

08 GRP07 All Engine

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
Camshaft Actuator Solenoid Circuit	P0010	This DTC checks the circuit for electrical integrity during operation.	The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match.	Output driver commanded on Ignition switch is in crank or run 11 volts < Ignition Voltage < 18 volts	20 failures out of 25 samples 250ms loop continuous	DTC Type B (Applications with Cam Phaser Only)
Camshaft Actuator Solenoid Performance	P0011	Detects a VVT system error by comparing the desired and actual cam positions when VVT is activated	Camshaft position error [absolute value of (desired position - actual position)] > 8°	Engine is running VVT is enabled Desired camshaft position > 0 Δ Desired Camshaft position < 7.5° for 3.35 seconds 11 volts < Ignition Voltage < 18 volts Power Take Off (PTO) not active DTCs not active for the following sub-systems: Cam sensors Crank sensors Cam to crank rationality Cam phase output drivers	200 fail counts out of 1000 sample counts 100ms loop Continuous	DTC Type B (Applications with Cam Phaser Only)
CAM to Crank timing incorrect	P0016	Detects cam to crank misalignment by monitoring if cam sensor pulse occurs during the incorrect crank position	Cam signal falling edge out of more than -11 or +14 degrees from corresponding crank falling edge. (Equates to ± 1 tooth)	<ul style="list-style-type: none"> No 5 volt reference, camshaft position sensor circuit, or crankshaft position sensor circuit DTCs set Engine speed < 2000 RPM Engine is spinning Crankshaft position signal is in sync. Cam phase state is learned or default 	25 failures out of 35 samples when engine is running, or 4 failures out of 5 samples when engine is cranking Frequency: 1x per cam rotation Continuous	DTC Type B
O2S Heater Control Circuit Bank 1 Sensor 1	P0030	This DTC checks the Heater Output Driver circuit for electrical integrity	Voltage low during driver open state (indicates short-to-ground or open circuit) or voltage high during driver closed state (indicates short to voltage).	<ul style="list-style-type: none"> Ignition switch is in crank or run 11 volts < Ignition Voltage < 18 volts RPM > 400 	20 failures out of 25 samples Frequency: 250ms loop Continuous	DTC Type B
O2S Heater Control Circuit Bank 1 Sensor 2	P0036	This DTC checks the Heater Output Driver circuit for electrical integrity	Voltage low during driver open state (indicates short-to-ground or open circuit) or voltage high during driver closed state (indicates short to voltage).	<ul style="list-style-type: none"> Ignition switch is in crank or run 11 volts < Ignition Voltage < 18 volts RPM > 400 	20 failures out of 25 samples Frequency: 250ms loop Continuous	DTC Type B
O2S Heater Control Circuit Bank 2 Sensor 1	P0050	This DTC checks the Heater Output Driver circuit for electrical integrity	Voltage low during driver open state (indicates short-to-ground or open circuit) or voltage high during driver closed state (indicates short to voltage).	<ul style="list-style-type: none"> Ignition switch is in crank or run 11 volts < Ignition Voltage < 18 volts RPM > 400 	20 failures out of 25 samples Frequency: 250ms loop Continuous	DTC Type B
HO2S Heater Resistance Bank 1 Sensor 1	P0053	Detects an oxygen sensor heater having an incorrect or out of range resistance value.	2.185 Ohms< Calculated Heater resistance < 9.512 Ohms	<ul style="list-style-type: none"> Coolant – IAT < 8°C Engine Soak Time > 36000 Seconds -30 °C < Coolant Temp < 45°C Coolant Fault = Not Active Ignition Off Timer Fault = Not Active Intake Air Temp Fault = Not Active Ignition Voltage < 18 	Once per valid cold start.	DTC Type B

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HO2S Heater Resistance Bank 1 Sensor 2	P0054	Detects an oxygen sensor heater having an incorrect or out of range resistance value.	4.1191 Ohms < Calculated Heater resistance < 10.8105 Ohms	<ul style="list-style-type: none"> • Coolant – IAT < 8°C • Engine Soak Time > 36000 Seconds • -30 °C < Coolant Temp < 45°C • Coolant Fault = Not Active • Ignition Off Timer Fault = Not Active • Intake Air Temp Fault = Not Active • Ignition Voltage < 18 • 	Once per valid cold start.	DTC Type B
O2S Heater Control Circuit Bank 2 Sensor 2	P0056	This DTC checks the Heater Output Driver circuit for electrical integrity	Output state shorted or open Voltage low during driver open state (indicates short-to-ground or open circuit) or voltage high during driver closed state (indicates short to voltage).	<ul style="list-style-type: none"> • Ignition switch is in crank or run • 11 volts < Ignition Voltage < 18 volts • RPM > 400 	20 failures out of 25 samples Frequency: 250ms loop Continuous	DTC Type B
HO2S Heater Resistance Bank 2 Sensor 1	P0059	Detects an oxygen sensor heater having an incorrect or out of range resistance value.	2.185 Ohms < Calculated Heater resistance < 9.512 Ohms	<ul style="list-style-type: none"> • Coolant – IAT < 8°C • Engine Soak Time > 36000 Seconds • -30 °C < Coolant Temp < 45°C • Coolant Fault = Not Active • Ignition Off Timer Fault = Not Active • Intake Air Temp Fault = Not Active • Ignition Voltage < 18 • 	Once per valid cold start.	DTC Type B
HO2S Heater Resistance Bank 2 Sensor2	P0060	Detects an oxygen sensor heater having an incorrect or out of range resistance value.	4.1191 Ohms < Calculated Heater resistance < 10.8105 Ohms	<ul style="list-style-type: none"> • Coolant – IAT < 8°C • Engine Soak Time > 36000 Seconds • -30 °C < Coolant Temp < 45°C • Coolant Fault = Not Active • Ignition Off Timer Fault = Not Active • Intake Air Temp Fault = Not Active • Ignition Voltage < 18 • 	Once per valid cold start.	DTC Type B
Map/Maf/Throttle Position Correlation	P0068	Detect when manifold absolute pressure and measured airflow do not match estimated engine airflow as established by the TPS	<ol style="list-style-type: none"> 1. Difference between measured MAP and estimated MAP > X kPa OR V5B OOR OR After Throttle Blade MAP sensor TFTKO, then MAP leg failed 2. Difference between measured MAF and estimated MAF > Y grams/sec OR MAF sensor TFTKO OR Vbatt < 10 volts, then MAF leg failed. 3. X, Y depend on throttle position, (see table “MAP and MAF Delta Criterion based on TPS % for P0068 code” attached) 	Engine running, engine speed > 800 rpm	Continuously fail MAP AND MAF legs for longer than 187.5 msec Continuous in the main processor	DTC Type A
Mass Air Flow System Performance (Rationality)	P0101	This DTC determines if the MAF sensor is stuck within the normal operating range	(Measured Flow – Modeled air Flow) Filtered > 12 AND (Measured Manifold Air Pressure – Manifold Model 2 pressure) Filtered > 15	<p>Engine rpm =>450 and <= 8000 MAP sensor high/low DTCs not active MAF sensor high/low DTCs not active Crank sensor DTCs not active Engine Coolant DTCs not active Intake Air Temp. DTCs not active Engine Coolant > 70 deg C and < 125 deg C Intake Air Temp > -7 deg C and < 125 deg C</p>	Continuous The Mass Air Flow reading and Mass Air Flow calculation are performed during the same 12.5 ms loop	DTC Type B

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Mass Air Flow Sensor Circuit Low Frequency	P0102	Detects a continuous short to low or a open in either the signal circuit or the MAF sensor	MAF \leq 1400 Hz (~1.07 g/s)	Engine Running > 1 second Engine Speed \geq 300 RPM System Voltage \geq 8 volts The above must be present for a period of time greater than 1.0 second	400 test failures in 500 test samples 1 sample every Lo Res event	DTC Type B
Mass Air Flow Sensor Circuit High Frequency	P0103	Detects a continuous short to high in either the signal circuit or the MAF sensor	MAF \geq 14500 Hz (~511.9 g/s)	Engine Running > 1 second Engine Speed \geq 300 RPM System Voltage \geq 8 volts The above must be present for a period of time greater than 1.0 second	400 test failures in 500 test samples 1 sample every Lo Res event	DTC Type B
Map Sensor Range/ Performance (Rationality)	P0106	This DTC determines if the MAP sensor is stuck within the normal operation range	(Measured MAP - Manifold Model 1 pressure) filtered > 15 AND (Measured MAP - Manifold Model 2 pressure) filtered > 15	Engine rpm \Rightarrow 450 and \leq 8000 Time in All Cylinder mode \Rightarrow 2 seconds MAP sensor high/low DTCs not active MAF sensor high/low DTCs not active Crank sensor DTCs not active Engine Coolant DTCs not active Intake Air Temp. DTCs not active Engine Coolant > 70 deg C and < 125 deg C Intake Air Temp > -7 deg C and < 125 deg C	Continuous The MAP reading and the Manifold Model calculations are performed in the same LoRes loop	DTC Type B
Manifold Absolute Pressure Sensor Circuit Low	P0107	This DTC detects a continuous short to low or open in either the signal circuit or the MAP sensor.	MAP voltage < 2% of Vref (0.1 volts ~ 10.3kPa)	TP sensor DTCs not active Engine Running \geq 400 RPM Throttle Position is \geq 0% when engine speed is \leq 800 RPM Or Throttle Position is \geq 12.5 % when engine speed is > 800 RPM No 5v ref. DTCs	320 test failures in 400 test samples 1 sample/12.5 ms	DTC Type B LS7 Only
Manifold Absolute Pressure Sensor Circuit Low	P0107	This DTC detects a continuous short to low or open in either the signal circuit or the MAP sensor.	MAP voltage < 2% of Vref (0.1 volts ~ 10.3kPa)	TP Sensor DTCs not active MAF sensor DTCs not active Manifold Model 1 pressure > 25	320 test failures in 400 test samples 1 sample/12.5 ms	DTC Type B
Manifold Absolute Pressure Sensor Circuit Low	P0107	Detects a MAP sensor output that is out of the operating range low or continuous short to low or open in either the signal circuit or the MAP sensor.	MAP voltage < 3% of Vref (0.15 volts ~ 6.1kPa)	MAP Sensor has Dead bands	320 test failures in 400 test samples 1 sample/12.5 ms	DTC Type B LU3, LS3, LS4 only
Manifold Absolute Pressure Sensor Circuit High	P0108	This DTC detects an open sensor ground or continuous short to high in either the signal circuit or the MAP sensor	MAP voltage > 98% of Vref (4.9 volts ~ 104.7kPa)	Engine Run Time based on power up ECT: \geq 0 sec at \geq 30°C \geq 80 sec at 15°C \geq 134 sec at 0°C \geq 188 sec at -15°C \geq 242 sec at -30° C; time is interpolated between temperature points TP sensor DTCs not active Throttle Position is \leq 1 % when engine speed is \leq 1200 RPM Or Throttle Position is \leq 20 % when engine speed is > 1200 RPM	320 test failures in 400 test samples 1 sample/12.5 ms	DTC Type B LS7 Only

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Manifold Absolute Pressure Sensor Circuit High	P0108	This DTC detects an open sensor ground or continuous short to high in either the signal circuit or the MAP sensor	MAP voltage > 98% of Vref (4.9 volts ~ 104.7kPa)	Engine Run Time based on power up ECT: ≥ 0 sec at ≥ 30°C ≥ 80 sec at 15°C ≥ 134 sec at 0°C ≥ 188 sec at -15°C ≥ 242 sec at -30° C; time is interpolated between temperature points TP sensor DTCs not active Manifold Model 1 pressure < 90 MAF sensor DTCs not active	320 test failures in 400 test samples 1 sample/12.5 ms	DTC Type B
Manifold Absolute Pressure Sensor Circuit High	P0108	Detects a MAP sensor output that is out of the operating range high or continuous short to high in either the signal circuit or the MAP sensor.	MAP voltage > 97% of Vref (4.85 volts ~ 121.4kPa)	MAP Sensor has Dead bands	320 test failures in 400 test samples 1 sample/12.5 ms	DTC Type B LU3, LS3, LS4 only
Intake Air Temp Sensor Circuit Low (High Temp)	P0112	This DTC detects a continuous short to ground in the IAT signal circuit or the IAT sensor	Raw IAT < 45 ohms (~ 150degC)	VS sensor DTCs not active ECT sensor DTCs not active Engine run time > 10 seconds ECT Temperature < 150°C VSS >= 0 KPH	50 test failures in 63 test samples 1 sample/100 msec	DTC Type B
Intake Air Temp Sensor Circuit High (Low Temp)	P0113	This DTC detects a continuous open or short to high in the IAT signal circuit or the IAT sensor	Raw IAT > 420,000 Ohms (~ -60degC)	MAF sensor DTCs not active ECT sensor DTCs not active VS sensor DTCs not active Engine run time > 10 seconds ECT > -40 MAF > 512 gm/s 512 KPH >= VSS	50 test failures in 63 test samples 1 sample/100 msec	DTC Type B
Engine Coolant Temp Sensor Rationality (High-Sided)	P0116	Detects ECT temp sensor stuck in mid range	A failure will be reported if any of the following occur: ECT at power up > IAT at power up by an IAT based table lookup (See "P0116: Fail if power up ECT exceeds IAT by these values. 5.3L (LY5) ") value after a minimum 10 hour soak (fast fail). ECT at power up > IAT at power up by 15°C after a minimum 10 hour soak and a block heater has not been detected. ECT at power up > IAT at power up by 15°C after a minimum 10 hour soak and the time spent cranking the engine without starting is greater than 10 seconds with the fuel level being above a minimum level of 5%.	No VSS DTC's No IAT DTC's No ECT sensor shorted DTC's ECM/PCM Internal Engine Off Timer Performance DTC not active Non-volatile memory failure has not been detected on power-up. Engine off time > 600 minutes (10 hours) Test run this trip = false Test aborted this trip = false IAT >= -7C Block heater detection: ECT at power up > IAT at power up by 15°C Power up IAT > -7°C Vehicle driven a minimum of 400 seconds above 24 kph and IAT drops more than 8° C from power up IAT.	1 failure 500 ms loop	DTC Type B

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Engine Coolant Temp Sensor Circuit Low (High Temp)	P0117	This DTC detects a continuous short to ground in the ECT signal circuit or the ECT sensor.	Raw ECT < 45 ohms (~ 150° C)		5 test failures in a 6 sample test. 1 sec / sample	DTC Type B
Engine Coolant Temp Sensor Circuit Low (High Temp)	P0117	This DTC detects a continuous short to ground in the ECT signal circuit or the ECT sensor.	Raw ECT < 45 ohms (~ 150° C)	Engine run time > 10 seconds Or IAT < 50° C	5 test failures in a 6 sample test. 1 sec / sample	DTC Type B LS7 Only
Engine Coolant Temp Sensor Circuit High (Low Temp)	P0118	Circuit Continuity This DTC detects a continuous short to high or open in the ECT signal circuit or the ECT sensor.	Raw ECT > 450,000ohms(~ -60° C)	Engine run time > 10 seconds Or IAT < 50° C	5 test failures in a 6 sample test. 1 sec / sample	DTC Type B
Throttle Position (Tp) Sensor 1 Circuit	P0120	Detects a continuous or intermittent short or open in TP sensor #1 circuit	0.325 Volts > TPS > 4.75 Volts	Ignition in unlock/accessory, run or crank System voltage>5.23 V No , 5 V reference DTCs	79/159 counts; 55 counts continuous; 3.125 msec /count in the ECM main processor 19/39 counts or 13 counts continuous; 12.5 msec/count in the MHC processor	DTC Type A
Throttle Position Sensor Circuit Performance (Rationality)	P0121	The DTC determines if a TPS sensor is stuck within the normal operating range	Filtered throttle error > 250 kPa/grams per second	Engine rpm =>450 and <= 8000 MAP sensor high/low DTCs not active MAF sensor high/low DTCs not active Crank sensor DTCs not active Engine Coolant DTCs not active Intake Air Temp. DTCs not active Engine Coolant > 70 deg C and < 125 deg C Intake Air Temp > -7 deg C and < 125 deg C	Continuous Calculations are performed every 12.5 ms	DTC Type B
Throttle Position (Tp) Sensor 1 Circuit Lo	P0122	Detects a continuous or intermittent Out of Range lo TPS	TPS < 0.325 Volts	Ignition in unlock/accessory, run or crank System voltage>5.23 V No , 5 V reference DTCs	79/159 counts; 55 counts continuous; 3.125 msec /count in the ECM main processor 19/39 counts or 13 counts continuous; 12.5 msec/count in the MHC processor	DTC Type A
Throttle Position (Tp) Sensor 1 Circuit Hi	P0123	Detects a continuous or intermittent Out of Range Hi TPS	TPS > 4.75 Volts	Ignition in unlock/accessory, run or crank System voltage>5.23 V No 5 V reference DTCs	79/159 counts; 55counts continuous; 3.125 msec /count in the ecm main processor 19/39 counts or 13 counts continuous; 12.5 msec/count in the MHC processor	DTC Type A

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Engine Coolant Temperature Below Stat 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 (See attached table "P0128: Maximum Accumulated Airflow for IAT and Start-up ECT conditions. 5.3L (LMG) "_") before engine coolant reaches 75 °C when IAT is > 10° C, and before engine coolant reaches 55°C when IAT is ≤ 10°C but ≥ -7°C.	No MAF, MAP, TP Sensor, IAT, ECT shorted or open, VSS, ECT High Sided Rationality, or Fuel Compensation faults active ECT shorted or open faults not failing IAT ≥ -7°C 90seconds ≤ Engine runtime ≤ 1370 seconds Fuel ethanol percent ≤ 85% ECT at start run ≤ 70°C for IAT above 10°C; ECT at start run ≤ 50°C for IAT ≤ 10°C but ≥ -7°C Minimum Average Airflow ≥ 10 gm/sec Vehicle speed ≥ 5 MPH for at least 1.50 miles Maximum airflow added to actual accumulated airflow limited to 75 gm/sec Airflow added to actual accumulated airflow is considered 0 gm/sec below an actual 20 gm/sec.	30 failures to set DTC <u>Frequency:</u> Once per ignition cycle 1 second loop	DTC Type B
O2S Circuit Low Voltage Bank 1 Sensor 1	P0131	This DTC determines if the O2 sensor circuit is shorted to low.	O2 sensor voltage < 50 millivolts	<u>Common Enable Criteria</u> <ul style="list-style-type: none"> • No TP Sensor, MAP, ECT, MAF, IAT, Evap, Fuel Injector DTC's • Catalyst monitor diagnostic Intrusive Test = Not Active • Post Oxygen Sensor Diagnostic Intrusive Test = Not Active • Traction Control, AIR, Fuel, Idle, EGR, and Engine Not Over speed Intrusive Tests = Not Active • 10 volts < system voltage < 18 volts • EGR, Idle, Fuel Injector, and AIR Device controls = Not Active • Fuel Level > 10 % or fuel level data fault active <u>Specific Enable Criteria</u> <ul style="list-style-type: none"> • 0.992 ≤ Equivalence ratio ≤ 1.014 • 3 % ≤ throttle position ≤ 70 % • Fuel state = closed loop with no fault pending • All fuel injectors = ON • Traction Control = not active <p style="text-align: center;">All of the above met for at least 2 seconds</p>	450 test failures in a 480 sample test <u>Frequency:</u> Continuous 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.	<p>O2 sensor voltage > 1050 millivolts to go fault pending</p> <p>O2 sensor voltage > 1050 millivolts to set DTC</p>	<p><u>Common Enable Criteria</u></p> <ul style="list-style-type: none"> • No TP Sensor, MAP, ECT, MAF, IAT, Evap, Fuel Injector DTC's • Catalyst monitor diagnostic Intrusive Test = Not Active • Post Oxygen Sensor Diagnostic Intrusive Test = Not Active • Traction Control, AIR, Fuel, Idle, EGR, and Engine Not Over speed Intrusive Tests = Not Active • 10 volts < system voltage < 18 volts • EGR, Idle, Fuel Injector, and AIR Device controls = Not Active • Fuel Level > 10 % or fuel level data fault active <p><u>Specific Enable Criteria</u></p> <ul style="list-style-type: none"> • $0.992 \leq \text{Equivalence Ratio} \leq 1.014$ • $0 \% \leq \text{throttle position} \leq 70 \%$ • Fuel State = Closed loop <p>All of the above met for at least 2 seconds</p>	<p>90 test failures in a 100 sample test</p> <p><u>Frequency:</u> Continuous 100 ms loop</p>	DTC Type B

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O2S Slow Response Bank 1 Sensor 1	P0133	This DTC determines if the O2 sensor response time is degraded	Refer to “ O2S Slow Response Bank 1 Sensor 1 (P0133), O2S Slow Response Bank 2 Sensor 1 (P0153) Pass/Fail Thresholds. ” In Lookup Tables section.	<p><u>Common Enable Criteria</u></p> <ul style="list-style-type: none"> • No TP Sensor, MAP, ECT, MAF, IAT, Evap, Fuel Injector DTC’s • Catalyst monitor diagnostic Intrusive Test = Not Active • Post Oxygen Sensor Diagnostic Intrusive Test = Not Active • Traction Control, AIR, Fuel, Idle, EGR, and Engine Not Over speed Intrusive Tests = Not Active • 10 volts < system voltage < 18 volts • EGR, Idle, Fuel Injector, and AIR Device controls = Not Active • Fuel Level > 10 % or fuel level data fault active <p><u>Specific Enable Criteria</u></p> <ul style="list-style-type: none"> • O2 Heater on for ≥ 0 seconds • B1S1 DTCs = Not Active • Learned heater resistance is valid • Misfire DTC = Not Active • ECT > 60 °C • IAT > -40 °C • Engine run time > 160 seconds • EVAP Canister purge duty cycle ≥ 0 % • 20 gm/sec \leq MAF \leq 55 gm/sec • 1200 \leq RPM \leq 3000 • Ethanol percentage < 87 % • Baro > 69.8 kPa • Throttle position ≥ 4.999 % Fuel state = closed loop Transmission (automatic) not in Park, Reverse or Neutral • Transmission gear selection is not defaulted • Baro is not defaulted <p>All of the above met for at least 1 second.</p>	<p>100 seconds</p> <p><u>Frequency:</u> Once per trip</p> <p><u>Green Sensor Delay Criteria</u></p> <ul style="list-style-type: none"> • The diagnostic will not be enabled until the next ignition cycle after the following has been met: Airflow greater than 22 g/sec for 120000 grams of accumulated flow 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) <p>Note: this feature is only enabled when the vehicle is new and cannot be enabled in service</p>	DTC Type B

