|---|---|---|---|---|
| Malfunction Indicator Lamp (MIL) Control Circuit | P0650 | This DTC checks the output driver for electrical integrity | Output state is shorted, open or over temperature | • Ignition switch is in crank or run<br>• 9< Ignition Voltage < 18 | 15 failure out of 20 samples for open or over temperature<br><br>chip protection logic indicates a short failure 1 time<br><br>Frequency:<br>Continuous<br>100 ms loop<br><br>Chip protection logic:<br>5 failures out of 10 samples indicate a short<br><br>Frequency of this logic is 12.5 ms loop<br>Continuous<br><br>Once the chip protection logic detects 5 failures out of 10 samples, the driver is turned off for the rest of the trip. | DTC Type B<br><br>No MIL |
| 5 Volt Reference 2 Circuit | P0651 | This DTC detects if the 5 Volt supply is too high or too low | Voltage state invalid (Voltage > 4.7 volts or voltage < 4.4 volts) | • PCM state = run | Failed for 10.00 sec<br><br>Frequency:<br>100ms loop<br>Continuous | DTC Type B |
| Accelerator Pedal Position (APP) System | P1125 | PCM determines a limp home mode of operation due to multiple accelerator pedal sensor faults. | This DTC is set when:<br>1) 1 or more APP sensors are out of range, OR<br>2) Both APP sensors disagree | • Ignition in Run or Crank.<br>• Ignition voltage > 5.23 V.<br>• Valid TACM - PCM serial data.<br>• No TACM processor DTC. | One occurrence.<br><br>Check runs every 18.75 ms. | 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 |
|---|---|---|---|---|---|---|
| O2S Insufficient Switching Bank 1 Sensor 1 | P1133 | This DTC determines if the O2 sensor is no longer sufficiently switching. | Half cycle L/R switches < 45.00 OR Half cycle R/L switches < 45.00<br><br>OR<br><br>Slope Time L/R switches < 4.00 OR Slope Time R/L switches < 4.00 | <u>Common Enable Criteria</u><br>• No TP Sensor DTC's<br>• No MAP DTC's<br>• No ECT DTC's<br>• No MAF DTC's<br>• No IAT DTC's<br>• No Evap DTC's<br>• No Fuel Injector DTC's<br>• EGR flow diagnostic Intrusive Test= Not Active<br>• Catalyst monitor diagnostic Intrusive Test= Not Active<br>• Post Oxygen Sensor Diagnostic Intrusive Test = Not Active<br>• 9 volts < system voltage < 18.00 volts<br>• Device control = Not Active<br><br><u>Specific Enable Criteria</u><br>• O2 Heater on for $\geq$ 0 seconds<br>• Bank 1 Sensor1 circuit and heater and heater drive DTCs = Not Active<br>• Bank 2 Sensor1 circuit and heater and heater driver DTCs = Not Active<br>• In one of the following four fueling cells: Purge off, normal; purge off, high flow; purge on, normal; purge on, high flow<br>• Misfire DTC = Not Active<br>• ECT  > 65.00 °C<br>• Engine run time > 60.00 seconds<br>• EVAP canister purge duty cycle $\geq$ 0.00 %<br>• 15.00   gps $\leq$ MAF $\leq$ 29.00   gps<br>• 1300  $\leq$ RPM $\leq$ 3000<br>• Throttle position $\geq$ 2.00 %<br>• Fuel state = closed loop<br>• Transmission (automatic) not in Park, Reverse or Neutral<br>• 1280 °C $\geq$ Calculated O2 temp $\geq$  -1280 °C<br><br>All of the above met for at least 2 seconds. | 90000.00 ms<br><br><u>Frequency:</u><br>Once per trip | DTC Type B |

