

**2006 2.0L (LSJ) when used in: ION, Cobalt 2.2L (L61) when used in: Malibu, ION, Cobalt, HHR
2.8 (LK5) when used in: Colorado, Canyon
4.2L (LL8) when used in: Trailblazer, Envoy, Rainier, Saab 9-7, Isuzu Ascender**

ENGINE DIAGNOSTIC PARAMETERS

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SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
HO2S Heater Control Circuit Bank 1 Sensor 1	P0030	Output state invalid	Circuit fault indicated	11 V < System Voltage < 18 V Engine Speed > 425 RPM	10 fails out of 12 samples	DTC Type B
HO2S Heater Control Circuit Bank 1 Sensor 2	P0036	Output state invalid	Circuit fault indicated	11 V < System Voltage < 18 V Engine Speed > 425 RPM	10 fails out of 12 samples	DTC Type B
MAP/MAF/Throttle Position Correlation	P0068	Detect when Manifold Absolute Pressure and Measured Airflow does not match estimated engine airflow as established by the TPS	Difference between measured MAP and Estimated MAP < 30 kPa Difference between measured MAF and Estimated MAF < 20 g/s	Engine running =true Engine Speed > 800 RPM	187.5 ms continuous in the main μ P	DTC Type A
Mass Airflow (MAF) Sensor Performance	P0101	This DTC determines if the MAF sensor is stuck within the normal operating range.	Filtered airflow error > 10 grams per second and Filtered manifold pressure 2 error > 20 kPa and Filtered throttle error < 230 kPa grams per second	No MAF circuit DTCs set No MAP circuit DTCs set No EGR DTCs set No ECT circuit DTCs set No IAT circuit DTCs set No CKP DTCs set Engine Speed > 400RPM 70°C < Engine Coolant Temperature < 125°C -7°C < Intake Air Temperature < 125°C	Immediate Frequency: 12.5 ms loop Continuous	DTC Type B
MAF Sensor Circuit Low Frequency	P0102	This DTC detects a continuous short to low or open in either the signal circuit or the MAF sensor.	MAF sensor signal < 100 Hz	Engine Run Time > 5 seconds Engine Speed > 500 rpm System Voltage > 11 V Enable Criteria Stable Time > 2.5 seconds	30 test failures in a 40 test sample Once per revolution	DTC Type B
MAF Sensor Circuit High Frequency	P0103	This DTC detects a continuous short to high in either the signal circuit or the MAF sensor.	MAF sensor signal > 11000 Hz	Engine Run Time > 5 seconds Engine Speed > 500 rpm System Voltage > 11 V Enable Criteria Stable Time > 2.5 seconds	30 test failures in a 40 test sample Once per revolution	DTC Type B

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Manifold Absolute Pressure (MAP) Sensor 1 Performance	P0106	This DTC determines if the MAP sensor is stuck within the normal operating range.	Filtered manifold pressure 1 error > 20 kPa And Filtered manifold pressure 2 error > 20 kPa And Filtered throttle error < 230 kPa grams per second	No MAF circuit DTCs set No MAP circuit DTCs set No EGR DTCs set No ECT circuit DTCs set No IAT circuit DTCs set No CKP DTCs set Engine Speed > 400 RPM 70°C < Engine Coolant Temperature < 125°C -7°C < Intake Air Temperature < 125°C	Immediate Frequency: 12.5 ms loop Continuous	DTC Type B
MAP Circuit Low Input	P0107	This DTC detects a continuous short to low or open in either the signal circuit or the MAP sensor.	MAP < 1.0% of 5 Volt reference	No TPS DTC's No 5 Volt Reference DTC's Controller State = RUN [(TPS > 0% & Engine Speed < 1100 rpm) or (TPS > 5.0% & Engine Speed > 1100 rpm)]	320 test failures in a 400 test sample 80 samples/sec	DTC Type B
MAP Circuit High Input	P0108	This DTC detects a continuous short to high or open in either the signal circuit or the MAP sensor.	MAP > 86.0% of 5 Volt reference	No TPS DTC's No 5 Volt Reference DTC's Controller State = RUN Engine Run Time > table value based on start-up coolant temperature [(TPS > 2.2% & Engine Speed < 1100 rpm) or (TPS > 4.5% & Engine Speed > 1100 rpm)]	320 test failures in a 400 test sample 80 samples/sec	DTC Type B
IAT Sensor Circuit Low Voltage	P0112	This DTC determines if the IAT sensor is shorted low by checking for an IAT sensor resistance below a threshold	IAT Resistance < 25 Ohms	No ECT DTC's No VSS DTC's ECT < 110°C VSS > 25 mph Engine Run Time > 10 seconds	50 test failures in a 100 test sample 4 samples/sec	DTC Type B
IAT Sensor Circuit High Voltage	P0113	This DTC determines if the IAT sensor is shorted high by checking for an IAT sensor resistance above a threshold	IAT Resistance > 1500000 Ohms	No ECT DTC's No VSS DTC's No MAF DTC's ECT > 50°C VSS < 1 mph MAF < 12 g/s Engine Run Time > 10 seconds	50 test failures in a 100 test sample 4 samples/sec	DTC Type B

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High Sided Coolant Rationality	P0116	This DTC detects if the ECT sensor is biased high in range. If the engine has been off long enough, both ECT and IAT should be approximately equal to ambient.	A. The difference between ECT and IAT is >100 °C (180 °F) B. The difference between ECT and IAT is > 15.75 °C (27 °F) C. The difference between ECT and IAT is > 15.75 °C (27 °F)	No MAF, IAT, or VSS DTCs set No ECT sensor circuit DTCs set IAT > 10°C Ignition Off Time > 8 hours (threshold A) OR Vehicle driven > 6.7 min over 25mph IAT drops < 5 °C (9 °F) (threshold B) OR Fuel Level > 2.5% Engine Crank without start > 30 sec (threshold C)	30 seconds <u>Frequency:</u> Once per ignition cycle 1 second loop	DTC Type B
ECT Sensor Circuit Low Voltage	P0117	This DTC determines if the ECT sensor is shorted low by checking for an ECT sensor resistance below a threshold	ECT Resistance < 25 Ohms	No IAT DTC's IAT ≤ 70 °C or Engine run time ≥ 10 sec.	50 test failures in a 100 test sample 1 sample/sec	DTC Type B
ECT Sensor Circuit High Voltage	P0118	This DTC determines if the ECT sensor is shorted high by checking for an ECT sensor resistance above a threshold	ECT Resistance > 750000 Ohms	No IAT DTC's IAT ≥ -7 °C or Engine run time ≥ 60 sec.	50 test failures in a 100 test sample 1 sample/sec	DTC Type B
Throttle Position (TP) Sensor 1 Circuit	P0120	Detects a continuous or intermittent short or open in TP sensor #1 circuit	0.275V > Raw TPS sensor signal > 4.725 V	Ignition in unlock/accessory, run or crank Ignition Voltage > 5.23 V No Vref Fault	20/40 Cts 10 Cnts Continuous 12.5 ms /Ct in the MCP	DTC Type A MIL
Throttle Position (TP) Sensor 1 Performance	P0121	This DTC determines if the TP sensor is stuck within the normal operating range.	Filtered throttle error > 230 kPa grams per second and Filtered manifold pressure 2 error < 20 kPa	No MAF circuit DTCs set No MAP circuit DTCs set No EGR DTCs set No ECT circuit DTCs set No IAT circuit DTCs set No CKP DTCs set Engine Speed > 400 RPM 70°C < Engine Coolant Temperature < 125°C -7°C < Intake Air Temperature < 125°C	Immediate <u>Frequency:</u> 12.5 ms loop Continuous	DTC Type B

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Throttle Position (TP) Sensor 1 Circuit OOR Low	P0122	Detects a continuous or intermittent low voltage situation in TP sensor #1 circuit	0.275V > Raw TPS sensor signal	Ignition in unlock/accessory, run or crank Ignition Voltage > 5.23 V No Vref Fault	20/40 Cts 10 Cnts Continuous 12.5 ms /Ct in the MCP	DTC Type A MIL
Throttle Position (TP) Sensor 1 Circuit OOR High	P0123	Detects a continuous or intermittent high voltage situation in TP sensor #1 circuit	Raw TPS sensor signal > 4.725 V	Ignition in unlock/accessory, run or crank Ignition Voltage > 5.23 V No Vref Fault	20/40 Cts 10 Cnts Continuous 12.5 ms /Ct in the MCP	DTC Type A MIL
Engine Coolant Temperature (ECT) Insufficient for Closed Loop Fuel Control	P0125	This DTC detects if the engine coolant temperature rises too slowly due to an ECT sensor or cooling system fault.	Actual accumulated airflow > predicted accumulated airflow and engine coolant temperature < 8 °C	No MAF, IAT, or VSS DTCs set No ECT sensor circuit DTCs set Start up ECT < 8°C Minimum Average Airflow > 30 gram per second Vehicle speed > 5 MPH for 1 kilometer 30 sec < Engine Run Time < 1800 sec IAT ≥ -7 °C	30 Seconds < Engine Run Time < 30 minutes <u>Frequency:</u> Once per ignition cycle 1 second loop	DTC Type B
Engine Coolant Temperature (ECT) Below Thermostat Regulating Temperature	P0128	This DTC detects if the engine coolant temperature rises too slowly due to an ECT sensor or cooling system fault.	Actual accumulated airflow > predicted accumulated airflow and engine coolant temperature < 80 °C	No MAF, IAT, or VSS DTCs set No ECT sensor circuit DTCs set Start up ECT < 80 °C Minimum Average Airflow > 2 grams per second Vehicle speed > 5 MPH for 1 kilometer 30 sec < Engine Run Time < 1800 sec 10 °C ≥ IAT ≥ -7 °C OR Start up ECT < 75 °C Minimum Average Airflow > 2 grams per second Vehicle speed > 5 MPH for 1 kilometer 30 sec < Engine Run Time < 1800 sec IAT ≥ 10 °C	30 Seconds < Engine Run Time < 30 minutes <u>Frequency:</u> Once per ignition cycle 1 second loop	DTC Type B