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O2S Circuit Insufficient Activity Bank 1 Sensor 1	P0134	This DTC determines if the O2 sensor circuit is open.	350 millivolts < O2 sensor < 550 millivolts	<p><u>Common Enable Criteria</u></p> <ul style="list-style-type: none"> • No TP Sensor, MAP, ECT, MAF, IAT, Evap, Fuel Injector DTC's • Catalyst monitor diagnostic Intrusive Test = Not Active • Post Oxygen Sensor Diagnostic Intrusive Test = Not Active • Traction Control, AIR, Fuel, Idle, EGR, and Engine Not Over speed Intrusive Tests = Not Active • 10 volts < system voltage < 18 volts • EGR, Idle, Fuel Injector, and AIR Device controls = Not Active <p><u>Specific Enable Criteria</u></p> <ul style="list-style-type: none"> • Engine run time > 300 seconds • Ethanol percentage > 87 % • No B1S1 heater related DTCs 	<p>285 test failures in a 300 test samples</p> <p>Minimum of 0 occurrences of a delta TP sensor $\geq 4.999\%$ during diagnostic test</p> <p><u>Frequency:</u> Continuous for pre catalyst sensors 100 ms loop rate</p>	DTC Type B
O2S Heater Performance Bank 1 Sensor 1	P0135	This DTC determines if the O2 sensor heater is functioning properly by monitoring the current through the heater circuit.	O2 sensor heater current is < 0.25 amps or > 3.125 amps	<p><u>Common Enable Criteria</u></p> <ul style="list-style-type: none"> • No TP Sensor, MAP, ECT, MAF, IAT, Evap, Fuel Injector DTC's • Catalyst monitor diagnostic Intrusive Test = Not Active • Post Oxygen Sensor Diagnostic Intrusive Test = Not Active • Traction Control, AIR, Fuel, Idle, EGR, and Engine Not Over speed Intrusive Tests = Not Active • 10 volts < system voltage < 18 volts • EGR, Idle, Fuel Injector, and AIR Device controls = Not Active <p><u>Specific Enable Criteria</u></p> <ul style="list-style-type: none"> • Engine Run Time ≥ 300 Secs. (LS7 Only) • Engine Run Time ≥ 300 Secs. (LS7 Only) • ECT $\geq 50^\circ$ C (LS7 Only) • $500 \leq$ Engine Rpm ≤ 3000 (LS7 Only) • $3 \text{ gm/sec} \leq$ Mass Airflow $\leq 40 \text{ gm/sec}$ (LS7 Only) • O2 heater not in Device control • B2S1 O2 heater resistance DTC not active <p>• All of the above met for at least 120 seconds</p>	<p>8 test failures in 10 test samples</p> <p><u>Frequency:</u> 1 tests per trip 5 seconds delay between tests 1 second execution rate</p>	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 < 50 millivolts	<p><u>Common Enable Criteria</u></p> <ul style="list-style-type: none"> • No TP Sensor, MAP, ECT, MAF, IAT, Evap, Fuel Injector DTC's • Catalyst monitor diagnostic Intrusive Test = Not Active • Post Oxygen Sensor Diagnostic Intrusive Test = Not Active • Traction Control, AIR, Fuel, Idle, EGR, and Engine Not Over speed Intrusive Tests = Not Active • 10 volts < system voltage < 18 volts • EGR, Idle, Fuel Injector, and AIR Device controls = Not Active • Fuel Level > 10 % or fuel level data fault active <p><u>Specific Enable Criteria</u></p> <ul style="list-style-type: none"> • $0.992 \leq \text{Equivalence ratio} \leq 1.014$ • $3 \% \leq \text{throttle position} \leq 70 \%$ • Fuel state = closed loop • All fuel injectors = ON • Traction Control = not active <p style="text-align: center;">All of the above met for at least 2 seconds</p>	570 test failures in a 600 sample test <u>Frequency:</u> Continuous 100 ms loop	DTC Type B
O2S Circuit High Voltage Bank 1 Sensor 2	P0138	This DTC determines if the O2 sensor or circuit is shorted to high	O2 sensor voltage > 1050 millivolts to go fault pending O2 sensor voltage > 1050 millivolts to set DTC	<p><u>Common Enable Criteria</u></p> <ul style="list-style-type: none"> • No TP Sensor, MAP, ECT, MAF, IAT, Evap, Fuel Injector DTC's • Catalyst monitor diagnostic Intrusive Test = Not Active • Post Oxygen Sensor Diagnostic Intrusive Test = Not Active • Traction Control, AIR, Fuel, Idle, EGR, and Engine Not Over speed Intrusive Tests = Not Active • 10 volts < system voltage < 18 volts • EGR, Idle, Fuel Injector, and AIR Device controls = Not Active • Fuel Level > 10 % or fuel level data fault active <p><u>Specific Enable Criteria</u></p> <ul style="list-style-type: none"> • $0.992 \leq \text{Equivalence Ratio} \leq 1.014$ • $3 \% \leq \text{throttle position} \leq 70 \%$ • Fuel State = Closed loop <p style="text-align: center;">All of the above met for at least 2 seconds</p>	570 test failures in a 600 sample test <u>Frequency:</u> Continuous 100 ms loop	DTC Type B

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SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
O2 Sensor Slow Response – Rich to Lean Bank 1 Sensor 2	P013A	This DTC determines if the post catalyst O2 sensor has Slow Response in a predefined Rich to Lean voltages range during Rich to Lean transition. The diagnostic is an intrusive test which runs in a DFCO mode to achieve the required response.	The EWMA of the Post O2 (B1S2) normalized integral value is NaOXYD_i_POPD_R2L_EWMA > 8 integral units (this value is proportional to mV/sec). OR > 50 grams of accumulated mass air flow monitored during R-L transition between 450 mV and 150 mV	<u>Common Enable Criteria</u> <ul style="list-style-type: none"> • No O2 circuit, response, heater current, or heater resistance DTC's active • No TP Sensor, ETC, MAF, MAP, EVAP, Secondary Air, Fuel Injector DTC's, Fuel Trim System DTCs, Misfire DTCs, E85 FFS DTCs • 10 volts < system voltage < 18 volts • Learned heater resistance is valid • ICAT MAT Burn off delay is not active • Green O2 Sensor Condition is not present • Fuel Level > 10 % or fuel level data fault active • Engine run time (from key start) ≥ 295 secs <u>Specific Enable Criteria:</u> <ul style="list-style-type: none"> • <u>The DFCO mode and no driver initiated throttle input, TCC Locked.</u> • <u>Complete and PASS the following POPD tests:</u> <ol style="list-style-type: none"> 1. <u>P2270 and P2272, if applicable.</u> 2. <u>P013E and P014A, if applicable</u> 	<u>Frequency:</u> Once per trip Note: if NaPOPD_b_ResetFastRespFunc = FALSE for the given Fuel Bank OR NaPOPD_b_RapidResponseActive = TRUE, multiple tests per trip are allowed. <u>Green Sensor Delay Criteria</u> <ul style="list-style-type: none"> • The diagnostic will not be enabled until the next ignition cycle after the following has been met: Airflow greater than 22 g/sec for 120000 grams of accumulated flow 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) Note: this feature is only enabled when the vehicle is new and cannot be enabled in service	DTC Type A H2 and H3 Programs Only
O2 Sensor Slow Response – Lean to Rich Bank 1 Sensor 2	P013B	This DTC determines if the post catalyst O2 sensor has Slow Response in a predefined Lean to Rich voltages range during Lean to Rich transition. The diagnostic is an intrusive test which increases the delivered A/F ratio to achieve the required rich threshold..	The EWMA of the Post O2 (B1S2) normalized integral value is NaOXYD_i_POPD_L2R_EWMA > 8 integral units (this value is proportional to mV/sec). OR > 50 grams of accumulated mass air flow monitored during L-R transition between 350mV and 650 mV	<u>Common Enable Criteria</u> <ul style="list-style-type: none"> • No O2 circuit, response, heater current, or heater resistance DTC's active • No TP Sensor, ETC, MAF, MAP, EVAP, Secondary Air, Fuel Injector DTC's, Fuel Trim System DTCs, Misfire DTCs, E85 FFS DTCs • 10 volts < system voltage < 18 volts • Learned heater resistance is valid • ICAT MAT Burn off delay is not active • Green O2 Sensor Condition is not present • Fuel Level > 10 % or fuel level data fault active • Engine run time (from key start) ≥ 295 secs <u>Specific Enable Criteria:</u> <ul style="list-style-type: none"> • <u>Complete and PASS the following POPD tests:</u> <ol style="list-style-type: none"> 1. <u>P2270 and P2272, if applicable.</u> 2. <u>P013E and P014A, if applicable.</u> 3. <u>P013A and P013C, if applicable.</u> 4. <u>P2271 and P2273, if applicable.</u> 5. <u>P013F and P014B, if applicable.</u> 	<u>Frequency:</u> Once per trip Note: if NaPOPD_b_ResetFastRespFunc = FALSE for the given Fuel Bank OR NaPOPD_b_RapidResponseActive = TRUE, multiple tests per trip are allowed. <u>Green Sensor Delay Criteria</u> <ul style="list-style-type: none"> • The diagnostic will not be enabled until the next ignition cycle after the following has been met: Airflow greater than 22 g/sec for 120000 grams of accumulated flow 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) Note: this feature is only enabled when the vehicle is new and cannot be enabled in service	DTC Type A H2 and H3 Programs Only

08 GRP07 All Engine

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
O2 Sensor Slow Response – Rich to Lean Bank 2 Sensor 2	P013C	This DTC determines if the post catalyst O2 sensor has Slow Response in a predefined Rich to Lean voltages range during Rich to Lean transition. The diagnostic is an intrusive test which runs in a DFCO mode to achieve the required response.	The EWMA of the Post O2 (B2S2) normalized integral value is NaOXYD_i_POPD_R2L_EWMA > 8 integral units (this value is proportional to mV/sec) OR > 50 grams of accumulated mass air flow monitored during R-L transition between 450 mV and 150 mV	<u>Common Enable Criteria</u> <ul style="list-style-type: none"> • No O2 circuit, response, heater current, or heater resistance DTC's active • No TP Sensor, ETC, MAF, MAP, EVAP, Secondary Air, Fuel Injector DTC's, Fuel Trim System DTCs, Misfire DTCs, E85 FFS DTCs • 10 volts < system voltage < 18 volts • Learned heater resistance is valid • ICAT MAT Burn off delay is not active • Green O2 Sensor Condition is not present • Fuel Level > 10 % or fuel level data fault active • Engine run time (from key start) ≥ 295 secs <u>Specific Enable Criteria:</u> <ul style="list-style-type: none"> • <u>The DFCO mode and no driver initiated throttle input, TCC Locked.</u> • <u>Complete and PASS the following POPD tests:</u> <ol style="list-style-type: none"> 1. <u>P2270 and P2272, if applicable.</u> 2. <u>P013E and P014A, if applicable</u> 	<u>Frequency:</u> Once per trip Note: if NaPOPD_b_ResetFastRespFunc = FALSE for the given Fuel Bank OR NaPOPD_b_RapidResponseActive = TRUE, multiple tests per trip are allowed. <u>Green Sensor Delay Criteria</u> <ul style="list-style-type: none"> • The diagnostic will not be enabled until the next ignition cycle after the following has been met: Airflow greater than 22 g/sec for 120000 grams of accumulated flow 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) Note: this feature is only enabled when the vehicle is new and cannot be enabled in service	DTC Type A H2 and H3 Programs Only
O2 Sensor Slow Response – Lean to Rich Bank 2 Sensor 2	P013D	This DTC determines if the post catalyst O2 sensor has Slow Response in a predefined Lean to Rich voltages range during Lean to Rich transition. The diagnostic is an intrusive test which increases the delivered A/F ratio to achieve the required rich threshold..	The EWMA of the Post O2 (B2S2) normalized integral value is NaOXYD_i_POPD_L2R_EWMA > 8 integral units (this value is proportional to mV/sec) OR > 50 grams of accumulated mass air flow monitored during L-R transition between 350mV and 650 mV.	<u>Common Enable Criteria</u> <ul style="list-style-type: none"> • No O2 circuit, response, heater current, or heater resistance DTC's active • No TP Sensor, ETC, MAF, MAP, EVAP, Secondary Air, Fuel Injector DTC's, Fuel Trim System DTCs, Misfire DTCs, E85 FFS DTCs • 10 volts < system voltage < 18 volts • Learned heater resistance is valid • ICAT MAT Burn off delay is not active • Green O2 Sensor Condition is not present • Fuel Level > 10 % or fuel level data fault active • Engine run time (from key start) ≥ 295 secs <u>Specific Enable Criteria:</u> <ul style="list-style-type: none"> • <u>Complete and PASS the following POPD tests:</u> <ol style="list-style-type: none"> 1. <u>P2270 and P2272, if applicable.</u> 2. <u>P013E and P014A, if applicable.</u> 3. <u>P013A and P013C, if applicable.</u> 4. <u>P2271 and P2273, if applicable.</u> 5. <u>P013F and P014B, if applicable.</u> 	<u>Frequency:</u> Once per trip Note: if NaPOPD_b_ResetFastRespFunc = FALSE for the given Fuel Bank OR NaPOPD_b_RapidResponseActive = TRUE, multiple tests per trip are allowed. <u>Green Sensor Delay Criteria</u> <ul style="list-style-type: none"> • The diagnostic will not be enabled until the next ignition cycle after the following has been met: Airflow greater than 22 g/sec for 120000 grams of accumulated flow 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) Note: this feature is only enabled when the vehicle is new and cannot be enabled in service	DTC Type A H2 and H3 Programs Only

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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
O2 Sensor Delayed Response Rich to Lean Bank 1 Sensor 2	P013E	This DTC determines if the post catalyst O2 sensor has an initial delayed response to an A/F change from Rich to Lean. The diagnostic is an intrusive test which runs in a DFCO mode to achieve the required response..	Post catalyst (B1S2) O2 sensor cannot achieve voltage below 450 millivolts within 50grams of accumulated air flow.	<p><u>Common Enable Criteria</u></p> <ul style="list-style-type: none"> • <u>No O2 circuit, response, heater current, or heater resistance DTC's active</u> • <u>No TP Sensor, ETC, MAF, MAP, EVAP, Secondary Air, Fuel Injector DTC's, Fuel Trim System DTCs, Misfire DTCs, E85 FFS DTCs</u> • <u>10 volts < system voltage < 18 volts</u> • <u>Learned heater resistance is valid</u> • <u>ICAT MAT Burn off delay is not active</u> • <u>Green O2 Sensor Condition is not present</u> • <u>Fuel Level > 10 % or fuel level data fault active</u> • <u>Engine run time (from key start) ≥ 295 secs</u> <p><u>Specific Enable Criteria:</u></p> <ul style="list-style-type: none"> • <u>The DFCO mode and no driver initiated throttle input, TCC Locked.</u> • <u>Complete and PASS the following POPD tests: P2270 and P2272, if applicable</u> 	<p>Frequency: Once per trip Note: if NaPOPD_b_ResetFastRespFunc = FALSE for the given Fuel Bank OR NaPOPD_b_RapidResponseActive = TRUE, multiple tests per trip are allowed. Green Sensor Delay Criteria</p> <ul style="list-style-type: none"> • The diagnostic will not be enabled until the next ignition cycle after the following has been met: Airflow greater than 22 g/sec for 120000 grams of accumulated flow 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) <p>Note: this feature is only enabled when the vehicle is new and cannot be enabled in service</p>	<p>DTC Type B</p> <p>H2 and H3 Programs Only</p>

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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
O2 Sensor Delayed Response Lean to Rich Bank 1 Sensor 2	P013F	This DTC determines if the post catalyst O2 sensor has an initial delayed response to an A/F change from Lean to Rich. The diagnostic is an intrusive test which increases the delivered A/F ratio to achieve the required rich threshold.	Post catalyst (B1S2) O2 sensor cannot achieve voltage above 350millivolts within 50 grams of accumulated air flow.	<p><u>Common Enable Criteria</u></p> <ul style="list-style-type: none"> No O2 circuit, response, heater current, or heater resistance DTC's active No TP Sensor, ETC, MAF, MAP, EVAP, Secondary Air, Fuel Injector DTC's, Fuel Trim System DTCs, Misfire DTCs, E85 FFS DTCs 10 volts < system voltage < 18 volts Learned heater resistance is valid ICAT MAT Burn off delay is not active Green O2 Sensor Condition is not present Fuel Level > 10 % or fuel level data fault active Engine run time (from key start) ≥ 295 secs <p><u>Specific Enable Criteria:</u></p> <ul style="list-style-type: none"> Complete and PASS the following POPD tests: <ol style="list-style-type: none"> P2270 and P2272, if applicable. P013E and P014A, if applicable. P013A and P013C, if applicable. P2271 and P2273, if applicable. 	<p><u>Frequency:</u> Once per trip Note: if NaPOPD_b_ResetFastRespFunc = FALSE for the given Fuel Bank OR NaPOPD_b_RapidResponseActive = TRUE, multiple tests per trip are allowed.</p> <p><u>Green Sensor Delay Criteria</u></p> <ul style="list-style-type: none"> The diagnostic will not be enabled until the next ignition cycle after the following has been met: Airflow greater than 22 g/sec for 120000 grams of accumulated flow 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) <p>Note: this feature is only enabled when the vehicle is new and cannot be enabled in service</p>	DTC Type B H2 and H3 Programs Only
O2s Circuit Insufficient Activity Bank 1 Sensor 2	P0140	This DTC determines if the O2 sensor circuit is open.	<p>410 millivolts < O2 sensor < 490 millivolts for regular open test</p> <p>350 millivolts < O2 sensor < 550 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)</p>	<p><u>Common Enable Criteria</u></p> <ul style="list-style-type: none"> No TP Sensor, MAP, ECT, MAF, IAT, Evap, Fuel Injector DTC's Catalyst monitor diagnostic Intrusive Test = Not Active Post Oxygen Sensor Diagnostic Intrusive Test = Not Active Traction Control, AIR, Fuel, Idle, EGR, and Engine Not Over speed Intrusive Tests = Not Active 10 volts < system voltage < 18 volts EGR, Idle, Fuel Injector, and AIR Device controls = Not Active <p><u>Specific Enable Criteria</u></p> <ul style="list-style-type: none"> Ethanol percentage > 86.99951 % No B1S2 heater related DTCs PCM State = run <p><u>Fast Pass:</u></p> <ul style="list-style-type: none"> Engine run time ≤ 200 seconds <p>(Fast pass cannot report a fail; if Fast pass fails, the regular open test is run)</p> <p><u>Regular Open Test</u></p> <ul style="list-style-type: none"> Engine run time > 300 seconds Fuel state = closed loop 	<p>1450 test failures in a 1500 samples test</p> <p>Minimum of 6 occurrences of a delta TP sensor ≥ 4.998779 % during diagnostic test</p> <p>(sample counts – failure counts) < 550 within 200 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)</p> <p><u>Frequency:</u> Once/trip for post catalyst sensors 100 ms loop</p>	DTC Type B

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SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
O2S Heater Performance Bank 1 Sensor 2	P0141	This DTC determines if the O2 sensor heater is functioning properly by monitoring the current through the heater circuit.	O2 sensor heater current is < 0.25 amps or > 2.875 amps	<p><u>Common Enable Criteria</u></p> <ul style="list-style-type: none"> • No TP Sensor, MAP, ECT, MAF, IAT, Evap, Fuel Injector DTC's • Catalyst monitor diagnostic Intrusive Test = Not Active • Post Oxygen Sensor Diagnostic Intrusive Test = Not Active • Traction Control, AIR, Fuel, Idle, EGR, and Engine Not Over speed Intrusive Tests = Not Active • 10 volts < system voltage < 18 volts • EGR, Idle, Fuel Injector, and AIR Device controls = Not Active <p><u>Specific Enable Criteria</u></p> <ul style="list-style-type: none"> • Engine Run Time ≥ 300 Secs. (LS7 Only) • ECT ≥ 50° C (LS7 Only) • 500 ≤ Engine Rpm ≤ 3000 (LS7 Only) • 3 gm/sec ≤ Mass Airflow ≤ 40 gm/sec (LS7 Only) • O2 heater not in Device control • B2S1 O2 heater resistance DTC not active <p>All of the above met for at least 120 seconds</p>	8 test failures in 10 test samples Frequency: 1 tests per trip 5 seconds delay between tests 1 second execution rate	DTC Type B
O2 Sensor Delayed Response Rich to Lean Bank 2 Sensor 2	P014A	This DTC determines if the post catalyst O2 sensor has an initial delayed response to an A/F change from Rich to Lean. The diagnostic is an intrusive test which runs in a DFCO mode to achieve the required response..	Post catalyst (B2S2) O2 sensor cannot achieve voltage below 450 millivolts within 50grams of accumulated air flow.	<p><u>Common Enable Criteria</u></p> <ul style="list-style-type: none"> • No O2 circuit, response, heater current, or heater resistance DTC's active • No TP Sensor, ETC, MAF, MAP, EVAP, Secondary Air, Fuel Injector DTC's, Fuel Trim System DTCs, Misfire DTCs, E85 FFS DTCs • 10 volts < system voltage < 18 volts • Learned heater resistance is valid • ICAT MAT Burn off delay is not active • Green O2 Sensor Condition is not present • Fuel Level > 10 % or fuel level data fault active • Engine run time (from key start) ≥ 295 secs <p><u>Specific Enable Criteria:</u></p> <ul style="list-style-type: none"> • <u>The DFCO mode and no driver initiated throttle input, TCC Locked.</u> • <u>Complete and PASS the following POPD tests: P2270 and P2272, if applicable</u> 	<p><u>Frequency:</u> Once per trip Note: if NaPOPD_b_ResetFastRespFunc = FALSE for the given Fuel Bank OR NaPOPD_b_RapidResponseActive = TRUE, multiple tests per trip are allowed. <u>Green Sensor Delay Criteria</u></p> <ul style="list-style-type: none"> • The diagnostic will not be enabled until the next ignition cycle after the following has been met: Airflow greater than 22 g/sec for 120000 grams of accumulated flow 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) <p>Note: this feature is only enabled when the vehicle is new and cannot be enabled in service</p>	DTC Type B H2 and H3 Programs Only

