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 SENSOR MISINSTALLED	*P0016	1X Signal This diagnostic will determine if the Cam sensor and high voltage switch have been installed correctly.	Cam signal falling edge out of phase ±27 degrees from crank falling edge.	Engine is running – run flag is true No crank position sensor not valid DTC	30 test failures within a 50 test sample size. Time necessary to complete sample: Varies with engine speed Every crank fall	DTC Type B
(B1S1) HEATED OXYGEN SENSOR HEATER CONTROL CIRCUIT	P0030	This DTC checks the Heater Output Driver circuit for electrical integrity.	Output state shorted or open.	10 < Ignition Voltage < 18 Volts	5 failures out of 12 samples 500ms loop continuous	DTC Type B
(B1S2) HEATED OXYGEN SENSOR HEATER CONTROL CIRCUIT	P0036	This DTC checks the Heater Output Driver circuit for electrical integrity.	Output state shorted or open.	10 < Ignition Voltage < 18 Volts	5 failures out of 12 samples 500ms loop continuous	DTC Type B
(B2S1) HEATED OXYGEN SENSOR HEATER CONTROL CIRCUIT	P0050	This DTC checks the Heater Output Driver circuit for electrical integrity.	Output state shorted or open.	10 < Ignition Voltage < 18 Volts	5 failures out of 12 samples 500ms loop continuous	DTC Type B
(B1S1) HEATED OXYGEN SENSOR HEATER RESISTANCE	P0053	Out-Of-Range (OOR) Resistance: Detects an oxygen sensor heater having an incorrect or out of range (OOR) resistance value.	O2 Heater Resistance < 1.39 ohms OR O2 Heater Resistance > 8.08 ohms (O2 Heater Resistance is corrected to 20 degrees C)	Engine Soak Time > 10 Hours ECT – IAT < 8ºC -30ºC < ECT < 45ºC ECM/PCM Internal Engine Off Timer Performance Fault Not Active No ECT faults Active No IAT faults Active Engine run time < .15 seconds	Frequency: Once per valid cold start 1 second loop	DTC Type B
(B1S2) HEATED OXYGEN SENSOR HEATER RESISTANCE	P0054	Out-Of-Range (OOR) Resistance: Detects an oxygen sensor heater having an incorrect or out of range (OOR) resistance value.	O2 Heater Resistance < 6.20 ohms OR O2 Heater Resistance > 18.27 ohms (O2 Heater Resistance is corrected to 20 degrees C)	Engine Soak Time > 10 Hours ECT – IAT < 8ºC -30ºC < ECT Temp < 45ºC ECM/PCM Internal Engine Off Timer Performance Fault Not Active No ECT faults Active No IAT faults Active Engine run time < .15 seconds	Frequency: Once per valid cold start 1 second loop	DTC Type B

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
(B2S2) HEATED OXYGEN SENSOR HEATER CONTROL CIRCUIT	P0056	This DTC checks the Heater Output Driver circuit for electrical integrity.	Output state shorted or open.	10 < Ignition Voltage < 18 Volts	5 failures out of 12 samples 500ms loop continuous	DTC Type B
(B2S1) HEATED OXYGEN SENSOR HEATER RESISTANCE	P0059	Out-Of-Range (OOR) Resistance: Detects an oxygen sensor heater having an incorrect or out of range (OOR) resistance value.	O2 Heater Resistance < 1.39 ohms OR O2 Heater Resistance > 8.08 ohms (O2 Heater Resistance is corrected to 20 degrees C)	Engine Soak Time > 10 Hours ECT – IAT < 8ºC -30ºC < ECT < 45ºC ECM/PCM Internal Engine Off Timer Performance Fault Not Active No ECT faults Active No IAT faults Active Engine run time < .15 seconds	Frequency: Once per valid cold start 1 second loop	DTC Type B
(B2S2) HEATED OXYGEN SENSOR HEATER RESISTANCE	P0060	Out-Of-Range (OOR) Resistance: Detects an oxygen sensor heater having an incorrect or out of range (OOR) resistance value.	O2 Heater Resistance < 6.20 ohms OR O2 Heater Resistance > 18.27 ohms (O2 Heater Resistance is corrected to 20 degrees C)	Engine Soak Time > 10 Hours ECT – IAT < 8ºC -30ºC < ECT < 45ºC ECM/PCM Internal Engine Off Timer Performance Fault Not Active No ECT faults Active No IAT faults Active Engine run time < .15 seconds	Frequency: Once per valid cold start 1 second loop	DTC Type B
TAC SYSTEM MAF PERFORMANCE	P0068	Indicates that measured engine airflow does not match estimated engine airflow as established by the TPS.	MAP based airflow - estimated airflow > 150 mg/cyl AND MAF based airflow - estimated airflow > 150 mg/cyl	Engine running = true. Ignition on > 1 sec. RPM > 500. No Throttle Actuation DTC's. No PCM-TACM Serial Data DTC. Both TPS Circuit DTC's are not set. No PCM Processor DTC's No TACM Processor DTC	Both counters are incremented by 2 for every error and decrement by 1 for every pass; both thresholds are 20; both counters must exceed threshold to set DTC. Check runs every 18.75 ms.	DTC Type A For use on vehicles with ETC

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
MASS AIR FLOW SYSTEM PERFORMANCE (RATIONALITY)	P0101	This DTC determines if the MAF sensor is stuck within the normal operating range	Calculated Flow – Measured Flow ≥ cal (table) Table look up as a function of calculated flow	Engine running TP sensor DTC's not active MAP sensor DTC's not active EVAP DTC's not active MAF sensor high/low DTC's not active Traction control not active Not in DFCO System voltage ≥ 11V but ≤ 18V Canister Purge DC ≤ 100% MAP Δ ≤ 3% TP Δ ≤ 5% Engine vacuum ≤ 80 kPa Throttle Position ≤ 95% The above must be present for a period of time greater than 1.5 seconds	40 test failures in a 100 test sample Check runs every 100 ms.	DTC Type B
MASS AIR FLOW SENSOR CIRCUIT LOW FREQUENCY	P0102	Detects a continuous short to low or a open in either the signal circuit or the MAF sensor	*LOW FREQUENCY TEST*: MAF ≤ 1200 Hz	*LOW FREQUENCY TEST* Engine Runtime ≥ 2 seconds Engine Speed ≥ 400 RPM System Voltage ≥ 8 volts The above must be present for a period of time greater than 1 second	*LOW FREQUENCY TEST*: 6 test failures in a 40 test sample. 1 sample per 100 ms Test is run at every reading of the Mass Air Flow sensor frequency	DTC Type B
MASS AIR FLOW SENSOR CIRCUIT HIGH FREQUENCY	P0103	Detects a continuous short to high in either the signal circuit or the MAF sensor	*HIGH FREQUENCY TEST:* MAF ≥ 13500 Hz	*HIGH FREQUENCY TEST:* Engine Runtime ≥ 2 seconds Engine Speed ≥ 400 RPM System Voltage ≥ 8 volts The above must be present for a period of time greater than 1 second	*HIGH FREQUENCY TEST:* 18 test failures in a 24 test sample. 1 sample per 100 ms Test is run at every reading of the Mass Air Flow sensor frequency	DTC Type B