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|---|---|---|---|---|---|---|
| O2S Transition Time Ratio Bank 1 Sensor 1 | P1134 | This DTC determines if the O2 sensor transition time between rich to lean and lean to rich is degraded | Transition time difference < -75<br><br>OR<br><br>Transition time difference > 75 | Common Enable Criteria<br>• No TP Sensor DTC's<br>• No MAP DTC's<br>• No ECT DTC's<br>• No MAF DTC's<br>• No IAT DTC's<br>• No Evap DTC's<br>• No Fuel Injector DTC's<br>• EGR flow diagnostic Intrusive Test = Not Active<br>• Catalyst monitor diagnostic Intrusive Test = Not Active<br>• Post Oxygen Sensor Diagnostic Intrusive Test = Not Active<br>• 9 volts < system voltage < 18.00 volts<br>• Device control = Not Active<br><br>Specific Enable Criteria<br>• O2 Heater on for $\geq$ 0 seconds<br>• Bank 1 Sensor1 circuit and heater and heater drive DTCs = Not Active<br>• Bank 2 Sensor1 circuit and heater and heater driver DTCs = Not Active<br>• In one of the following four fueling cells: Purge off, normal; purge off, high flow; purge on, normal; purge on, high flow<br>• Misfire DTC = Not Active<br>• ECT > 65.00 $^\circ$C<br>• Engine run time > 60.00 seconds<br>• EVAP canister purge duty cycle $\geq$ 0.00 %<br>• 15.00  gps $\leq$ MAF $\leq$ 29.00  gps<br>• 1300  $\leq$ RPM $\leq$ 3000<br>• Throttle position $\geq$ 2.00 %<br>• Fuel state = closed loop<br>• Transmission (automatic) not in Park, Reverse or Neutral.<br>• 1280 $^\circ$C $\geq$ Calculated O2 temp $\geq$  -1280 $^\circ$C<br><br>All of the above met for at least  2 seconds. | 90000.00 ms<br><br>Frequency:<br>Once per trip | 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 |
|---|---|---|---|---|---|---|
| Engine Coolant Over Temperature - Protection Mode Active | P1258 | This DTC indicates that the engine is or has been in camel mode, where the coolant has gotten so hot that the engine is being run first on one bank of injectors, and then on the other bank, in an effort to save the engine. | Injectors are turned off due to ECT > 131°C | • ECT shorts tests not failing<br>• Engine is running<br>• Engine run time > 5 seconds | Frequency:<br>1 second<br>Continuous | DTC Type A |
| Bypass Line Monitor | P1350 | This diagnostic detects an open or short on the Electronic Spark Timing (EST) output circuits. | Fault is detected | Engine is running or cranking | 90 failure out of 100 samples<br><br>Frequency:<br>Continuous<br>100 ms loop<br><br>Once the fault logic detects a failures, the diagnostic is turned off for the rest of the trip. | DTC Type B |
| Exhaust Gas Recirculation (EGR) Closed Position Performance | P1404 | This diagnostic detects if the valve is stuck open when commanded closed. | Actual pintle position >= 5.5% of 5 volt reference voltage from learned closed position | 5 Volt reference DTC's not active<br>Engine is running<br>Off-board device not active<br>Pintle cleaning not active<br>P0401 not intrusive<br>Ignition voltage ≥ 11 volts<br>EGR valve icing or over temperature not occurring.<br>EGR is enabled<br>Desired EGR position = 0%, for 1 sec. | 4 failure detections of:<br>360 fail counts out of 400 sample counts<br>(with pintle movement between failure detections of 40% for at least 1 second open time)<br><br>Frequency:<br>100ms loop<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 |
|---|---|---|---|---|---|---|
| Throttle Actuator Control (TAC) Module Throttle Actuator Position Performance | P1516 | 1)  Indicates that the TAC Module has detected a throttle positioning error<br><br><br><br>OR<br><br>2)  Either Processor cannot determine throttle positioning<br><br>OR<br><br>3) Both TP Sensors are invalid | 1) Absolute value of the throttle error:<br>a) ≥2 degrees for >200 ms with no change in Commanded Throttle Position.<br>OR<br>b) ≥2 degrees for >500 ms for throttle command changes ≥ 2 degrees.<br>OR<br>c) ≥ 5 degrees for >200 ms for throttle command changes ≥ 5 degrees.<br>OR<br>d) ≥ 5 degrees for > 300 ms as commanded throttle changes continuously (no step change)<br><br>[Throttle error = Measured throttle position - commanded throttle position]<br><br>OR<br><br>2a) PCM processor DTC's.<br>OR<br>2b) TACM processor DTC.<br><br>OR<br><br>3a) both TP Sensor Circuit DTC's are set.<br>OR<br>3b) PCM-TACM Serial Data DTC with any APP Sensor DTC or TP Sensor DTC.<br>[Throttle error = Measured throttle position - commanded throttle position] | • Ignition in Run or Crank.<br>• Ignition voltage > 5.23 V.<br>• Valid TACM - PCM serial data.<br>• Not in battery saver mode. | One occurrence.<br><br>Check runs every 3 ms. | DTC Type A |