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HO2S Closed Loop Rationality Bank 1 Sensor 1	P0130	This DTC determines if the O2 sensor voltage is not meeting the voltage criteria to enable closed loop fueling.	<p>Closed loop fuel control O2 sensor Ready flag set to "Not Ready."</p> <p>O2 sensor voltage must be > 550 millivolts or < 350 millivolts for forty counts to set closed loop fuel O2 Ready flag.</p> <p>Once set to "Ready," the O2 sensor voltage cannot be > 350 millivolts and < 550 millivolts for > 5 seconds or the O2 Ready flag will be reset to "Not Ready."</p>	<p>No injector DTC's No MAF DTC's No ETC DTCs No TP sensor DTC's No MAP DTC's No ECT sensor DTC's No Bank 1 Sensor 1 DTC's or Engine Run Time > 200 sec. Coolant temp > 70 C</p> <p>11 volts < Ignition Voltage < 18 volts Traction control not active. Catalyst Protection mode not active. 1000 RPM ≤ Engine Speed ≤ 3400 RPM 10.0 grams per second ≤ MAF ≤ 50.0 grams per second Decel Fuel Cut Off not active. Power Enrichment not active.</p> <p>Above conditions must be met for 2.0 seconds.</p>	<p>400 test failures in a 500 test sample.</p> <p>100 millisecond execution rate.</p> <p>Continuous</p>	DTC Type B

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HO2S Circuit Low Voltage (bank 1 sensor 1)	P0131	This DTC determines if the O2 sensor or circuit is shorted to low by checking for a lean condition.	O2 sensor voltage < 50 millivolts OR O2 sensor voltage < 550 while in Power Enrichment	No injector DTC's No MAF DTC's No ETC DTC's No TP sensor DTC's No Evap. DTC's No IAT sensor DTC's No MAP DTC's No ECT sensor DTC's Catalyst diagnostic test not active No injectors are disabled Traction control not active Fuel level > 10% 11 volts < Ignition Voltage < 18 volts Continuous lean test: Closed Loop Fuel Enabled 14.5 ≤ Air/Fuel ratio ≤ 14.8 15% ≤ Throttle position ≤ 50 % Above conditions must be met for 2.0 seconds. Lean in PE test: Power Enrichment mode enabled Above conditions must be met for 2.0 seconds	Continuous lean test: 950 test failures in a 1000 test sample for 1 sets of samples 100 millisecond execution rate. Continuous Lean in PE test: 950 failures in 1000 samples 100 millisecond execution rate. Runs during each occurrence of PE	DTC Type B

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HO2S 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.	O2 sensor voltage > 1000 millivolts OR O2 sensor voltage > 350 millivolts while in DFCO	No injector DTC's No MAF DTC's No ETC DTCs No TP sensor DTC's No Evap. DTC's No IAT sensor DTC's No MAP DTC's No ECT sensor DTC's Catalyst diagnostic test not active Traction control not active 11 volts < Ignition Voltage < 18 volts Continuous rich test: Closed Loop Fuel Enabled 14.5 ≤ Air/Fuel ratio ≤ 14.8 0% ≤ Throttle position ≤ 50 % Above conditions must be met for 2.0 seconds. Rich in DFCO test: Decel Fuel Cut-off mode enabled Above conditions must be met for 2.0 seconds	Continuous rich test: 140 test failures in a 150 test sample for 1 sets of samples 100 millisecond execution rate. Continuous Rich in DFCO test: 95 failures in 100 samples 100 millisecond execution rate. Runs during each occurrence of DFCO	DTC Type B

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HO2S Circuit Slow Response (bank 1 sensor 1)	P0133	This DTC determines if the O2 sensor functioning properly by checking its response time.	O2 sensor average transition time: L/R > 175 msec R/L > 140 msec 450 mv < O2 voltage < 650 mv.	No misfire DTC's No injector DTC's No MAF DTC's No ETC DTC's No TP sensor DTC's No Evap. DTC's No IAT sensor DTC's No MAP DTC's No ECT sensor DTC's No AIR DTC's No Bank 1 Sensor 1 Voltage DTC's No front O2 Heater Circuit DTC No front O2 too Few Switches DTC Catalyst diagnostic test not active Closed Loop Fuel Enabled Traction control not active No injectors are disabled Fuel level > 10% 11 volts < Ignition Voltage < 18 volts Engine Run Time > 200 sec. Coolant temp > 70 C 1000 < RPM < 3500 15.0 grams per second < MAF < 50.0 grams per second Throttle position ≥ 5 % BLM cell number = 4, 5, 6, 8, 9, or 12 Transmission not in Park, Reverse or Neutral Above conditions met for 2.0 seconds.	60.00 seconds Once per key cycle	DTC Type B

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HO2S Circuit Insufficient Activity (bank 1 sensor 1)	P0134	This DTC determines if the O2 sensor or the O2 sensor circuit has developed an open.	400 mv < O2 sensor voltage < 500 millivolts	No injector DTC's No MAF DTC's No ETC DTCs No TP sensor DTC's No Evap. DTC's No IAT sensor DTC's No MAP DTC's No ECT sensor DTC's Catalyst diagnostic test not active Traction control not active 11 volts < Ignition Voltage < 18 volts Engine run time > 200 seconds Minimum 3 occurrences of a delta TP sensor > 1 % during diagnostic test	950 test failures in a 1000 test sample 100 millisecond execution rate. Continuous	DTC Type B

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HO2S Heater Circuit (bank 1 sensor 1)	P0135	This DTC determines if the O2 sensor heater is functioning properly by monitoring the current through the heater circuit.	<p><u>RCOHT Learn Diagnostic</u> Cold start Calculated heater resistance is <3.7 Ω or > 7.7 Ω</p> <p><u>Current Monitor Diagnostic</u> During Warm Operation The heater current is <0.3 amps or > 1.5 amps</p>	<p><u>RCOHT Learn Diagnostic</u> Engine Off Time > 10 hours -30°C < ECT < 45°C Delta between Coolant and IAT < 140°C</p> <p>No injector, MAF, ETC, TPS, Evap, IAT, MAP, ECT, Catalyst monitor DTCs set 11 V < System voltage < 18 V Traction control not active</p> <p><u>Current Monitor Diagnostic</u> Engine run time >230 secs ECT > 70°C 1000 RPM < Engine speed < 2500 RPM 15 grams/sec < MAF < 30 grams/sec O2 heater overtemp control not active. Above conditions must be met for 1 sec</p>	<p><u>RCOHT Learn Diagnostic</u> Once per cold start</p> <p><u>Current Monitor Diagnostic</u> 45/50 counts 10 counts/sec</p> <p>2 tests per key cycle 20 sec delay between tests</p> <p>100ms second execution rate.</p>	DTC Type B

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O2S Circuit Bank 1 Sensor 2	P0136	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 ≥ 700 millivolts and voltage ≤ 300 millivolts	<p>Common Enable Criteria</p> <ul style="list-style-type: none"> • No O2 circuit, heater, response or heater driver DTC's active • No TP Sensor DTC's • No MAF DTC's • No ETC DTCs • No ECT DTC's • No MAP DTC's • No IAT DTC's • No EVAP DTC's • No Fuel Injector DTC's • No Fuel Trim DTC's • No AIR DTC's • 11 volts \leq system voltage \leq 18 volts • Engine Runtime ≥ 2 seconds <p>Stage 2 Specific Enable Criteria:</p> <ul style="list-style-type: none"> • Stage 1 portion of test not passed • 1000 rpm \leq Engine Speed \leq 5000 rpm • 14 gps \leq Airflow \leq 100 gps • 19 mph \leq Vehicle Speed \leq 81 mph <p>All of the above met for at least 1 seconds, and then:</p> <ul style="list-style-type: none"> • 0.94 \leq Short term fuel trim \leq 1.05 • Fuel state = closed loop • EVAP diagnostic not in control of purge 	<p>Stage 1: Up to 800 seconds</p> <p>Stage 2: Up to 12 seconds for each threshold</p> <p>Frequency: One test per trip</p>	DTC Type B

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HO2S Circuit Low Voltage (bank 1 sensor 2)	P0137	This DTC determines if the O2 sensor or circuit is shorted to low by checking for a lean condition during steady throttle	O2 sensor voltage < 50 millivolts OR O2 sensor voltage < 700 millivolts while in Power Enrichment	No injector DTC's No MAF DTC's No ETC DTC's No TP sensor DTC's No Evap. DTC's No IAT sensor DTC's No MAP DTC's No ECT sensor DTC's Catalyst diagnostic test not active No injectors are disabled Traction control not active Fuel level > 10% 11 volts < Ignition Voltage < 18 volts Continuous lean test: Closed Loop Fuel Enabled 14.5 ≤ Air/Fuel ratio ≤ 14.8 15% ≤ Throttle position ≤ 50 % Above conditions must be met for 2.0 seconds. Lean in PE test: Power Enrichment mode enabled Above conditions must be met for 2 seconds	Continuous lean test: 950 test failures in a 1000 test sample for 1 sets of samples 100 millisecond execution rate. Continuous Lean in PE test: 95 failures in 100 samples 100 millisecond execution rate. Runs during each occurrence of PE	DTC Type B