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
MAP SENSOR RANGE/ PERFORMANCE(RATIONALITY)	P0106	This DTC determines if the MAP sensor is stuck within the normal operation range	MAP (kPa) > or < predicted MAP (lookup table as a function of TPS and RPM)	Engine Running MAP sensor high/low DTC's not active TP sensor DTC's not active IAC DTC's not active Traction Control not active Engine Speed Δ ≤ 125 RPM Throttle Position Δ ≤ 100% Idle Air Δ ≤ 10 g/s Brake Switch State = no change Clutch Switch State = no change Power Steering = Stable PTO = not active AC Clutch State = no change Above stabilized for 1 second Engine Speed ≥ 500 RPM Engine Speed ≤ 5000 RPM	20 test failures within a 30 test sample 1 sample/sec	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 < 1.171875 % of Vref (.056 volts)	TP sensor DTC's not active Engine Running Throttle Position is ≥ 0% when engine speed is ≤ 800 RPM Or Throttle Position is ≥ 12.5 % when engine speed is > 800 RPM	320 test failures in a 400 test sample. 1 sample/12.5 ms	DTC Type B
MANIFOLD ABSOLUTE PRESSURE SENSOR CIRCUIT HIGH	P0108	This DTC detects an open sensor ground or continuous short to high in either the signal circuit or the MAP sensor	MAP > 98.00781 % of Vref (4.9 volts)	TP sensor DTC's not active Engine Running Engine Run Time based on power up ECT: ≥ 10 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 Throttle Position is ≤ 0.996094 % when engine speed is ≤ 1200 RPM Or Throttle Position is ≤ 20 % when engine speed is > 1200 RPM	320 test failures in a 400 test sample. 1 sample/12.5 ms	DTC Type B
INTAKE AIR TEMP SENSOR CIRCUIT LOW (HIGH TEMP)	P0112	This DTC detects a continuous short to ground in the IAT signal circuit or the IAT sensor	IAT < 0.703125 % of Vref (.035 volts)	VS sensor DTC's not active ECT sensor DTC's not active Vehicle speed ≥ 25 mph Engine run time > 45 seconds ECT < 125°C	25 test failures in a 50test sample 1 sample/500 ms	DTC Type B

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
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	IAT > 99.19922 % of Vref (4.96 volts)	ECT sensor DTC's not active VS sensor DTC's not active ECT ≥ 60 °C Mass Air Flow < 15 g/s Vehicle Speed < 7 mph Engine run time > 120 seconds	25 test failures in a 50 test sample. 1 sample/ 500 ms	DTC Type B
ENGINE COOLANT TEMP SENSOR RATIONALITY (HIGH-SIDED)	P0116	Detects ECT sensor stuck in mid range	A failure will be reported if any of the following occur: ECT at powerup > IAT at powerup by 99.9843°C after a minimum 10 hour soak (fast fail). ECT at powerup > IAT at powerup by 15°C after a minimum 10 hour soak and a block heater has not been detected. ECT at powerup > IAT at powerup 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 Block heater detection: ECT at powerup > IAT at powerup by 15°C Powerup IAT > -7°C Vehicle driven a minumum of 400 seconds above 15 mph and IAT drops more than 8° C from powerup IAT.	1 failure 200 ms loop	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.	Low Resistance Pull-up Raw ECT < .234 Volts High Resistance Pull-up Raw ECT < .035 Volts	Engine run time > 10 seconds Or Min IAT < 50° C (min IAT is never allowed to go higher than 54.5 degrees C)	45 test failures in a 50 test sample. 1 sample/500 ms	DTC Type B
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.	Low Resistance Pull-up Raw ECT > 4.93 Volts High Resistance pull-up Raw ECT > 4.95 Volts	Engine run time > 60 seconds Or Min IAT ≥ 0° C	45 test failures in a 50 test sample. 1 sample/ 500 ms Continuous	DTC Type B

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
THROTTLE POSITION SENSOR 1 CIRCUIT	P0120	1) TACM indicates a continuous or intermittent short or open in either the signal circuit or the TP sensor #1. OR 2) TACM indicates an invalid minimum mechanical position for the TP sensor #1. OR 3) TACM indicated reference voltage out of range.	1) Raw TP sensor signal < 0.376 V or > 4.506 V. OR 2)TP sensor minimum mechanical stop voltage < 0.376 V or > 0.714 V. OR 3) Vref out of range < 4.54 V or > 5.21 V.	Ignition in Run or Crank. Ignition voltage > 5.23 V. Valid TACM - PCM serial data. No TACM processor DTC.	1) Counter increments by 4 for every error, decrements by 1 for every pass; threshold is 133. Check runs every 3 ms. 2) One occurrence. Check runs at power-up. 3) Continuous. Counter increments by 1 for every error, decrements by 1 for every pass. Threshold is 10ms. For Ref direct short to ground. 4) Second continuous counter increments by 1 for every error and decrements by 1 for every pass, threshold is 1000 msec. Verify A/D input on Ref to be 5volts +/- tolerance.	DTC Type A For use on vehicles with ETC
TP SENSOR CIRCUIT PERFORMANCE	*P0121	The DTC determines if a TPS sensor is stuck within the normal operating range	***Stuck high test:*** The last throttle position value is > predicted throttle position based on engine RPM. ***Stuck low test:*** The last throttle position value is < predicted throttle position based on engine RPM	***Test Enable:*** ECT ≥ 60° C No TP sensor short DTC's active No IAC DTC's active No MAP DTC's active No MAF DTC's active Engine run time ≥ 120 sec BARO not defaulted MAP delta ≤ 1.5 kPa for ≥ 1 sec IAC ≥ 0 counts but ≤ 310 counts ***Stuck high test:*** MAP < 50 kPa ***Stuck low test:*** MAP > 65 kPa	***Stuck high test:*** 150 test failures within a 200 test sample ***Stuck low test:*** 150 test failures within a 200 test sample 1 sample/100ms	DTC Type B
TP SENSOR CIRCUIT LOW	*P0122	This DTC detects a continuous short to low or open in either the signal circuit or the TP sensor	TP sensor signal voltage < .149 volts	None	90 test failures in a 100 test sample size. 1 sample/12.5ms	DTC Type B

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
TP SENSOR CIRCUIT HIGH	*P0123	This DTC detects a continuous short to high in either the signal circuit or the TP sensor.	TP sensor signal voltage > 4.89 volts.	None	90 test failures in a 100 test sample size. 1 sample/12.5ms	DTC Type B
COOLANT TEMPERATURE BELOW STAT REGULATING TEMPERATURE	P0128	This DTC detects if the ECT rises too slowly due to an ECT or cooling system fault	If actual accumulated airflow is > predicted accumulated airflow before ECT reaches 75 °C when IAT is > 10° C, and before ECT 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 ≤ 87% ECT at startrun ≤ 70°C for IAT above 10°C; ECT at startrun ≤ 50°C for IAT ≤ 10°C but ≥ -7°C Minimum Average Airflow ≥ 10 gps Vehicle speed ≥ 5 MPH for at least 1.50 miles Maximum airflow added to actual accumulated airflow limited to 75 gps Airflow added to actual accumulated airflow is considered 0 gps below an actual 20 gps.	30 failures to set DTC <u>Frequency:</u> Once per ignition cycle 1 second loop	DTC Type B
(B1S1) HEATED OXYGEN SENSOR CIRCUIT LOW	P0131	Circuit Continuity Detects a HO2S voltage stationary lean (low signal voltage) condition.	Oxygen sensor voltage < 80 mV	No Throttle, IAT, Injector, ECT, Air Flow, Purge Control, MAP, Fuel Composition or Engine Protect faults Active. Catalyst Monitor Test not Intrusive Not in Device Control Post Oxygen Sensor Diagnostic not Intrusive 10 V ≤ System Voltage ≤ 18 V No injectors disabled Closed loop fueling Ethanol % ≤ 90 0.992 ≤ Equivalence Ratio ≤ 1.014 Fuel Level ≥ 10% 3% ≤ TPS ≤ 70% Above conditions met for 2 sec	450 failures out of 480 samples. 100 ms/sample Continuous	DTC Type B