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|---|---|---|---|---|---|---|
| Control Module Throttle Actuator Position Performance | P2101 | Indicates that the PCM has detected a throttle positioning error | Absolute value of the throttle error > 6%.<br><br>[Throttle error = Measured throttle position - modeled throttle position] | • Ignition in Run or Crank<br>• TACM determines PCM Desired Throttle Position is valid.<br>• Not in battery saver mode.<br>• No Airflow Actuation DTC.<br>• (Engine Running = true) OR (Ignition Voltage > 8.5 volts).<br>• No Throttle Actuation DTC.<br>• No PCM-TACM Serial Data DTC.<br>• Both TP Sensor Circuit DTC's are not set.<br>• No PCM Processor DTC's.<br>• No TACM Processor DTC. | High counter increments by 2 for every throttle error > 6%; decrements by 1 if 0% < throttle error <5%; decrements by 5 if -6% < throttle error <0%; clears if throttle error < -6%.<br><br>Check runs every 18.75 ms with TACM - PCM valid message received.<br>Low counter increments by 2 for every throttle error < -6%; decrements by 1 if -6%<throttle error <0%; decrements by 5 if 0%<throttle error <6%; clears if throttle error > 6%.<br><br>Check runs every 18.75 ms with TACM - PCM valid message received. | DTC Type A |

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|---|---|---|---|---|---|---|
| Throttle Actuator Control (TAC) Module Performance | P2108 | Indicates that TAC Module is unable to correctly read data from the flash memory.<br><br>Indicates that TAC Module is unable to correctly write and read data to and from RAM.<br><br>Indicates that the TAC Module has detected an internal processor integrity fault. | 1) Power-up test fails to read/write data OR<br>2) Maximum allowed Running Resets exceeded OR<br>3) ROM checksum does not match expected checksum OR<br>4) RAM data read does not match data written OR<br>5) Failure of Interrupt process flag to match expected value. OR<br>6) Program is not executed in the proper order OR<br>7) Primary and Redundant RAM variables disagree OR<br>8) Primary and Redundant Indicated Pedal Position calculation difference > 0.0%. OR<br>9) Math/Logic test fails to equate to a predetermined value. OR<br>10) Internal Register data read does not match data written. OR<br>11) Internal Timer fails to increment OR<br>12) Watchdog Timer fails to increment OR<br>13) Failure of Processor Stack pointer to zero at Main Loop. | • Ignition in Run or Crank.<br>• Ignition voltage > 5.23 V.<br>• Valid TACM - PCM serial data. | 1) One occurrence<br><br>Check runs at Reset initialization<br><br>2) 10 occurrences during ignition cycle<br><br>Check runs at Reset initialization<br><br>3) One occurrence.<br><br>Check runs at power up and every 60 seconds thereafter.<br><br>4) One occurrence.<br><br>Check runs at power up and every 800 milliseconds thereafter<br><br>5) - 13) One occurrence.<br><br>Check runs every 3 milliseconds. Second Watchdog timer runs in 10 millisecond loop. | DTC Type A |