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HO2S 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 > 1000 millivolts OR O2 sensor voltage > 300 millivolts while in DFCO	No injector DTC's No MAF DTC's No ETC DTC's No TP sensor DTC's No Evap. DTC's No IAT sensor DTC's No MAP DTC's No ECT sensor DTC's Catalyst diagnostic test not active Traction control not active Fuel level > 10% 11 volts < Ignition Voltage < 18 volts Continuous rich test: Closed Loop Fuel Enabled 14.5 ≤ Air/Fuel ratio ≤ 14.80 15% ≤ Throttle position ≤ 50 % Above conditions must be met for 2.0 seconds. Rich in DFCO test: Decel Fuel Cut-off mode enabled Above conditions must be met for 2.0 seconds	Continuous rich test: 950 test failures in a 1000 test sample for 1 sets of samples. 100 millisecond execution rate. Continuous Rich in DFCO test: 95 failures in 100 samples 100 millisecond execution rate. Runs during each occurrence of DFCO	DTC Type B

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HO2S Circuit Insufficient Activity (bank 1 sensor 2)	P0140	This DTC determines if the O2 sensor or the O2 sensor circuit has developed an open.	425 mV < O2 sensor < 475 mV	No injector DTC's No MAF DTC's No ETC DTCs No TP sensor DTC's No Evap. DTC's No IAT sensor DTC's No MAP DTC's No ECT sensor DTC's No Rear O2 Heater Circuit DTC Closed Loop Fuel Enabled Catalyst diagnostic test not active Traction control not active 11 volts < Ignition Voltage < 18 volts Engine run time > 200.00 seconds Minimum 3 occurrences of a delta TP sensor > 1 % during diagnostic test	950 test failures in a 1000 test sample 100 millisecond execution rate. Once per key cycle.	DTC Type B

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HO2S Heater Circuit (bank 1 sensor 2)	P0141	This DTC determines if the O2 sensor heater is functioning properly by monitoring the current through the heater circuit.	<p><u>RCOHT Learn Diagnostic</u> Cold start Calculated heater resistance is <9.5 Ω or > 20.2 Ω</p> <p><u>Current Monitor Diagnostic</u> During Warm Operation The heater current is <0.2 amps or > 1.5 amps</p>	<p><u>RCOHT Learn Diagnostic</u> Engine Off Time > 10 hours -30°C < ECT < 45°C Delta between Coolant and IAT < 140°C</p> <p>No injector, MAF, ETC, TPS, Evap, IAT, MAP, ECT, Catalyst monitor DTCs set 11 V < System voltage < 18 V Traction control not active</p> <p><u>Current Monitor Diagnostic</u> Engine run time >230 secs ECT > 70°C 1000 RPM < Engine speed < 2500 RPM 15 grams/sec < MAF < 30 grams/sec O2 heater overtemp control not active. Above conditions must be met for 1 sec</p>	<p><u>RCOHT Learn Diagnostic</u> Once per cold start</p> <p><u>Current Monitor Diagnostic</u> 45/50 counts 10 counts/sec</p> <p>2 tests per key cycle 20 sec delay between tests</p> <p>100ms second execution rate.</p>	DTC Type B

2006

2.0L (LSJ) when used in: ION, Cobalt

2.2L (L61) when used in: Malibu, ION, Cobalt, HHR

2.8 (LK5) when used in: Colorado, Canyon

4.2L (LL8) when used in: Trailblazer, Envoy, Rainier, Saab 9-7, Isuzu Ascender

ENGINE DIAGNOSTIC PARAMETERS

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SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
Fuel System Too Lean Bank 1	P0171	Determines if the fuel control system is in a lean condition.	<p>The EWMA of long term fuel trim (LTM) samples ≥ 1.190002 for at least 2 seconds</p> <p>(Note: EWMA stands for "Exponentially Weighted Moving Average")</p> <p>Notes:</p> <ol style="list-style-type: none"> At least 35 seconds of data must accumulate on each trip before the EWMA of LTM samples is considered usable and at least 14 seconds of data in the current fuel trim cell must accumulate on each trip before the LTM for that cell is considered usable in the EWMA calculation. 	<ul style="list-style-type: none"> No Misfire DTC's No O2 Sensor DTC's No EVAP DTC's No Fuel Injector DTC's No Fuel Temperature or Composition DTC's No IAC, MAF, or MAP DTC's No ECT DTC's No EGR DTC's No A.I.R. DTC's No TP Sensor or TAC System DTC's 400 RPM < Engine speed < 6100 RPM rpm BARO > 72 kpa -7°C < ECT < 120°C 15 kpa < MAP < 100 kpa -7 °C < IAT < 145°C 1.0 grams per second < MAF < 512 grams per second Vehicle speed < 82 mph Closed Loop Fueling Long Term Fuel Trim Learning enabled Not in Device Control EGR Flow Diagnostic Intrusive Test = Not Active Catalyst Monitor Diagnostic Intrusive Test = Not Active Post O2 Diagnostic Intrusive Test = Not Active Evap diagnostic is at any stage except the "tank pull down" portion of the test. Fuel Level > 10 % (must be < 10% for at least 30 seconds to disable; default is to enable if fuel sender is broken) 	Frequency: Continuous 100 ms loop	DTC Type B

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Fuel System Too Rich Bank 1	P0172	Determines if the fuel control system is in a rich condition.	<p>The EWMA of long term fuel trim (LTM) samples < 0.82</p> <p>Once the above occurs, purge is ramped off to determine if excess purge is the cause. Therefore, the following must also occur to report a failure:</p> <p>The EWMA of LTM samples with purge off < 0.8099976 for at least 7 seconds during each of 3 intrusive segments.</p> <p>General Notes:</p> <ol style="list-style-type: none"> At least 35 seconds of data must accumulate on each trip before the EWMA of LTM samples is considered usable and at least 14 seconds of data in the current fuel trim cell must accumulate on each trip before the LTM for that cell is considered usable in the EWMA calculation. <p>Intrusive Notes:</p> <ol style="list-style-type: none"> Segments can last up to 35 seconds, and are separated by the smaller of a 30 second purge-on time or enough time to purge 18 grams of vapor. A maximum of 5 completed segments are allowed for each intrusive test, and up to 30 intrusive attempts allowed per trip. After an intrusive test report is completed, another intrusive test cannot occur for 1200 seconds to allow sufficient time to purge excess vapors from the canister. During this period, fuel trim will pass if the EWMA of LTM samples > 0.8099976 for at least 60 seconds, indicating that the canister has been purged. Performing intrusive tests too frequently may also affect EVAP and FTP emissions, and the execution frequency of other diagnostics. 	<ul style="list-style-type: none"> No Misfire DTC's No O2 Sensor DTC's No EVAP DTC's No Fuel Injector DTC's No Fuel Temperature or Composition DTC's No IAC, MAF, or MAP DTC's No ECT DTC's No EGR DTC's No A.I.R. DTC's No TP Sensor or TAC System DTC's 400 RPM < Engine speed < 6100 RPM BARO > 72 kpa -7°C < ECT < 120°C 15 kpa > MAP < 90 kpa -7 °C < IAT < 145°C 1.0 grams per second < MAF < 512 grams per second Vehicle speed < 82 mph Closed Loop Fueling Long Term Fuel Trim Learning enabled Not in Device Control EGR Flow Diagnostic Intrusive Test = Not Active Catalyst Monitor Diagnostic Intrusive Test = Not Active Post O2 Diagnostic Intrusive Test = Not Active Evap diagnostic is at any stage except the "tank pull down" portion of the test. Fuel Level > 10 % (must be < 10% for at least 30 seconds to disable; default is to enable if fuel sender is broken) <p>Intrusive Enable Criteria</p> <ul style="list-style-type: none"> The EWMA of long term fuel trim (LTM) samples < 0.82 RPM > 400 1.0 grams per second < Mass Airflow < 512 grams per second 15 kpa < MAP < 100 kpa <p>Temporary Intrusive Test Inhibit Criteria</p> <ul style="list-style-type: none"> If intrusive test segment exceeds 35 consecutive seconds. (in this case, purge valve is opened for the smaller of 30 seconds or enough time to purge 18 grams vapor before attempting additional intrusive segments) 	<p>If rich fail counter is ≥ 3 before pass counter ≥ 2, diagnostic fails.</p> <p>Frequency: Continuous 100 ms loop</p>	DTC Type B

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2.8 (LK5) when used in: Colorado, Canyon
4.2L (LL8) when used in: Trailblazer, Envoy, Rainier, Saab 9-7, Isuzu Ascender**

ENGINE DIAGNOSTIC PARAMETERS

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Fuel Injector 1 Control Circuit	P0201	circuit continuity	Injector Driver feedback indication = fault	Ignition voltage > 11.0 for 5 seconds	10 failures out of 20 samples frequency: 250 ms cont.	DTC Type B
Fuel Injector 2 Control Circuit	P0202	circuit continuity	Injector Driver feedback indication = fault	Ignition voltage > 11.0 for 5 seconds	10 failures out of 20 samples frequency: 250 ms cont.	DTC Type B
Fuel Injector 3 Control Circuit	P0203	circuit continuity	Injector Driver feedback indication = fault	Ignition voltage > 11.0 for 5 seconds	10 failures out of 20 samples frequency: 250 ms cont.	DTC Type B
Fuel Injector 4 Control Circuit	P0204	Circuit Continuity	Injector Driver feedback indication = fault	Ignition voltage > 11.0 for 5 seconds	10 failures out of 20 samples frequency: 250 ms cont.	DTC Type B
Throttle Position (TP) Sensor 2 Circuit	P0220	Detects a continuous or intermittent short or open in TP sensor #2 circuit	0.275V > Raw TPS sensor signal > 4.725 V	Ignition in Unlock/accessory, run, crank Ignition Voltage > 5.23 V No 5VR DTCs	15/35 Cts 10 Cnts Continuous 12.5 ms / Ct in the MCP	DTC Type A MIL
Throttle Position (TP) Sensor 2 Circuit OOR Low	P0222	Detects a continuous or intermittent low voltage situation in TP sensor #2 circuit	0.275V > Raw TPS sensor signal	Ignition in Unlock/accessory, run, crank Ignition Voltage > 5.23 V No 5VR DTCs	15/35 Cts 10 Cnts Continuous 12.5 ms / Ct in the MCP	DTC Type A MIL
Throttle Position (TP) Sensor 2 Circuit OOR High	P0223	Detects a continuous or intermittent high voltage situation in TP sensor #2 circuit	Raw TPS sensor signal > 4.725 V	Ignition in Unlock/accessory, run, crank Ignition Voltage > 5.23 V No 5VR DTCs	15/35 Cts 10 Cnts Continuous 12.5 ms / Ct in the MCP	DTC Type A MIL