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
(B1S1) HEATED OXYGEN SENSOR CIRCUIT HIGH	P0132	Circuit Continuity Detects a HO2S voltage stationary rich (high signal voltage) condition.	Oxygen sensor voltage > 1050 mV	No Throttle, IAT, Injector, ECT, Air Flow, Purge Control, MAP, Fuel Composition or Engine Protect faults Active. Catalyst Monitor Test not Intrusive Not in Device Control Post Oxygen Sensor Diagnostic not Intrusive 10 V ≤ System Voltage ≤ 18 V Closed loop fueling Ethanol % ≤ 90 0.992 ≤ Equivalence Ratio ≤ 1.014 Fuel Level ≥ 10% 3% ≤ TPS ≤ 70% Above conditions met for 2 seconds	450 failures out of 480 samples. 100 ms/sample Continuous	DTC Type B
(B1S1) HEATED OXYGEN SENSOR CIRCUIT SLOW RESPONSE	P0133	Detects slow symmetrical rich to lean or lean to rich HO2S signal transition rates.	The oxygen sensor transitions between 250 – 625 mV. HO2S sensor average transition time: L/R > 255 ms R/L > 255 ms	No Throttle, IAT, Injector, ECT, Air Flow, Purge Control, MAP, Fuel Composition or Engine Protect faults Active. Catalyst Monitor Test not Intrusive Not in Device Control Post Oxygen Sensor Diagnostic not Intrusive 10 V ≤ System Voltage ≤ 18 V DTC's P0131, P0132, P0134 and P0135 not Active -1280 ºC < Predicted O2 Sensor Temp < 1280 ºC No Misfire Faults Active Fuel Level ≥ 10% Ethanol % ≤ 90 ECT > 60 °C Engine runtime > 160 sec CCP Duty Cycle ≥ 0% PRNDL in drive range Closed Loop Fuel Control 1200 ≤ RPM ≤ 3000 20 ≤ Air Flow ≤ 55g/s. TPS ≥ 5% Above conditions met for 1 sec	100 sec Once per trip.	DTC Type B

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
(B1S1) HEATED OXYGEN SENSOR CIRCUIT NO ACTIVITY	P0134	Circuit Continuity Detects a HO2S circuit open.	350 mV < B1S1 voltage < 550 mV	No Throttle, IAT, Injector, ECT, Air Flow, Purge Control, MAP, Fuel Composition or Engine Protect faults Active. Catalyst Monitor Test not Intrusive Not in Device Control Post Oxygen Sensor Diagnostic not Intrusive 10 V ≤ System Voltage ≤ 18 V Ethanol % ≤ 90 Engine runtime > 300 sec	285 failures out of 300 samples 100 ms/sample Continuous.	DTC Type B
(B1S1) HEATED OXYGEN SENSOR HEATER CIRCUIT	P0135	Current Monitor: Detects a malfunctioning HO2S heater circuit by monitoring the current through the circuit.	0.25 A < Heater Current < 3.125 A	No Throttle, IAT, Injector, ECT, Air Flow, Purge Control, MAP, Fuel Composition or Engine Protect faults Active. Catalyst Monitor Test not Intrusive Not in Device Control Post Oxygen Sensor Diagnostic not Intrusive 10 V ≤ System Voltage ≤ 18 V ECT ≥ 50 ºC 3 g/s ≤ Airflow ≤ 40 g/s Engine runtime ≥ 300 sec 500 ≤ RPM ≤ 3000 Ethanol % ≤ 90 DTC P0053 not set. All of the above true for at least 2 seconds Heater must be commanded on.	8 failures out of 10 samples Frequency: 2 times per key cycle	DTC Type B
(B1S2) HEATED OXYGEN SENSOR CIRCUIT LOW	P0137	Circuit Continuity Detects a HO2S voltage stationary lean (low signal voltage) condition.	Oxygen sensor voltage < 80 mV	No Throttle, IAT, Injector, ECT, Air Flow, Purge Control, MAP, Fuel Composition or Engine Protect faults Active. Catalyst Monitor Test not Intrusive Not in Device Control Post Oxygen Sensor Diagnostic not Intrusive 10 V ≤ System Voltage ≤ 18 V No injectors disabled Closed loop fueling Ethanol % ≤ 90 0.992 ≤ Equivalence Ratio ≤ 1.014 Fuel Level ≥ 10% 3% ≤ TPS ≤ 70% Above conditions met for 2 sec	1900 failures out of 2000 samples 100 ms/sample Continuous	DTC Type B

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
(B1S2) HEATED OXYGEN SENSOR CIRCUIT HIGH	P0138	Circuit Continuity Detects a HO2S voltage stationary rich (high signal voltage) condition.	Oxygen sensor voltage > 950 mV	No Throttle, IAT, Injector, ECT, Air Flow, Purge Control, MAP, Fuel Composition or Engine Protect faults Active. Catalyst Monitor Test not Intrusive Not in Device Control Post Oxygen Sensor Diagnostic not Intrusive 10 V ≤ System Voltage ≤ 18 V Closed loop fueling Ethanol % ≤ 90 0.992 ≤ Equivalence Ratio ≤ 1.014 Fuel Level ≥ 10% 3% ≤ TPS ≤ 70% Above conditions met for 2 seconds	1900 failures out of 2000 samples. 100 ms/sample Continuous	DTC Type B
(B1S2) HEATED OXYGEN SENSOR CIRCUIT NO ACTIVITY	P0140	Circuit Continuity Detects a HO2S circuit open.	410 mV < B1S2 voltage < 490 mV <OR> Post O2 sensor fast pass B1S2 > 550 mV B1S2 < 350 mV	No Throttle, IAT, Injector, ECT, Air Flow, Purge Control, MAP, Fuel Composition or Engine Protect faults Active. Catalyst Monitor Test not Intrusive Not in Device Control Post Oxygen Sensor Diagnostic not Intrusive 10 V ≤ System Voltage ≤ 18 V Ethanol % ≤ 90 Engine runtime > 300 sec Closed Loop Fueling 5% Δ TPS within 1 sec, 6 times DTC P0141 not Active DTC P0054 not Active No Throttle, IAT, Injector, ECT, Air Flow, Purge Control, MAP, Fuel Composition or Engine Protect faults Active. Catalyst Monitor Test not Intrusive Not in Device Control Post Oxygen Sensor Diagnostic not Intrusive 10 V ≤ System Voltage ≤ 18 V Ethanol % ≤ 90 Engine is running Engine runtime ≤ 200 sec DTC P0141 not Active DTC P0054 not Active	1450 failures out of 1500 samples. 100 ms/sample Once per trip 550 more passing samples than failing samples. 100 ms/sample Once per trip	DTC Type B

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
(B1S2) HEATED OXYGEN SENSOR HEATER CIRCUIT	P0141	Current Monitor: Detects a malfunctioning HO2S heater circuit by monitoring the current through the circuit.	0.25 A < Heater Current < 1.375 A	No Throttle, IAT, Injector, ECT, Air Flow, Purge Control, MAP, Fuel Composition or Engine Protect faults Active. Catalyst Monitor Test not Intrusive Not in Device Control Post Oxygen Sensor Diagnostic not Intrusive 10 V ≤ System Voltage ≤ 18 V ECT ≥ 50 ºC 3 g/s ≤ Airflow ≤ 40 g/s Engine runtime ≥ 300 sec 500 ≤ RPM ≤ 3000 Ethanol % ≤ 90 DTC P0053 not set. All of the above true for at least 2 seconds Heater must be commanded on.	8 failures out of 10 samples Frequency: 2 times per key cycle	DTC Type B
(B2S1) HEATED OXYGEN SENSOR CIRCUIT LOW	P0151	Circuit Continuity Detects a HO2S voltage stationary lean (low signal voltage) condition.	Oxygen sensor voltage < 80 mV	No Throttle, IAT, Injector, ECT, Air Flow, Purge Control, MAP, Fuel Composition or Engine Protect faults Active. Catalyst Monitor Test not Intrusive Not in Device Control Post Oxygen Sensor Diagnostic not Intrusive 10 V ≤ System Voltage ≤ 18 V No injectors disabled Closed loop fueling Ethanol % ≤ 90 0.992 ≤ Equivalence Ratio ≤ 1.014 Fuel Level ≥ 10% 3% ≤ TPS ≤ 70% Above conditions met for 2 sec	450 failures out of 480 samples. 100 ms/sample Continuous	DTC Type B