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|---|---|---|---|---|---|---|
| Accelerator Pedal Position (APP) Sensor 1 Circuit | P2120 | 1) TACM indicates a continuous or intermittent short or open in either the signal circuit or the APP sensor #1. OR 2) TACM indicates an invalid minimum mechanical position for the APP sensor #1. OR 3) TACM indicates reference voltage out of range. | 1) Raw APP sensor signal < 0.235 V or > 4.487 V. OR 2) APP sensor minimum mechanical stop voltage < 0.235 V. OR 3) Reference Voltage  < 4.54 V or > 5.21 V. | • Ignition in Run or Crank. • Ignition voltage > 5.23 V. • Valid TACM - PCM serial data. • No TACM processor DTC. | 1) & 2) Counter increments by 4 for every error, decrements by 1 for every pass; threshold is 133. Check runs every 3 ms. | DTC Type A |
| Accelerator Pedal Position (APP) Sensor 2 Circuit | P2125 | 1) TACM indicates a continuous or intermittent short or open in either the signal circuit or the APP sensor #2. OR 2) TACM indicates an invalid minimum mechanical position for the APP sensor #2. OR 3) TACM indicates reference voltage out of range. | 1) Raw APP sensor signal < 0.235 V or > 4.487 V. OR 2) APP sensor minimum mechanical stop voltage > 0.235 V. OR 3) Reference voltage < 4.54 V or > 5.21 V. | • Ignition in Run or Crank. • Ignition voltage > 5.23 V. • Valid TACM - PCM serial data. • No TACM processor DTC. | 1) & 2) Counter increments by 4 for every error, decrements by 1 for every pass; threshold is 180. Check runs every 3 ms. | 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 |
|---|---|---|---|---|---|---|
| Throttle Position (TP) Sensor 1-2 Correlation | P2135 | 1) TACM indicates a continuous or intermittent correlation fault between TP sensors #1 and #2. OR 2) TACM indicates an invalid minimum mechanical position correlation between TP sensor #1 and #2. OR 3) TP Sensor 1 signal short to TP Sensor 2 signal, Any reference, or ground. | 1) Absolute value of (TP Sensor 1 raw – TP Sensor 2 raw) < 6.0%. OR 2) TP Sensor 1 signal to TP Sensor 2 signal > 0.05V when TP Sensor 2 reference = 0.0 V. | • Ignition in Run or Crank. • Ignition voltage > 5.23 V. • Valid TACM - PCM serial data. • No TACM processor DTC. | 1) Counter increments by 4 for every error, decrements by 1 for every pass; threshold is 180.  Check runs every 3 ms.  2) One occurrence.  Check runs at power-up  3) Counter increments by 4 for every error, decrements by 1 for every pass: threshold is 133  Check runs every 3ms.. | DTC Type A |
| Accelerator Pedal Position (APP) Sensor 1-2 Correlation | P2138 | 1) TACM indicates a continuous or intermittent correlation fault between APP sensors #1 and #2 OR 2) TACM indicates an invalid minimum mechanical position correlation between APP sensor #1 and #2. OR 3) APP sensor 1 signal short to APP sensor 2 signal, any reference, or ground. | 1)Absolute value of ( raw APP sensor #2 voltage - raw APP sensor #1 voltage) > 0.269 V.  OR 2) APP sensor 1 to APP sensor 2 > 0.05V when APP sensor 2 reference is 0.0 V. | • Ignition in Run or Crank. • Ignition voltage > 5.23 V. • Valid TACM - PCM serial data. • No TACM processor DTC. | 1) Counter increments by 4  for every error, decrements by 1 for every pass; threshold is 180  Check runs every 3 ms.  2) Counter increments by 4 for every error, decrements by 1 for every pass: threshold is 1333  Check runs every 3ms.. | DTC Type A |
| AIR System Pressure Sensor A Circuit | P2430 | Detects a stuck-in-range AIR pressure sensor signal. | Stuck in Range Average Error < 0.5 AND Stuck in Range Variance < 1.0 | No active DTC P0412 set. No active DTC P0418 set. No active DTC P0606 set. No active DTC P2432 set. No active DTC P2433 set. No active 5 volt reference DTCs set. AIR pressure sensor circuit fault pending = False. AIR pump is commanded ON | Stuck in Range Cumulative Info > 5 sec.  Once per trip where AIR pump operation is requested at startup. | DTC Type B |