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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
O2 Sensor Delayed Response Lean to Rich Bank 2 Sensor 2	P014B	This DTC determines if the post catalyst O2 sensor has an initial delayed response to an A/F change from Lean to Rich. The diagnostic is an intrusive test which increases the delivered A/F ratio to achieve the required rich threshold.	Post catalyst (B2S2) O2 sensor cannot achieve voltage above 350millivolts within 50 grams of accumulated air flow.	<p><u>Common Enable Criteria</u></p> <ul style="list-style-type: none"> • No O2 circuit, response, heater current, or heater resistance DTC's active • No TP Sensor, ETC, MAF, MAP, EVAP, Secondary Air, Fuel Injector DTC's, Fuel Trim System DTCs, Misfire DTCs, E85 FFS DTCs • 10 volts < system voltage < 18 volts • Learned heater resistance is valid • ICAT MAT Burn off delay is not active • Green O2 Sensor Condition is not present • Fuel Level > 10 % or fuel level data fault active • Engine run time (from key start) ≥ 295 secs <p><u>Specific Enable Criteria:</u></p> <ul style="list-style-type: none"> • <u>Complete and PASS the following POPD tests:</u> <ol style="list-style-type: none"> 1. <u>P2270 and P2272, if applicable.</u> 2. <u>P013E and P014A, if applicable.</u> 3. <u>P013A and P013C, if applicable.</u> 4. <u>P2271 and P2273, if applicable.</u> 	<p><u>Frequency:</u> Once per trip Note: if NaPOPD_b_ResetFastRespFunc = FALSE for the given Fuel Bank OR NaPOPD_b_RapidResponseActive = TRUE, multiple tests per trip are allowed.</p> <p><u>Green Sensor Delay Criteria</u></p> <ul style="list-style-type: none"> • The diagnostic will not be enabled until the next ignition cycle after the following has been met: Airflow greater than 22 g/sec for 120000 grams of accumulated flow 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) <p>Note: this feature is only enabled when the vehicle is new and cannot be enabled in service</p>	<p style="text-align: center;">DTC Type B</p> <p style="text-align: center;">H2 and H3 Programs Only</p>
O2S Circuit Low Voltage Bank 2 Sensor 1	P0151	This DTC determines if the O2 sensor circuit is shorted to low	O2 sensor voltage < 50 millivolts	<p><u>Common Enable Criteria</u></p> <ul style="list-style-type: none"> • No TP Sensor, MAP, ECT, MAF, IAT, Evap, Fuel Injector DTC's • Catalyst monitor diagnostic Intrusive Test = Not Active • Post Oxygen Sensor Diagnostic Intrusive Test = Not Active • Traction Control, AIR, Fuel, Idle, EGR, and Engine Not Over speed Intrusive Tests = Not Active • 10 volts < system voltage < 18 volts • EGR, Idle, Fuel Injector, and AIR Device controls = Not Active • Fuel Level > 10 % or fuel level data fault active <p><u>Specific Enable Criteria</u></p> <ul style="list-style-type: none"> • $0.992 \leq \text{Equivalence ratio} \leq 1.014$ • $3 \% \leq \text{throttle position} \leq 70 \%$ • Fuel state = closed loop with no fault pending • All fuel injectors = ON • Traction Control = not active <p style="text-align: center;">All of the above met for at least 2 seconds</p>	<p>450 test failures in a 480 sample test</p> <p><u>Frequency:</u> Continuous 100 ms loop</p>	<p style="text-align: center;">DTC Type B</p>

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SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
O2S Circuit High Voltage Bank 2 Sensor 1	P0152	This DTC determines if the O2 sensor or circuit is shorted to high.	O2 sensor voltage > 1050 millivolts to go fault pending O2 sensor voltage > 1050 millivolts to set DTC	<u>Common Enable Criteria</u> <ul style="list-style-type: none"> • No TP Sensor, MAP, ECT, MAF, IAT, Evap, Fuel Injector DTC's • Catalyst monitor diagnostic Intrusive Test = Not Active • Post Oxygen Sensor Diagnostic Intrusive Test = Not Active • Traction Control, AIR, Fuel, Idle, EGR, and Engine Not Over speed Intrusive Tests = Not Active • 10 volts < system voltage < 18 volts • EGR, Idle, Fuel Injector, and AIR Device controls = Not Active • Fuel Level > 10 % or fuel level data fault active <u>Specific Enable Criteria</u> <ul style="list-style-type: none"> • $0.992 \leq \text{Equivalence Ratio} \leq 1.014$ • $0 \% \leq \text{throttle position} \leq 70 \%$ • Fuel State = Closed loop All of the above met for at least 2 seconds	90 test failures in a 100 sample test <u>Frequency:</u> Continuous 100 ms loop	DTC Type B

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SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
O2S Slow Response Bank 2 Sensor 1	P0153	This DTC determines if the O2 sensor response time is degraded	Refer to “ O2S Slow Response Bank 1 Sensor 1 (P0133), O2S Slow Response Bank 2 Sensor 1 (P0153) Pass/Fail Thresholds. ” In Lookup Tables section.	<p><u>Common Enable Criteria</u></p> <ul style="list-style-type: none"> • No TP Sensor, MAP, ECT, MAF, IAT, Evap, Fuel Injector DTC’s • Catalyst monitor diagnostic Intrusive Test = Not Active • Post Oxygen Sensor Diagnostic Intrusive Test = Not Active • Traction Control, AIR, Fuel, Idle, EGR, and Engine Not Over speed Intrusive Tests = Not Active • 10 volts < system voltage < 18 volts • EGR, Idle, Fuel Injector, and AIR Device controls = Not Active • Fuel Level > 10 % or fuel level data fault active <p><u>Specific Enable Criteria</u></p> <ul style="list-style-type: none"> • O2 Heater on for ≥ 0 seconds • B2S1 DTCs = Not Active • Learned heater resistance is valid • Misfire DTC = Not Active • ECT > 60 °C • IAT > -40 °C • Engine run time > 160 seconds • EVAP Canister purge duty cycle ≥ 0 % • 20 gm/sec \leq MAF \leq 55 gm/sec • 1200 \leq RPM \leq 3000 • Ethanol percentage < 87 % • Baro > 69.8 kPa • Throttle position ≥ 4.999 % Fuel state = closed loop Transmission (automatic) not in Park, Reverse or Neutral • Transmission gear selection is not defaulted • Baro is not defaulted <p>All of the above met for at least 1 second.</p>	<p>100 seconds</p> <p><u>Frequency:</u> Once per trip</p> <p><u>Green Sensor Delay Criteria</u></p> <ul style="list-style-type: none"> • The diagnostic will not be enabled until the next ignition cycle after the following has been met: Airflow greater than 22 g/sec for 120000 grams of accumulated flow 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) <p>Note: this feature is only enabled when the vehicle is new and cannot be enabled in service</p>	DTC Type B

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SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
O2S Circuit Insufficient Activity Bank 2 Sensor 1	P0154	This DTC determines if the O2 sensor circuit is open.	350 millivolts < O2 sensor < 550 millivolts	<p><u>Common Enable Criteria</u></p> <ul style="list-style-type: none"> • No TP Sensor, MAP, ECT, MAF, IAT, Evap, Fuel Injector DTC's • Catalyst monitor diagnostic Intrusive Test = Not Active • Post Oxygen Sensor Diagnostic Intrusive Test = Not Active • Traction Control, AIR, Fuel, Idle, EGR, and Engine Not Over speed Intrusive Tests = Not Active • 10 volts < system voltage < 18 volts • EGR, Idle, Fuel Injector, and AIR Device controls = Not Active <p><u>Specific Enable Criteria</u></p> <ul style="list-style-type: none"> • Engine run time > 300 seconds • Ethanol percentage > 87 % • No B2S1 heater related DTCs 	<p>285 test failures in a 300 test samples</p> <p>Minimum of 0 occurrences of a delta TP sensor ≥ 4.999 % during diagnostic test</p> <p><u>Frequency:</u> Continuous for pre catalyst sensors 100 ms loop rate</p>	DTC Type B
O2S Heater Performance Bank 2 Sensor 1	P0155	This DTC determines if the O2 sensor heater is functioning properly by monitoring the current through the heater circuit.	O2 sensor heater current is < 0.25 amps or > 3.125 amps	<p><u>Common Enable Criteria</u></p> <ul style="list-style-type: none"> • No TP Sensor, MAP, ECT, MAF, IAT, Evap, Fuel Injector DTC's • Catalyst monitor diagnostic Intrusive Test = Not Active • Post Oxygen Sensor Diagnostic Intrusive Test = Not Active • Traction Control, AIR, Fuel, Idle, EGR, and Engine Not Over speed Intrusive Tests = Not Active • 10 volts < system voltage < 18 volts • EGR, Idle, Fuel Injector, and AIR Device controls = Not Active <p><u>Specific Enable Criteria</u></p> <ul style="list-style-type: none"> • Engine Run Time ≥ 300 Secs. (LS7 Only) • ECT $\geq 50^{\circ}$ C (LS7 Only) • $500 \leq$ Engine Rpm ≤ 3000 (LS7 Only) • $3 \text{ gm/sec} \leq$ Mass Airflow $\leq 40 \text{ gm/sec}$ (LS7 Only) • O2 heater not in Device control • B2S1 O2 heater resistance DTC not active <p>All of the above met for at least 120 seconds</p>	<p>8 test failures in 10 test samples</p> <p><u>Frequency:</u> 1 tests per trip 5 seconds delay between tests 1 second execution rate</p>	DTC Type B

08 GRP07 All Engine

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
O2S Circuit Low Voltage Bank 2 Sensor 2	P0157	This DTC determines if the O2 sensor circuit is shorted to low by checking for a lean condition during steady throttle.	O2 sensor voltage < 50 millivolts	<p><u>Common Enable Criteria</u></p> <ul style="list-style-type: none"> • No TP Sensor, MAP, ECT, MAF, IAT, Evap, Fuel Injector DTC's • Catalyst monitor diagnostic Intrusive Test = Not Active • Post Oxygen Sensor Diagnostic Intrusive Test = Not Active • Traction Control, AIR, Fuel, Idle, EGR, and Engine Not Over speed Intrusive Tests = Not Active • 10 volts < system voltage < 18 volts • EGR, Idle, Fuel Injector, and AIR Device controls = Not Active • Fuel Level > 10 % or fuel level data fault active <p><u>Specific Enable Criteria</u></p> <ul style="list-style-type: none"> • $0.992 \leq \text{Equivalence ratio} \leq 1.014$ • $3\% \leq \text{throttle position} \leq 70\%$ • Fuel state = closed loop • All fuel injectors = ON • Traction Control = not active <p style="text-align: center;">All of the above met for at least 2 seconds</p>	570 test failures in a 600 sample test <u>Frequency:</u> Continuous 100 ms loop	DTC Type B
O2S Circuit High Voltage Bank 2 Sensor 2	P0158	This DTC determines if the O2 sensor or circuit is shorted to high by checking for a rich condition during steady throttle.	O2 sensor voltage > 1050 millivolts to go fault pending O2 sensor voltage > 1050 millivolts to set DTC	<p><u>Common Enable Criteria</u></p> <ul style="list-style-type: none"> • No TP Sensor, MAP, ECT, MAF, IAT, Evap, Fuel Injector DTC's • Catalyst monitor diagnostic Intrusive Test = Not Active • Post Oxygen Sensor Diagnostic Intrusive Test = Not Active • Traction Control, AIR, Fuel, Idle, EGR, and Engine Not Over speed Intrusive Tests = Not Active • 10 volts < system voltage < 18 volts • EGR, Idle, Fuel Injector, and AIR Device controls = Not Active • Fuel Level > 10 % or fuel level data fault active <p><u>Specific Enable Criteria</u></p> <ul style="list-style-type: none"> • $0.992 \leq \text{Equivalence Ratio} \leq 1.014$ • $3\% \leq \text{throttle position} \leq 70\%$ • Fuel State = Closed loop <p style="text-align: center;">All of the above met for at least 2 seconds</p>	570 test failures in a 600 sample test <u>Frequency:</u> Continuous 100 ms loop	DTC Type B

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SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
O2S Circuit Insufficient Activity Bank 2 Sensor 2	P0160	This DTC determines if the O2 sensor is open.	<p>410 millivolts < O2 sensor < 490 millivolts for regular open test</p> <p>350 millivolts < O2 sensor < 550 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)</p>	<p><u>Common Enable Criteria</u></p> <ul style="list-style-type: none"> • No TP Sensor, MAP, ECT, MAF, IAT, Evap, Fuel Injector DTC's • Catalyst monitor diagnostic Intrusive Test = Not Active • Post Oxygen Sensor Diagnostic Intrusive Test = Not Active • Traction Control, AIR, Fuel, Idle, EGR, and Engine Not Over speed Intrusive Tests = Not Active • 10 volts < system voltage < 18 volts • EGR, Idle, Fuel Injector, and AIR Device controls = Not Active • Fuel Level > 10 % or fuel level data fault active <p><u>Specific Enable Criteria</u></p> <ul style="list-style-type: none"> • Ethanol percentage > 87 % • No B1S2 heater related DTCs • PCM State = run <p><u>Fast Pass:</u> Engine run time ≤ 200 seconds</p> <p>(Fast pass cannot report a fail; if Fast pass fails, the regular open test is run)</p> <p><u>Regular Open Test</u></p> <ul style="list-style-type: none"> • Engine run time > 300 seconds <p>Fuel state = closed loop</p>	<p>1450 test failures in a 1500 test samples</p> <p>Minimum of 0 occurrences of a delta TP sensor ≥ 4.999 % during diagnostic test</p> <p>(sample counts – failure counts) < 550 within 200 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)</p> <p><u>Frequency:</u></p> <p>Once/trip for post catalyst sensors 100 ms loop</p>	DTC Type B

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SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
O2S Heater Performance Bank 2 Sensor 2	P0161	This DTC determines if the O2 sensor heater is functioning properly by monitoring the current through the heater circuit.	O2 sensor heater current is < 0.25 amps or > 2.875 amps	<p><u>Common Enable Criteria</u></p> <ul style="list-style-type: none"> • No TP Sensor, MAP, ECT, MAF, IAT, Evap, Fuel Injector DTC's • Catalyst monitor diagnostic Intrusive Test = Not Active • Post Oxygen Sensor Diagnostic Intrusive Test = Not Active • Traction Control, AIR, Fuel, Idle, EGR, and Engine Not Over speed Intrusive Tests = Not Active • 10 volts < system voltage < 18 volts • EGR, Idle, Fuel Injector, and AIR Device controls = Not Active <p><u>Specific Enable Criteria</u></p> <ul style="list-style-type: none"> • Engine Run Time ≥ 300 Secs. (LS7 Only) • ECT ≥ 50° C (LS7 Only) • 500 ≤ Engine Rpm ≤ 3000 (LS7 Only) • 3 gm/sec ≤ Mass Airflow ≤ 40 gm/sec (LS7 Only) • O2 heater not in Device control • B2S1 O2 heater resistance DTC not active <p>All of the above met for at least 120 seconds</p>	8 test failures in 10 test samples Frequency: 1 tests per trip 5 seconds delay between tests 1 second execution rate	DTC Type B

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SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
Fuel System Too Lean Bank 1	P0171	<p>Determines if the fuel control system is in a lean condition, based on the EWMA of long-term fuel trim (LONG FT).</p> <p>(Note: EWMA stands for “Exponentially Weighted Moving Average”)</p>	The EWMA of LONG FT samples \geq 1.295	<ul style="list-style-type: none"> • No Misfire, pre-cat O2S, or EVAP DTC’s • No Fuel Injector DTC’s • No IAC, MAF, MAP, ECT, EGR, or AIR DTC’s • No TP Sensor or TAC System DTC’s • Engine speed > 375 RPM but < 7000 RPM • BARO > 70 kpa • ECT > -40 °C but < 150 °C • MAP > 10 kpa but < 255 kpa • IAT > -20°C but < 150 °C • MAF > 1 g/s but < 510 g/s • VSS < 83 mph (134 km/h) • Closed Loop and LONG FT enabled • Not in Device Control • EGR Flow Diagnostic Intrusive Test = Not Active • Catalyst Monitor Diag. 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; enable if fuel sender is faulty) <p>General Notes:</p> <ol style="list-style-type: none"> 1. At least 25-55 seconds of data must accumulate on each trip, with at least 15-45 seconds of data in the current fuel trim cell before a pass or fail decision can be made. 2. Development data indicates that the Fuel Adjustment System Diagnostic (FASD) is typically enabled during 85% of the EPAIII Drive cycle. This is also typical of the real-world driving, however values will vary (higher or lower) based on the actual conditions present during the drive cycle 	<p>The EWMA of LONG FT samples \geq 1.295 for \geq 100 ms</p> <p><u>Frequency:</u> Continuous 100 ms loop</p>	DTC Type B

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SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
Fuel System Too Rich Bank 1	P0172	<p>Determines if the fuel control system is in a rich condition, based on the EWMA of long-term fuel trim (LONG FT).</p> <p>(Note: EWMA stands for “Exponentially Weighted Moving Average”)</p>	<p>There exists both a Passive and, if needed, Intrusive rich test.</p> <p>Passive: The EWMA of purge-off LONG FT samples ≤ 0.75</p> <p>Intrusive: If a passive decision cannot be made, and the EWMA of purge-on LONG FT samples ≤ 0.76, 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 LONG FT samples with purge off ≤ 0.75 for at least 6 seconds during each of 3 intrusive segments.</p> <p>Intrusive Notes:</p> <ol style="list-style-type: none"> Segments can last up to 30 seconds, and are separated by the smaller of a 20 second purge-on time or enough time to purge 16 grams of vapor. A maximum of 5 completed segments or 20 intrusive attempts are allowed for each intrusive test. After an intrusive test report is completed, another intrusive test cannot occur for 300 seconds to allow sufficient time to purge excess vapors from the canister. During this period, fuel trim will pass if the EWMA of LONG FT samples > 0.76 for at least 200 seconds, indicating that the canister has been purged. Performing intrusive tests too frequently may also affect EVAP and EPAIII emissions, and the execution frequency of other diagnostics. 	<ul style="list-style-type: none"> No Misfire, pre-cat O2S, or EVAP DTC's No Fuel Injector DTC's No IAC, MAF, MAP, ECT, EGR, or AIR DTC's No TP Sensor or TAC System DTC's Engine speed > 375 RPM but < 7000 RPM BARO > 70 kpa ECT > -40 °C but < 150 °C MAP > 10 kpa but < 255 kpa IAT > -20°C but < 150 °C MAF > 1 g/s but < 510 g/s VSS < 83 mph (134 km/h) Closed Loop and LONG FT enabled Not in Device Control EGR Flow Diagnostic Intrusive Test = Not Active Catalyst Monitor Diag. 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; enable if fuel sender is faulty) <p>General Notes:</p> <ol style="list-style-type: none"> At least 25-55 seconds of data must accumulate on each trip, with at least 15-45 seconds of data in the current fuel trim cell before a pass or fail decision can be made. Development data indicates that the Fuel Adjustment System Diagnostic (FASD) is typically enabled during 85 % of the EPAIII drive cycle. This is also typical of real-world driving, however values will vary (higher or lower) based on the actual conditions present during the drive cycle. In addition to the above, the Intrusive Test requires at least 58 more seconds of LTM data before a pass or fail decision can be made. 	<p>Passive: The EWMA of purge-off LONG FT samples ≤ 0.75 for ≥ 100ms</p> <p>Intrusive: If rich fail counter is ≥ 3 before pass counter ≥ 3, the diagnostic fails.</p> <p><u>Frequency:</u> Continuous 100 ms loop</p>	DTC Type B

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SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
Fuel System Too Rich Bank 1 (Cont)				Intrusive Enable Criteria <ul style="list-style-type: none"> • Insufficient purge-off data prior to purge-on operation, such as often occurs after a hot start (or if the passive test is not used on this application). • The EWMA of purge-on LONG FT samples ≤ 0.76 • RPM > 375 RPM • Mass Airflow > 1 g/s but < 510 g/s • MAP > 18 kpa but 255 kpa Temporary Intrusive Test Inhibit Criteria: If the duration of an intrusive test segment reaches 30 seconds before a pass or fail count is registered, the purge valve is opened for the smaller of 10 seconds or enough time to purge 16 grams vapor.		
Fuel System Too Lean Bank 2	P0174	Determines if the fuel control system is in a lean condition, based on the EWMA of long-term fuel trim (LTM). (Note: EWMA stands for "Exponentially Weighted Moving Average")	The EWMA of LONG FT samples ≥ 1.295	<ul style="list-style-type: none"> • No Misfire, pre-cat O2S, or EVAP DTC's • No Fuel Injector DTC's • No IAC, MAF, MAP, ECT, EGR, or AIR DTC's • No TP Sensor or TAC System DTC's • Engine speed > 375 RPM but < 7000 RPM • BARO > 70 kpa • ECT > -40 °C but < 150 °C • MAP > 10 kpa but < 255 kpa • IAT > -20°C but < 150 °C • MAF > 1 g/s but < 510 g/s • VSS < 83 mph (134 km/h) • Closed Loop and LONG FT enabled • Not in Device Control • EGR Flow Diagnostic Intrusive Test = Not Active • Catalyst Monitor Diag. 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; enable if fuel sender is faulty) General Notes: <ol style="list-style-type: none"> 1. At least 25-55 seconds of data must accumulate on each trip, with at least 15-45 seconds of data in the current fuel trim cell before a pass or fail decision can be made. 2. Development data indicates that the Fuel Adjustment System Diagnostic (FASD) is typically enabled during 85% of the EPAIII Drive cycle. This is also typical of the real-world driving, however values will vary (higher or lower) based on the actual conditions present during the drive cycle 	The EWMA of LONG FT samples ≥ 1.295 for ≥ 100 ms <u>Frequency:</u> Continuous 100 ms loop	DTC Type B

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SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
Fuel System Too Rich Bank 2	P0175	<p>Determines if the fuel control system is in a rich condition, based on the EWMA of long-term fuel trim (LTM).</p> <p>(Note: EWMA stands for “Exponentially Weighted Moving Average”)</p>	<p>There exists both a Passive and, if needed, Intrusive rich test.</p> <p>Passive: The EWMA of purge-off LONG FT samples ≤ 0.75</p> <p>Intrusive: If a passive decision cannot be made, and the EWMA of purge-on LONG FT samples ≤ 0.76, 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 LONG FT samples with purge off ≤ 0.75 for at least 6 seconds during each of 3 intrusive segments.</p> <p>Intrusive Notes:</p> <ol style="list-style-type: none"> 1. Segments can last up to 30 seconds, and are separated by the smaller of a 20 second purge-on time or enough time to purge 16 grams of vapor. 2. A maximum of 5 completed segments or 20 intrusive attempts are allowed for each intrusive test. 3. After an intrusive test report is completed, another intrusive test cannot occur for 300 seconds to allow sufficient time to purge excess vapors from the canister. During this period, fuel trim will pass if the EWMA of LONG FT samples > 0.76 for at least 200 seconds, indicating that the canister has been purged. Performing intrusive tests too frequently may also affect EVAP and EPAIII emissions, and the execution frequency of other diagnostics. 	<ul style="list-style-type: none"> • No Misfire, pre-cat O2S, or EVAP DTC's • No Fuel Injector DTC's • No IAC, MAF, MAP, ECT, EGR, or AIR DTC's • No TP Sensor or TAC System DTC's • Engine speed > 375 RPM but < 7000 RPM • BARO > 70 kpa • ECT > -40 °C but < 150 °C • MAP > 10 kpa but < 255 kpa • IAT > -20°C but < 150 °C • MAF > 1 g/s but < 510 g/s • VSS < 83 mph (134 km/h) • Closed Loop and LONG FT enabled • Not in Device Control • EGR Flow Diagnostic Intrusive Test = Not Active • Catalyst Monitor Diag. 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; enable if fuel sender is faulty) • <p>General Notes:</p> <ol style="list-style-type: none"> 1. At least 25-55 seconds of data must accumulate on each trip, with at least 15-45 seconds of data in the current fuel trim cell before a pass or fail decision can be made. 2. Development data indicates that the Fuel Adjustment System Diagnostic (FASD) is typically enabled during 85% of the EPAIII drive cycle. This is also typical of real-world driving, however values will vary (higher or lower) based on the actual conditions present during the drive cycle. 3. In addition to the above, the Intrusive Test requires at least 58 more seconds of LTM data before a pass or fail decision can be made. 	<p>Determines if the fuel control system is in a rich condition, based on the EWMA of long-term fuel trim (LONG FT).</p> <p>(Note: EWMA stands for “Exponentially Weighted Moving Average”)</p>	DTC Type B