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
(B2S1) HEATED OXYGEN SENSOR CIRCUIT HIGH	P0152	Circuit Continuity Detects a HO2S voltage stationary rich (high signal voltage) condition.	Oxygen sensor voltage > 1050 mV	No Throttle, IAT, Injector, ECT, Air Flow, Purge Control, MAP, Fuel Composition or Engine Protect faults Active. Catalyst Monitor Test not Intrusive Not in Device Control Post Oxygen Sensor Diagnostic not Intrusive 10 V ≤ System Voltage ≤ 18 V Closed loop fueling Ethanol % ≤ 90 0.992 ≤ Equivalence Ratio ≤ 1.014 Fuel Level ≥ 10% 3% ≤ TPS ≤ 70% Above conditions met for 2 seconds	450 failures out of 480 samples. 100 ms/sample Continuous	DTC Type B
(B2S1) HEATED OXYGEN SENSOR CIRCUIT SLOW RESPONSE	P0153	Detects slow symmetrical rich to lean or lean to rich HO2S signal transition rates.	The oxygen sensor transitions between 250 – 625 mV. HO2S sensor average transition time: L/R > 255 ms R/L > 255 ms	No Throttle, IAT, Injector, ECT, Air Flow, Purge Control, MAP, Fuel Composition or Engine Protect faults Active. Catalyst Monitor Test not Intrusive Not in Device Control Post Oxygen Sensor Diagnostic not Intrusive 10 V ≤ System Voltage ≤ 18 V DTC's P0131, P0132, P0134 and P0135 not Active -1280 ºC < Predicted O2 Sensor Temp < 1280 ºC No Misfire Faults Active Fuel Level ≥ 10% Ethanol % ≤ 90 ECT > 60 °C Engine runtime > 160 sec CCP Duty Cycle ≥ 0% PRNDL in drive range Closed Loop Fuel Control 1200 ≤ RPM ≤ 3000 20 ≤ Air Flow ≤ 55g/s. TPS ≥ 5% Above conditions met for 1 sec	100 sec Once per trip.	DTC Type B

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
(B2S1) HEATED OXYGEN SENSOR CIRCUIT NO ACTIVITY	P0154	Circuit Continuity Detects a HO2S circuit open.	350 mV < B2S1 voltage < 550 mV	No Throttle, IAT, Injector, ECT, Air Flow, Purge Control, MAP, Fuel Composition or Engine Protect faults Active. Catalyst Monitor Test not Intrusive Not in Device Control Post Oxygen Sensor Diagnostic not Intrusive 10 V ≤ System Voltage ≤ 18 V Ethanol % ≤ 90 Engine runtime > 300 sec	285 failures out of 300 samples. 100 ms/sample Continuous	DTC Type B
(B2S1) HEATED OXYGEN SENSOR HEATER CIRCUIT	P0155	Current Monitor: Detects a malfunctioning HO2S heater circuit by monitoring the current through the circuit.	0.25 A < Heater Current < 3.125 A	No Throttle, IAT, Injector, ECT, Air Flow, Purge Control, MAP, Fuel Composition or Engine Protect faults Active. Catalyst Monitor Test not Intrusive Not in Device Control Post Oxygen Sensor Diagnostic not Intrusive 10 V ≤ System Voltage ≤ 18 V ECT ≥ 50 ºC 3 g/s ≤ Airflow ≤ 40 g/s Engine runtime ≥ 300 sec 500 ≤ RPM ≤ 3000 Ethanol % ≤ 90 DTC P0053 not set. All of the above true for at least 2 seconds Heater must be commanded on.	8 failures out of 10 samples Frequency: 2 times per key cycle	DTC Type B
(B2S2) HEATED OXYGEN SENSOR CIRCUIT LOW	P0157	Circuit Continuity Detects a HO2S voltage stationary lean (low signal voltage) condition.	Oxygen sensor voltage < 80 mV	No Throttle, IAT, Injector, ECT, Air Flow, Purge Control, MAP, Fuel Composition or Engine Protect faults Active. Catalyst Monitor Test not Intrusive Not in Device Control Post Oxygen Sensor Diagnostic not Intrusive 10 V ≤ System Voltage ≤ 18 V No injectors disabled Closed loop fueling Ethanol % ≤ 90 0.992 ≤ Equivalence Ratio ≤ 1.014 Fuel Level ≥ 10% 3% ≤ TPS ≤ 70% Above conditions met for 2 sec	1900 failures out of 2000 samples. 100 ms/sample Continuous	DTC Type B

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
(B2S2) HEATED OXYGEN SENSOR CIRCUIT HIGH	P0158	Circuit Continuity Detects a HO2S voltage stationary rich (high signal voltage) condition.	Oxygen sensor voltage > 950 mV	No Throttle, IAT, Injector, ECT, Air Flow, Purge Control, MAP, Fuel Composition or Engine Protect faults Active. Catalyst Monitor Test not Intrusive Not in Device Control Post Oxygen Sensor Diagnostic not Intrusive 10 V ≤ System Voltage ≤ 18 V Closed loop fueling Ethanol % ≤ 90 0.992 ≤ Equivalence Ratio ≤ 1.014 Fuel Level ≥ 10% 3% ≤ TPS ≤ 70% Above conditions met for 2 seconds	1900 failures out of 2000 samples. 100 ms/sample Continuous	DTC Type B
(B2S2) HEATED OXYGEN SENSOR CIRCUIT NO ACTIVITY	P0160	Circuit Continuity Detects a HO2S circuit open.	410 mV < B2S2 voltage < 490 mV <OR> Post O2 sensor fast pass B2S2 > 550 mV B2S2 < 350 mV	No Throttle, IAT, Injector, ECT, Air Flow, Purge Control, MAP, Fuel Composition or Engine Protect faults Active. Catalyst Monitor Test not Intrusive Not in Device Control Post Oxygen Sensor Diagnostic not Intrusive 10 V ≤ System Voltage ≤ 18 V Ethanol % ≤ 90 Engine runtime > 300 sec Closed Loop Fueling 5% Δ TPS within 1 sec, 6 times DTC P0161 not Active DTC P0060 not Active No Throttle, IAT, Injector, ECT, Air Flow, Purge Control, MAP, Fuel Composition or Engine Protect faults Active. Catalyst Monitor Test not Intrusive Not in Device Control Post Oxygen Sensor Diagnostic not Intrusive 10 V ≤ System Voltage ≤ 18 V Ethanol % ≤ 90 Engine is running Engine runtime ≤ 200 sec DTC P0161 not Active DTC P0060 not Active	1450 failures out of 1500 samples. 100 ms/sample Once per trip 550 more passing samples than failing samples. 100 ms/sample Once per trip	DTC Type B

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
(B2S2) HEATED OXYGEN SENSOR HEATER CIRCUIT	P0161	Current Monitor: Detects a malfunctioning HO2S heater circuit by monitoring the current through the circuit.	0.25 A < Heater Current < 1.375 A	No Throttle, IAT, Injector, ECT, Air Flow, Purge Control, MAP, Fuel Composition or Engine Protect faults Active. Catalyst Monitor Test not Intrusive Not in Device Control Post Oxygen Sensor Diagnostic not Intrusive 10 V ≤ System Voltage ≤ 18 V ECT ≥ 50 ºC 3 g/s ≤ Airflow ≤ 40 g/s Engine runtime ≥ 300 sec 500 ≤ RPM ≤ 3000 Ethanol % ≤ 90 DTC P0053 not set. All of the above true for at least 2 seconds Heater must be commanded on.	8 failures out of 10 samples Frequency: 2 times per key cycle	DTC Type B
BANK 1 FUEL TRIM SYSTEM LEAN	P0171	Determines if the fuel control system is in a lean condition	The EWMA of long term fuel trim (LTM) samples ≥ 1.246 for at least 2 seconds (Note: EWMA stands for "Exponentially Weighted Moving Average") Notes: 1. At least 24 seconds of data must accumulate on each trip before the EWMA of LTM samples is considered usable and at least 15 seconds of data in the current fuel trim cell must accumulate on each trip before the LTM for that cell is considered usable in the EWMA calculation.	• No Misfire DTC's • No EVAP DTC's • No Fuel Injector DTC's • No Fuel Composition DTC's • No IAC, MAF, or MAP DTC's • No B1S1 O2 DTC's • Engine speed > 400 rpm but < 6500 rpm • BARO > 70 kpa • ECT > -40°C but < 139°C • MAP > 15 kpa but < 105 kpa • IAT > -20 °C but < 152°C • Mass Airflow > 1.0 g/s but < 250 g/s • Vehicle speed < 82 mph • Long Term Fuel Trim Learning enabled • CCP DC ≤ 8% when canister vent is closed • Closed Loop Reset not active. • Fuel Level ≥ 15 % (must be <15% for at least 10 seconds to disable; default is to enable if fuel sender is broken)	100 ms loop Continuous	DTC Type B