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|---|---|---|---|---|---|---|
| AIR System Pressure Sensor A Performance | P2431 | Detects a skewed or drifting AIR pressure sensor signal | Difference between AIR Pressure Sensor and Barometric pressure > 10 kPa with AIR pump commanded OFF. OR Difference between AIR Pressure Sensor and Barometric pressure > 50 kPa with AIR pump commanded ON. | No active DTC P0606 set. No active DTC P0412 set. No active DTC P0418 set. No active DTC P2432 set. No active DTC P2433 set. No active 5 volt reference DTCs set. No active MAP sensor DTCs set. AIR pressure sensor circuit fault pending = False. | Air Pressure Sensor Performance cumulative info > 30 seconds.  Cumulative info is updated at a rated determined by Barometric pressure reading quality.  Baro quality is determined by distance traveled since last key-on or part throttle Baro update.  Continuous, 100ms loop. | DTC Type B |
| AIR System Pressure Sensor A Circuit Low | P2432 | Detects a low out-of-range AIR pressure sensor signal | AIR Pressure Sensor signal < 5% of 5V ref. | No active DTC P0606 set. No active 5 volt reference DTCs set. | 400 fail counts out of 1000 sample counts.  Continuous, 12.5 ms loop. | DTC Type B |
| AIR System Pressure Sensor A Circuit High | P2433 | Detects a high out-of-range AIR pressure sensor signal | AIR Pressure Sensor signal > 95% of 5V ref. | No active DTC P0606 set. No active 5 volt reference DTCs set. | 400 fail counts out of 1000 sample counts.  Continuous, 12.5 ms loop. | 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 |
|---|---|---|---|---|---|---|
| AIR System Switch / Valve Stuck Open | P2440 | Detects an AIR system control valve stuck open condition.<br><br>This test is run during the phase 2 (pump on, control valve shut) portion of the SAI diagnostic. | AIR normalized pressure error < -3 kPa (lower than predicted pressure) during SAID phase 2 test | No active AIR pressure sensor circuit DTCs set.<br>No active AIR pressure sensor performance DTCs set.<br>No active MAP sensor DTCs set.<br>No active AIR pump relay circuit DTC set.<br>No active AIR control valve relay circuit DTC set.<br>No active MAF sensor DTCs set.<br>No active 5 volt reference DTCs set.<br>No active IAT sensor DTCs set.<br>No active ECT sensor DTCs set.<br>No active Misfire DTCs set.<br>No active catalyst monitor DTCs set.<br>No active fuel injector DTCs set.<br>No active EST DTCs set.<br>No active DTC P0411 set.<br>No active DTC P0606 set.<br>AIR pressure sensor circuit fault pending = False.<br>AIR operation is allowed this start.<br>BARO > 65 kPa.<br>3 g/sec < Mass Air Flow < 26 g/sec.<br>18 volts > System voltage > 10.5 volts. | SAID phase 2 conditional test weight > 1.5 seconds<br><br>Conditional test weight is based on Baro, Mass air flow & System voltage.<br><br>Once per trip where AIR pump operation is requested at startup. | 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 |
|---|---|---|---|---|---|---|