2006

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Random Misfire Detected Cylinder 1 Misfire Detected Cylinder 2 Misfire Detected Cylinder 3 Misfire Detected Cylinder 4 Misfire Detected	P0300 P0301 P0302 P0303 P0304	These DTC 's will determine if a random misfire or a cylinder specific misfire is occurring by monitoring crankshaft velocity.	Deceleration index Vs Engine Speed Vs Load and Camshaft Position Emission Failure Threshold = 1% Misfire Catalyst Damage Threshold = 5% - 22.5% Misfire depending on engine speed and engine load.	<ul style="list-style-type: none"> • Engine run time > 1 engine cycle • DTCs not active for VSS, CKP, TP, MAP, ECT, MAF, ETC, PCM, CMP, Fuel Sensing, Throttle Actuator and IAT sensors. • Crankshaft Position System Variation must be learned or Engine speed < 1000 RPM. • Fuel cutoff not active. • Power management is not active. • Brake torque management not active. • Drag Control not active. N/A • Fuel level > 2.5%. Disablement ends 88 engine cycles, after a low fuel level condition ceases, and fuel disable does not occur with a fuel sensor DTC. • -7 °C < ECT < 125°C. • If ECT at startup < -7 °C, then disable until ECT > 21 °C. • 450 RPM < Engine speed < 6200 RPM. • 9 volts < System voltage < 18 volts. • + Throttle position delta < 95% per 100 ms. • - Throttle position delta < 95% per 100 ms. • Abnormal engine speed is not present. • Excess Engine Acceleration is not present. • No rough road. • TCS is not active. • Positive and zero torque. • Detectable engine speed and engine load region. • EGR Intrusive test not active. N/A • AIR Intrusive test not active. N/A • CAM sensor is in sync with CKP sensor. N/A • Misfire Diag is not requesting to disable TCC when transmission is in hot mode. • Crankshaft Ring Filter inactive (after a low level misfire, another misfire may not be detectable until crankshaft ringing ceases) 	Emission Exceedence = (5) failed 200 revolution blocks of 16. Failure reported with (1) Exceedence in 1st (16) 200 revolution block, or (4) Exceedences thereafter. 1st Catalyst Exceedence = Number of 200 revolution blocks as data supports for catalyst damage. 2nd and subsequent Catalyst Exceedences = (1) 200 revolution block with catalyst damage. Failure reported with (3) Exceedences in FTP, or (1) Exceedence outside FTP. Frequency: Continuous	DTC Type B

2006

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Crankshaft Position System Variation Not Learned	P0315	The DTC will determine if the Crankshaft Position System Variation has not been learned.	Sum of compensation factors between 65404 and 65667	PCM state = run Manufacturers enable counter must be Zero.	0.50 sec 100ms loop continuous	DTC Type A
Knock Sensor Circuit	P0325	Circuit Continuity	Signal voltage shorted high or shorted low	Engine Speed > 1800 rpm	60 failures out of 80 samples frequency: 100ms cont.	DTC Type B
Knock Sensor Circuit Excessive Spark Retard	P0326	System Performance check	Knock total retard > a value (MAP, RPM)	Knock detection = enabled Engine Speed > 1800 rpm MAP > 55 kpa	40 failures out of 80 samples frequency: 100ms cont.	DTC Type B
Knock Sensor Circuit Low Voltage - Bank 1	P0327	Rationality Check	Knock Sensor Noise Level <5600	Engine Speed > 1800 rpm	60 failures out of 80 samples frequency: 100ms cont.	DTC Type B
Crankshaft Position Sensor-A Circuit	P0335	CKP Time Without Match Test: Excessive time without CKP sensor Match (CKP Circuit Diagnostic)	CKP Time Without Match Test: See 'TIME LENGTH AND FREQUENCY' column	CKP Time Without Match Test: IF[(Engine_Running = TRUE OR Engine_Cranking = TRUE) AND (Engine_Speed_Defaulted < 2000 rpm) AND { (Starter_Motor_Is_Engaged = TRUE AND Cranking_MAF ≥ 0 g/s AND Cranking_MAF_Frequency is ≥1400 Hz) OR (Engine_Running_MAF ≥ 3 g/s) }] THEN ENABLE DIAGNOSTIC ELSE DISABLE DIAGNOSTIC ENDIF	CKP Time Without Match Test: Fail Report During Engine Crank = Match has not occurred within the last 4 seconds. Fail Report During Engine Run = Match has not occurred within the last 2 seconds	DTC Type B

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Crankshaft Position Sensor-A Performance	P0336	CKP Excessive Resyncs Test: Excessive number of CKP Resyncs	CKP Excessive Resyncs Test: See 'TIME LENGTH AND FREQUENCY' column	CKP Excessive Resyncs Test: IF[Engine_Running = TRUE and Engine RPM ≥ 450 THEN ENABLE DIAGNOSTIC ELSE DISABLE DIAGNOSTIC ENDIF	CKP Excessive Resyncs Test:Auto Fail Report = 4 CKP Resyncs occur within 5 seconds Manual Fail Report = 15 CKP Resyncs occur within 20 seconds	DTC Type B
Camshaft Position Sensor-A Bank-1 Circuit	P0340	Detects CMP sensor circuit malfunctions by monitoring for the absence of CMP sensor pulses (CMP sensor Circuit Diagnostic)	See 'TIME LENGTH AND FREQUENCY' column	IF MAF ≥ 0 AND Engine_Running = TRUE MAP > 45 KPA No crank sensor DTCs failed this key cycle No MAP DTCs active THEN ENABLE DIAGNOSTIC ELSE DISABLE DIAGNOSTIC ENDIF	Fail Report = 1 sensor pulse does NOT occur within 3 Seconds	DTC Type B

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Camshaft Position Sensor-A Bank-1 Performance	P0341	Detects CMP sensor performance malfunctions by monitoring for the incorrect number of CMP sensor pulses in a given number of CKP sensor pulses (CMP sensor Performance Diagnostic)	After Engine Start (CMP Slow Event Based Test): Number-of-CMP-pulses < 80 OR > 120	After Engine Start (CMP Slow Event Based Test) : IF[CKP_MedRes_Active = TRUE AND Crank_Sync_Flag = Crank_In_Sync No CAM circuit DTCs active MAP > 45 KPA No MAP DTCs active THEN ENABLE DIAGNOSTIC ELSE DISABLE DIAGNOSTIC ENDIF Footnote = The CKP_MedRes_Counter increments when the diagnostic is enabled and counts the number of CKP MedRes software interrupts. ECM thru-put prohibits interrupting on every CKP sensor pulse. Typical CKP MedRes software interrupts occur twice per cylinder, but varies in each engine	After Engine Start (CMP Slow Event Based Test): One Test = 1200 MedRes software interrupts (Footnote). Fail Report = 8 Failed-Tests out of the last 10 Tests Footnote = CKP MedRes software interrupts occur in a certain number of CKP sensor pulses. ECM thru-put prohibits interrupting on every CKP sensor pulse. Typically occurs twice per cylinder, but each engine varies.	DTC Type B

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Secondary AIR Incorrect Airflow	P0411	Detects an insufficient flow condition This test is run during Phase 1 (SAI pump commanded On, Valve commanded Open)	Predicted System Pressure versus Actual System Pressure Error > 6kPa	No active MAF DTCs No active MAP DTCs No active SAI Pressure Sensor Performance DTCs No active SAI Pressure Sensor Circuit DTCs No active SAI pump relay DTCs No active SAI valve relay DTCs No active IAT DTCs No active ECT DTCs No active Misfire DTCs No active Catalyst Monitor DTCs No active P0606 DTC No active 5 Volt DTCs No active EST DTCs No active Fuel Injector DTCs BARO > 70 kPa Engine Airflow < 33 g/s 9V < System Voltage < 18V Stability Time > 5 seconds SAI System commanded On	Conditional test weight > 7 seconds Frequency: Once per trip when SAI pump commanded On	DTC Type B
Secondary AIR Solenoid Control Circuit	P0412	This DTC checks the SAI solenoid circuit for electrical integrity	Output state invalid	Ignition Voltage in Range	100/120 counts Frequency: 4 counts/second Continuous check	DTC Type B
Secondary AIR Pump Control Circuit	P0418	This DTC checks the SAI pump relay circuit for electrical integrity	Output state invalid	Ignition Voltage in Range	20/25 counts Frequency: 4 counts/second Continuous check	DTC Type B