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
BANK 1 FUEL TRIM SYSTEM RICH	P0172	Determines if the fuel control system is in a rich condition	The EWMA of long term fuel trim (LTM) samples $\leq$ 0.825 Once the above occurs, purge is ramped off to determine if excess purge is the cause. Therefore, the following must also occur to report a failure: The EWMA of LTM samples with purge off $\leq$ 0.83 for at least 2 seconds during each of 3 intrusive segments. General Notes: 1. At least 24 seconds of data must accumulate on each trip before the EWMA of LTM samples is considered usable and at least 15 seconds of data in the current fuel trim cell must accumulate on each trip before the LTM for that cell is considered usable in the EWMA calculation. Intrusive Notes: 1. Segments can last up to 16 seconds, and are separated by the smaller of a a 30 second purge-on time or enough time to purge 18 grams of vapor. 2. A maximum of 5 completed segments are allowed for each intrusive test, and up to 20 intrusive attempts allowed per trip. 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 LTM samples $\geq$ 0.83 for at least 60 seconds, indicating that the canister has been purged. Performing intrusive tests too frequently may also affect EVAP and FTP emissions, and the execution frequency of other	• No Misfire DTC's • No B1S1 O2 Sensor DTC's • No EVAP DTC's • No Fuel Injector DTC's • No IAC, MAF, or MAP DTC's • Engine speed > 400 rpm but < 6500 rpm • BARO > 70 kpa • ECT > -40°C but < 139°C • MAP > 15 kpa but < 105 kpa • IAT > -20 °C but < 152°C • Mass Airflow > 1.0 g/s but < 250 g/s • Vehicle speed < 82 mph • Long Term Fuel Trim Learning enabled • CCP DC ≤ 8% when canister vent is closed • Closed Loop Reset not active. Intrusive Enable Criteria • The EWMA of long term fuel trim (LTM) samples $\leq$ 0.825 • RPM > 375 • Mass Airflow > 3 g/s but < 250 g/s • MAP > 15 kpa but < 105 kpa • Virtual Flex Fuel Sender Learn Algorithm is not intrusive (L59 RPO only). Temporary Intrusive Test Inhibit Criteria • If intrusive test segment exceeds 16 consecutive seconds (in this case, purge valve is opened for the smaller of 30 seconds or enough time to purge 18 grams of vapor).	If rich fail counter is ≥ 3 before pass counter ≥ 3, diagnostic fails. 100 ms loop Continuous	DTC Type B

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
BANK 2 FUEL TRIM SYSTEM LEAN	P0174	Determines if the fuel control system is in a lean condition	The EWMA of long term fuel trim (LTM) samples ≥ 1.246 for at least 2 seconds (Note: EWMA stands for "Exponentially Weighted Moving Average") Notes: 2. At least 24 seconds of data must accumulate on each trip before the EWMA of LTM samples is considered usable and at least 15 seconds of data in the current fuel trim cell must accumulate on each trip before the LTM for that cell is considered usable in the EWMA calculation.	• No Misfire DTC's • No B2S1 O2 Sensor DTC's • No EVAP DTC's • No Fuel Injector DTC's • No Fuel Composition DTC's • No IAC, MAF, or MAP DTC's • Engine speed > 400 rpm but < 6500 rpm • BARO > 70 kpa • ECT > -40°C but < 139°C • MAP > 15 kpa but < 105 kpa • IAT > -20 °C but < 152°C • Mass Airflow > 1.0 g/s but < 250 g/s • Vehicle speed < 82 mph • Long Term Fuel Trim Learning enabled • CCP DC ≤ 8% when canister vent is closed • Closed Loop Reset not active. • Fuel Level ≥ 15 % (must be <15% for at least 10 seconds to disable; default is to enable if fuel sender is broken)	100 ms loop Continuous	DTC Type B

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
BANK 2 FUEL TRIM SYSTEM RICH	P0175	Determines if the fuel control system is in a rich condition	The EWMA of long term fuel trim (LTM) samples $\leq$ 0.825 Once the above occurs, purge is ramped off to determine if excess purge is the cause. Therefore, the following must also occur to report a failure: The EWMA of LTM samples with purge off $\leq$ 0.83 for at least 2 seconds during each of 3 intrusive segments. General Notes: 1. At least 24 seconds of data must accumulate on each trip before the EWMA of LTM samples is considered usable and at least 15 seconds of data in the current fuel trim cell must accumulate on each trip before the LTM for that cell is considered usable in the EWMA calculation. Intrusive Notes: 4. Segments can last up to 16 seconds, and are separated by the smaller of a a 30 second purge-on time or enough time to purge 18 grams of vapor. 5. A maximum of 5 completed segments are allowed for each intrusive test, and up to 20 intrusive attempts allowed per trip. 6. After an intrusive test report is completed, another intrusive test cannot occur for 300 seconds to allow sufficient time to purge excess vapors from the canister. During this period, fuel trim will pass if the EWMA of LTM samples $\geq$ 0.83 for at least 60 seconds, indicating that the canister has been purged. Performing intrusive tests too frequently may also affect EVAP and FTP emissions, and the execution frequency of other	• No Misfire DTC's • No O2 Sensor DTC's • No EVAP DTC's • No Fuel Injector DTC's • No IAC, MAF, or MAP DTC's • Engine speed > 400 rpm but < 6500 rpm • BARO > 70 kpa • ECT > -40°C but < 139°C • MAP > 15 kpa but < 105 kpa • IAT > -20 °C but < 152°C • Mass Airflow > 1.0 g/s but < 250 g/s • Vehicle speed < 82 mph • Long Term Fuel Trim Learning enabled • CCP DC ≤ 8% when canister vent is closed • Closed Loop Reset not active. Intrusive Enable Criteria • The EWMA of long term fuel trim (LTM) samples $\leq$ 0.825 • RPM > 375 • Mass Airflow > 3 g/s but < 250 g/s • MAP > 15 kpa but < 105 kpa • Virtual Flex Fuel Sender Learn Algorithm is not intrusive (L59 RPO only) Temporary Intrusive Test Inhibit Criteria • If intrusive test segment exceeds 16 consecutive seconds (in this case, purge valve is opened for the smaller of 30 seconds or enough time to purge 18 grams of vapor).	If rich fail counter is ≥ 3 before pass counter ≥ 3, diagnostic fails. 100 ms loop Continuous	DTC Type B

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
INJECTOR CONTROL CIRCUIT	P0200	This DTC checks the Injector Control Circuit for electrical integrity.	Output state shorted or open.	Engine speed > 400 rpm. 6 V < System voltage < 18 V	10 failures out of 100 samples 1 sample / 500 msec Continuous.	DTC Type B
THROTTLE POSITION SENSOR 2 CIRCUIT	P0220	1) TACM indicates a continuous or intermittent short or open in either the signal circuit or the TP sensor #2. OR 2) TACM indicates an invalid minimum mechanical position for the TP sensor #2. OR 3) TACM indicated reference voltage out of range.	1) Raw TP sensor signal < 0.282 V or > 4.60 V. OR 2) TP sensor minimum mechanical stop voltage < 0.282 V or > 0.813V OR 3) Vref > 0.5 V	Ignition in Run or Crank. Ignition voltage > 5.23 V. Valid TACM - PCM serial data. No TACM processor DTC.	1) Counter increments by 4 for every error, decrements by 1 for every pass; threshold is 133. Check runs every 3 ms. 2) One occurrence. Check runs at power-up. 3) Continuous. Counter increments by 1 for every error, decrements by 1 for every pass. Threshold is 10ms. For Ref direct short to ground.	DTC Type A For use on vehicles with ETC
FUEL PUMP CONTROL CIRCUIT	P0230	This DTC checks the Fuel Pump Control Circuit for electrical integrity.	Output state shorted or open.	Engine speed > 400 rpm. 6 V < System voltage < 18 V	5 failures out of 100 samples 1 sample per 500 msec Continuous.	DTC Type B