| AIR System Pump Stuck On | P2444 | Detects an AIR pump stuck ON condition.<br><br>This test is run during the phase 3 (pump off) portion of the SAI diagnostic. | AIR normalized pressure error > 1.5 kPa (higher than predicted pressure) during SAID phase 3 test | No active AIR pressure sensor circuit DTCs set.<br>No active AIR pressure sensor performance DTCs set.<br>No active MAP sensor DTCs set.<br>No active AIR pump relay circuit DTC set.<br>No active AIR control valve relay circuit DTC set.<br>No active MAF sensor DTCs set.<br>No active 5 volt reference DTCs set.<br>No active IAT sensor DTCs set.<br>No active ECT sensor DTCs set.<br>No active Misfire DTCs set.<br>No active catalyst monitor DTCs set.<br>No active fuel injector DTCs set.<br>No active EST DTCs set.<br>No active DTC P0411 set.<br>No active DTC P0606 set.bb<br>No active DTC P2440 set.<br>AIR pressure sensor circuit fault pending = False.<br>AIR operation is allowed this start.<br>SAID post control time < 14 seconds | Within 5 seconds of the AIR pump being commanded OFF.<br><br>Once per trip where AIR pump operation is requested at startup. | 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 |
|---|---|---|---|---|---|---|
| ECM/PCM Internal Engine Off Timer Performance | P2610 | This DTC determines if the ignition off timer has failed. | A failure will be reported if any of the following occur:<br><br>Ignition Off Time < 0 seconds<br><br>Ignition Off Time > 8 seconds<br><br>Sample Counter > 25<br><br>Ignition Off Time < Old Ignition Off Time<br><br>On positive timer transition<br>Sample Counter < 7<br><br> or<br><br>Sample Counter > 13<br><br> Or<br><br>( Ignition Off Time - Old Ignition Off Time) ≠ 1 second<br><br>note:  Sample Counter is incremented if Ignition Off Time = Old Ignition Off Time | Test Run This Trip = FALSE<br><br>Ignition Off Timer Enabled = TRUE<br>(PCM State = Poweroff; Time in poweroff ≥ 1.6 seconds) | Frequency:<br>100 ms loop<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 |
|---|---|---|---|---|---|---|
| O2 Sensor Circuit Range/Performance Bank 1 Sensor 1 | P2A00 | This DTC determines if the O2 sensor voltage is not meeting the voltage criteria to enable closed loop fueling. | Closed loop fuel control O2 sensor Ready flag set to "Not Ready." <br><br>O2 sensor voltage must be > 600 millivolts or < 300 millivolts to set closed loop fuel O2 Ready flag. Once set to "Ready," the O2 sensor voltage cannot be > 300 millivolts and  < 600 millivolts for > 10 seconds or the O2 Ready flag will be reset to "Not Ready." | • No TP Sensor DTC's <br>• No MAF DTC's <br>• No MAP DTC's <br>• No ECT DTC's <br>• No Bank 1 Sensor 1 or Bank 2 Sensor 1 O2 DTC's <br>• Engine Run Time $\geq$ 180 seconds <br>• ECT $\geq$ 65° C <br>• Traction Control = Not Active <br>• Not in Catalyst Protection Mode <br>• 9 volts $\leq$ Ignition Voltage $\leq$ 18 volts <br>• 602 $\leq$ Engine Speed $\leq$ 3000 <br>• 5gps $\leq$ Mass Airflow $\leq$ 38gps <br>• 3% $\leq$ TP Sensor $\leq$ 35% <br>• Not in Decel Fuel Cutoff Mode <br>• Not in Power Enrichment <br>• Calculated O2 temp $\geq$ -1280°C <br> All of the above met for 3 seconds | 300 test failures in a 360 test sample <br><br>Frequency: <br>Continuous <br>100ms loop | DTC Type B |