2006

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Catalyst Low Efficiency - Bank 1	P0420	Oxygen Storage	<p>OSC Time Difference ≥ 0.2021 sec</p> <p>OSC Time Difference = OSC Worst Pass Thresh - OSC Compensation Factor * (Post Cat O2 Resp Time - Pre Cat O2 Resp Time)</p> <p>OSC Worst Pass Thresh = 2.0 sec</p>	<p>Trip Enable Criteria</p> <ul style="list-style-type: none"> • No ECT DTC's • No Fuel Trim DTC's • No IAC DTC's • No IAT DTC's • No O2 Sensor DTC's • No Cam Sensor DTC's • No Idle System DTC's • No VSS DTC's • No TPS DTC's • No MAP DTC's • No MAF DTC's • No Purge System DTC's • No Crank Sensor DTC's • No Misfire DTC's <p>Valid Idle Period Criteria</p> <ul style="list-style-type: none"> • Engine Speed ≥ 1050 rpm for minimum of 45/27 sec (manual/auto) since end of last idle period • Engine Runtime ≥ 600 sec • Vehicle Speed ≤ 2 mph <p>Test Enable Conditions</p> <ul style="list-style-type: none"> • Closed loop fuel control • No other intrusive diagnostics running • $550 \text{ }^\circ\text{C} \leq \text{Predicted Catalyst Temperature} \leq 765 \text{ }^\circ\text{C}$ • Barometric Pressure ≥ 70 kPa • $-20 \text{ }^\circ\text{C} < \text{IAT} < 80 \text{ }^\circ\text{C}$ • $69 \leq \text{ECT} \leq 125 \text{ }^\circ\text{C}$ • System Voltage > 9 V • $0 < \text{Idle Time} \leq 60$ sec ⇒ Idle Time is incremented if: Vehicle Speed < 4 mph & Throttle Position (without IAC) ≤ 2 % • $2 \leq \text{Airflow} \leq 12$ grams per second • Delta Throttle Position (with IAC) ≤ 39 % • Load Change ≤ 199 % • $0.96 \leq \text{Short Term Integrator Multiplier} \leq 1.04$ • HO2S (bank1 sensor1) RtoL+LtoR transitions (450mv transition pt.) ≥ 2 • CCP DC Multiplier ≤ 1 • Fuel Ethanol Percent $\leq \text{NA}$ • Tests Attempted this idle period < 1 <p>Green Converter Delay Criteria</p> <ul style="list-style-type: none"> • Predicted catalyst temperature $\geq 500 \text{ }^\circ\text{C}$ for 3600 sec (non-continuously) when vehicle is new. The diagnostic will not be enabled until the next ignition cycle after this criteria has been met. In addition, all other enable criteria must be met on the next ignition cycle for the test to run on that ignition cycle. • Note: This feature is only enabled when the vehicle is new and cannot be enabled in service. <p>Rapid Step Response Enable Criteria</p> <ul style="list-style-type: none"> • OSC Time Difference Step ≥ 0.533 sec. • OSC Time Difference ≥ 0 sec. 	<p>1 test attempted per valid idle period</p> <p>Minimum of 1 test per trip.</p> <p>Rapid Step Response Maximum of 6 tests per trip.</p> <p>Maximum of 18 tests to detect failure when Rapid Step Response is enabled.</p> <p>Frequency: Execution Rate 12.5 ms</p>	DTC Type A

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Evaporative Emission (EVAP) System Small Leak Detection	P0442	This DTC will detect a small leak ($\geq 0.020''$) in the EVAP system between the fuel fill cap and the purge solenoid. The engine off natural vacuum (EONV) method is used.	<p><u>Small Leak Test Fail:</u> Engine Off Natural Vacuum The total pressure change achieved during the test is normalized against a target value = 374 Pa. The normalized value is entered into EWMA (with 0 = perfect pass and 1 = perfect fail). Once EWMA exceeds the fail threshold, the DTC light is illuminated. The DTC light can be turned off if the EWMA falls below the re-pass threshold for 3 consecutive trips.</p> <p>Fail threshold = 0.50 Re-Pass threshold = 0.33</p>	<p><u>TEST ENABLE :</u> No MAP DTC's No Thermostat Rationality DTC's VS Sensor DTC's not active No Fuel Tank Pressure Sensor circuit DTC's No EVAP Canister Purge Solenoid circuit DTC's No EVAP Canister Vent Solenoid circuit DTC's No Fuel Level DTC's Coolant Sensor DTC's not active IAT Sensor DTC's not active EVAP CCP stuck open DTC not active. EVAP large leak DTC not active. Ignition off timer DTC not active. Canister Vent restriction DTC is not active Fuel Level >15.0% but < 85.0% Drive time ≥ 600 seconds. Drive length ≥ 5 kilometers. Coolant $\geq 70^\circ\text{C}$. No fuel filling (fuel level increment $\geq 10\%$) During EONV test. BARO > 74.0kPa Estimated ambient temperature at end of drive > 2°C but < 32°C.</p> <p>Estimate of Ambient Air Temperature Valid Conditions to be valid 1. Cold Start Startup $\Delta^\circ\text{C}(\text{ECT-IAT}) < 8^\circ\text{C}$ if ECT > IAT OR 2. Hot Restart Sufficient drive length to get accurate estimate of ambient air temperature (at least a minimum of 3 minutes and 5 kilometers)</p>	<p>Once per cold start, during hot soak (up to 2500 sec.).</p> <p>Time since last complete test ≥ 17 hours if EWMA is passing, or ≥ 10 hours if EWMA is failing.</p> <p>No more than 2 attempts per day.</p>	<p>DTC Type A EWMA</p> <p>Average Run Length: 4.45</p>
Canister Purge Circuit Fault	P0443	This DTC checks the canister purge solenoid circuit for electrical integrity	Output state invalid	Ignition Voltage in Range	<p>20/25 counts 10 counts/second</p> <p>Continuous check</p>	DTC Type B

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Evap. Emission Control System – Vent Control Malfunction	P0446	This DTC will determine if a restriction is present in the vent solenoid, vent filter, vent hose or canister.	Vent solenoid commanded OPEN Fuel Tank Vacuum \geq 2491 Pa for 5 seconds BEFORE Purge Volume > 6 liters OR Vented Vacuum < -663 Pa Or Vented Vacuum > 1245 Pa For 5 seconds. 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 No MAP DTC's No TP Sensor DTC's No VSS DTC's No IAT DTC's No ECT DTC's No Fuel Tank Pressure Sensor circuit DTC's No Evap Canister Purge solenoid circuit DTC's No EVAP Canister Vent Solenoid circuit DTC's No Thermostat Rationality DTC's 15 % < Fuel Level < 85. % 10.00 V < System Voltage < 18.00 V 4 °C < IAT < 30°C ECT < 30 °C BARO > 74.00 kPa (8000 ft)	Time is dependent on driving conditions Max. before test abort is 780 seconds Once per cold start	DTC Type B
Fuel Tank Vent Circuit Fault	P0449	This DTC checks the vent solenoid circuit for electrical integrity	Output state invalid	Ignition Voltage in Range	100/120 counts 10 counts/second Continuous check.	DTC Type B

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ENGINE DIAGNOSTIC PARAMETERS

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SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
Fuel Tank Pressure (FTP) Sensor Circuit Performance	P0451	The DTC will be set if the fuel tank vacuum sensor is out of range when it tries to re-zero prior to the phase-1 or phase-2 portions of the engine-off natural vacuum small leak test.	<p>The tank vacuum sensor voltage is compared to a window about the nominal sensor voltage offset (~1.5 volts)</p> <p>upper voltage threshold (voltage addition above the nominal voltage): 0.2 volts</p> <p>lower voltage threshold (voltage subtraction below the nominal voltage): 0.2 volts</p> <p>The difference between tank vacuum sensor voltage and the nominal offset voltage is then normalized against the appropriate threshold listed above to produce a ratio between 0.0 and 1.0. This normalized re-zero ratio is then filtered with 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.</p> <p>Fail threshold = 0.72998 Re-Pass threshold = 0.400024</p>	This test will execute whenever the engine-off natural vacuum small leak test (P0442) executes	<p>This test is executed during an engine-off natural vacuum small leak test. The number of times that it executes can range from zero to two per engine-off period.</p> <p>The length of the test is determined by the refueling rationality test which can take up to 600 seconds to complete.</p>	<p>DTC Type A EWMA</p> <p>Average Run Length: 6</p>
Fuel Tank Pressure (FTP) Sensor Circuit Low Voltage	P0452	This DTC will detect a Fuel tank pressure sensor that is to low out of range	<p>Fuel tank pressure sensor signal < 0.1 volts produces a failing sample. Otherwise, the sample is considered passing.</p> <p>If 80 samples fail out of 100 samples total, then a fail will be reported to the DTC.</p>	<ul style="list-style-type: none"> 0.10 second delay after sensor power up for sensor warm-up ECM State != crank 	<u>Frequency:</u> Continuous 100ms loop	DTC Type B

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2.0L (LSJ) when used in: ION, Cobalt