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
RANDOM MISFIRE DETECTED CYLINDER 1 MISFIRE DETECTED CYLINDER 2 MISFIRE DETECTED CYLINDER 3 MISFIRE DETECTED CYLINDER 4 MISFIRE DETECTED CYLINDER 5 MISFIRE DETECTED CYLINDER 6 MISFIRE DETECTED CYLINDER 7 MISFIRE DETECTED CYLINDER 8 MISFIRE DETECTED	P0300 P0301 P0302 P0303 P0304 P0305 P0306 P0307 P0308	These DTC's will determine if a random or a cylinder specific misfire is occurring by monitoring crankshaft velocity.	Deceleration index Vs Engine speed Vs Load and Camshaft Position Emission Failure Threshold = 1% Catalyst Damage Threshold = 5% to 10.625% depending on engine speed and engine load	• 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 < 50% per 100 ms. • - Throttle position delta < 50% per 100 ms. • Power Take Off is disabled • Abnormal engine speed is not present. • ABS rough road not detected. • ABS is not active. • Not an abusive engine speed condition Abusive engine speed = 6100 RPM. Abusive engine speed delay = 1250 cycles (Manual Trans only) • 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. • 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 >95%.	Emission Exceedence = (5) failed 200 revolution blocks of 16. Failure reported with (1) Exceedence in 1st (16) 200 revolution block, or (4) Exceedences thereafter. 1st Catalyst Exceedence = Number of 200 revolution blocks as data supports for catalyst damage. 2nd and subsequent Catalyst Exceedences = (1) 200 revolution block with catalyst damage. Failure reported with (3) Exceedences in FTP, or (1) Exceedence outside FTP. <u>Frequency:</u> Continuous	DTC Type B (MIL Flashes with Catalyst Damaging Misfire)
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 <u>Frequency:</u> Continuous 100 ms loop	DTC Type A
KNOCK SENSOR CIRCUIT	P0325	This diagnostic will detect a failed internal PCM component associated with knock control	Instant noise level greater than a defined value or instantaneous knock signal greater than 254 counts for a defined time.	Engine run time ≥ 10 sec Ignition voltage ≥ 10 Volts	24 failed tests within 30 tests. Each test is 500 msec.	DTC Type B

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
KNOCK SENSOR 1 CIRCUIT LOW	P0327	Check knock sensor filtered noise level - front knock sensor	Delta filtered noise level outside of defined range. Filtered noise counts ≤ 20	No ECT Sensor DTC's No TP sensor DTC's 1500 ≤ engine rpm ≤ 3000 ECT ≥ 60° C TP Sensor ≥ 0% Engine run time ≥ 10 sec Ignition voltage > 10 Volts	24 failed tests within 30 tests. Each test is 25 msec.	DTC Type B
KNOCK SENSOR 2 CIRCUIT LOW	P0332	Check knock sensor filtered noise level - rear knock sensor	Delta filtered noise level outside of defined range. Filtered noise counts ≤ 20	No ECT Sensor DTC's No TP sensor DTC's 1500 ≤ engine rpm ≤ 3000 ECT ≥ 60° C TP Sensor ≥ 0% Engine run time ≥ 10 sec Ignition voltage > 10 Volts	24 failed tests within 30 tests. Each test is 125 msec. Continuous check	DTC Type B For use on 2 sensor applications
CRANKSHAFT POSITION SENSOR CIRCUIT	P0335	3X signal This diagnostic will detect if there is no output from the crankshaft position sensor.	No output (~0 volts) from the crankshaft position sensor.	Cam is transitioning Sensed mass airflow ≥ 2.8984 No Cam Position Sensor DTC's No Airflow DTC's PCM state = READY or CRANK	30 test failures in a 40 test sample. 200 ms loop Continuous	DTC Type B
CRANKSHAFT POSITION SENSOR CIRCUIT RANGE/PERF.	P0336	3X signal This diagnostic will detect occurrences when engine position is no longer known.	Crank position sensor signal missing for a time ≥ .5 seconds	PCM state = CRANK or RUN	50 test failures in a 3120 test sample. 50 ms loop Continuous	DTC Type B
CAMSHAFT POSITION SENSOR CIRCUIT RANGE/PERF.	P0341	Monitor for cam position state change when expected at crank-shaft sync.	CAM signal occurs at the incorrect crankshaft position.	Engine Running or Cranking	15 Failures out of 100 test samples Every low res pulse Continuous	DTC Type B
CAMSHAFT POSITION SENSOR CIRCUIT LOW	P0342	Monitor for continuous low state when state should be high.	Evaluated at crankshaft position synchronization	Engine Running or Cranking	15 Failures out of 100 test samples, engine cranking; 50 failures out of 100 test samples, engine running; every low res pulse Continuous	DTC Type B
CAMSHAFT POSITION SENSOR CIRCUIT HIGH	P0343	Monitor for continuous high state when state should be low.	Evaluated at crankshaft position synchronization	Engine Running or Cranking	15 Failures out of 100 test samples, engine cranking; 50 failures out of 100 test samples, engine running; every low res pulse Continuous	DTC Type B

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
IGNITION CONTROL #1 CIRCUIT	P0351	Monitor EST channel A (Cylinder 1)	EST line is Stuck Low, is open, or is Stuck High. If engine speed is < 1500 RPM test failures and samples increment by 1 each time the diagnostic executes. If engine speed is ≥ 1500 RPM test failures and samples increment by 2 each time the diagnostic executes in order to report a failure faster		30 Failures out of 100 500 msec / test Continuous	DTC Type B
IGNITION CONTROL #2 CIRCUIT	P0352	Monitor EST channel B (Cylinder 2)	EST line is Stuck Low, is open, or is Stuck High. If engine speed is < 1500 RPM test failures and samples increment by 1 each time the diagnostic executes. If engine speed is ≥ 1500 RPM test failures and samples increment by 2 each time the diagnostic executes in order to report a failure faster		30 Failures out of 100 500 msec / test Continuous	DTC Type B
IGNITION CONTROL #3 CIRCUIT	P0353	Monitor EST channel C (Cylinder 3)	EST line is Stuck Low, is open, or is Stuck High. If engine speed is < 1500 RPM test failures and samples increment by 1 each time the diagnostic executes. If engine speed is ≥ 1500 RPM test failures and samples increment by 2 each time the diagnostic executes in order to report a failure faster		30 Failures out of 100 500 msec / test Continuous	DTC Type B
IGNITION CONTROL #4 CIRCUIT	P0354	Monitor EST channel D (Cylinder 4)	EST line is Stuck Low, is open, or is Stuck High. If engine speed is < 1500 RPM test failures and samples increment by 1 each time the diagnostic executes. If engine speed is ≥ 1500 RPM test failures and samples increment by 2 each time the diagnostic executes in order to report a failure faster		30 Failures out of 100 500 msec / test Continuous	DTC Type B
IGNITION CONTROL #5 CIRCUIT	P0355	Monitor EST channel E (Cylinder 5)	EST line is Stuck Low, is open, or is Stuck High. If engine speed is < 1500 RPM test failures and samples increment by 1 each time the diagnostic executes. If engine speed is ≥ 1500 RPM test failures and samples increment by 2 each time the diagnostic executes in order to report a failure faster		30 Failures out of 100 500 msec / test Continuous	DTC Type B