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SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
Fuel System Too Rich Bank 2 (Cont)				<p>Intrusive Enable Criteria</p> <ul style="list-style-type: none"> • Insufficient purge-off data prior to purge-on operation, such as often occurs after a hot start (or if the passive test is not used on this application). • The EWMA of purge-on LONG FT samples ≤ 0.76 • RPM > 375 RPM • Mass Airflow > 1 g/s but < 510 g/s • MAP > 18 kpa but 255 kpa <p>Temporary Intrusive Test Inhibit Criteria: If the duration of an intrusive test segment reaches 30 seconds before a pass or fail count is registered, the purge valve is opened for the smaller of 10 seconds or enough time to purge 16 grams vapor.</p>		
Injector Control Circuit (Cylinders 1-8) (Odm)	P0201 – P0208	This DTC checks the circuit for electrical integrity during operation.	The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match.	Engine running and 18 volts > Ignition voltage > 11 volts for more than 1 second	8 failures out of 10 samples 250ms loop continuous	DTC Type B
Throttle Position (Tp) Sensor 2 Circuit	P0220	Detects a continuous or intermittent short or open in TP sensor #2 circuit	0.25 Volts > TPS > 4.59 Volts	Ignition in Unlock/accessory, run, crank System voltage > 5.23 V No 5 V reference DTCs	79/159 counts; 55 counts continuous; 3.125 msec /count in the motor processor 19/39 counts or 13 counts continuous; 12.5 msec/count in the MHC processor	DTC Type A
Throttle Position (Tp) Sensor 2 Lo	P0222	Detects a continuous or intermittent short or open in TP sensor #2 circuit	TPS < 0.25 Volts	Ignition in Unlock/accessory, run, crank System voltage > 5.23 V No 5 V reference DTCs	79/159 counts ; 55 counts continuous; 3.125 msec /count in the ecm main processor 19/39 counts or 13 counts continuous; 12.5 msec/count in the MHC processor	DTC Type A
Throttle Position (Tp) Sensor 2 Circuit Hi	P0223	Detects a continuous or intermittent short or open in TP sensor #2 circuit	TPS > 4.59 Volts	Ignition in Unlock/accessory, run, crank System voltage > 5.23 V No 5 V reference DTCs	79/159 counts ; 55 counts continuous; 3.125 msec /count in the ecm main processor 19/39 counts or 13 counts continuous; 12.5 msec/count in the MHC processor	DTC Type A
Fuel Pump Primary Circuit (ODM)	P0230	This DTC checks the circuit for electrical integrity during operation.	The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match.	RunCrankIgnInRange (11 volts \leq Ignition \leq 18 volts) Engine speed \geq 0 RPM	8 failures out of 10 samples 250 ms / sample Continuous	DTC Type B

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SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
Random Misfire Detected	P0300	These DTC's will determine if a random or a cylinder specific misfire is occurring by monitoring crankshaft velocity.	Deceleration index Vs	<ul style="list-style-type: none"> • Engine run time > 2 crankshaft revolutions. • DTCs not active for VSS, CKP, TP, MAP, ECT, CMP, IAT and MAF sensors. • No engine protection faults. • No Electronic Throttle Control Faults. • P0315 (Crankshaft Position System Variation Not Learned) not active or engine speed < 1000 RPM. • Fuel cutoff not active. • Power management is not active. • Brake torque management not active. • Fuel level > 10% (disablement ends 500 after a low fuel level condition ceases, and fuel disable does not occur with a fuel sensor DTC). • -7°C < ECT < 130°C. • If ECT at startup < -7°C, then disable until ECT > 21°C. • 375 RPM < Engine speed < 5600 RPM. • 11 volts < System voltage < 18 volts. • + Throttle position delta < 60% per 25 ms. • - Throttle position delta < 60% per 25 ms. • Power Take Off is disabled • Abnormal engine speed is not present. • ABS rough road not detected. • ABS/TCS is not active. • Positive and zero torque (except the CARB approved 3000 rpm to redline triangle). Positive and zero torque is detected when both is true: 1) engine load > zero torque cal (cal a function of engine speed and temperature), and 2) TPS > 1 or VSS < 30 mph. • Detectable engine speed and engine load region. • CAM sensor is in sync with CKP sensor. • 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) • Not an automatic transmission shift with a Throttle position >94.999%. • Displacement On Demand transition is not in progress. 	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. <u>Frequency:</u> Continuous	DTC Type B (MIL Flashes with Catalyst Damaging Misfire)
Cylinder 1 Misfire Detected	P0301		Engine speed Vs			
Cylinder 2 Misfire Detected	P0302		Emission Failure Threshold = 1.0%			
Cylinder 3 Misfire Detected	P0303		Catalyst Damage Threshold = 5% to 10.625% depending on engine speed and engine load (table attached)			
Cylinder 4 Misfire Detected	P0304					
Cylinder 5 Misfire Detected	P0305					
Cylinder 6 Misfire Detected	P0306					
Cylinder 7 Misfire Detected	P0307					
Cylinder 8 Misfire Detected	P0308					

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Random Misfire Detected (Cont.)	P0300			Not an abusive engine speed condition. Abusive engine speed = 500 RPM above redline. Abusive engine speed delay = 1250 engine cycles (Corvette Manual Trans only). Excessive Wheel Speed slip not detected. Enablement occurs if {non drive wheel speed} <16 KPH OR {drive wheel speed - non Drive wheel speed } < 116KPH (Corvette & Trailblazer SS only)		
Crankshaft Position System Variation Not Learned	P0315	Monitor for valid crankshaft error compensation factors	Sum of Compensation Factors are ≥ 4.001 or ≤ 3.999	OBd Manufacturer Enable Counter = 0	0.50 seconds Frequency: Continuous 100 ms loop	DTC Type A
Knock Sensor Module Performance	P0324	This diagnostic will detect a failed internal ECM component associated with knock control	Any Cylinder's Avg Gain Signal > 4.5 if RPM>1500 OR All Cylinder's Actual Signals < 0.2 if RPM>1500	Air Per Cylinder >200 mg per engine cycle per cylinder Temporarily disabled ('Indeterminate' state reported) for samples in which P0325, P0327, P0328, P0330, P0332, or P0333 report 'Failed' state.	50 out of 63 100ms sample rate Continuous	DTC Type A All Product except LU3
Knock Sensor Circuit	P0325	This diagnostic checks for an open to the knock sensor	Gated Low Pass Filter Voltage > 4V or < 1.24 V	ECT>-40 and Engine Run Time > 2 PTO not active RPM > 400 Temporarily disabled ('Indeterminate' state reported) for samples in which P0327 or P0328 report 'Failed' state.	50 out of 63 100ms sample rate Continuous	DTC Type B
Knock Sensor (KS) Circuit Bank 1	P0325	This diagnostic checks for an open to the knock sensor	Gated FFT Output > 60000	Engine Speed > 1800 rpm Coolant > -40C and Engine Run Time > 1 sec PTO not active Temporarily disabled ('Indeterminate' state reported) for samples in which P0327 or P0328 report 'Failed' state.	53 failure counts out of 60 sample counts 100ms sample rate Continuous	DTC Type B LU3 Only
Knock Sensor Performance Bank 1	P0326	This diagnostic checks for an overactive knock sensor caused by noisy engine components (e.g. lifters)	Fast Retard ≥ 12	Engine Speed ≥ 500 MAP ≥ 60 No throttle fault No PTO active Fast spark retard active	50 out of 63 100ms sample rate Continuous	DTC Type B

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Knock Sensor Circuit Low Bank 1	P0327	This diagnostic checks for an out of range low knock sensor signal	Sensor Input Signal Line > 2.86 V or Sensor Return Signal Line < 1.48 V	ECT> -40 and Engine Run Time > 2 secs PTO not active	50 out of 63 100ms sample rate Continuous	DTC Type B
Knock Sensor Circuit High Bank 1	P0328	This diagnostic checks for an out of range high knock sensor signal	Sensor Input Signal Line < 2.02 V or Sensor Return Signal Line > 3.76 V	ECT> -40 and Engine Run Time > 2 PTO not active	50 out of 63 100ms sample rate Continuous	DTC Type B
Knock Sensor Circuit Bank 2	P0330	This diagnostic checks for an open to the knock sensor	Gated Low Pass Filter Voltage > 4V or < 1.24 V	ECT> -40 and Engine Run Time > 2 PTO not active RPM > 400 Temporarily disabled ('Indeterminate' state reported) for samples in which P0332 or P0333 report 'Failed' state.	50 out of 63 100ms sample rate Continuous	DTC Type B
Knock Sensor (KS) Circuit Bank 2	P0330	This diagnostic checks for an open to the knock sensor	Gated FFT Output f(Engine RPM) > 60000	Engine Speed > 1800 rpm Coolant > -40C and Engine Run Time > 1 sec PTO not active Temporarily disabled ('Indeterminate' state reported) for samples in which P0327 or P0328 report 'Failed' state.	53 failure counts out of 60 sample counts 100ms sample rate Continuous	DTC Type B LU3 Only
Knock Sensor Circuit Low Bank 2	P0332	This diagnostic checks for an out of range low knock sensor signal	Sensor Input Signal Line > 2.86 V or Sensor Return Signal Line < 1.48 V	ECT> -40 and Engine Run Time > 2 PTO not active	50 out of 63 100ms sample rate Continuous	DTC Type B
Knock Sensor Circuit High Bank 2	P0333	This diagnostic checks for an out of range high knock sensor signal	Sensor Input Signal Line < 2.02 V or Sensor Return Signal Line > 3.76 V	ECT> -40 and Engine Run Time > 2 PTO not active	50 out of 63 100ms sample rate Continuous	DTC Type B

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SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
Crankshaft Position (Ckp) Sensor A Circuit	P0335	This diagnostic determines whether a fault exists with crank position sensor signal	<ol style="list-style-type: none"> 1. No crankshaft position sensor pulses received for 4 seconds 2. No crankshaft position sync 3. No crankshaft position sensor pulses received 	<ol style="list-style-type: none"> 1. Engine cranking and either CMP pulses being received or MAF > 3 grams per second 2. Engine is spinning and no 5V reference DTCs set 3. Engine is spinning and no 5V reference or cam position sensor DTCs set 	<ol style="list-style-type: none"> 1. While starter is engaged 2. Continuous – 75 ms 3. Continuous - 2 test failures out of 10 samples 	DTC Type A
Crankshaft Position (Ckp) Sensor A Performance	P0336	This diagnostic determines whether a performance fault exists with crank position sensor signal	<ol style="list-style-type: none"> 1. Unable to achieve crank sync 2. Twenty five crank resyncs occur within 20 seconds 3. 55 > number of crank pulses received in one engine revolution >61 	<ol style="list-style-type: none"> 1. Engine cranking and either CMP pulses being received or MAF >3 grams per second 2. Engine speed > 450 RPM 3. Engine is spinning and no 5V reference or cam position sensor DTCs set 	<ol style="list-style-type: none"> 1. While starter engaged – 1.5s 2. Continuous – 1 test failures 3. Continuous – 8 test failures out of 10 samples 	DTC Type A
Camshaft Position (Cmp) Sensor Circuit Bank 1 Sensor A	P0340	This diagnostic will detect if a fault exists on the camshaft position sensor signal.	<ol style="list-style-type: none"> 1. No Cam pulses received during first 24 MEDRES events 2. No Cam pulses received for 100 engine cycles 3. No Cam pulses received while starter is engaged 4. No Cam pulses received 	<ol style="list-style-type: none"> 1. Crank is synchronized and no 5V ref DTCs set 2. Crank is synchronized and no 5V ref DTCs set 3. Engine is cranking and either crank pulses are received or MAF > 3 grams per second 4. Engine is spinning and no 5V ref DTCs set 	<ol style="list-style-type: none"> 1. One time while starter is engaged 2. Continuous – 8 test failures out of 10 samples 3. Continuous – 4 seconds while starter is engaged 4. 3 seconds 	DTC Type B
Camshaft Position (Cmp) Sensor Performance Bank 1 Sensor A	P0341	Detects cam sensor performance malfunctions by monitoring for the incorrect number of cam sensor pulses in a given number of crank sensor pulses	<ol style="list-style-type: none"> 1. 2 > number of cam pulses received in 24 MEDRES events > 8 2. 398 > number of cam pulses received in 100 engine cycles > 402 	<ol style="list-style-type: none"> 1. Crank is synchronized and no 5V ref DTCs set 2. Crank is synchronized and no 5V ref DTCs set 	<ol style="list-style-type: none"> 1. One time while starter is engaged 2. Continuous – 8 test failures out of 10 samples 	DTC Type B
Ignition Control (Cylinders 1 through 8) (ODM)	P0351 – P0358	This DTC checks the circuit for electrical integrity during operation. Monitors EST for each cylinder	The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match.	Ignition voltage > 6V	<p>50 out of 63</p> <p>100ms sample rate</p> <p>Continuous</p>	DTC Type B

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SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
Catalyst System Low Efficiency Bank 1	P0420	Oxygen Storage	<p>Normalized Ratio OSC Value < 0.35 (EWMA filtered)</p> <p>Normalized Ratio OSC Value Calculation Information and Definitions =</p> <ol style="list-style-type: none"> 1. Raw OSC Calculation = (post cat O2 Resp time - pre cat O2 Resp time) 2. Best Failing OSC value from a calibration table (based on temp and exhaust gas flow) 3. Worst Passing OSC value (based on temp and exhaust gas flow) <p>Normalized Ratio Calculation = (1-2) / (3-2)</p> <p>A Normalized Ratio of 1 essentially represents a good part and a ratio of 0 essentially represents a very bad part.</p>	<p><u>General Enable</u></p> <ul style="list-style-type: none"> • No EVAP, PTO not active, TAC system, MAF, CAM, ECT, CKP, EGR, BARO, AIR, EST, Fuel Injector, Fuel Trim, Idle Air, MAP, IAT, Misfire, O2 Sensor, TP Sensor, VSS or Engine Overtemp Protection Mode DTCs <p><u>Valid Idle Period Criteria</u></p> <ul style="list-style-type: none"> • Throttle Position < 2% • Vehicle Speed <= 3.2kph • Engine speed >= 1000 RPM for a minimum of 10 seconds since end of last idle period. • Engine run time >= 100 seconds • Tests attempted this trip < 255 • The catalyst diagnostic has not yet completed for the current trip. <p><u>Catalyst Idle Conditions Met Criteria</u></p> <p>General Enable met and the Valid Idle Period Criteria met</p> <ul style="list-style-type: none"> • Green Converter Delay = Not Active • Induction Air > -20° C • Induction Air < 85° C • FASD and/ or POS Diagnostic Intrusive Test and/or AIR Diagnostic Intrusive Test not Active • RunCrank Voltage > 10.9 volts • Ethanol Estimation Is NOT in Progress • ECT >= 45° C • ECT <= 128.5 ° C • Barometric Pressure > 70 KPA • Idle Time is <= 50 seconds ⇒ Idle time is incremented if the vehicle speed <= vehicle speed cal and the throttle position <= TPS cal as identified in the Valid Idle Period Criteria section. • Short Term Fuel Trim < 1.10 • Short Term Fuel Trim > 0.90 • Predicted catalyst temp ≥ 375°C and engine airflow >> (10, 8, 4)g/s (based on ECT of 0, 45, 90° C respectively) for at least 20 seconds with a closed throttle time ≤ 180 seconds consecutively (closed throttle consideration involves having the TPS < the value as stated in the Valid Idle Period Criteria Section) • Closed loop fueling • PRNDL is in Drive Range 	<p>1 test attempted per valid idle period</p> <p>Minimum of 1 test per trip</p> <p>Maximum of 8 tests per trip</p> <p><u>Frequency:</u></p> <ul style="list-style-type: none"> • Fueling Related : 12.5 ms • OSC Measurements: 100 ms • Temp Prediction: 1000ms <p>Rapid Step Response (RSR) feature will initiate multiple tests:</p> <ul style="list-style-type: none"> • If the difference between current EWMA value and the current OSC Normalized Ratio value is >= 0.59 The current OSC Normalized Ratio value is <= 0.10 <p>Maximum of 8 tests per trip Maximum of 24 tests to detect failure when RSR is enabled.</p>	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
Catalyst System Low Efficiency Bank 1 (cont)				<p><u><i>Idle Stable Criteria :: Must hold true from after Catalyst Idle Conditions Met to the end of test</i></u></p> <ul style="list-style-type: none"> • MAF >= 3.5 grams per second • MAF <=21 grams per second • CCP DC Multiplier <= 1 • Predicted catalyst temperature <= 820 degC <p><u><i>Engine Fueling Criteria at Beginning of Idle Period</i></u> The following fueling related must also be met from between 4 and 7 seconds after the Catalyst Idle Conditions Met Criteria has been met for at least 4 seconds prior to allowing intrusive control</p> <ul style="list-style-type: none"> • Number of pre-O2 switches >= 2 • Short Term Fuel Trim Avg >= 0.96 • Short Term Fuel Trim Avg <= 1.04 	<p><u><i>Green Converter Delay Criteria</i></u> This is part of the check for the Catalyst Idle Conditions Met Criteria section</p> <ul style="list-style-type: none"> • The diagnostic will not be enabled until the following has been met: Predicted catalyst temperature >= 535° C for 3600 seconds non-continuously. <p>Note: this feature is only enabled when the vehicle is new and cannot be enabled in service</p>	

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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
Catalyst System Low Efficiency Bank 2	P0430	Oxygen Storage	<p>Normalized Ratio OSC Value < 0.35 (EWMA filtered)</p> <p>Normalized Ratio OSC Value Calculation Information and Definitions =</p> <ol style="list-style-type: none"> 1. Raw OSC Calculation = (post cat O2 Resp time - pre cat O2 Resp time) 2. Best Failing OSC value from a calibration table (based on temp and exhaust gas flow) 3. Worst Passing OSC value (based on temp and exhaust gas flow) <p>Normalized Ratio Calculation = (1-2) / (3-2)</p> <p>A Normalized Ratio of 1 essentially represents a good part and a ratio of 0 essentially represents a very bad part.</p>	<p><u>General Enable</u></p> <ul style="list-style-type: none"> • No EVAP, PTO not active, TAC system, MAF, CAM, ECT, CKP, EGR, BARO, AIR, EST, Fuel Injector, Fuel Trim, Idle Air, MAP, IAT, Misfire, O2 Sensor, TP Sensor, VSS or Engine Overtemp Protection Mode DTCs <p><u>Valid Idle Period Criteria</u></p> <ul style="list-style-type: none"> • Throttle Position < 2% • Vehicle Speed <= 3.2kph • Engine speed >= 1000 RPM for a minimum of 10 seconds since end of last idle period. • Engine run time >= 100 seconds • Tests attempted this trip < 255 • The catalyst diagnostic has not yet completed for the current trip. <p><u>Catalyst Idle Conditions Met Criteria</u></p> <p>General Enable met and the Valid Idle Period Criteria met</p> <ul style="list-style-type: none"> • Green Converter Delay = Not Active • Induction Air > -20° C • Induction Air < 85° C • FASD and/ or POS Diagnostic Intrusive Test and/or AIR Diagnostic Intrusive Test not Active • RunCrank Voltage > 10.9 volts • Ethanol Estimation Is NOT in Progress • ECT >= 45° C • ECT <= 128.5 ° C • Barometric Pressure > 70 KPA • Idle Time is <= 50 seconds ⇒ Idle time is incremented if the vehicle speed <= vehicle speed cal and the throttle position <= TPS cal as identified in the Valid Idle Period Criteria section. • Short Term Fuel Trim < 1.10 • Short Term Fuel Trim > 0.90 • Predicted catalyst temp ≥ 375°C and engine airflow > (10, 8, 4) g/s (based on ECT of 0, 45, 90° C respectively) for at least 20 seconds with a closed throttle time ≤ 180 seconds consecutively (closed throttle consideration involves having the TPS < the value as stated in the Valid Idle Period Criteria Section) • Closed loop fueling • PRNDL is in Drive Range 	<p>1 test attempted per valid idle period</p> <p>Minimum of 1 test per trip</p> <p>Maximum of 8 tests per trip</p> <p><u>Frequency:</u></p> <ul style="list-style-type: none"> • Fueling Related : 12.5 ms • OSC Measurements: 100 ms • Temp Prediction: 1000ms <p>Rapid Step Response (RSR) feature will initiate multiple tests:</p> <ul style="list-style-type: none"> • If the difference between current EWMA value and the current OSC Normalized Ratio value is >= 0.59 The current OSC Normalized Ratio value is <= 0.10 <p>Maximum of 8 tests per trip Maximum of 24 tests to detect failure when RSR is enabled.</p>	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
Catalyst System Low Efficiency Bank 2 (Cont)				<p><u><i>Idle Stable Criteria :: Must hold true from after Catalyst Idle Conditions Met to the end of test</i></u></p> <ul style="list-style-type: none"> • MAF >= 3.5 grams per second • MAF <=21 grams per second • CCP DC Multiplier <= 1 • Predicted catalyst temperature <= 820 degC <p><u><i>Engine Fueling Criteria at Beginning of Idle Period</i></u> The following fueling related must also be met from between 4 and 7 seconds after the Catalyst Idle Conditions Met Criteria has been met for at least 4 seconds prior to allowing intrusive control</p> <ul style="list-style-type: none"> • Number of pre-O2 switches >= 2 • Short Term Fuel Trim Avg >= 0.96 • Short Term Fuel Trim Avg <= 1.04 	<p><u><i>Green Converter Delay Criteria</i></u> This is part of the check for the Catalyst Idle Conditions Met Criteria section</p> <ul style="list-style-type: none"> • The diagnostic will not be enabled until the following has been met: Predicted catalyst temperature >= 535° C for 3600 seconds non-continuously. • Note: this feature is only enabled when the vehicle is new and cannot be enabled in service 	