2.2L (L61) when used in: Malibu, ION, Cobalt, HHR

2.8 (LK5) when used in: Colorado, Canyon

4.2L (LL8) when used in: Trailblazer, Envoy, Rainier, Saab 9-7, Isuzu Ascender

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Fuel Tank Pressure (FTP) Sensor Circuit High Voltage	P0453	This DTC will detect a Fuel tank pressure sensor that is to high out of range	Fuel tank pressure sensor signal > 4.9 volts produces a failing sample. Otherwise, the sample is considered passing. If 80 samples fail out of 100 samples total, then a fail will be reported to the DTC.	<ul style="list-style-type: none"> 0.10 second delay after sensor power up for sensor warm-up ECM 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. The abrupt change is defined as a change > 0.45 below 50% fuel and > 0.75 above 50% fuel and < 1249 Pa vacuum in the span of 1.0 seconds. A refueling event is confirmed if the fuel level has a persistent change of 10.0 % for 30 seconds. The test will report a failure if 2 out of 3 samples are failures.	This test will execute whenever the engine-off natural vacuum small leak test (P0442) executes	This test is executed during an engine-off natural vacuum small leak test. The test can only execute up to once per engine-off period. 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 restriction) in the EVAP system.	Purge volume > 10.00 liters BEFORE Tank vacuum < 1993 Pa 2 liters of fuel must be consumed after setting the DTC active the first time to set the DTC active the second time. <u>Weak Vacuum Follow-up Test</u> (fuel cap replacement test) Weak Vacuum Test failed previous trip and this trip. Passes if tank vacuum > 1993Pa Note: Weak Vacuum Follow-up Test can only report a pass.	<u>General Test Enable</u> <ul style="list-style-type: none"> No MAP DTC's No TP Sensor DTC's No VSS DTC's No IAT DTC's No ECT DTC's No Fuel Tank Pressure circuit Sensor DTC's No Evap Canister Purge solenoid circuit DTC's No EVAP Canister Vent Solenoid circuit DTC's No Thermostat Rationality DTC's 15 % < Fuel Level < 85 % 10.00 V < System Voltage < 18.00 V 4 °C < IAT < 30°C ECT < 30 °C BARO > 74.00 kPa (8000 ft) <u>Cold Start Test</u> <ul style="list-style-type: none"> IAT < 30°C Cold temperature Δ(ECT-IAT): < 8 °C if ECT > IAT Cold Test Timer < 780 seconds 	Once per cold start Time is dependent on driving conditions Max. before test abort is 780 seconds <u>Weak Vacuum Follow-up Test</u> On 2 nd trip with large leak detected, the follow-up test is limited to 600 seconds. Once the MIL is on, the follow-up test runs indefinitely.	DTC Type B
Fuel Level No Change, Stuck in Range Primary Tank	P0461	This DTC will detect a fuel sender stuck in range.	IF Delta Fuel Volume change < 5 liters over a accumulated 250 Kilometers.	No VSS DTC's set Engine Running	Continuous	DTC Type B
Fuel Level Stuck Low Primary Tank	P0462	This DTC will detect a fuel sender stuck out of range low	Fuel level Sender % of 5V range < 6.25 %	runs continuously	60 failures out of 100 samples 1 sample = 100 ms Continuous	DTC Type B
Fuel Level Stuck High Primary Tank	P0463	This DTC will detect a fuel sender stuck out of range high	Fuel level Sender % of 5V range > 53.125%	runs continuously	60 failures out of 100 samples 1 sample = 100 ms Continuous	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.	<p>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.</p> <p>The refuel event is defined as a change of 10.0 % fuel level during the engine-off test.</p> <p>A refueling event is confirmed if the fuel level has a persistent change of 10.0 % for 30 seconds.</p> <p>The test will report a failure if 2 out of 3 samples are failures.</p>	This test will execute whenever the engine-off natural vacuum small leak test (P0442) executes	<p>This test is executed during an engine-off natural vacuum small leak test. The test can only execute up to once per engine-off period.</p> <p>The length of the test is determined by the refueling rationality test which can take up to 600 seconds to complete.</p>	DTC Type A
Engine Cooling Fan Relay 1 Control Circuit	P0480	This DTC checks the Engine cooling fan relay 1 circuit for electrical integrity	Output state invalid	11V < System Voltage < 18 V Engine Speed > 425 RPM	100 failures out of 120 samples frequency: 100ms cont.	DTC Type B
Engine Cooling Fan Relay 2 Control Circuit	P0481	This DTC checks the Engine cooling fan relay 1 circuit for electrical integrity	Output state invalid	11V < System Voltage < 18 V Engine Speed > 425 RPM	100 failures out of 120 samples frequency: 100ms cont.	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 > 2491 Pa for 5.00 sec BEFORE Test time > 60 seconds (cold start)	<u>General Test Enable</u> <ul style="list-style-type: none"> • No MAP DTC's • No TP Sensor DTC's • No VSS DTC's • No IAT DTC's • No ECT DTC's • No Fuel Tank Pressure Sensor circuit DTC's • No EVAP canister purge solenoid circuit DTC's • No EVAP Canister Vent Solenoid circuit DTC's • No Thermostat Rationality DTC's • 15 % < Fuel Level < 85. % • 10.00 V < System Voltage < 18.00 V • 4 °C < IAT < 30°C • ECT < 30 °C • BARO > 74.00 kPa (8000 ft) <u>Cold Start Test</u> <ul style="list-style-type: none"> • IAT < 30°C • Cold temperature Δ(ECT-IAT): < 8 °C if ECT > IAT • Cold Test Timer < 780 seconds 	Once per cold start. Cold start: max time is 780 seconds	DTC Type B
VSS No Activity	P0502	If there is a high engine speed and the transmission is in a drive gear but the control module does not detect that the vehicle is moving, DTC P0502 sets.	Unfiltered Output speed ≤ 100 RPM for ≥ 3 sec	No Input Speed Sensor Codes No Throttle Position Sensor Codes Throttle Position ≥ 15% 1000 RPM ≤ Engine speed indicating ≤ 5000 RPM for ≥ 5 sec. No Engine Torque Default 54.125 Nm ≤ Engine torque ≤ 8191.875 Nm No P0503 DTC's Range / Perf. 500 RPM ≤ Engine RPM ≤ 6500 RPM for ≥ 5 sec. 8 V ≤ System Voltage ≤ 18 V	100 ms Loop	DTC Type B

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VSS Circuit Performance (Drop)	P0503	When a drop occurs and a gear range change has not occurred in a calibrated time, or the rate of acceleration has not exceeded a calibrated rate, DTC P0503 sets.	Unfiltered Output speed drop \geq 500 RPM and retain drop for \geq 6 sec.	500 RPM \leq Engine RPM \leq 6500 RPM for \geq 5 sec. No Engine Torque Default 54.125 Nm \leq Engine torque \leq 8191.875 Nm Unfiltered Output Speed $>$ 3000 RPM for \geq 6 sec. Positive Unfiltered Output Speed Change \leq 1500 RPM for \geq 0.5 sec. Input Speed Change \leq 500 RPM for \geq 2 sec. No input speed sensor code 8 V \leq System Voltage \leq 18 V No P1843 DTC's	25 ms Loop	DTC Type B
Idle System Low	P0506	This DTC checks the Idle Control system for a low idle	Idle rpm $>$ 75 rpm below desired rpm based on coolant temperature.	<u>General Test Enable:</u> No VS sensor DTC's. 11 \leq System volt \leq 18 volts. IAT \geq -7 °C BARO \geq 75 kPa ECT \geq -7°C Engine run time \geq 5 sec. Closed loop fueling enabled <u>Idle test:</u> General conditions met. Idle conditions present $>$ 2 seconds Time since a transition to or from park/neutral $>$ 3 sec.. Time since TCC mode change $>$ 3 sec.	3 failed tests required to set fault 5 seconds per test frequency: 250 ms cont.	DTC Type B
Idle System High	P0507	This DTC checks the Idle Control system for a high idle	Idle rpm $>$ 150 RPM above desired RPM based on coolant temperature.	<u>General Test Enable:</u> No VS sensor DTC's. 11 \leq System volt \leq 18 volts. IAT \geq -7 °C BARO \geq 75 kPa ECT \geq -7°C Engine run time \geq 5 sec. Closed loop fueling enabled <u>Idle test:</u> General conditions met. Idle conditions present $>$ 2 seconds Time since a transition to or from park/neutral $>$ 3 sec.. Time since TCC mode change $>$ 3 sec.	1 failed tests required to set fault 10 seconds per test frequency: 250 ms cont.	DTC Type B

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PCM Memory	P0601	functional check	Computed EPROM checksum not equal to expected	None	1 failure during the first execution 5 failures thereafter Continuous	DTC Type A
PCM not Programmed	P0602	functional check	Calibration parameter not equal to expected value	None	1 failure Checked once during initialization.	DTC Type A
PCM Memory - Long term memory	P0603	functional check	Long term memory checksum not equal to expected	None	1 failure Checked once during initialization.	DTC Type A
PCM Memory - RAM	P0604	functional check	Bad RAM location found	None	100 failure if found during first test in ignition cycle. 2 failures if found during subsequent tests in the ignition cycle. Continuous	DTC Type A

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1. Processor Performance Check - Throttle limiting Fault (MCP) 2. Processor Performance Check - ETC software is not executed in proper order 3. Processor Performance Check 4. Processor Performance Check - SPI failed 5. Processor Performance Check - MCP state of health (Main) 6. Processor Performance Check - Learn Corruption Fault (Main&MCP) 7. Processor Performance Check - Learn Corruption Fault MAIN & MCP 8. Processor Performance Check - MCP state of health (Main) 9. Processor Performance Check - MAIN state of health (MCP)	P0606	Indicates that the ECM has detected an ETC internal processor integrity fault	1. MCP desired throttle limiting occurring 2. ETC software is not executed in proper order 3. Software tasks loops > schedule tasks loop 4. Loss of SPI communication from the MCP 5. Average MCP SOH toggle 1.5 ms < x < 2.5 ms 6. TPS or APPS minimum learned values fail compliment check 7. TPS or APPS minimum learned values fail range check 8. MCP integrity check error occurs 9. MCP integrity check error of main μP occurs	Ignition in unlock/accessory, run or crank Ignition Voltage > 5.23 V	1. 99 Cnts continuous, 2 ms /Ct in the MCP 2. 1 Cnt continuous, 12.5 ms / Cnt in the main μP 3. Error > 3 Cnts, 100ms/ Cnt in the main μP 4. 160/400 Cts or 15 Cnts continuous, 39 Cnts continuous @ init., 12.5 ms / Ct in the main μP 5. 3 Cnts continuous, 50 ms / Cnt in the main μP 6. 100 ms in the main μP. 7. 10 ms in the main μP. 8. 4 Cnt Continuous, 50 ms / Ct in the main μP 9. 2 Cnt Continuous, 12.5 ms/Ct in the main MCP	DTC Type A