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
IGNITION CONTROL #6 CIRCUIT	P0356	Monitor EST channel F (Cylinder 6)	EST line is Stuck Low, is open, or is Stuck High. If engine speed is < 1500 RPM test failures and samples increment by 1 each time the diagnostic executes. If engine speed is ≥ 1500 RPM test failures and samples increment by 2 each time the diagnostic executes in order to report a failure faster		30 Failures out of 100 500 msec / test Continuous	DTC Type B
IGNITION CONTROL #7 CIRCUIT	P0357	Monitor EST channel G (Cylinder 7)	EST line is Stuck Low, is open, or is Stuck High. If engine speed is < 1500 RPM test failures and samples increment by 1 each time the diagnostic executes. If engine speed is ≥ 1500 RPM test failures and samples increment by 2 each time the diagnostic executes in order to report a failure faster		30 Failures out of 100 500 msec / test Continuous	DTC Type B
IGNITION CONTROL #8 CIRCUIT	P0358	Monitor EST channel H (Cylinder 8)	EST line is Stuck Low, is open, or is Stuck High. If engine speed is < 1500 RPM test failures and samples increment by 1 each time the diagnostic executes. If engine speed is ≥ 1500 RPM test failures and samples increment by 2 each time the diagnostic executes in order to report a failure faster		30 Failures out of 100 500 msec / test Continuous	DTC Type B

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
CATALYTIC CONVERTER LOW OXYGEN STORAGE	P0420	Oxygen Storage.	OSC Time Difference ≥ 0.2 OSC Time Difference = OSC Worst Pass Thresh - OSC Compensation Factor * (Post Cat O2 Resp Time - Pre Cat O2 Resp Time) OSC Worst Pass Thresh = 2 sec	Trip Enable Criteria No Throttle, Injector, Misfire, CAM, Engine Protection, VSS, EVAP, Oxygen Sensor, IAT, MAP, IAC, Fuel System, EST, ECT, Crank or MAF faults IAT > -20°C Green Converter Delay = Not Active Not in PTO Valid Idle Period Criteria Engine Speed ≥ 1000 rpm for minimum of 19 sec since end of last idle period Engine Speed < 1000 rpm Vehicle Speed ≤ 2 mph Engine runtime ≥ 300 seconds Not in Device Control Purge control either normal or controlled by Catalyst Monitor Test attempts this trip ≤ 12 Idle Conditiosn Met Criteria Trip Enable Met, Valid Idle Period Met Predicted Catalyst Temperature ≥ 533°C 0.9 < Short Term Fuel Trim < 1.1 Delta Increase in Short Term Fuel Trim ≤ 0.15 Closed Loop Fueling and LTM Learning is enabled Barometric Pressure > 70 kpa 70°C ≤ ECT ≤ 125.5°C System voltage > 10.9 Volts 0 < Idle Period ≤ 60 seconds IAT < 85°C Not E85 Ethanol Estimation in Process (only applies to L59 RPO) PRNDL is in Drive Range (default to run if PRNDL is failing) Idle Time is incremented if VSS ≤ 2mph and TPS ≤ 2% Test Enable Conditions – must hold true from 3.5 seconds after idle conditions are met to end of test Delta IAC ≤ 399 steps Delta Load ≤ 99% Delta RPM ≤ 12798 3 ≤ MAF ≤ 16 RPM – Desired RPM ≤ 12798 Desired RPM – RPM ≤ 12798 Predicted Catalyst Temperature ≤ 800°C Ethanol ≤ 87% Engine Fueling Criteria at Beginning of Idle Period Must be met from between 3.5 and 7 seconds after idle conditions have been met for at least 3.5 seconds Number of pre-O2 switches ≥ 2 Average BPW is within a window based on a table defined by airflow 0.96 ≤ average short term fuel trim ≤ 1.04	1 test attempted per valid idle period Minimum of 1 test per trip. Maximum of 6 tests per trip. Maximum of 6 trips to detect failure when Rapid Step Response is enabled frequency: 12.5 ms continuous Rapid Step Response Enable Criteria The difference between current EWMA value and the current OSC time difference ≥ 3 sec and OSC Time Difference ≥ 0.000 sec. Maximum of 6 tests per trip, maximum of 18 tests to detect failure when rapid step response is enabled. Green Converter Delay Criteria Diagnostic will not enable until the next ignition cycle after the following has been met: predicted catalyst temperature ≥ 590° C for 1 hour (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)	DTC Type A

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
CATALYTIC CONVERTER LOW OXYGEN STORAGE	P0430	Oxygen Storage.	OSC Time Difference ≥ 0.45 OSC Time Difference = OSC Worst Pass Thresh - OSC Compensation Factor * (Post Cat O2 Resp Time - Pre Cat O2 Resp Time) OSC Worst Pass Thresh = 2 sec	Trip Enable Criteria No Throttle, Injector, Misfire, CAM, Engine Protection, VSS, EVAP, Oxygen Sensor, IAT, MAP, IAC, Fuel System, EST, ECT, Crank or MAF faults IAT > -20°C Green Converter Delay = Not Active Not in PTO Valid Idle Period Criteria Engine Speed ≥ 1000 rpm for minimum of 19 sec since end of last idle period Engine Speed < 1000 rpm Vehicle Speed ≤ 2 mph Engine runtime ≥ 300 seconds Not in Device Control Purge control either normal or controlled by Catalyst Monitor Test attempts this trip ≤ 12 Idle Conditiosn Met Criteria Trip Enable Met, Valid Idle Period Met Predicted Catalyst Temperature ≥ 526°C 0.9 < Short Term Fuel Trim < 1.1 Delta Increase in Short Term Fuel Trim ≤ 0.15 Closed Loop Fueling and LTM Learning is enabled Barometric Pressure > 70 kpa 70°C ≤ ECT ≤ 125.5°C System voltage > 10.9 Volts 0 < Idle Period ≤ 60 seconds IAT < 85°C Not E85 Ethanol Estimation in Process (only applies to L59 RPO) PRNDL is in Drive Range (default to run if PRNDL is failing) Idle Time is incremented if VSS ≤ 2mph and TPS ≤ 2% Test Enable Conditions – must hold true from 3.5 seconds after idle conditions are met to end of test Delta IAC ≤ 399 steps Delta Load ≤ 99% Delta RPM ≤ 12798 3 ≤ MAF ≤ 16 RPM – Desired RPM ≤ 12798 Desired RPM – RPM ≤ 12798 Predicted Catalyst Temperature ≤ 800°C Ethanol ≤ 87% Engine Fueling Criteria at Beginning of Idle Period Must be met from between 3.5 and 7 seconds after idle conditions have been met for at least 3.5 seconds Number of pre-O2 switches ≥ 2 Average BPW is within a window based on a table defined by airflow 0.96 ≤ average short term fuel trim ≤ 1.04	1 test attempted per valid idle period Minimum of 1 test per trip. Maximum of 6 tests per trip. Maximum of 6 trips to detect failure when Rapid Step Response is enabled frequency: 12.5 ms continuous Rapid Step Response Enable Criteria The difference between current EWMA value and the current OSC time difference ≥ 1.9 sec and OSC Time Difference ≥ 0.000 sec. Maximum of 6 tests per trip, maximum of 18 tests to detect failure when rapid step response is enabled. Green Converter Delay Criteria Diagnostic will not enable until the next ignition cycle after the following has been met: predicted catalyst temperature ≥ 590° C for 1 hour (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)	DTC Type A