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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
Evaporative Emission (EVAP) System Small Leak Detected	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 method (EONV) is used.	<p><u>SMALL LEAK TEST FAIL:</u> Engine Off Natural Vacuum (EONV) while the engine is off. The total pressure change achieved during the test is normalized against a target value that is based upon fuel level and ambient temperature. (Values range from 597 to 597 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 = 0.70 Re-Pass threshold = 0.35</p>	<p><u>TEST ENABLE :</u> No MAP DTC's No MAF Sensor DTC's No Thermostat Rationality DTC's VSS DTC's not active No Fuel Tank Pressure Sensor circuit DTC's No EVAP Canister Purge Valve circuit DTC's No EVAP Canister Vent Solenoid circuit DTC's No Fuel Level Sensor DTC's ECT Sensor DTC's not active IAT Sensor DTC's not active EVAP Canister Purge Valve stuck open DTC not active. EVAP large leak DTC not active. Ignition off timer DTC not active. EVAP Canister Vent restriction DTC is not active $10\% \leq \text{Fuel Level} \leq 90\%$ Drive time ≥ 600 seconds. Drive length ≥ 5 kilometers. $\text{ECT} \geq 70^\circ\text{C}$. No fuel filling (fuel level increment $\geq 10\%$) during EONV test. $\text{BARO} \geq 74.0$ kPa Estimate of Ambient Air Temperature Valid Estimated ambient temperature at end of drive $\geq 0^\circ\text{C}$ but $\leq 34^\circ\text{C}$. Odometer ≥ 16.1 kilometers</p> <p>Note: Conditions for Estimate of Ambient Air Temperature to be valid</p> <ol style="list-style-type: none"> 1. Cold Start Startup $\Delta^\circ\text{C}(\text{ECT}-\text{IAT}) \leq 8^\circ\text{C}$ if $\text{ECT} > \text{IAT}$ OR 2. Hot Restart Sufficient drive length to get accurate estimate of ambient air temperature (at least a minimum of 4 minutes and 2 kilometers) 	Once per trip, during hot soak (up to 2400 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 Average run length is 9 under normal conditions Run length is 2 to 6 trips after code clear or non-volatile reset
Evaporative Emission (EVAP) Canister Purge Solenoid Valve Circuit (ODM)	P0443	This DTC checks the circuit for electrical integrity during operation.	The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match.	RunCrankIgnInRange (11 volts \leq Ignition \leq 18 volts)	20 failures out of 25 samples 250 ms / sample Continuous with solenoid operation	DTC Type B

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SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
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	<p>Tank Vacuum > 2989 Pa for 5 seconds BEFORE Purge Volume ≥ 10 liters</p> <p>OR</p> <p>Vented Vacuum < -623 Pa or Vented Vacuum > 1245 Pa for 120 seconds</p> <p>2 liters of fuel must be consumed after setting the DTC active the first time to set the DTC active the second time.</p>	<p>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 Valve circuit DTC's No EVAP Canister Vent Solenoid circuit DTC's No Thermostat Rationality DTC's 10% ≤ Fuel Level ≤ 90% 11 volts ≤ System Voltage ≤ 18 volts 4°C ≤ Startup IAT ≤ 30°C Startup ECT ≤ 35°C BARO ≥ 74.0 kPa (8000 ft)</p>	<p>Once per Cold Start</p> <p>Time is dependent on driving conditions</p> <p>Max. before test abort is 1000 seconds</p>	DTC Type B
Evaporative Emission (EVAP) Vent Solenoid Control Circuit (ODM)	P0449	This DTC checks the circuit for electrical integrity during operation.	The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match.	RunCrankIgnInRange (11 volts ≤ Ignition ≤ 18 volts)	<p>20 failures out of 25 samples 250 ms / sample</p> <p>Continuous with solenoid operation</p>	DTC Type A
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 = 0.73 Re-Pass threshold = 0.40</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>

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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 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 < 3% of Vref (0.15 volts or ~1681 Pa) produces a failing sample. Otherwise, the sample is considered passing. The normal operating range of the fuel tank pressure sensor is 0.5 volts (~1245 Pa) to 4.5 volts (~ -3736 Pa).	<ul style="list-style-type: none"> • 0.10 second delay after sensor power up for sensor warm-up • ECM State ≠ crank 	<p><u>Frequency:</u> 80 failures out of 100 samples 100 ms / sample</p> <p>Continuous</p>	DTC Type B
Fuel Tank Pressure (FTP) Sensor Circuit High Voltage	P0453	This DTC will detect a fuel tank pressure sensor signal that is too high out of range.	Fuel tank pressure sensor signal > 97% of Vref (4.85 volts or ~ -4172 Pa) produces a failing sample. Otherwise, the sample is considered passing. The normal operating range of the fuel tank pressure sensor is 0.5 volts (~1245 Pa) to 4.5 volts (~ -3736 Pa).	<ul style="list-style-type: none"> • 0.10 second delay after sensor power up for sensor warm-up • ECM state ≠ crank 	<p><u>Frequency:</u> 80 failures out of 100 samples 100 ms / sample</p> <p>Continuous.</p>	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.	<p>If an abrupt change in tank vacuum is detected the engine-off natural vacuum test is aborted due to an apparent refueling event. Subsequent to the abort, a refueling rationality test is executed to confirm that a refueling event occurred. If a refueling is confirmed, then the test sample is considered passing. Otherwise, the sample is considered failing indicating an intermittent signal problem.</p> <p>The abrupt change is defined as a change > 112 Pa and < 249 Pa vacuum in the span of 1.0 seconds.</p> <p>A refueling event is confirmed if the fuel level has a persistent change of 10% for 30 seconds.</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> <p>The test will report a failure if 2 out of 3 samples are failures.</p>	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
Evaporative Emission (EVAP) System Large Leak Detected	P0455	This DTC will detect a weak vacuum condition (large leak or purge blockage) in the EVAP system.	<p>Purge volume > 14 liters BEFORE Tank vacuum \leq 2740 Pa</p> <p>2 liters of fuel must be consumed after setting the DTC active the first time to set the DTC active the second time.</p> <p><u>Weak Vacuum Follow-up Test</u> (fuel cap replacement test) Weak Vacuum Test failed. Passes if tank vacuum \geq 2740 Pa.</p> <p>Note: Weak Vacuum Follow-up Test can only report a pass.</p>	<p><u>General Test Enable</u></p> <ul style="list-style-type: none"> • No MAP Sensor 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 Valve circuit DTC's • No EVAP Canister Vent Solenoid circuit DTC's • No Thermostat Rationality DTC's • $10\% \leq$ Fuel Level \leq 90% • $11 \text{ volts} \leq$ System Voltage \leq 18 volts • $\text{BARO} \geq 74.0 \text{ kPa}$ (8000 ft) <p style="text-align: center;">Cold Start Test</p> <ul style="list-style-type: none"> • Startup temperature $\Delta(\text{ECT-IAT})$: $\leq 8^\circ\text{C}$ if $\text{ECT} > \text{IAT}$ • Cold Test Timer \leq 1000 seconds • $4^\circ\text{C} \leq$ Startup IAT $\leq 30^\circ\text{C}$ • Startup ECT $\leq 35^\circ\text{C}$ <p><u>Weak Vacuum Follow-up Test</u> This test can run following a weak vacuum failure or on a hot restart.</p>	<p>Once per cold start</p> <p>Time is dependent on driving conditions</p> <p>Max. before test abort is 1000 seconds</p> <p><u>Weak Vacuum Follow-up Test</u> With large leak detected, the follow-up test is limited to 1300 seconds. Once the MIL is on, the follow-up test runs indefinitely.</p>	DTC Type B
Fuel Level Sensor 1 Performance	P0461	This DTC will detect a fuel sender stuck in range in the primary fuel tank.	IF Delta Fuel Volume change < 10 liters over an accumulated 241.4 kilometers.	No VSS DTC's set Engine Running	250 ms / sample Continuous	DTC Type B
Fuel Level Sensor 1 Circuit Low Voltage	P0462	This DTC will detect a fuel sender stuck out of range low in the primary fuel tank.	Fuel level Sender % of 5V range < 10%	RunCrankIgnInRange (11 volts \leq Ignition \leq 18 volts)	240 failures out of 300 samples 100 ms / sample Continuous	DTC Type B
Fuel Level Sensor 1 Circuit High Voltage	P0463	This DTC will detect a fuel sender stuck out of range high in the primary fuel tank.	Fuel level Sender % of 5V range > 60%	RunCrankIgnInRange (11 volts \leq Ignition \leq 18 volts)	240 failures out of 300 samples 100 ms / sample Continuous	DTC Type B

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SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
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 event 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% fuel level during the engine-off test.</p> <p>A refueling event is confirmed if the fuel level has a persistent change of 10% for 30 seconds.</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> <p>The test will report a failure if 2 out of 3 samples are failures.</p>	DTC Type A
Cooling Fan 1 Relay Control Circuit (ODM)	P0480	This DTC checks the circuit for electrical integrity during operation.	The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match	RunCrankIgnInRange (11 volts ≤ Ignition ≤ 18 volts) Engine speed ≥ 400 rpm	<p>20 failures out of 25 samples 250 ms / sample</p> <p>Continuous with fan operation</p>	<p>DTC Type B</p> <p>(Not used on systems with Mechanical Fan)</p>
Cooling Fan 2 Relay Control Circuit (ODM)	P0481	This DTC checks the circuit for electrical integrity during operation.	The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match	RunCrankIgnInRange (11 volts ≤ Ignition ≤ 18 volts) Engine speed ≥ 400 rpm	<p>20 failures out of 25 samples 250 ms / sample</p> <p>Continuous with fan operation</p>	<p>DTC Type B</p> <p>(Not used on systems with Mechanical Fan)</p>
Evaporative Emission (EVAP) System Flow During Non-Purge	P0496	This DTC will determine if the purge solenoid is leaking to engine manifold vacuum.	<p>Tank Vacuum > 2491 Pa for 5 sec BEFORE</p> <p>Test time > 60 seconds (cold start)</p>	<p><u>General Test Enable</u></p> <ul style="list-style-type: none"> • No MAP Sensor 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 Valve circuit DTC's • No EVAP Canister Vent Solenoid circuit DTC's • No Thermostat Rationality DTC's • 10% ≤ Fuel Level ≤ 90% • 11 volts ≤ System Voltage ≤ 18 volts • 4°C ≤ Startup IAT ≤ 30°C • Startup ECT ≤ 35°C • BARO ≥ 74.0 kPa (8000 ft) 	<p>Once per cold start.</p> <p>Cold start: max time is 1000 seconds</p>	DTC Type B

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SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
Vehicle Speed Sensor Circuit Low Voltage	P0502	Lack of activity in the VSS circuit	Transmission output speed \leq 58 RPM	No TPS or VSS intermittent DTCs Engine Running 8 V < System Voltage < 18 V Engine Torque Inaccurate not True TPS \geq 3.5 % Transmission Fluid Temperature \geq -40°C. 1500 RPM < Engine speed < 6500 RPM VSS < 200 KPH 68 Nm < Engine torque < 8192 Nm PTO not active	Fail Time = 4.5 sec Continuous	DTC Type B (Manual Applications Only)
Vehicle Speed Sensor Circuit Intermittent	P0503	Intermittent fault in the VSS circuit	Transmission output speed delta \geq 351 RPM	8 V \leq Ignition Voltage \leq 18 V 500 < Engine Speed < 7500 for 5.0 sec PTO not active Trans Output Speed > 292 RPM for 2.0 sec Delta Trans Output Speed \leq 146 RPM for 2.0 sec 4WD Range Change \geq 6.0 sec	Fail time = 3.25 sec Continuous	DTC Type B (Manual Applications Only)

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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
Idle System - Low Engine Speed	P0506	This DTC will determine if a low idle exists.	<p>Filtered Engine Speed Error > Fault threshold, where the fault threshold = 95 rpm</p> <p>Filter coefficient for engine speed error =0.00375</p>	<p>No MAF, MAP, Baro, IAT, ECT, TP, Injector, Fuel System, Misfire, EST (spark), ETC, VSS, EGR or Purge DTC's</p> <p>TCM Communication Fault not active</p> <p>Disabled for 4wd low</p> <p>Transfer Case not in 4WD Low State</p> <p>Transfer Case State Valid</p> <p>Engine Run \geq 60 seconds</p> <p>ECT \geq 60°C</p> <p>BARO \geq 70 kPa</p> <p>18 volts \geq IGN. voltage \geq 11 volts</p> <p>IAT \geq -20°C</p> <p>Time since a gear state change \geq 3 seconds</p> <p>Time since a TCC mode change \geq 3 seconds</p> <p>Idle control logic indicates that the engine is in an idle condition</p> <p>Vehicle Speed \leq 2 Kph</p> <p>Clutch pedal must be above Top of Travel or at Bottom of Travel or a Clutch Code must be Active to enable the diagnostic test.</p> <p>PTO (power take-off) must not be active.</p> <p>Off-vehicle device control (service bay control) must not be active.</p> <p>Commanded RPM delta < 25 rpm</p> <p>Engine Over temperature light not on</p> <p>(Conditions for Engine Overtemperature light: ((Engine Coolant Temperature > 128 °C) And (engine is hot enough to command it to stop OR engine is in engine metal over temperature protection OR hot coolant enrichment is active)) OR (Engine Coolant Temperature > 128 °C And Engine run \geq 0 seconds And the engine is not hot enough to command it to stop And engine is not in engine metal over temperature protection And hot coolant enrichment is not active))</p> <p>Above Idle conditions present for \geq 10 seconds seconds to enable diagnostic test</p>	<p>Time for each test:</p> <p>Filtered engine speed error must be within pass criteria continuously for 10 seconds to consider a pass.</p> <p>Filtered engine speed must reach the fault threshold to set a fault.</p> <p>Frequency: Continuous after enable 100ms loop</p>	DTC Type B

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SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
Idle System - High Engine Speed	P0507	This DTC will determine if a high idle exists	<p>Filtered Engine Speed Error < Fault threshold, where the fault threshold = -190 rpm</p> <p>Filter coefficient for engine speed error =0.00375</p>	<p>No MAF, MAP, Baro, IAT, ECT, TP, Injector, Fuel System, Misfire, EST (spark), ETC, VSS, EGR or Purge DTC's</p> <p>TCM Communication Fault not active</p> <p>Disabled for 4wd low</p> <p>Transfer Case not in 4WD Low State</p> <p>Transfer Case State Valid</p> <p>Engine Run \geq 60 seconds</p> <p>ECT \geq 60°C</p> <p>BARO \geq 70 kPa</p> <p>18 volts \geq IGN. voltage \geq 11 volts</p> <p>IAT \geq -20 °C</p> <p>Time since a gear state change \geq 3 seconds</p> <p>Time since a TCC mode change \geq 3 seconds</p> <p>Idle control logic indicates that the engine is in an idle condition</p> <p>Vehicle Speed \leq 2 Kph</p> <p>Clutch pedal must be above Top of Travel or at Bottom of Travel or a Clutch Code must be Active to enable the diagnostic test.</p> <p>PTO (power take-off) must not be active.</p> <p>Off-vehicle device control (service bay control) must not be active.</p> <p>Commanded RPM delta < 25 rpm</p> <p>Engine Over temperature light not on</p> <p>(Conditions for Engine Overtemperature light: ((Engine Coolant Temperature > 128 °C) And (engine is hot enough to command it to stop OR engine is in engine metal over temperature protection OR hot coolant enrichment is active))</p> <p>OR</p> <p>(Engine Coolant Temperature > 128 °C And Engine run \geq 0 seconds And the engine is not hot enough to command it to stop And engine is not in engine metal over temperature protection And hot coolant enrichment is not active))</p> <p>Above Idle conditions present for \geq 10 seconds</p>	<p>Time for each test:</p> <p>Filtered engine speed error must be within pass criteria continuously for 10 seconds to consider a pass.</p> <p>Filtered engine speed must reach the fault threshold to set a fault.</p> <p>Frequency: Continuous after enable 100ms loop</p>	DTC Type B
Engine Oil Pressure Sensor Performance	P0521	This diagnostic determines if the oil pressure sensor is stuck out of range.	The filtered and weighted difference between actual engine oil pressure and predicted engine oil pressure (a function of engine speed and engine oil temperature) is either greater than 47 kPa or less than -50 kPa.	<p>Oil temp between -5 and 130C</p> <p>Engine speed between 1000 and 3500</p> <p>Engine Load stability is less than 10 kPa</p> <p>Engine Predicted Pressure between 170 and 400kPa</p> <p>Engine run flag true</p> <p>No Crank Sensor DTCs set</p> <p>No Coolant Sensor DTCs set</p> <p>No Intake Air Temp Sensor DTCs set</p> <p>No MAF DTCs set</p> <p>No Oil Pressure Sensor Circuit DTCs set</p>	Sample rate of 100ms loop	DTC Type B (AFM and cam phased Applications Only)

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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
Engine Oil Pressure Circuit Low	P0522	This diagnostic determines if the oil pressure sensor circuit has low voltage.	Voltage <5% of 5 volt ref (0 kPa)	Run crank true I1 >= Ignition Voltage <= 18	50 fail counts out of 63 samples Sample rate of 50ms	DTC Type B (AFM and cam phased Applications Only)
Engine Oil Pressure Circuit High	P0523	This diagnostic determines if the oil pressure sensor circuit has high voltage.	Voltage > 85% of 5 volt ref (827 kPa)	Run crank true I1 >= Ignition Voltage <= 18	204 counts out of 255 samples Sample rate of 50ms	DTC Type B (AFM and cam phased Applications Only)
Brake Booster Pressure Sensor Performance	P0556	This DTC determines if the Brake Booster Vacuum sensor is stuck or skewed within the normal operating range by comparing the engine vacuum to the brake booster vacuum when the engine is producing a large amount of vacuum	The engine vacuum value is compared to the brake booster vacuum sensor value when the throttle has been below a calibrated value for a calibrated period of time. When the throttle once again exceeds the calibrated value, the min and max vacuum sensor values are normalized and subtracted from a EWMA value of 1. A properly operating vacuum sensor would have a normalized result of 1 or greater. If the normalized result is greater than 1 it is considered 1. The EWMA value would be 0 in a passing system EWMA fail threshold > 0.69 EWMA re-pass threshold < 0.59	Throttle Area with idle ≤ 1% for 3 seconds TPS DTC's not active MAP DTC's not active BrkBoostVacDiff > 0.3 kPa for a time >= 0.3 seconds and Vacuum Delta >= 6	6.25ms loop	DTC Type B (Applications with Brake Booster Sensors Only)
Brake Booster Pressure Sensor Circuit Low	P0557	This DTC detects a continuous short to low or open in either the signal circuit or the Brake Booster Vacuum sensor.	Voltage < 2% of 5v Ref (-10 kPa)		Fail 320 out of 400 samples to fail 6.25ms loop	DTC Type B (Applications with Brake Booster Sensors Only)
Brake Booster Pressure Sensor Circuit High	P0558	This DTC detects an open sensor ground or continuous short to high in either the signal circuit or the Brake Booster Vacuum sensor	Voltage > 87% of 5v Ref (96.25 kPa)		Fail 2000 out of 2400 samples to fail 6.25ms loop	DTC Type B (Applications with Brake Booster Sensors Only)

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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
Control Module Read Only Memory (Rom)	P0601	This DTC will be stored if any software or calibration checksum is incorrect	Calculated Checksum does not match stored checksum	Ignition in Run or Crank	1 failure if it occurs during the first ROM test of the ignition cycle, otherwise 5 failures <u>Frequency:</u> Runs continuously in the background	DTC Type A
Control Module Not Programmed	P0602	Indicates that the ECM needs to be programmed	Fails if No Start Calibration is set to true which is only available on a new un-programmed ECM	Ignition in Run or Crank	Runs once at power up	DTC Type A
Control Module Long Term Memory Reset	P0603	Non-volatile memory checksum error at controller power-up	Checksum at power-up does not match checksum at power-down	Ignition in Run or Crank	1 failure <u>Frequency:</u> Once at power-up	DTC Type A
Control Module Random Access Memory (Ram)	P0604	Indicates that ECM is unable to correctly write and read data to and from RAM	Data read does not match data written	Ignition in Run or Crank	1 failure if it occurs during the first RAM test of the ignition cycle, otherwise 5 failures <u>Frequency:</u> Runs continuously in the background.	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
Processor Performance Check - Learn Corruption Fault Main & Motor Processor 1. Processor Performance Check - Throttle limiting Fault 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 - motor processor state of health (Main) 6. Processor Performance Check - Learn Corruption Fault (Main&motor processor) 7. Processor Performance Check - Learn Corruption Fault MAIN & motor processor 8. Processor Performance Check - motor processor state of health (Main) Processor Performance Check - MAIN state of health (motor processor)	P0606	Indicates that the ECM has detected an ETC internal processor integrity fault	1. MHC processor detects throttle limiting fault 2. Software tasks loops > schedule tasks loop 3. Loss of SPI communication from the motor processor 4. 1.5 msec < Average motor processor state of health toggle > 2.5 msec 5. TPS or APPS minimum learned values fail compliment check 6. TPS or APPS minimum learned values fail range check 7. Motor processor integrity check error occurs 8. Motor processor integrity check error of main processor occurs	Ignition in unlock/accessory, run or crank System voltage>5.23 V	1. 187.5 ms in the MHC processor 2. Error > 5 times of loop time; loop time are 12.5, 25,50,100 and 250 ms in the main processor 3. 159/400 counts or 15 counts continuous; 39 counts continuous @ initialization, 4. counts/ 10 counts at initialization, 50 msec/count in the main processor, 487.5ms in MHC processor. 5. 187.5ms continuous/100 ms intermittent in the main processor 6. 187.5ms continuous/100 msec intermittent in the main processor	DTC Type A
Vehicle Speed Output Circuit 2 (odm)	P0609	This DTC checks the circuit for electrical integrity during operation.	The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match.	RunCrankIgnInRange (11 volts <= Ignition <= 18 volts)	100 failures in a 120 sample test 250 msec / sample	DTC Type B (Packages without Stabilatrack)