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|---|---|---|---|---|---|---|
| O2 Sensor Circuit Range/Performance Bank 1 Sensor 2<br><br>(Intrusive test runs on unified cycle) | P2A01 | This DTC determines if the post catalyst O2 sensor is stuck in a normal voltage range and thereby can no longer be used for post oxygen sensor fuel control or for catalyst monitoring.  The diagnostic includes a passive (stage 1) test and an intrusive (stage 2) test.  The stage 2 increases or reduces delivered fuel to achieve the required rich or lean threshold. | Post catalyst O2 sensor cannot achieve voltage $\geq$ 685.76 millivolts and voltage $\leq$ 290.8 millivolts | Common Enable Criteria<br>• No O2 circuit, heater, response or heater driver DTC's active<br>• No TP Sensor DTC's<br>• No MAF DTC's<br>• No ECT DTC's<br>• No MAP DTC's<br>• No IAT DTC's<br>• No EVAP DTC's<br>• No Fuel Injector DTC's<br>• 9 volts $\leq$ system voltage $\leq$ 18 volts<br>• Engine Runtime $\geq$ 6 seconds<br><br>Stage 2 Specific Enable Criteria:<br>• Stage 1 portion of test not passed.<br>• No active misfire DTCs<br>• No active fuel trim DTCs<br>• Must be in one of the following fuel cells: Purge, normal; Purge, high flow<br>• 1000 rpm $\leq$ Engine Speed $\leq$ 3000 rpm<br>• 13 gps $\leq$ Airflow $\leq$ 40 gps<br>• 20 mph $\leq$ Vehicle Speed $\leq$ 80 mph<br>• EGR Flow diagnostic intrusive test not active<br>• 96 $\leq$ Short term fuel trim $\leq$ 104<br><br>All of the above met for at least 2.5 seconds, and then:<br><br>• Fuel state = closed loop<br>EVAP diagnostic not in control of purge | Stage 1:<br>Up to 380 seconds<br><br>Stage 2:<br>Up to 11.0 seconds for each threshold<br><br>Frequency:<br>One test per  trip | DTC Type B |