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Control Module Accelerator Pedal Position (APP) System Performance	P060D	<ol style="list-style-type: none"> Verify the PCM's ability to detect a short between the APPS 1 & 2 circuits Verify that the indicated accelerator pedal position calculation is correct. 	<ol style="list-style-type: none"> APPS #2 signal voltage > 2.05V Difference between Main μP indicated accelerator pedal position and MCP indicated accelerator pedal position > 5% 	<ol style="list-style-type: none"> Ignitions in unlock/ accessory and run, not during TPS minimum learn active during intrusive portion of diagnostic execution. Ignition Voltage > 5.23 V No PCM processor DTC Ignition in unlock, accessory, run or crank Ignition Voltage > 5.23 V No PCM processor DTC 	<ol style="list-style-type: none"> 2 Cts, 156.25 ms w/immediate retest on an error, performed in the Main μP 99 Cnts continuous, 12.5 ms / Ct in the MCP 	DTC Type A
Control Module Throttle Position (TP) System Performance	P060E	<ol style="list-style-type: none"> Verify the PCM's ability to detect a short between the TPS 1 & 2 circuits Verify that the throttle control system position sensor short diagnostic is functioning. 	<ol style="list-style-type: none"> TPS #2 Signal voltage > 2.05 V No detection of the sensor short diagnostic active state 	Ignition voltage > 5.23 V No PCM processor DTC. Ignition in unlock/accessory or run, not during TPS minimum learn active during intrusive portion of diagnostic execution	<ol style="list-style-type: none"> 2 cts, 156.25 ms w/immediate retest on an error, performed in the main μP No sensor short diagnostic activity for 498 ms. Detected by the MCP 	DTC Type A
PCM - EEPROM General Failure	P062F	Checks for a write error	Subsequent read does not equal values written	None	Immediately on next key up if flagged on previous key down Once at key down	DTC Type B

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5 Volt Reference 1 Circuit	P0641	Detects a continuous or intermittent short on the #1 5 Volt Sensor Reference Circuit	Vref1 voltage - Vcc voltage > 0.125 V OR Vcc voltage - Vref1 voltage > 0.175 V	Ignition in unlock/accessory, run or crank Ignition Voltage > 5.23 V No ECM processor DTC	20/40 CTS or 200 ms continuous 12.5 ms/Ct in main μ P 125/250 Cts or 99Cts continuous 2 ms/Ct in MCP μ P	DTC Type A

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Malfunction Indicator Lamp (MIL) Control Circuit	P0650	This DTC checks the Malfunction Indicator Lamp circuit for electrical integrity	Output state invalid	Ignition Voltage in Range	100 failures out of 120 samples frequency: 100ms cont.	DTC Type B No MIL
5 Volt Reference 2 Circuit	P0651	Detects a continuous or intermittent short on the #2 5 Volt Sensor Reference Circuit	Vref2 voltage - Vcc voltage > 0.125 V OR Vcc voltage - Vref2 voltage > 0.175 V	Ignition in unlock/accessory, run or crank Ignition Voltage > 5.23 V No ECM processor DTC	20/40 CTS or 200 ms continuous 12.5 ms/Ct in main μ P 125/250 Cts or 99Cts continuous 2 ms/Ct in main μ P	DTC Type A
Transmission Control Module (TCM) Requested MIL Illumination	P0700	Monitors the TCM MIL request line to determine when the TCM has detected a MIL illuminating fault.	Transmission Emissions-Related DTC set		Continuous	DTC Type A No MIL
Intake Rationality Cross-check Out of Range	P1101	This DTC determines if there are multiple air induction system problems affecting airflow and/or manifold pressure.	Filtered throttle error > 230 kPa grams per second and Filtered manifold pressure 2 error > 20 kPa and [Filtered manifold pressure 1 error > 20 kPa or Filtered airflow error > 10 grams per second]	No MAF circuit DTCs set No MAP circuit DTCs set No EGR DTCs set No ECT circuit DTCs set No IAT circuit DTCs set No CKP DTCs set Engine Speed > 400 RPM 70°C < Engine Coolant Temperature < 125°C -7°C < Intake Air Temperature < 125°C	Immediate Frequency: 12.5 ms loop Continuous	DTC Type B

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HO2S Circuit Insufficient Switching (bank 1 sensor 1)	P1133	This DTC determines if the O2 sensor functioning properly by monitoring the number of L/R and R/L switches. Half cycle (HC) switch count is reported if a minimum number of slope time (ST) Switches are counted.	Slope Time L/R switches < 2 OR Slope Time R/L switches < 2 OR Half Cycle L/R switches < 45 OR Half Cycle R/L switches < 45 O2 voltage between 500 millivolts and 600 millivolts	No misfire DTC's No injector DTC's No MAF DTC's No ETC DTC's No TP sensor DTC's No Evap. DTC's No IAT sensor DTC's No MAP DTC's No ECT sensor DTC's No Bank 1 Sensor 1 Voltage DTC's No O2 Heater Circuit DTC Catalyst diagnostic test not active Closed Loop Fuel Enabled Fuel level > 10% 11 volts < Ignition Voltage < 18 volts Engine Run Time > 200 sec. Coolant temp > 70 C 1000 RPM < Engine Speed < 3500 RPM 15.0 grams per second < MAF < 50 grams per second Throttle position ≥ 5 % BLM cell number = 4, 5, 6, 8, 9, or 12 Transmission not in Park, Reverse or Neutral Above conditions met for 2.0 seconds.	60 seconds of response data after enable Once per key cycle	DTC Type B

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HO2S Transition Time Ratio bank 1 sensor 1	P1134	Determines if O2 sensor is functioning properly by checking asymmetry of response (rich-to-lean time minus lean-to-rich time)	O2 sensor average transition time difference: R/L – L/R > 100 ms Or R/L – L/R < -75 ms	No misfire DTC's No injector DTC's No MAF DTC's No ETC DTC's No TP sensor DTC's No Evap. DTC's No IAT sensor DTC's No MAP DTC's No ECT sensor DTC's No Bank 1 Sensor 1 Voltage DTC's No O2 Heater Circuit DTC Catalyst diagnostic test not active Closed Loop Fuel Enabled Fuel level > 10% 11 volts < Ignition Voltage < 18 volts Engine Run Time > 200 sec. Coolant temp > 70 C 1000 RPM < Engine Speed < 3500 RPM 15.0 grams per second < MAF < 50 grams per second Throttle position ≥ 5 % BLM cell number = 4, 5, 6, 8, 9, or 12 Transmission not in Park, Reverse or Neutral Above conditions met for 2.0 seconds.	60 seconds of response data after enable Once per key cycle	DTC Type B
Cold Start Emission Reduction Control	P1400	Model based test computes exhaust thermal energy from elevated idle speed and retarded spark advance. Detects if the cold start emission reduction system has failed resulting in the delivered thermal energy being out of range.	(Average desired accumulated exhaust energy - Average estimated accumulated exhaust energy) < -8 kJ/s OR (Average desired accumulated exhaust energy - Average estimated accumulated exhaust energy) > 0.2 kJ/s	<ul style="list-style-type: none"> • Cold start emission reduction strategy is active. • Vehicle speed < 2 kph. • Throttle position < 2%. • Air per cylinder > 40 mg. • No DTC's set for the following systems: MAP, MAF, IAT, ECT, Misfire, Electronic Spark Timing, Crank sensor, Idle, Fuel Injection, ETC, VS sensor, 5 volt reference, Intake Flow Rationality, ECM Memory 	100 ms loop Runs once per trip when the cold start emission reduction strategy is active. Test completes after 15 seconds of accumulated qualified data.	DTC Type A

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SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
Throttle Actuator Control (TAC) Module - Throttle Actuator Position Performance	P1516	<ol style="list-style-type: none"> 1. Detect a throttle positioning error. 2. Detect a throttle positioning error. 3. Detect excessive current draw on the actuator circuit. 4. Determine if the actuator has been miswired. 	<ol style="list-style-type: none"> 1. $\text{throttle error} \geq 2\%$ after > 5 second stability with no change in error sign, after 4 second stable command. 2. $\text{throttle error} > 10\%$ 3. $I(\text{actuator}) > 9\text{A}$ 4. $\text{TPS1} < 2.36\text{V}$ 	<ol style="list-style-type: none"> 1-3. Ignition in run or crank [RPM>0 or (RPM=0 and not in battery saver mode)]. No airflow actuation DTC. No throttling actuation DTC. Engine running=true or Ignition voltage > 6.5 V 4. Minimum TPS learn active state 	<ol style="list-style-type: none"> 1. 249 Cnts continuous 2 ms/ Ct in the MCP 2. 99 Cnts continuous 2 ms/ Ct in the MCP 3. 50 Cnts continuous 2 ms/ Ct in the MCP 4. 99 Cnts continuous 2 ms/ Ct in the MCP 	DTC Type A

2006 2.0L (LSJ) when used in: ION, Cobalt 2.2L (L61) when used in: Malibu, ION, Cobalt, HHR
2.8 (LK5) when used in: Colorado, Canyon
4.2L (LL8) when used in: Trailblazer, Envoy, Rainier, Saab 9-7, Isuzu Ascender

ENGINE DIAGNOSTIC PARAMETERS

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Control Module Throttle Actuator Position Performance	P2101	Detect a throttle positioning error	Difference between measured throttle position and modeled throttle position > 10%	Ignition in run or crank [RPM > 0 or (RPM = 0 and not in battery saver mode)]. No airflow actuation DTC. No throttle actuation DTC. No PCM Processor DTC Engine running=true or Ignition voltage > 8 V	Positive error counter: increments by 3 if t.e.> 10% decrements by 2 if 0%<t.e.<10% decrements by 2 if -10%<t.e.<0%; clears if t.e.<-10%. Negative error counter: increments by 3 if t.e.< -10% decrements by 2 if -10%< t.e.< 0% decrements by 2 if 0%< t.e. < 10% clears if t.e. > 10%. Thresholds are 45 Check runs every 12.5 ms in the Main μ P	DTC Type A
Accelerator Pedal Position (APP) Sensor 1	P2120	Detect a continuous or intermittent short or open in the APP sensor #1.	Raw APP sensor signal is < 0.75 V OR > 4.65V	Ignition in unlock/ accessory, run or crank. Ignition voltage > 5.23 V No 5VR DTCs Pcodes 2122 or 2123 Not Active	20/40 Cts or 10 Cnts continuous 12.5 ms /Ct in the main μ P 92/217 Cts or 67 Cnts continuous 2 ms/Ct in the MCP	DTC Type A
Accelerator Pedal Position (APP) Sensor 1 OOR Low	P2122	Detect a continuous or intermittent low voltage situation in the APP sensor #1.	Raw APP sensor signal is < 0.75 V	Ignition in unlock/ accessory, run or crank. Ignition voltage > 5.23 V No 5VR DTCs	20/40 Cts or 10 Cnts continuous 12.5 ms /Ct in the main μ P 92/217 Cts or 67 Cnts continuous 2 ms/Ct in the MCP	DTC Type A