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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
Control Module Accelerator Pedal Position (App) System Performance	P060D	Verify that the indicated accelerator pedal position calculation is correct	<ol style="list-style-type: none"> PPS sensor switch fault (GMT360 Only) Difference between Main processor indicated accelerator pedal position and MHC processor indicated accelerator pedal position > 2.5% 	<ol style="list-style-type: none"> Ignitions in unlock/ accessory and run, System voltage > 5.23 V Ignition in unlock, accessory, run or crank System voltage > 5.23 V No Comm. Fault w/ Main 	39 counts continuous; 12.5 msec/count in the MHC processor	DTC Type A
Control Module EPROM Error	P062F	Indicates that the NVM Error flag has not been cleared	Last EEPROM write did not complete	Ignition on.	1 test failure Once on controller power-up	DTC Type A
5 Volt Reference 1 Circuit	P0641	Detects a continuous or intermittent short on the #1 5 V sensor reference circuit	Vref1 < 4.43 or > 4.66 Volts	Ignition in unlock/accessory, run or crank System voltage > 5.23 V	19/39 counts or 187.5 msec continuous; 12.5 msec/count in main /MHC processor	DTC Type A
Malfunction Indicator Lamp(MIL) Control Circuit (ODM)	P0650	This DTC checks the circuit for electrical integrity during operation.	The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match.	RunCrankIgnInRange (11 volts ≤ Ignition ≤ 18 volts) Remote Vehicle Start is not active	20 failures out of 25 samples 250 ms / sample Continuous	DTC Type B No MIL
5 Volt Reference 2 Circuit	P0651	Detects a continuous or intermittent short on the #2 5 V sensor reference circuit	Vref2 < 4.43 or > 4.66 Volts	Ignition in unlock/accessory, run or crank System voltage > 5.23 V	19/39counts or 187.5 msec continuous; 12.5 msec/count in main/MHC processor	DTC Type A
Powertrain Relay Control (ODM)	P0685	This DTC checks the circuit for electrical integrity during operation.	The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match.	RunCrankIgnInRange (11 volts ≤ Ignition ≤ 18 volts)	8 failures out of 10 samples 250 ms / sample Continuous	DTC Type B
Powertrain Relay Feedback Circuit High	P0690	This DTC is a check to determine if the Powertrain relay is functioning properly	PT Relay feedback voltage is > 2 volts when commanded 'OFF'	No Powertrain Relay Control output driver fault	100 ms / sample Continuous failures ≥ 2 seconds	DTC Type B
Fuel System Control Module (FSCM) Requested MIL Illumination	P069E	Monitor Fuel System Control Module(FSCM) MIL Request to determine when the FSCM has detected a MIL illuminating fault.	Fuel System Control Module Emissions-Related DTC set requesting MIL illumination	Time since power-up > 3 seconds Time Since Code Clear > 2 seconds Diagnostic System not Disabled for Service Run Crank Active	Continuous 100ms Sample Rate	DTC Type A No MIL (FSCM Equipped vehicles only)
Transmission Control Module (Tcm) Requested Mil Illumination	P0700	Monitor Transmission Control Module (TCM) MIL Request to determine when the TCM has detected a MIL illuminating fault.	Transmission Emissions-Related DTC set requesting MIL illumination	Time since power-up > 3 seconds Time Since Code Clear > 2 seconds Diagnostic System not Disabled for Service Run Crank Active	Continuous 100ms Sample Rate	DTC Type A No MIL
Skip Shift Solenoid Control Circuit	P0803	Control circuit voltage is monitored during operation. It should be low during operation and near B+ when "off".	The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match.	Engine speed ≥ 600 rpm 9 volts ≤ Ignition ≤ 18 volts	20 failures out of 25 samples 250 ms / sample Continuous	DTC Type B (Manual Transmission Only)

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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
Clutch Pedal Position Sensor Circuit Range/Performance	P0806	Detects if Clutch Pedal Position Sensor is Stuck in a range indicative of a vehicle NOT in gear, when the vehicle is determined to be in gear.	Filtered Clutch Pedal Position Error is greater than 1 % (versus a reference calibration) when the vehicle is determined to be in gear.	No Clutch Pedal Out-of-Range DTCs Active No VSS DTC Active No Crank Sensor DTC Active N/V Ratio must Match Actual Gear (i.e. vehicle in gear) Transfer Case not in 4WD Low range Engine Torque > See table (P0806: Clutch Torque Enablement)N-m 99.9 % > Clutch Pedal Position > 0 %	25 ms loop Continuous	DTC Type A
Clutch Pedal Position Sensor Circuit Low	P0807	Detects Continuous Circuit Short to Low or Open	Clutch Position Sensor Circuit < 4% of Vref	No active 5 Volt reference DTCs Engine Not Cranking System Voltage > 9	200 failures out of 250 samples 25 ms loop Continuous	DTC Type A
Clutch Pedal Position Sensor Circuit High	P0808	Detects Continuous Circuit Short to High	Clutch Position Sensor Circuit >96 % of Vref	No active 5 Volt reference DTCs Engine Not Cranking System Voltage > 9	200 failures out of 250 samples 25 ms loop Continuous	DTC Type A
Clutch Pedal Position Not Learned	P080A	Monitor for Valid Clutch Pedal Fully Applied Learn Position values	9 % > Clutch Fully Applied Learn Position > 36 % of Vref	OBD Manufacturer Enable Counter = 0 Clutch Pedal Position Not Learned	250 ms loop Continuous	DTC Type B
Traction Control Torque Request Circuit	P0856	Determines if torque request from the EBTCM is valid	For PPEI3 1. Serial Communication 2's complement not equal for message \$1C9 (PPEI3) 2.Serial Communication rolling count value shall be + 1 from previous \$1C9 message (PPEI3) or for PPEI2 1. Serial Communication 2's complement not equal for message \$140 (PPEI2) 2.Serial Communication rolling count value shall be + 1 from previous \$140 message (PPEI2) or for Class2 w/ PWM 5%<=PWM or 95%>= PWM set a fail count	Torque Reduction Signal Diagnostic Enabled For GMLAN PPEI2 or PPEI3 (KeTCSD_b_GMLAN_DiagEnable == TRUE) No Serial communication loss to TCM (U0108) Engine Running == TRUE Power Mode = Run Traction Control System == Present for GMLAN \$380 (PPEI2) or \$4E9 (PPEI3) message or for Class2 w/ PWM Systems: KbTCSD_NoFreqDiagEnbl == TRUE Traction/Drag Control System == Present for PWM \$2B3C (Class2) message	1.# of Protect Errors >= 10 2. # of Alive Rolling Errors >= 10 in 10 Sample Size # of Samples performed in the 25ms loop or for Class2 w/ PWM Systems: Fail Counts => 12 in 30 # of samples performed in the 50ms loop	Special DTC Type C

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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
Inlet Airflow System Performance	P1101	This DTC determines if there are multiple air induction problems affecting airflow and/or manifold pressure.	Filtered Throttle Error > 200 kPa/grams per second And Filtered Manifold2 Error > 15 kPa And Filtered Pressure1 Error > 15 kPa OR Filtered Airflow Error > 12 grams per second	Engine rpm =>450 and <= 8000 MAP sensor high/low DTCs not active EGR circuit/performance DTCs not active MAF sensor high/low DTCs not active Crank sensor DTCs not active Engine Coolant DTCs not active Intake Air Temp. DTCs not active Engine Coolant > 70 deg C and < 125 deg C Intake Air Temp > -7 deg C and < 125 deg C	Continuous Evaluated every 12.5 ms	DTC Type B
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 < refer to: "O2s Insufficient Switching (Half Cycle) Bank 1 Sensor 1 (P1133), O2 Insufficient Switching (Half Cycle) Bank 2 Sensor 1 (P1153) Pass/Fail Thresholds" in Lookup Tables Section. OR Slope Time L/R switches < 1 OR Slope Time R/L switches < 1	<u>Common Enable Criteria</u> <ul style="list-style-type: none"> • No TP Sensor, MAP, ECT, MAF, IAT, Evap, Fuel Injector DTC's • Catalyst monitor diagnostic Intrusive Test = Not Active • Post Oxygen Sensor Diagnostic Intrusive Test = Not Active • Traction Control, AIR, Fuel, Idle, EGR, and Engine Not Over speed Intrusive Tests = Not Active • 10 volts < system voltage < 18 volts • EGR, Idle, Fuel Injector, and AIR Device controls = Not Active <u>Specific Enable Criteria</u> <ul style="list-style-type: none"> • O2 Heater on for ≥ 0 seconds • B1S1 DTCs = Not Active • Learned heater resistance is valid • Misfire DTC = Not Active • ECT > 60 °C • IAT > -40 °C • Engine run time > 160 seconds • EVAP Canister purge duty cycle ≥ 0 % • 20 gm/sec ≤ MAF ≤ 55 gm/sec • 1200 ≤ RPM ≤ 3000 • Ethanol percentage < 87 % • Baro > 69.8 kPa • Throttle position ≥ 4.999 % • Fuel Level > 10 % • Fuel state = closed loop • No fuel level data faults • Transmission (automatic) not in Park, Reverse or Neutral • Transmission gear selection is not defaulted • Baro is not defaulted All of the above met for at least 1 second.	100 seconds <u>Frequency:</u> Once per trip	DTC Type B

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SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
O2S Insufficient Switching Bank 2 Sensor 1	P1153	This DTC determines if the O2 sensor is no longer sufficiently switching.	Half cycle L/R switches << refer to: "O2s Insufficient Switching (Half Cycle) Bank 1 Sensor 1 (P1133), O2 Insufficient Switching (Half Cycle) Bank 2 Sensor 1 (P1153) Pass/Fail Thresholds" in Lookup Tables Section. OR Slope Time L/R switches < 1 OR Slope Time R/L switches < 1	<u>Common Enable Criteria</u> <ul style="list-style-type: none"> • No TP Sensor, MAP, ECT, MAF, IAT, Evap, Fuel Injector DTC's • Catalyst monitor diagnostic Intrusive Test = Not Active • Post Oxygen Sensor Diagnostic Intrusive Test = Not Active • Traction Control, AIR, Fuel, Idle, EGR, and Engine Not Over speed Intrusive Tests = Not Active • 10 volts < system voltage < 18 volts • EGR, Idle, Fuel Injector, and AIR Device controls = Not Active <u>Specific Enable Criteria</u> <ul style="list-style-type: none"> • O2 Heater on for ≥ 0 seconds • B2S1 DTCs = Not Active • Learned heater resistance is valid • Misfire DTC = Not Active • ECT > 60 °C • IAT > -40 °C • Engine run time > 160 seconds • EVAP Canister purge duty cycle ≥ 0 % • 20 gm/sec \leq MAF \leq 55 gm/sec • 1200 \leq RPM \leq 3000 • Ethanol percentage < 87 % • Baro > 69.8 • Throttle position ≥ 4.999 % • Fuel Level > 10 • Fuel state = closed loop • No fuel level data faults • Transmission (automatic) not in Park, Reverse or Neutral • Transmission gear selection is not defaulted • Baro is not defaulted All of the above met for at least 1 second.	100 seconds <u>Frequency:</u> Once per trip	DTC Type B

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SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
Air Fuel Imbalance Bank 1	P1174	Determines if the air-fuel delivery system is imbalanced by monitoring the pre-catalyst O2 sensor voltage characteristics	<p>The Bank 1 AFIM Filtered Length Ratio (EWMA) variable exceeds a value of 1.6.</p> <p>AND</p> <p>Post O2 voltage < 685 mV or > 725 mV</p> <p>Notes:</p> <ol style="list-style-type: none"> The AFIM Filtered Length Ratio is determined by calculating the difference between the measured O2 voltage length (accumulated O2 voltage over a 2.5 second period) and an emissions-correlated threshold value, divided by the threshold value, and finally multiplied by a Quality Factor (the latter ranges between 0 and 1, based on robustness to false diagnosis in the current operating region). The resulting ratio is then filtered utilizing an Exponentially Weighted Moving Average (EWMA). The AFIM Filtered Length Ratio is initialized to its value at the end of the previous trip between the bounds of -1 and 0.8. The first report is delayed for 100 seconds to allow time for the AFIM Filtered Length Ratio variable to saturate. This minimizes the possibility of reporting a pass before a potential failure could be detected. 	<ul style="list-style-type: none"> No Misfire, Fuel Injector, A.I.R., or EVAP DTC's No ECT, MAF, MAP, or pre-cat O2 Sensor DTC's No Fuel Composition (Ethanol) DTC's Device Control = Not Active Intrusive Diagnostics = Not Active Engine Over Speed Protection = Not Active Reduced Power Mode (ETC DTC) = Not Active PTO = Not Active Traction Control = Not Active Fuel Control in A/F Closed Loop or Learn-Enabled System Voltage < 10 Volts or > 18 Volts for > 4 seconds Engine Run Time ≥ 100 seconds ECT > -20 °C Engine speed ≥ 425 rpm but ≤ 6000 rpm Mass Airflow ≥ 25 g/s but ≤ 510 g/s Percent Ethanol ≤ 85 % Delta O2 voltage during previous 12.5ms ≥ ± 5 volts O2 sensor voltages crosses 450mV > 1 time during current 2.5 second sample period Quality Factor ≠ 0 in the current operating region For DoD equipped vehicles only: no DoD state change during current 2.5 second sample period 	<p>EWMA variable is updated after every 2.5 seconds of valid data.</p> <p><u>Frequency:</u> Continuous Monitoring of O2 voltage signal in 12.5ms loop</p>	DTC Type B

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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
Air Fuel Imbalance Bank 2	P1175	Determines if the air-fuel delivery system is imbalanced by monitoring the pre-catalyst O2 sensor voltage characteristics	<p>The Bank 2 AFIM Filtered Length Ratio (EWMA) variable exceeds a value of 0.25.</p> <p>Notes:</p> <ol style="list-style-type: none"> The AFIM Filtered Length Ratio is determined by calculating the difference between the measured O2 voltage length (accumulated O2 voltage over a 2.5 second period) and an emissions-correlated threshold value, divided by the threshold value, and finally multiplied by a Quality Factor (the latter ranges between 0 and 1, based on robustness to false diagnosis in the current operating region). The resulting ratio is then filtered utilizing an Exponentially Weighted Moving Average (EWMA). The AFIM Filtered Length Ratio is initialized to its value at the end of the previous trip between the bounds of -1 and 0.125. The first report is delayed for 100 seconds to allow time for the AFIM Filtered Length Ratio variable to saturate. This minimizes the possibility of reporting a pass before a potential failure could be detected. 	<ul style="list-style-type: none"> No Misfire, Fuel Injector, A.I.R., or EVAP DTC's No ECT, MAF, MAP, or pre-cat O2 Sensor DTC's No Fuel Composition (Ethanol) DTC's Device Control = Not Active Intrusive Diagnostics = Not Active Engine Over Speed Protection = Not Active Reduced Power Mode (ETC DTC) = Not Active PTO = Not Active Traction Control = Not Active Fuel Control in A/F Closed Loop or Learn-Enabled System Voltage < 10 Volts or > 18 Volts for > 4 seconds Engine Run Time ≥ 100 seconds ECT > -20 °C Engine speed ≥ 425 rpm but ≤ 6000 rpm Mass Airflow ≥ 25 g/s but ≤ 510 g/s Percent Ethanol ≤ 85 % Delta O2 voltage during previous 12.5ms ≥ ± 5 volts O2 sensor voltages crosses 450mV > 1 time during current 2.5 second sample period Quality Factor ≠ 0 in the current operating region <p>For DoD equipped vehicles only: no DoD state change during current 2.5 second sample period</p>	<p>EWMA variable is updated after every 2.5 seconds of valid data.</p> <p><u>Frequency:</u> Continuous Monitoring of O2 voltage signal in 12.5ms loop</p>	DTC Type B
Engine Coolant Over Temperature - Protection Mode Active	P1258	Monitor for engine protection mode active.	ECT temperature >= 129.4°C for more than 10 seconds.	No ECT sensor DTCs.	Set immediately upon engine protection mode active.	DTC Type A
Abs Rough Road Malfunction	P1380	This diagnostic detects if the ABS controller is indicating a fault. When this occurs, misfire will continue to run.	ABS controller sends a message to PCM indicating that a failure has occurred in the ABS module	VS ≥ 5mph RPM ≤ 8191 Engine Load ≤ 60%	40 failures out of 80 samples 100 msec loop continuous	DTC Special Type C (DTC can only set when a P0300 Light Request is True)

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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
Abs System Rough Road Detection Communication Fault	P1381	This diagnostic detects if the rough road information is no longer being received from the ABS module. When this occurs, misfire will continue to run.	Serial data messages are lost	VS ≥ 5mph RPM ≤ 8191 Engine Load ≤ 60%	40 failures out of 80 samples 100 msec loop continuous	DTC Special Type C (DTC can only set when a P0300 Light Request is True)
Cold Start Emissions Reduction System Fault	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) < -6.15 kJ/s OR (Average desired accumulated exhaust energy - Average estimated accumulated exhaust energy) > 0.51 kJ/s	<ul style="list-style-type: none"> Cold start emission reduction strategy is active. Vehicle speed < 2 kph. Throttle position < 2%. No DTCs set for the following systems: MAP, MAF, IAT, ECT, Misfire, Electronic Spark Timing, Crank sensor, Idle, Fuel Injection, ETC, VS sensor, 5 volt reference, Intake Flow Rationality, ECM Memory 	100 ms loop Runs once per trip when the cold start emission reduction strategy is active. Test completes after 14 seconds of accumulated qualified data.	DTC Type A
Cooling Fan Speed Output Circuit	P1482	Control circuit voltage is monitored during operation. It should be low during operation and near B+ when "off"	The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match.	Engine speed ≥ 400 rpm. RunCrankIgnInRange (11 volts ≤ Ignition ≤ 18 volts)	20 failures out of 25 samples 250 ms / sample Continuous	DTC Type B (Corvette Only)
Transmission Output Speed Signal Circuit	P150A	Lack of activity in the Replicated Transmission Output Speed Signal circuit.	Replicated Transmission Output Speed ≤ 60 RPM	Transmission indicates the Transmission Output Speed information is valid. 8 V ≤ Ignition Voltage ≤ 18 V Engine Speed ≥ 500 RPM Trans Output Speed ≥ 1200 RPM	4.5 seconds continuous	DTC Type B (Packages without Stabilatrack)
Transmission Output Speed Signal Circuit Intermittent	P150B	Intermittent fault in the Replicated Transmission Output Speed Signal circuit.	Δ in Replicated Transmission Output Speed ≥ 350 rpm	8 V ≤ Ignition Voltage ≤ 18 V Engine Speed ≥ 500 RPM Trans Output Speed > 300 RPM for 2.0 sec Delta Trans Output Speed ≤ 500 RPM for 2.0 sec	3.25 seconds continuous	DTC Type B (Packages without Stabilatrack)
Throttle Actuator Control (Tac) Module - Throttle Actuator Position Performance	P1516	<ol style="list-style-type: none"> Detect a throttle positioning error. Determine if the actuator has been miswired. 	<ol style="list-style-type: none"> $\text{throttle error} \geq 2\%$ after > 0.4875 sec stability with no change in error sign, OR $\text{throttle error} > 9.1 \%$ TPS1 < 1.91 Volts 	Ignition in run or crank [(RPM>0 and system voltage > 5.4 Volts) OR (RPM=0 and not in battery saver mode and System voltage > 11 Volts)] No comm. Fault w/ Main TPS min learn not active	187.5ms in the MHC processor	DTC Type A

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SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
Ignition Correlation	P1682	Detect a continuous or intermittent Out Of Correlation in the Run/Crank Ignition Voltage & ETC Run/Crank Ignition Voltage	$ \text{Run/Crank} - \text{ETC Run/Crank} > 3 \text{ Volts}$	Ignition in unlock/accessory, run or crank System voltage > 5.23 V & Powertrain Relay Commanded on. Run/Crank Ignition \geq voltage required to engage relay at the current IAT temperature, or ETC Run/Crank > voltage required to hold relay in once engaged. <u>Pull-In Voltage</u> <u>Hold-In Voltage</u> 23° C = 7.00 volts 5.50 volts 85° C = 8.70 volts 95° C = 9.00 volts 105° C = 9.20 volts 125° C = 10.00 volts	14 Failures out of 14 Samples 12.5msec per sample loop time, in main processor	DTC Type A
Fuel Level Sensor 2 Performance	P2066	This DTC will detect a fuel sender stuck in range in the secondary fuel tank	IF Delta Fuel Volume change < 3 liters over an accumulated 282 kilometers OR If Primary is FULL and Secondary is EMPTY for > 322 kilometers	No VSS DTC's Engine Running	250 ms / sample Continuous	DTC Type B (For use on vehicles with dual fuel tanks)
Fuel Level Sensor 2 Circuit Low Voltage	P2067	This DTC will detect a fuel sender stuck out of range low in the secondary fuel tank.	Fuel level Sender % of 5V range < 10%	RunCrankIgnInRange (11 volts \leq Ignition \leq 18 volts)	240 failures out of 300 samples 100 ms / sample Continuous	DTC Type B (For use on vehicles with dual fuel tanks)
Fuel Level Sensor 2 Circuit High Voltage	P2068	This DTC will detect a fuel sender stuck out of range high in the secondary fuel tank.	Fuel level Sender % of 5V range > 60%	RunCrankIgnInRange (11 volts \leq Ignition \leq 18 volts)	240 failures out of 300 samples 100 ms / sample Continuous	DTC Type B (For use on vehicles with dual fuel tanks)
Control Module Throttle Actuator Position Performance	P2101	1. Detect a throttle positioning error 2. Detect excessive motor driver current (PWM)	1. Difference between measured throttle position and modeled throttle position > 9.1 % 2. Motor driver PWM output > Thresh. Thresh based on system voltage.	1. Ignition in run or crank [(RPM>0 and system voltage > 5.5 Volts) OR (RPM=0 and not in battery saver mode and System voltage > 11 Volts)] Throttle not at default position 2. NA	1. 15/15 counts continuous 2. Check runs every 12.5 msec in the main processor	DTC Type A
Accelerator Pedal Position (App) Sensor 1	P2120	1. Detect a continuous or intermittent short or open in the APP sensor #1 on Main processor 2. Detect a continuous or intermittent short or open in the APP sensor #1 on MHC processor	1. APP1 < 0.325 OR APP1 > 4.75 Volts 2. APP1 < 0.325 OR APP1 > 4.75Volts	Ignition in unlock/accessory, run or crank System voltage > 5.23 V No 5 Volt reference DTCs	1. 19/39counts or 13counts continuous; 12.5 msec/count in the main processor 2. 19/39counts or 13counts continuous; 12.5 msec/count in the MHC processor	DTC Type A