**2005    3.8L (L26)**  *with*  Air Injection Reaction  (AIR)
**ENGINE  DIAGNOSTIC  PARAMETERS**

## LOOK UP TABLES

P0101: (Calculated Flow – Measured Flow)  Lookup Table: 3.8L (L26) with AIR

| Calculated Airflow | Airflow Delta |
|---|---|
| Grams_Air_0 | 15 |
| Grams_Air_40 | 20 |
| Grams_Air_80 | 25 |
| Grams_Air_120 | 35 |
| Grams_Air_160 | 35 |
| Grams_Air_200 | 35 |
| Grams_Air_240 | 35 |
| Grams_Air_280 | 400 |
| Grams_Air_320 | 400 |
| Grams_Air_360 | 400 |
| Grams_Air_400 | 400 |

**2005    3.8L (L26)**  *with*  Air Injection Reaction  (AIR)
**ENGINE  DIAGNOSTIC  PARAMETERS**

## LOOK UP TABLES

P0300:  Catalyst Damaging Misfire Percentages as a Function of Engine Speed and Load Table: L26 with AIR

| Eng. Load ↓ / Eng. RPM → | 0 RPM | 1000 RPM | 2000 RPM | 3000 RPM | 4000 RPM | 5000 RPM | 6000 RPM | 7000 RPM |
|---|---|---|---|---|---|---|---|---|
| 0 Load_In_Percent | 31.875% | 31.875% | 31.875% | 31.875% | 31.875% | 31.875% | 31.875% | 31.875% |
| 10 Load_In_Percent | 31.875% | 31.875% | 31.875% | 31.875% | 31.875% | 31.875% | 31.875% | 31.875% |
| 20 Load_In_Percent | 31.875% | 31.875% | 5.00% | 5.00% | 5.00% | 5.00% | 5.00% | 5.00% |
| 30 Load_In_Percent | 31.875% | 31.875% | 5.00% | 5.00% | 5.00% | 5.00% | 5.00% | 5.00% |
| 40 Load_In_Percent | 31.875% | 31.875% | 5.00% | 5.00% | 5.00% | 5.00% | 5.00% | 5.00% |
| 50 Load_In_Percent | 31.875% | 31.875% | 5.00% | 5.00% | 5.00% | 5.00% | 5.00% | 5.00% |
| 60 Load_In_Percent | 31.875% | 31.875% | 5.00% | 5.00% | 5.00% | 5.00% | 5.00% | 5.00% |
| 70 Load_In_Percent | 31.875% | 31.875% | 5.00% | 5.00% | 5.00% | 5.00% | 5.00% | 5.00% |
| 80 Load_In_Percent | 31.875% | 31.875% | 5.00% | 5.00% | 5.00% | 5.00% | 5.00% | 5.00% |
| 90 Load_In_Percent | 31.875% | 31.875% | 5.00% | 5.00% | 5.00% | 5.00% | 5.00% | 5.00% |
| 100 Load_In_Percent | 31.875% | 31.875% | 5.00% | 5.00% | 5.00% | 5.00% | 5.00% | 5.00% |

**2005    3.8L (L26)** *with* Air Injection Reaction  (AIR)
**ENGINE  DIAGNOSTIC  PARAMETERS**

## LOOK UP TABLES

P0401:  Engine Run Time as a Function of Coolant Temperature Table: 3.8L (L26) with AIR

| Coolant Temperature at Startrun | Engine Run Time (seconds) |
|---|---|
| Deg_C_m40 | 120 |
| Deg_C_m30 | 120 |
| Deg_C_m20 | 120 |
| Deg_C_m10 | 120 |
| Deg_C___0 | 120 |
| Deg_C__10 | 65 |
| Deg_C__20 | 50 |
| Deg_C__30 | 50 |
| Deg_C__40 | 50 |
| Deg_C__50 | 50 |
| Deg_C__60 | 50 |
| Deg_C__70 | 45 |
| Deg_C__80 | 35 |
| Deg_C__90 | 20 |
| Deg_C_100 | 20 |
| Deg_C_110 | 20 |
| Deg_C_120 | 60 |
| Deg_C_130 | 65 |
| Deg_C_140 | 70 |

**2005   3.8L (L26) _with_ Air Injection Reaction  (AIR)**
**ENGINE  DIAGNOSTIC  PARAMETERS**

**LOOK UP TABLES**

P0420:  Average Base Pulse Width Maximum Allowed Value as a Function of Airflow Table: 3.8L (L26) with AIR

| Airflow in gps | Average BPW in milliseconds |
|---|---|
| 0 | 100.0029 |
| 1 | 100.0029 |
| 2 | 100.0029 |
| 3 | 100.0029 |
| 4 | 100.0029 |
| 5 | 100.0029 |
| 6 | 100.0029 |
| 7 | 100.0029 |
| 8 | 100.0029 |
| 9 | 100.0029 |
| 10 | 100.0029 |
| 11 | 100.0029 |
| 12 | 100.0029 |
| 13 | 100.0029 |
| 14 | 100.0029 |
| 15 | 100.0029 |
| 16 | 100.0029 |

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**LOOK UP TABLES**

P0420:  Average Base Pulse Width Minimum Allowed Value as a Function of Airflow Table:  3.8L (L26)  with AIR

| Airflow in gps | Average BPW in milliseconds |
|:---:|:---:|
| 0 | 0 |
| 1 | 0 |
| 2 | 0 |
| 3 | 0 |
| 4 | 0 |
| 5 | 0 |
| 6 | 0 |
| 7 | 0 |
| 8 | 0 |
| 9 | 0 |
| 10 | 0 |
| 11 | 0 |
| 12 | 0 |
| 13 | 0 |
| 14 | 0 |
| 15 | 0 |
| 16 | 0 |