2006

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Accelerator Pedal Position (APP) Sensor 1 OOR High	P2123	Detect a continuous or intermittent short or open in the APP sensor #1.	Raw APP sensor signal is > 4.65V	Ignition in unlock/ accessory, run or crank. Ignition voltage > 5.23 V No 5VR DTCs	20/40 Cts or 10 Cnts continuous 12.5 ms / Ct in the main μ P 92/217 Cts or 67 Cnts continuous 2 ms/Ct in the MCP	DTC Type A
Accelerator Pedal Position (APP) Sensor 2 Circuit	P2125	Detect a continuous or intermittent high voltage situation in the APP sensor #1.	Raw APP sensor signal is < 0.75 V OR > 4.65V	Ignition in unlock/ accessory, run or crank. Ignition voltage > 5.23 V No 5VR DTCs Pcodes 2127 or 2128 Not Active	15/35 Cts or 10 Cnts continuous 12.5 ms / Ct in the main μ P 92/217 Cts or 67 Cnts continuous 2 ms/Ct in the MCP	DTC Type A
Accelerator Pedal Position (APP) Sensor 2 Circuit OOR Low	P2127	Detect a continuous or intermittent low voltage situation in the APP sensor #2.	Raw APP sensor signal is < 0.75 V	Ignition in unlock/ accessory, run or crank. Ignition voltage > 5.23 V No 5VR DTCs	15/35 Cts or 10 Cnts continuous 12.5 ms / Ct in the main μ P 92/217 Cts or 67 Cnts continuous 2 ms/Ct in the MCP	DTC Type A
Accelerator Pedal Position (APP) Sensor 2 Circuit OOR High	P2128	Detect a continuous or intermittent high voltage situation in the APP sensor #2.	Raw APP sensor signal is > 4.65V	Ignition in unlock/ accessory, run or crank. Ignition voltage > 5.23 V No 5VR DTCs	15/35 Cts or 10 Cnts continuous 12.5 ms / Ct in the main μ P 92/217 Cts or 67 Cnts continuous 2 ms/Ct in the MCP	DTC Type A

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Throttle Position (TP) Sensor 1-2 Correlation	P2135	Detects a continuous or intermittent correlation fault between TP sensors #1 and #2	Difference between (raw min. learned TPS#1 voltage-raw min. TPS#1 voltage) and (raw TPS#2 voltage - raw min. learned TPS#2 voltage) < 6.54% offset at min. throttle position with an increasing to 10% at max. throttle position	Ignition in unlock/accessory, run or crank. Ignition voltage > 5.23 V No PCM processor DTCs No TP Sensor Circuit DTCs,	15/35 Cts or 12 Cnts Continuous 12.5 ms/Ct in the Main μ P 92/217 Cts or 67 Cnts Continuous 2 ms/Ct in the MCP	DTC Type A
Accelerator Pedal Position (APP) Sensor 1-2 Correlation	P2138	1. Detect an invalid minimum mechanical position correlation between APP sensor #1 and #2 2. Detect a short between APP sensors #1 and #2 circuits.	1. Difference between (5V-raw learned min. APPS#2 voltage)*2 and (raw learned min. APPS#1 voltage) > 0.25 V at min throttle position to 0.5 V at max throttle position 2. Difference between APP#1 and APP#2 < 1 V	1. Ignition in unlock/accessory, run or crank. Ignition voltage > 5.23 V No PCM processor DTCs No APP Sensor Circuit DTCs No 5VR DTCs 2. Ignition in unlock/accessory, run or crank. Ignition voltage >5.23 V No PCM processor DTCs.	1. 15/35 Cts or 12 Cnts Continuous, 12.5 ms/Ct in the Main μ P 92/217 Cts or 80 Cnts Continuous, 2 ms/Ct in the MCP 2. 2 Cts 156.25 ms w/ immediate test on an error, performed in the main μ P.	DTC Type A
Minimum Throttle Position Not Learned	P2176	Throttle position minimum learning not completed	Throttle Position 2 > 0.82 V Throttle Position 1 < 4.18 V	Minimum TPS learn active state. Stable throttle position reading for 40 ms. Ignition in run or crank. No TP Sensor Circuit DTCs No PCM processor DTCs No P1516 code set	3 seconds	DTC Type A
Secondary Air Injection System Pressure Sensor Circuit Bank 1	P2430	This DTC determines a stuck in range pressure sensor signal	Average Error < 0.5 kPa And Signal Variation < 1	No active P0412 DTC No active P0418 DTC No active DTC P0606 No active DTC P2432 No active DTC P2433 No active 5 Volt DTCs SAI pump commanded On	Stuck in range cumulative info > 5 seconds Frequency: Once per trip when SAI pump commanded On	DTC Type B

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Secondary Air Injection System Pressure Sensor Performance Bank 1	P2431	This DTC determines a skewed pressure sensor signal	Difference between SAI pressure sensor and BARO sensor > 10kPa with SAI pump commanded Off OR Difference between SAI pressure sensor and BARO sensor > 50kPa with SAI pump commanded On	No active P0412 DTC No active P0418 DTC No active DTC P0606 No active DTC P2432 No active DTC P2433 No active 5 Volt DTCs No active MAP DTCs	Skewed sensor cumulative info > 30 seconds Cumulative info is depending on BARO quality BARO quality is determined based on distance traveled since last BARO update Frequency: Continuous 100ms loop	DTC Type B
Secondary Air Injection System Pressure Sensor Circuit Low Voltage Bank 1	P2432	This DTC determines an out of range low SAI pressure sensor signal	SAI Pressure Sensor signal < 5% of 5V Ref	No active DTC P0606 No active 5 Volt DTCs	50 failures out of 63 samples frequency: 100ms cont.	DTC Type B
Secondary Air Injection System Pressure Sensor Circuit High Voltage Bank 1	P2433	This DTC determines an out of range high SAI pressure sensor signal	SAI Pressure Sensor signal < 94% of 5V Ref	No active DTC P0606 No active 5 Volt DTCs	50 failures out of 63 samples frequency: 100ms cont.	DTC Type B

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Secondary Air Injection System Shut-off Valve Stuck Open	P2440	This DTC determines if the SAI system control valve is stuck open Phase 2 test (Pump commanded On, valve commanded closed)	SAI pressure error < -3kPa (actual pressure lower than predicted during Phase 2)	No active MAF DTCs No active MAP DTCs No active SAI Pressure Sensor Performance DTCs No active SAI Pressure Sensor Circuit DTCs No active SAI pump relay DTCs No active SAI valve relay DTCs No active IAT DTCs No active ECT DTCs No active Misfire DTCs No active Catalyst Monitor DTCs No active P0606 DTC No active 5 Volt DTCs No active EST DTCs No active Fuel Injector DTCs BARO > 70 kPa Engine Airflow < 33 g/s 9V < System Voltage < 18V Stability Time > 5 seconds SAI System commanded On	Phase 2 Test cumulative info > 1.5 seconds Frequency: Once per trip when SAI pump commanded On	DTC Type B
Secondary Air Injection System Pump Stuck On	P2444	This DTC determines if the SAI pump is stuck On Phase 3 test (Pump commanded Off)	SAI Pressure Error > 1.5kPa (actual pressure higher than predicted during Phase 3 test)	No active MAF DTCs No active MAP DTCs No active SAI Pressure Sensor Performance DTCs No active SAI Pressure Sensor Circuit DTCs No active SAI pump relay DTCs No active SAI valve relay DTCs No active IAT DTCs No active ECT DTCs No active Misfire DTCs No active Catalyst Monitor DTCs No active P0606 DTC No active 5 Volt DTCs No active EST DTCs No active Fuel Injector DTCs BARO > 70 kPa Engine Airflow < 33 g/s 9V < System Voltage < 18V Stability Time > 5 seconds SAI System commanded On	Phase 3 Test cumulative info > 4 seconds Frequency: Once per trip when SAI pump commanded On	DTC Type A

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Control Module Ignition Off Timer Performance	P2610	This DTC determines if the ignition off timer has failed.	<p>1. A failure will be reported if the following occurs 3 times:</p> <p>Ignition Off Time < 0 Or Ignition Off Time > 10</p> <p>2. A failure will be reported if any of the following occur 15 times out of 20 tests:</p> <p>Time since last ignition off timer increment > 1.39375</p> <p>Current Ignition Off Time < Old Ignition Off Time</p> <p>Time between ignition off timer increments < 0.575</p> <p>Time between ignition off timer increments > 1.39375</p> <p>Current Ignition Off Time - Old Ignition Off Time = 1</p>	<p>Test Run This Trip = FALSE</p> <p>Ignition Off Timer Enabled = TRUE</p> <p>-40 < Intake Air Temperature < 125</p>	Frequency: 100 ms loop Continuous	DTC Type B
CAN BUS Error	U0001	Detects shorted CAN buss	CAN device driver has reported that it has entered a bus-off state.	None	Continuous, 10 failures out of 15 samples. 1 sample = 25ms	DTC Type B
CAN BUS Error TCM (automatic only)	U0101	Detects no CAN message from the TCM	Fails if no CAN message from TCM for > 250msec	None	Continuous, 20 failures out of 30 samples. 1 sample = 25ms	DTC Type B