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SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
Accelerator Pedal Position (App) Sensor 1 Lo	P2122	Detect a continuous or intermittent short or open in the APP sensor #1 on Main processor	APP 1 < 0.325 Volts	Ignition in unlock/accessory, run or crank System voltage >5.23 V No 5 Volt reference DTCs	19/39counts or 13 counts continuous; 12.5 msec/count in the Main processor	DTC Type A
Accelerator Pedal Position (App) Sensor 1 Hi	P2123	Detect a continuous or intermittent short or open in the APP sensor #1 on Main processor	APP 1 > 4.75 Volts	Ignition in unlock/accessory, run or crank System voltage >5.23 V No 5 Volt reference DTCs	19/39counts or 13 counts continuous; 12.5 msec/count in the Main processor	DTC Type A
Accelerator Pedal Position (App) Sensor 2	P2125	<ol style="list-style-type: none"> Detect a continuous or intermittent short or open in the APP sensor #1 on Main processor Detect a continuous or intermittent short or open in the APP sensor #1 on MHC processor 	<ol style="list-style-type: none"> APP2 < 0.325 OR APP2 > 4.75 Volts APP2 < 0.325 OR APP2 > 4.75 Volts 	Ignition in unlock/accessory, run or crank System voltage >5.23 V No 5 Volt reference DTCs	<ol style="list-style-type: none"> 19/39counts or 13counts continuous; 12.5 msec/count in the main processor 19/39counts or 13counts continuous; 12.5 msec/count in the MHC processor 	DTC Type A
Accelerator Pedal Position (App) Sensor 2 Lo	P2127	Detect a continuous or intermittent short or open in the APP sensor #2 on Main processor	APP 2 < 0.325 Volts	Ignition in unlock/accessory, run or crank System voltage >5.23 V No 5 Volt reference DTCs	19/39counts or 13 counts continuous; 12.5 msec/count in the Main processor	DTC Type A
Accelerator Pedal Position (App) Sensor 2 Hi	P2128	Detect a continuous or intermittent short or open in the APP sensor #2 on Main processor	APP 2 > 4.75 Volts	Ignition in unlock/accessory, run or crank System voltage >5.23 V No 5 Volt reference DTCs	19/39counts or 13 counts continuous; 12.5 msec/count in the Main processor	DTC Type A
Throttle Position (Tp) Sensor 1-2 Correlation	P2135	<ol style="list-style-type: none"> Detects a continuous or intermittent correlation fault between TP sensors #1 and #2 on Main processor Detects a continuous or intermittent correlation fault between TP sensors #1 and #2 on MHC processor 	<ol style="list-style-type: none"> Difference between TPS1 displaced and TPS2 displaced > 7.1% offset at min. throttle position with an increasing to 10% at max. throttle position Different between (raw min TPS1) and (raw min TPS2) > 5% of Vref 	Ignition in unlock/accessory, run or crank System voltage >5.23 V No 5 Volt reference DTCs	<ol style="list-style-type: none"> 79/159 counts or 63 counts continuous; 3.125 msec/count in the main processor 19/39 counts or 15 counts continuous; 12.5 msec/count in the MHCprocessor 	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
Accelerator Pedal Position (App) Sensor 1-2 Correlation	P2138	Detect an invalid minimum mechanical position correlation between APP sensor #1 and #2	<ol style="list-style-type: none"> Difference between (raw min. learned PPS#1 voltage-raw min. PPS#1 voltage) and (raw PPS#2 voltage - raw min. learned PPS#2 voltage) > 10% offset at min. throttle position with an increasing to 10% (0.5v) at max. throttle position for Main processor. <p style="text-align: center;">OR</p> <ol style="list-style-type: none"> Difference between the learned PPS1 min and PPS2 min > 5% Vref 	<ol style="list-style-type: none"> Ignition in unlock/accessory, run or crank System voltage >5.23 V No 5 Volt reference DTC's Ignition in unlock/accessory, run or crank System voltage >5.23 V No 5 Volt reference DTC's 	<ol style="list-style-type: none"> 19/39 counts intermittent or 15 counts continuous, 12.5 msec/count in the main processor 19/39 counts intermittent or 15 counts continuous, 12.5 msec/count in the MHC processor 	DTC Type A
Vehicle Speed Sensor B Circuit Low	P2160	Lack of activity in the Transfer Case Output Speed Sensor circuit	Transfer Case Output Speed \leq 50 rpm	PTO not active, not in Garage Shift Torque valid $60 \text{ N-m} \leq \text{Engine Torque} \leq 8192 \text{ N-m}$ TPS valid; $8\% \leq \text{Throttle} \leq 99\%$ $1500 \leq \text{Input Speed} \leq 6500 \text{ RPM}$ Trans Range \neq Park, Neutral, or Reverse No Engine Position Sensor, Throttle Position Sensor, Vehicle Speed Sensor, TCSS, Turbine Speed, or Output Speed Sensor codes	5 seconds continuous	DTC Type B (Packages with 6 speed transmission and 2 speed 4wd)
Vehicle Speed Sensor B Intermittent/Erratic	P2161	Intermittent fault in the Transfer Case Output Speed Sensor circuit.	Positive Delta in Transfer Case Output Speed \geq 225 rpm OR Negative Delta in Transfer Case Output Speed \geq 475 rpm	Engine Speed \geq 1200 RPM No Engine Position codes	4 seconds continuous	DTC Type B (Packages with 6 speed transmission and 2 speed 4wd)
Minimum Throttle Position Not Learned	P2176	TP minimum learning not completed	<ol style="list-style-type: none"> TPS > 0.98 Volts during TPS min learn on the Main processor <p style="text-align: center;">OR</p> <ol style="list-style-type: none"> TPS > 0.98 Volts during TPS min learn on the MHC processor 	Minimum TPS learn active state Stable throttle position reading for 40 msec Ignition in run or crank No TPS circuit DTCs	1.8secs	DTC Type A

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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
O2 Sensor Signal Stuck Lean Bank 1 Sensor 2	P2270	This DTC determines if the post catalyst O2 sensor is stuck in a normal lean voltage range and thereby can no longer be used for post oxygen sensor fuel control or for catalyst monitoring. The diagnostic is an intrusive test which increases the delivered fuel to achieve the required rich threshold.	Post catalyst (B1S2) O2 sensor cannot achieve voltage \geq 730 millivolts.	<p><u>Common Enable Criteria</u></p> <ul style="list-style-type: none"> • No O2 circuit, response, heater current, or heater resistance DTC's active • No TP Sensor, ETC, MAF, MAP, EVAP, Secondary Air, Fuel Injector DTC's, Fuel Trim System DTCs, Misfire DTCs, E85 FFS DTCs • 10 < system voltage < 18 volts • Learned heater resistance is valid • ICAT MAT Burn off delay is not active • Green O2 Sensor Condition is not present • Fuel Level > 10 % or fuel level data fault active <p><u>Specific Enable Criteria:</u></p> <ul style="list-style-type: none"> • No Fuel Trim or Misfire DTC's active • 500 rpm \leq Engine Speed \leq 5000 rpm • 3 gm/sec \leq Airflow \leq 50 gm/sec • 24 kph \leq Vehicle Speed \leq 132 kph • .959991 \leq Short term fuel trim \leq 1.040009 • Fuel state = closed loop • EVAP diagnostic not in control of purge • Ethanol Estimate is not in progress • Post Cell Enabled • Power Take Off is not active • EGR diagnostic is not intrusive • VaOXYC_b_O2_HeaterWarmUpDlyCmplt = TRUE for all post O2 sensors <p>All of the above met for at least 1 second, and then:</p> <p>Purge Duty Cycle = 0 % For 2 seconds</p>	<p>Up to 550 grams of accumulated air flow for the Rich Test.</p> <p><u>Frequency:</u> Once per trip</p> <p><u>Green Sensor Delay Criteria</u></p> <ul style="list-style-type: none"> • The diagnostic will not be enabled until the next ignition cycle after the following has been met: Airflow greater than 22 g/sec for 66000 grams of accumulated flow 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) <p>Note: this feature is only enabled when the vehicle is new and cannot be enabled in service</p>	DTC Type B

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SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
O2 Sensor Signal Stuck Lean Bank 1 Sensor 2	P2270	This DTC determines if the post catalyst O2 sensor is stuck in a normal lean voltage range and thereby can no longer be used for post oxygen sensor fuel control or for catalyst monitoring. The diagnostic is an intrusive test which increases the delivered fuel to achieve the required rich threshold.	Post catalyst (B1S2) O2 sensor cannot achieve voltage ≥ 810 millivolts AND Accumulated mass air flow monitored during the Stuck Lean Voltage Test > 80 grams.	<p><u>Common Enable Criteria</u></p> <ul style="list-style-type: none"> • No O2 circuit, response, heater current, or heater resistance DTC's active • No TP Sensor, ETC, MAF, MAP, EVAP, Secondary Air, Fuel Injector DTC's, Fuel Trim System DTCs, Misfire DTCs, E85 FFS DTCs • 10 volts $<$ system voltage $<$ 18 volts • Learned heater resistance is valid • ICAT MAT Burn off delay is not active • Green O2 Sensor Condition is not present • Fuel Level > 10 % or fuel level data fault active • Engine run time (from key start) ≥ 295 secs <p><u>Specific Enable Criteria:</u></p> <ul style="list-style-type: none"> • No Fuel Trim or Misfire DTC's active • 1100 rpm \leq Engine Speed \leq 2500 rpm • 3 gm/sec \leq Airflow \leq 20 gm/sec • 50 kph \leq Vehicle Speed \leq 120 kph • 0.74 \leq Short term fuel trim \leq 1.08 • Fuel state = closed loop • EVAP diagnostic not in control of purge • Ethanol Estimate is not in progress • Post Cell Enabled • Power Take Off is not active • EGR diagnostic is not intrusive • VaOXYC_b_O2_HeaterWarmUpDlyCmplt = TRUE for all post O2 sensors • 550 °C \leq Catalytic Converter Temperature \leq 900 °C <p>All of the above met for at least 0.5 seconds, and then: ForceCatRich intrusive stage is requested.</p>	<p><u>Frequency:</u> Once per trip Note: if NaPOPD_b_ResetFastRespFunc = FALSE for the given Fuel Bank OR NaPOPD_b_RapidResponseActive = TRUE, multiple tests per trip are allowed.</p> <p><u>Green Sensor Delay Criteria</u></p> <ul style="list-style-type: none"> • The diagnostic will not be enabled until the next ignition cycle after the following has been met: Airflow greater than 22 g/sec for 120000 grams of accumulated flow 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) <p>Note: this feature is only enabled when the vehicle is new and cannot be enabled in service</p>	<p style="text-align: center;">DTC Type B</p> <p style="text-align: center;">H2 and H3 Programs Only</p>

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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
O2 Sensor Signal Stuck Rich Bank 1 Sensor 2	P2271	This DTC determines if the post catalyst O2 sensor is stuck in a normal rich voltage range and thereby can no longer be used for post oxygen sensor fuel control or for catalyst monitoring. The diagnostic is an intrusive test which decreases the delivered fuel to achieve the required lean threshold.	Post catalyst (B1S2) O2 sensor cannot achieve voltage \leq 225 millivolts	<p><u>Common Enable Criteria</u></p> <ul style="list-style-type: none"> • No O2 circuit, response, heater current, or heater resistance DTC's active • No TP Sensor, ETC, MAF, MAP, EVAP, Secondary Air, Fuel Injector DTC's, Fuel Trim System DTCs, Misfire DTCs, E85 FFS DTCs • $10 <$ system voltage $<$ 18 volts • Learned heater resistance is valid • ICAT MAT Burn off delay is not active • Green O2 Sensor Condition is not present • Fuel Level $>$ 10 % or fuel level data fault active <p><u>Specific Enable Criteria:</u></p> <ul style="list-style-type: none"> • No Fuel Trim or Misfire DTC's active • $500 \text{ rpm} \leq \text{Engine Speed} \leq 5000 \text{ rpm}$ • $3 \text{ gm/sec} \leq \text{Airflow} \leq 50 \text{ gm/sec}$ • $24 \text{ kph} \leq \text{Vehicle Speed} \leq 132 \text{ kph}$ • $.959991 \leq \text{Short term fuel trim} \leq 1.040009$ • Fuel state = closed loop • EVAP diagnostic not in control of purge • Ethanol Estimate is not in progress • Post Cell Enabled • Power Take Off is not active • EGR diagnostic is not intrusive • VaOXYC_b_O2_HeaterWarmUpDlyCmplt = TRUE for all post O2 sensors <p>All of the above met for at least 1 second, and then:</p> <p>Purge Duty Cycle = 0 % For 2 seconds</p>	<p>Up to 550 grams of accumulated air flow for the Lean Test.</p> <p><u>Frequency:</u> Once per trip</p> <p><u>Green Sensor Delay Criteria</u></p> <ul style="list-style-type: none"> • The diagnostic will not be enabled until the next ignition cycle after the following has been met: Airflow greater than 22 g/sec for 66000 grams of accumulated flow 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) <p>Note: this feature is only enabled when the vehicle is new and cannot be enabled in service</p>	DTC Type B

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SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
O2 Sensor Signal Stuck Rich Bank 1 Sensor 2	P2271	This DTC determines if the post catalyst O2 sensor is stuck in a normal rich voltage range and thereby can no longer be used for post oxygen sensor fuel control or for catalyst monitoring. The diagnostic is an intrusive test which requests the DFCO mode to achieve the required lean threshold.	Post catalyst (B1S2) O2 sensor cannot achieve voltage \leq 100 millivolts AND Accumulated mass air flow monitored during the Stuck Rich Voltage Test $>$ 80 grams.	<u>Common Enable Criteria</u> <ul style="list-style-type: none"> • No O2 circuit, response, heater current, or heater resistance DTC's active • No TP Sensor, ETC, MAF, MAP, EVAP, Secondary Air, Fuel Injector DTC's, Fuel Trim System DTCs, Misfire DTCs, E85 FFS DTCs • 10 volts $<$ system voltage $<$ 18 volts • Learned heater resistance is valid • ICAT MAT Burn off delay is not active • Green O2 Sensor Condition is not present • Fuel Level $>$ 10 % or fuel level data fault active • Engine run time (from key start) \geq 295 secs <u>Specific Enable Criteria:</u> <ul style="list-style-type: none"> • <u>The DFCO mode and no driver initiated throttle input, TCC Locked.</u> • <u>Complete and PASS the following POPD tests:</u> <ol style="list-style-type: none"> 1. <u>P2270 and P2272, if applicable.</u> 2. <u>P013E and P014A, if applicable.</u> 3. <u>P013A and P013C, if applicable.</u> 	<u>Frequency:</u> Once per trip Note: if NaPOPD_b_ResetFastRespFunc = FALSE for the given Fuel Bank OR NaPOPD_b_RapidResponseActive = TRUE, multiple tests per trip are allowed. <u>Green Sensor Delay Criteria</u> <ul style="list-style-type: none"> • The diagnostic will not be enabled until the next ignition cycle after the following has been met: Airflow greater than 22 g/sec for 120000 grams of accumulated flow 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) Note: this feature is only enabled when the vehicle is new and cannot be enabled in service	DTC Type B H2 and H3 Programs Only

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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
O2 Sensor Signal Stuck Lean Bank 2 Sensor 2	P2272	This DTC determines if the post catalyst O2 sensor is stuck in a normal lean voltage range and thereby can no longer be used for post oxygen sensor fuel control or for catalyst monitoring. The diagnostic is an intrusive test which increases the delivered fuel to achieve the required rich threshold.	Post catalyst (B2S2) O2 sensor cannot achieve voltage ≥ 730 millivolts.	<p><u>Common Enable Criteria</u></p> <ul style="list-style-type: none"> • No O2 circuit, response, heater current, or heater resistance DTC's active • No TP Sensor, ETC, MAF, MAP, EVAP, Secondary Air, Fuel Injector DTC's, Fuel Trim System DTCs, Misfire DTCs, E85 FFS DTCs • $10 < \text{system voltage} < 18$ volts • Learned heater resistance is valid • ICAT MAT Burn off delay is not active • Green O2 Sensor Condition is not present • Fuel Level $> 10\%$ or fuel level data fault active <p><u>Specific Enable Criteria:</u></p> <ul style="list-style-type: none"> • No Fuel Trim or Misfire DTC's active • $500 \text{ rpm} \leq \text{Engine Speed} \leq 5000 \text{ rpm}$ • $3 \text{ gm/sec} \leq \text{Airflow} \leq 50 \text{ gm/sec}$ • $24 \text{ kph} \leq \text{Vehicle Speed} \leq 132 \text{ kph}$ • $.959991 \leq \text{Short term fuel trim} \leq 1.040009$ • Fuel state = closed loop • EVAP diagnostic not in control of purge • Ethanol Estimate is not in progress • Post Cell Enabled • Power Take Off is not active • EGR diagnostic is not intrusive • VaOXYC_b_O2_HeaterWarmUpDlyCmplt = TRUE for all post O2 sensors <p>All of the above met for at least 1 second, and then:</p> <p>Purge Duty Cycle = 0 % For 2 seconds</p>	<p>Up to 550 grams of accumulated air flow for the Rich Test.</p> <p><u>Frequency:</u> Once per trip</p> <p><u>Green Sensor Delay Criteria</u></p> <ul style="list-style-type: none"> • The diagnostic will not be enabled until the next ignition cycle after the following has been met: Airflow greater than 22 g/sec for 66000 grams of accumulated flow 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) <p>Note: this feature is only enabled when the vehicle is new and cannot be enabled in service</p>	DTC Type B

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SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
O2 Sensor Signal Stuck Lean Bank 2 Sensor 2	P2272	This DTC determines if the post catalyst O2 sensor is stuck in a normal lean voltage range and thereby can no longer be used for post oxygen sensor fuel control or for catalyst monitoring. The diagnostic is an intrusive test which increases the delivered fuel to achieve the required rich threshold.	Post catalyst (B2S2) O2 sensor cannot achieve voltage \geq 810 millivolts AND Accumulated mass air flow monitored during the Stuck Lean Voltage Test > 80 grams.	<p><u>Common Enable Criteria</u></p> <ul style="list-style-type: none"> • No O2 circuit, response, heater current, or heater resistance DTC's active • No TP Sensor, ETC, MAF, MAP, EVAP, Secondary Air, Fuel Injector DTC's, Fuel Trim System DTCs, Misfire DTCs, E85 FFS DTCs • 10 volts < system voltage < 18 volts • Learned heater resistance is valid • ICAT MAT Burn off delay is not active • Green O2 Sensor Condition is not present • Fuel Level > 10 % or fuel level data fault active • Engine run time (from key start) \geq 295 secs <p><u>Specific Enable Criteria:</u></p> <ul style="list-style-type: none"> • No Fuel Trim or Misfire DTC's active • 1100 rpm \leq Engine Speed \leq 2500 rpm • 3 gm/sec \leq Airflow \leq 20 gm/sec • 50 kph \leq Vehicle Speed \leq 120 kph • 0.74 \leq Short term fuel trim \leq 1.08 • Fuel state = closed loop • EVAP diagnostic not in control of purge • Ethanol Estimate is not in progress • Post Cell Enabled • Power Take Off is not active • EGR diagnostic is not intrusive • VaOXYC_b_O2_HeaterWarmUpDlyCmplt = TRUE for all post O2 sensors • 550 °C \leq Catalytic Converter Temperature \leq 900 °C <p>All of the above met for at least 0.5 seconds, and then: ForceCatRich intrusive stage is requested.</p>	<p><u>Frequency:</u> Once per trip Note: if NaPOPD_b_ResetFastRespFunc = FALSE for the given Fuel Bank OR NaPOPD_b_RapidResponseActive = TRUE, multiple tests per trip are allowed.</p> <p><u>Green Sensor Delay Criteria</u></p> <ul style="list-style-type: none"> • The diagnostic will not be enabled until the next ignition cycle after the following has been met: Airflow greater than 22 g/sec for 120000 grams of accumulated flow 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) <p>Note: this feature is only enabled when the vehicle is new and cannot be enabled in service</p>	<p>DTC Type B</p> <p>H2 and H3 Programs Only</p>

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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
O2 Sensor Signal Stuck Rich Bank 2 Sensor 2	P2273	This DTC determines if the post catalyst O2 sensor is stuck in a normal rich voltage range and thereby can no longer be used for post oxygen sensor fuel control or for catalyst monitoring. The diagnostic is an intrusive test which decreases the delivered fuel to achieve the required lean threshold.	Post catalyst (B2S2) O2 sensor cannot achieve voltage \leq 225 millivolts	<p><u>Common Enable Criteria</u></p> <ul style="list-style-type: none"> • No O2 circuit, response, heater current, or heater resistance DTC's active • No TP Sensor, ETC, MAF, MAP, EVAP, Secondary Air, Fuel Injector DTC's, Fuel Trim System DTCs, Misfire DTCs, E85 FFS DTCs • 10 < system voltage < 18 volts • Learned heater resistance is valid • ICAT MAT Burn off delay is not active • Green O2 Sensor Condition is not present • Fuel Level > 10 % or fuel level data fault active <p><u>Specific Enable Criteria:</u></p> <ul style="list-style-type: none"> • No Fuel Trim or Misfire DTC's active • 500 rpm \leq Engine Speed \leq 5000 rpm • 3 gm/sec \leq Airflow \leq 50 gm/sec • 24 kph \leq Vehicle Speed \leq 132 kph • .959991 \leq Short term fuel trim \leq 1.040009 • Fuel state = closed loop • EVAP diagnostic not in control of purge • Ethanol Estimate is not in progress • Post Cell Enabled • Power Take Off is not active • EGR diagnostic is not intrusive • VaOXYC_b_O2_HeaterWarmUpDlyCmplt = TRUE for all post O2 sensors <p>All of the above met for at least 1 second, and then:</p> <p>Purge Duty Cycle = 0 % For 2 seconds</p>	<p>Up to 550 grams of accumulated air flow for the Lean Test.</p> <p><u>Frequency:</u> Once per trip</p> <p><u>Green Sensor Delay Criteria</u></p> <ul style="list-style-type: none"> • The diagnostic will not be enabled until the next ignition cycle after the following has been met: Airflow greater than 22 g/sec for 66000 grams of accumulated flow 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) <p>Note: this feature is only enabled when the vehicle is new and cannot be enabled in service</p>	DTC Type B

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SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
O2 Sensor Signal Stuck Rich Bank 2 Sensor 2	P2273	This DTC determines if the post catalyst O2 sensor is stuck in a normal rich voltage range and thereby can no longer be used for post oxygen sensor fuel control or for catalyst monitoring. The diagnostic is an intrusive test which requests the DFCO mode to achieve the required lean threshold.	<p>Post catalyst (B2S2) O2 sensor cannot achieve voltage \leq 100 millivolts</p> <p>AND</p> <p>Accumulated mass air flow monitored during the Stuck Rich Voltage Test $>$ 80 grams.</p>	<p><u>Common Enable Criteria</u></p> <ul style="list-style-type: none"> • No O2 circuit, response, heater current, or heater resistance DTC's active • No TP Sensor, ETC, MAF, MAP, EVAP, Secondary Air, Fuel Injector DTC's, Fuel Trim System DTCs, Misfire DTCs, E85 FFS DTCs • 10 volts $<$ system voltage $<$ 18 volts • Learned heater resistance is valid • ICAT MAT Burn off delay is not active • Green O2 Sensor Condition is not present • Fuel Level $>$ 10 % or fuel level data fault active • Engine run time (from key start) \geq 295 secs <p><u>Specific Enable Criteria:</u></p> <ul style="list-style-type: none"> • <u>The DFCO mode and no driver initiated throttle input, TCC Locked.</u> • <u>Complete and PASS the following POPD tests:</u> <ol style="list-style-type: none"> 1. <u>P2270 and P2272, if applicable.</u> 2. <u>P013E and P014A, if applicable.</u> 3. <u>P013A and P013C, if applicable.</u> 	<p><u>Frequency:</u> Once per trip Note: if NaPOPD_b_ResetFastRespFunc = FALSE for the given Fuel Bank OR NaPOPD_b_RapidResponseActive = TRUE, multiple tests per trip are allowed.</p> <p><u>Green Sensor Delay Criteria</u></p> <ul style="list-style-type: none"> • The diagnostic will not be enabled until the next ignition cycle after the following has been met: Airflow greater than 22 g/sec for 120000 grams of accumulated flow 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) <p>Note: this feature is only enabled when the vehicle is new and cannot be enabled in service</p>	<p>DTC Type B</p> <p>H2 and H3 Programs Only</p>
Transmission Control Torque Request Circuit	P2544	Determines if torque request from the TCM is valid	<ol style="list-style-type: none"> 1. Serial Communication 2's complement not equal for message \$199 (PTEI3) 2. Serial Communication rolling count value shall be + 1 from previous \$199 message (PTEI3) 3. 2's complement not equal of torque requested value or torque requested type when stored in ECM 4. If TCM Requested Torque in message \$199 (PTEI3) $>$ 400 <p>or for PPEI2</p> <ol style="list-style-type: none"> 1. Serial Communication 2's complement not equal for message \$150 (PTEI2) 2. Serial Communication rolling count value shall be + 1 from previous \$150 message (PTEI2) 	<p>No Serial communication loss to TCM (U0101) Engine Running == TRUE Power Mode = Run Crank Active Engine running for greater than 0.5 seconds</p>	<ol style="list-style-type: none"> 1. # of Protect Errors \geq 16 2. # of Alive Rolling Errors \geq 6 in 10 samples 3. # of RAM errors \geq 3 4. # of range errors \geq 3 in 10 samples <p>If any the above exist for $>$ 2 seconds then increment fail counter else fail counter is reset</p> <p>If the fail counter is \Rightarrow 2 fault is active</p> <p>Pass diagnostic if none of the above conditions are present for \Rightarrow 2 seconds</p> <p>12.5ms loop</p>	DTC Type B

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SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
ECM/PCM Internal Engine Off Timer Performance	P2610	This DTC determines if the engine off timer does not initialize or count properly. Clock rate test: Checks the accuracy of the 1 second timer by comparing it with the 12.5 ms timer	Initial value test: Initial ignition off timer value < 0 sec OR Initial ignition off timer value > 10 sec Clock rate test: <ul style="list-style-type: none"> • Time between ignition off timer increments < 0.8 sec • Time between ignition off timer increments > 1.2 sec • Time since last ignition off timer increment \geq 1.375 sec • Current ignition off time < old ignition off time • Current ignition off timer minus old ignition off timer \neq 1.0 	ECM is powered down DTC sets on next key cycle if failure detected -40°C \leq IAT \leq 125°C	Initial value test: 3 failures 1.375 sec / sample Clock rate test: 8 failures out of 10 samples 1 second / sample test runs once each key-off	DTC Type B
Fuel Pump 2 Relay Control Circuit	P2632	This DTC monitors the secondary transfer pump output driver for faults.	The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match.	RunCrankIgnInRange (11 volts \leq Ignition \leq 18 volts) Engine speed \geq 400 rpm	100 failures out of 120 samples 250 ms / sample Continuous	DTC Type B (For use on vehicles with dual fuel tanks)
Fuel Pump 2 Flow Insufficient	P2636	This DTC detects if there is insufficient fuel flow from the secondary to the primary tank.	Delta Primary Fuel Volume change < 3 liters AND Delta Secondary Fuel Volume change < 3 liters	No VSS DTC's Engine Running Vehicle speed must be zero. Secondary Fuel Transfer pump is activated. A slosh delay of 20 sec has passed.	Secondary Fuel Transfer Pump on for 200 seconds	DTC Type B (For use on vehicles with dual fuel tanks)
Four Wheel Drive Lo Switch Circuit	P2771	Detects a continuous Open (stuck off) or Ground (stuck on) in the Four Wheel Drive Low Switch Circuit	<u>FAIL CASE 1</u> 4WD Low Switch is Open 2.39 < MTCR < 2.90 <u>FAIL CASE 2</u> 4WD Low Switch is Grounded 0.80 < MTCR < 1.75 MTCR = Measured Transfer Case Ratio	No Engine position, throttle position, Vehicle Speed, or transmission output speed sensor DTCs Transmission not in Park, Neutral, or Reverse 1000 \leq Engine Speed \leq 5500 RPM -32 \leq System Voltage \leq 32 5% \leq Throttle Position Sensor \leq 99% -20° C. \leq Transmission Fluid Temperature \leq 130° C Vehicle Speed \geq 16 km/hr Engine Run time \geq 30 sec 65 \leq Engine Torque \leq 8192 N-m	<u>4WD Low Switch Stuck OFF</u> Fail Time = 1.1 sec 2 nd Occurrence Continuous <u>4WD Low Switch Stuck ON</u> Fail Time = 7.0 sec 1st Occurrence Continuous	DTC Type B

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SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
O2 Sensor Circuit Range/Performance Bank 1 Sensor 2	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 is an intrusive test which increases or reduces delivered fuel to achieve the required rich or lean threshold.	Post catalyst O2 sensor cannot achieve voltage \geq 730 millivolts and voltage \leq 200 millivolts	<p><u>Common Enable Criteria</u></p> <ul style="list-style-type: none"> • <u>Engine Runtime \geq 300 seconds</u> • <u>No O2 circuit, response, heater current, or heater resistance DTC's active</u> • <u>No TP Sensor, ETC, MAF, ECT, MAP, IAT, EVAP, Secondary Air, Fuel Injector DTC's</u> • <u>10 volts < system voltage < 18 volts</u> • <u>Learned heater resistance is valid</u> • <u>ICAT MAT Burn off delay is not active</u> <p><u>Specific Enable Criteria:</u></p> <ul style="list-style-type: none"> • <u>No Fuel Trim or Misfire DTC's active</u> • <u>500 rpm \leq Engine Speed \leq 5000 rpm</u> • <u>3 gm/sec \leq Airflow \leq 50 gm/sec</u> • <u>24 kph \leq Vehicle Speed \leq 132 kph</u> • <u>0.959991 \leq Short term fuel trim \leq 1.0400085</u> • <u>Fuel state = closed loop</u> • <u>EVAP diagnostic not in control of purge</u> • <u>Ethanol Estimate is not in progress</u> • <u>Fuel Level > 10 %</u> • <u>Post Cell Enabled</u> • <u>Power Take Off is not active</u> • <u>EGR diagnostic is not intrusive</u> <p><u>All of the above met for at least 1 seconds, and then:</u></p> <p><u>Purge Duty Cycle = 0 %</u> <u>For 5 seconds</u></p>	<p>Up to 550 grams of accumulated air flow for the Lean Test and 550 grams of accumulated air flow for the Rich Test.</p> <p>Frequency: Once per trip</p> <p>Green O2 Sensor Delay Criteria This diagnostic will not be enabled until the following has been met: Total Accumulated Airflow \geq 0 grams.</p> <p>Airflow accumulates anytime the engine is running and the current engine airflow is \geq 20 gm/sec. The airflow can accumulate over several engine run cycles until the threshold is reached.</p> <p>Note: This feature is only enabled when the vehicle is new and cannot be enabled in service.</p>	<p>DTC Type B</p> <p>LS7 Only</p>

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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
O2 Sensor Circuit Range/Performance Bank 2 Sensor 2	P2A04	This DTC determines if the post catalyst O2 sensor is stuck in a normal voltage range and thereby can no longer be used for post oxygen sensor fuel control or for catalyst monitoring. The diagnostic is an intrusive test which increases or reduces delivered fuel to achieve the required rich or lean threshold.	Post catalyst O2 sensor cannot achieve voltage \geq 730 millivolts and voltage \leq 200 millivolts	<p><u>Common Enable Criteria</u></p> <ul style="list-style-type: none"> • <u>Engine Runtime \geq 300 seconds</u> • <u>No O2 circuit, response, heater current, or heater resistance DTC's active</u> • <u>No TP Sensor, ETC, MAF, ECT, MAP, IAT, EVAP, Secondary Air, Fuel Injector DTC's</u> • <u>10 volts < system voltage < 18 volts</u> • <u>Learned heater resistance is valid</u> • <u>ICAT MAT Burn off delay is not active</u> <p><u>Stage 2 Specific Enable Criteria:</u></p> <ul style="list-style-type: none"> • <u>No Fuel Trim or Misfire DTC's active</u> • <u>500 rpm \leq Engine Speed \leq 5000 rpm</u> • <u>3 gm/sec \leq Airflow \leq 50 gm/sec</u> • <u>24 kph \leq Vehicle Speed \leq 132 kph</u> • <u>0.959991 \leq Short term fuel trim \leq 1.0400085</u> • <u>Fuel state = closed loop</u> • <u>EVAP diagnostic not in control of purge</u> • <u>Ethanol Estimate is not in progress</u> • <u>Fuel Level > 10 %</u> • <u>Post Cell Enabled</u> • <u>Power Take Off is not active</u> • <u>EGR diagnostic is not intrusive</u> <p><u>All of the above met for at least 1 seconds, and then:</u></p> <p><u>Purge Duty Cycle = 0 %</u> <u>For 5 seconds</u></p>	<p>550 grams of accumulated air flow for the Lean Test and 550 grams of accumulated air flow for the Rich Test.</p> <p>Frequency: Once per trip</p> <p>Green O2 Sensor Delay Criteria This diagnostic will not be enabled until the following has been met: Total Accumulated Airflow \geq 0 grams.</p> <p>Airflow accumulates anytime the engine is running and the current engine airflow is \geq 20 gm/sec. The airflow can accumulate over several engine run cycles until the threshold is reached.</p> <p>Note: This feature is only enabled when the vehicle is new and cannot be enabled in service.</p>	<p>DTC Type B</p> <p>LS7 Only</p>
Deactivation System Performance	P3400	Detects a "failed to deactivate" condition	Manifold model 2 Lag – Manifold model 2 Lag in DoD > 8 and Manifold model 2 Lag < -8 while in DoD	<p>Engine rpm \Rightarrow 450 and \leq 8000</p> <p>Time in DoD mode \Rightarrow 2 seconds</p> <p>Time in All Cylinder mode \Rightarrow 2 seconds</p> <p>MAP sensor high/low DTC's not active</p> <p>MAF sensor high/low DTC's not active</p> <p>Crank sensor DTC's not active</p> <p>Engine Coolant DTC's not active</p> <p>Intake Air Temp. DTC's not active</p> <p>Engine Coolant > 70 deg C and < 125 deg C</p> <p>Intake Air Temp > -7 deg C and < 125 deg C</p> <p>Total residual weigh factors (filtered) \Rightarrow 0</p>	100 Failures out of 200 samples where a sample is a 100 ms loop while in DoD mode.	<p>DTC Type B</p> <p>(DoD Applications Only)</p>
Cylinder 1 Deactivation Solenoid Control Circuit	P3401	Detects shorted or open circuit for the DoD solenoid	20 fail counts out of 25 Sample Counts will fail the diagnostic	<p>Run Crank in Range</p> <p>Engine speed \geq 400</p>	250ms loop time	<p>DTC Type B</p> <p>(DoD Applications Only)</p>
Cylinder 4 Deactivation Solenoid Control Circuit	P3425	Detects shorted or open circuit for the DoD solenoid	20 fail counts out of 25 Sample Counts will fail the diagnostic	<p>Run Crank in Range</p> <p>Engine speed \geq 400</p>	250ms loop time	<p>DTC Type B</p> <p>(DoD Applications Only)</p>

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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
Cylinder 6 Deactivation Solenoid Control Circuit	P3441	Detects shorted or open circuit for the DoD solenoid	20 fail counts out of 25 Sample Counts will fail the diagnostic	Run Crank in Range Engine speed >= 400	250ms loop time	DTC Type B (DoD Applications Only)
Cylinder 7 Deactivation Solenoid Control Circuit	P3449	Detects shorted or open circuit for the DoD solenoid	20 fail counts out of 25 Sample Counts will fail the diagnostic	Run Crank in Range Engine speed >= 400	250ms loop time	DTC Type B (DoD Applications Only)
Control Module Communication Bus Off (Automatic Transmission)	U0073	Detects that a CAN serial data bus shorted condition has occurred to force the CAN device driver to enter a bus-off state	CAN device driver reported that it has entered a bus-off state for 5 failures out of 5 samples.		5 sec. <u>Frequency:</u> Continuous 1000 ms loop	DTC Type B
Lost Communication With TCM (Automatic Transmission)	U0101	Detects that CAN serial data communication has been lost with the TCM.	Lost communication with the TCM while the ignition switch is in the RUN power mode for 12 failures out of 12 samples.		12 sec. <u>Frequency:</u> Continuous 1000 ms loop	DTC Type B
Lost Communication With TCCM (4 wheel drive applications only)	U0102	Detects that CAN serial data communication has been lost with the TCM.	Lost communication with the TCM while the ignition switch is in the RUN power mode for 12 failures out of 12 samples.		12 sec. <u>Frequency:</u> Continuous 1000 ms loop	DTC Type B (TCCM equipped vehicles only)
Lost Communication With Fuel Pump Control Module	U0109	Detects that CAN serial data communication has been lost with the fuel pump control module.	Lost communication with the fuel pump control module while the ignition switch is in the RUN power mode for 12 failures out of 12 samples.		12 sec. <u>Frequency:</u> Continuous 1000 ms loop	DTC Type B (FSCM Equipped vehicles only)

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MAP and MAF Delta Criterion based on TPS % for P0068 code

Throttle position %	5.00	10.00	15.00	20.00	25.00	30.00	35.00	40.00	100.00
Max MAP delta	20.59	21.80	23.12	24.32	19.91	17.88	100.00	100.00	100.00
Max MAF delta	13.97	18.28	22.09	32.31	40.02	44.85	255.00	255.00	255.00

IFRD Residual Weighting Factors (P0101, P0106, P0121)

	Engine Speed																
	0	250	750	1250	1750	2250	2750	3250	3750	4250	4750	5250	5750	6250	6750	7250	9000
TPS residual weight factors	1.000	1.000	1.000	0.564	0.830	0.745	0.601	0.406	0.436	0.533	0.381	0.363	0.509	1.000	1.000	1.000	1.000
MAP2 Residual wt factors	1.000	0.550	0.573	0.373	0.595	0.495	0.415	0.462	0.445	0.587	0.524	0.460	0.359	0.416	1.000	1.000	1.000
MAP1 Residual wt factors	1.000	0.550	0.600	0.431	0.589	0.774	0.803	0.670	0.607	0.650	0.857	0.876	0.683	0.910	1.000	1.000	1.000
MAF Residual wt factors	1.000	1.000	1.000	1.000	0.491	0.559	0.390	0.353	0.187	0.305	0.276	0.220	0.176	0.193	1.000	1.000	1.000
MAF Residual wt factors based on MAF estimate	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

P0116: Fail if power up ECT exceeds IAT by these values. 5.3L (LY5)

Difference ↓ / IAT →	-40	-28	-16	-4	8	20	32	44	56	68	80	92	104	116	128	140	152
Temperature Difference	65	55	45	35	25	25	25	25	25	25	15	15	15	15	15	15	15

P0128: Maximum Accumulated Airflow for IAT and Start-up ECT conditions. 5.3L (LMG)

IAT ↓ / Start-	-40	-28	-16	-4	8	20	32	44	56	68	80
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up ECT →											
IAT > 10°C	17626	17626	17626	17626	17626	15882	14137	12392	10648	8903	7159
10°C ≤ IAT ≥ -7°C	16976	16976	16976	15517	14060	12600	11142	9684	8225	8225	8225

**TABLE - O2S Slow Response Bank 1 Sensor 1 (P0133), O2S Slow Response Bank 2 Sensor 1 (P0153)
Lean-Rich Ave**

	0	2	7	5	4	9	7	6	1	9	8	3	1	9	40.254883	1
Seconds	0	0.03027	0.04492	0.05957	0.07519	0.08984	0.10546	0.12011	0.13476	0.15039	0.16503	0.17968	0.19531	0.20996	0.22460	0.24023
Rich-Lean Ave	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL
	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL
	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL
	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL
	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	FAIL	FAIL	FAIL	FAIL	FAIL
	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	FAIL	FAIL	FAIL	FAIL
	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	FAIL	FAIL	FAIL
	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	FAIL	FAIL
	FAIL	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	FAIL	FAIL
	FAIL	FAIL	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	FAIL	FAIL
	FAIL	FAIL	FAIL	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	FAIL	FAIL
	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL
	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL
	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL

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P0300: Catalyst Damaging Misfire Percentages as a Function of Engine Speed and Load Table: 5.3L (LMG)

Eng. Load ↓ / Eng. RPM →	0 RPM	1000 RPM	2000 RPM	3000 RPM	4000 RPM	5000 RPM	6000 RPM	7000 RPM	8000 RPM
0 Load_In_Percent	10.625	10.625	10.625	10.625	10	5	5	5	5
10 Load_In_Percent	10.625	10.625	10.625	10	8.25	5	5	5	5
20 Load_In_Percent	10.625	10.625	10.625	8.25	7.125	5	5	5	5
30 Load_In_Percent	10.625	10.625	10	7.125	5	5	5	5	5
40 Load_In_Percent	10.625	10	8.25	5.5	5	5	5	5	5
50 Load_In_Percent	10.625	10	7.125	5	5	5	5	5	5
60 Load_In_Percent	10.625	10	6.25	5	5	5	5	5	5
70 Load_In_Percent	10	8.25	5.5	5	5	5	5	5	5
80 Load_In_Percent	8.25	7.125	5	5	5	5	5	5	5
90 Load_In_Percent	7.125	6.25	5	5	5	5	5	5	5
100 Load_In_Percent	6.25	5.5	5	5	5	5	5	5	5

P0300 Engine zero torque as a Function of Engine speed table: 5.3L (LMG)

Engine rpm	400	500	600	700	800	900	1000	1100	1200	1400	1600	1800	2000
Engine Load, %	16.5008 5	15.6005 9	14.8986 8	14.3005 4	13.8000 5	13.5009 8	13.2995 6	13.2507 3	13.2507 3	13.2507 3	13.2507 3	13.2507 3	13.2507 3
Engine rpm	2200	2400	2600	2800	3000	3500	4000	4500	5000	5500	6000		
Engine Load, %	13.2507 3	13.2507 3	13.2507 3	13.2995 6	13.5986 3	16.9403 1	20.2789 3	23.6175 5	26.9561 8	30.2978 5	33.6364 7		

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P0300 Engine (DOD) zero toque as a Function of Engine speed table: 5.3L (LMG)

Engine rpm	400	500	600	700	800	900	1000	1100	1200	1400	1600	1800	2000
Engine Load, %	22.5006	22.0001	21.4996	20.9991	20.4986	20.0012	19.5007	19.0002	18.4997	17.9992	17.7490	17.4987	17.2485
	1	2	3	5	6	2	3	4	6	7	2	8	4
Engine rpm	2200	2400	2600	2800	3000	3500							
Engine Load, %	17.0013	16.7511	16.5008	16.5008	16.5008	17.0013							
	4	5	5	5	4								

Knock Sensor Low Voltage Threshold (P0327)

RPM Axis	500	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000
Threshold (Volts)	2.5940337	2.5940337	2.5940337	2.5940337	2.5940337	2.5940337	2.5940337	2.5940337	2.5940337	2.4414435	2.2888533	2.1362631	1.9836728	1.8310826

P0521 Engine Oil Pressure Rationality Weighting Factors									
Engine Speed									
0	500	900	1000	1500	1750	2000	3500	4000	
0	0	0	0.45	0.45	0.45	0.46	0.44	0	
Engine Load Stability									
0	5	10	20	30	50	100	200	399.25	
1	1	1	0.30	0.00	0.00	0.00	0.00	0	
Engine Oil Temperature									
-10	-5	60	80	90	100	120	130	140	
0	0.7	0.7	0.70	0.70	0.70	0.70	0.70	0	
Engine Oil Pressure Predicted									
160	170	250	275	360	375	400	500	600	
0	1	1	1.00	1.00	1.00	1.00	0.86	0	

P0806: Clutch Torque Enablement

		6.24847	12.4969	18.7454		31.2423	37.4908	43.7393	49.9877	56.2362
Clutch Pedal Position (percent)	0	4	5	2	24.9939	7	4	2	9	7
Torque (N-m)	10	10.5	14	18.5	27	35	40	51.5	80	87
		62.4847	68.7332	74.9816	81.2301	87.4786	93.7271	99.9755		
Clutch Pedal Position (percent)	4	2	9	6	4	1	9			
Torque (N-m)	-8192	-8192	-8192	-8192	-8192	-8192	-8192	-8192		

**O2 Insufficient Switching (Half Cycle) Bank 1 Sensor 1 (P1133), O2 Insufficient Switching (Half Cycle) Bank 2 Sensor 2 (P1153)
Pass/Fail Thresholds - Number of Switches L-R or R-L as a function of Airflow and Ethanol Percentage**

08 GRP07 LMG Engine

Airflow ↓ / Ethanol % →	0.0000%	9.9991%	19.9997%	50.000%	79.9988%
0.00 g/s	50	50	50	50	50
6.25 g/s	50	50	50	50	50
12.50 g/s	50	50	50	50	50
18.75 g/s	51	51	51	51	51
25.00 g/s	52	52	52	52	52
31.25 g/s	54	54	54	54	54
37.50 g/s	55	55	55	55	55
43.75 g/s	57	57	57	57	57
50.00 g/s	58	58	58	58	58
56.25 g/s	60	60	60	60	60
62.50 g/s	60	60	60	60	60
68.75 g/s	60	60	60	60	60
75.00 g/s	60	60	60	60	60
81.25 g/s	60	60	60	60	60
87.50 g/s	60	60	60	60	60
93.75 g/s	60	60	60	60	60
100.00 g/s	60	60	60	60	60