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
EVAP SYSTEM SMALL LEAK DETECTED	P0442	This DTC will detect a small leak (≥ 0.020") in the EVAP system between the fuel fill cap and the purge solenoid. The engine off natural vacuum method (EONV) is used.	***SMALL LEAK TEST FAIL:*** 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 311 to 809.5 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. Fail threshold = 0.51 Re-Pass threshold = 0.35	***TEST ENABLE :*** No MAP DTC's No Thermostat Rationality DTC's VS Sensor DTC's not active No Fuel Tank Pressure Sensor circuit DTC's No EVAP Canister Purge Solenoid circuit DTC's No EVAP Canister Vent Solenoid circuit DTC's No Fuel Level DTC's ECT Sensor DTC's not active IAT Sensor DTC's not active EVAP CCP stuck open DTC not active. EVAP large leak DTC not active. Ignition off timer DTC not active. Canister Vent restriction DTC is not active Fuel Level ≥15.0% but ≤ 85.0% Drive time ≥ 600 seconds. Drive length ≥ 3 miles. ECT ≥ 70°C. No fuel filling (fuel level increment ≥ 10%) During EONV test. BARO ≥ 74.0kPa Estimated ambient temperature at end of drive ≥ 0°C but ≤ 34°C. Estimate of Ambient Air Temperature Valid Conditions to be valid 1. Cold Start Startup Δ°C(ECT-IAT) ≤ 8°C if ECT ≥ IAT OR 2. Hot Restart Sufficient drive length to get accurate estimate of ambient air temperature (at least a minimum of 4 minutes and 3 miles)	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
EVAP CANISTER PURGE SOLENOID VALVE CIRCUIT	P0443	This DTC checks the Purge Solenoid Control Circuit for electrical integrity	Output state shorted or open.	Engine speed > 400 rpm. 5 V < System voltage < 18 V	10 failures out of 100 samples 500ms loop continuous	DTC Type B

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
EVAP CANISTER VENT BLOCKED	P0446	This DTC will determine if a restriction is present in the vent solenoid, vent filler, vent hose or EVAP canister	Tank Vacuum > 2989 Pa for 5 seconds BEFORE Purge Volume ≥ 10 liters OR Vented Vacuum < -623 Pa or Vented Vacuum > 1245 Pa for 60 seconds 2 liters of fuel must be consumed after setting the DTC active the first time to set the DTC active the second time.	General Test Enable • No MAP DTC's • No TP Sensor DTC's • No VSS DTC's • No IAT DTC's • No ECT DTC's • No Fuel Tank Pressure Sensor Circuit DTC's • No Evap Canister Purge solenoid Circuit DTC's • No EVAP Canister Vent Solenoid Circuit DTC's • No Thermostat Rationality DTC's • 15 % ≤ Fuel Level ≤ 85. % • 11.00 V < System Voltage < 18.00 V • 4 °C ≤ IAT ≤ 30°C • ECT ≤ 35 °C • BARO ≥ 74.00 kPa (8000 ft)	Once per cold start Time is dependent on driving conditions Max. before test abort is 1000 seconds	DTC Type B
EVAP VENT SOLENOID CONTROL CIRCUIT	P0449	This DTC checks the Evap Vent Solenoid Control Circuit for electrical integrity	Output state shorted or open.	Engine speed > 400 rpm. 6 V < System voltage < 18 V	10 failures out of 100 samples 500ms loop continuous	DTC Type B

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
FUEL TANK PRESSURE (FTP) SENSOR CIRCUIT PERFORMANCE	P0451	The DTC will be set if the fuel tank vacuum sensor is out of range when it tries to re-zero prior to the phase-1 or phase-2 portions of the engine-off natural vacuum small leak test.	The tank vacuum sensor voltage is compared to a window about the nominal sensor voltage offset (~1.5 volts) upper voltage threshold (voltage addition above the nominal voltage): 0.2 volts lower voltage threshold (voltage subtraction below the nominal voltage): 0.2 volts 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. Fail threshold = 0.73 Re-Pass threshold = 0.40	This test will execute whenever the engine-off natural vacuum small leak test (P0442) executes	This test is executed during an engine-off natural vacuum small leak test. The number of times that it executes can range from zero to two per engine-off period. The length of the test is determined by the refueling rationality test which can take up to 600 seconds to complete.	DTC Type A EWMA average run length: 6
EVAP SYSTEM PRESSURE LOW	P0452	This DTC will detect a fuel tank pressure sensor signal that is too low out of range.	Fuel tank pressure sensor signal < 0.1 volts produces a failing sample. Otherwise, the sample is considered passing. If 80 samples fail out of 100 samples total, then a fail will be reported to the DTC.	• 0.10 second delay after sensor power up for sensor warm-up • PCM State <> crank	Frequency: Continuous 100ms loop	DTC Type B
EVAP SYSTEM PRESSURE HIGH	P0453	This DTC will detect a fuel tank pressure sensor signal that is too high out of range.	Fuel tank pressure sensor signal > 4.9 volts produces a failing sample. Otherwise, the sample is considered passing. If 80 samples fail out of 100 samples total, then a fail will be reported to the DTC.	• 0.10 second delay after sensor power up for sensor warm-up • PCM state <> crank	Frequency: Continuous 100ms loop	DTC Type B

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
FUEL TANK PRESSURE (Ftp) SENSOR CIRCUIT INTERMITTENT	P0454	This DTC will detect intermittent tank vacuum sensor signals that would have caused the engine-off natural vacuum small leak test to abort due to an apparent re-fueling event.	If an abrupt change in tank vacuum is detected the engine-off natural vacuum test is aborted due to an apparent refueling event. Subsequent to the abort, a refueling rationality test is executed to confirm that a refueling event occurred. If a refueling is confirmed, then the test sample is considered passing. Otherwise, the sample is considered failing indicating an intermittent signal problem. The abrupt change is defined as a change > 112 and < 249 Pa vacuum in the span of 1.0 seconds. A refueling event is confirmed if the fuel level has a persistent change of 10.0 % for 30 seconds. The test will report a failure if 2 out of 3 samples are failures.	This test will execute whenever the engine-off natural vacuum small leak test (P0442) executes	This test is executed during an engine-off natural vacuum small leak test. The test can only execute up to once per engine-off period. The length of the test is determined by the refueling rationality test which can take up to 600 seconds to complete. This test will report a failure if 2 out of 3 samples are failures.	DTC Type A

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
EVAPORATIVE EMISSION (EVAP) SYSTEM LARGE LEAK DETECTED	P0455	This DTC will detect a weak vacuum condition (large leak or purge blockage) in the Evap system.	Purge volume > 14 liters BEFORE Tank vacuum ≤ 2740 Pa 2 liters of fuel must be consumed after setting the DTC active the first time to set the DTC active the second time. <u>Weak Vacuum Follow-up Test</u> (fuel cap replacement test) Weak Vacuum Test failed previous trip and this trip. Passes if tank vacuum > 2740 Pa. Note: Weak Vacuum Follow-up Test can only report a pass.	<u>General Test Enable</u> • No MAP DTC's • No TP Sensor DTC's • No VSS DTC's • No IAT DTC's • No ECT DTC's • No Fuel Tank Pressure Sensor Circuit DTC's • No Evap Canister Purge solenoid Circuit DTC's • No EVAP Canister Vent Solenoid Circuit DTC's • No Thermostat Rationality DTC's • 15 % ≤ Fuel Level ≤ 85. % • 11.00 V ≤ System Voltage ≤ 18.00 V • 4 °C ≤ IAT ≤ 30°C • ECT ≤ 30 °C • BARO ≥ 74.00 kPa (8000 ft) • (L59 only) - The virtual flex fuel sensor algorithm may cause the large leak test to abort under certain refueling scenarios. Cold Start Test • IAT < 30°C • Cold temperature Δ(ECT-IAT): ≤ 8 °C if ECT > IAT • Cold Test Timer ≤ 1000 seconds	Once per cold start Time is dependent on driving conditions Max. before test abort is 1000 seconds <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.	DTC Type B

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
PRIMARY FUEL LEVEL NO CHANGE, STUCK IN RANGE	P0461	This DTC will detect a fuel sender stuck in range .	For single tank, if delta fuel volume change is less than 10 liters over accumulated 150 miles. OR For dual tank, if transfer pump is on and vehicle at idle delay for 90 seconds for slosh. Then If the primary tank does not increase by 3 liters when secondary tank did decrease by > 3 liters for more than 410 seconds. OR If primary tank is full and secondary tank is empty for > 175 miles.	No VSS DTC's set runs continuously		DTC Type B
PRIMARY FUEL LEVEL STUCK LOW	P0462	This DTC will detect a fuel sender stuck out of range low	Fuel level A/D counts less than 20 A/D counts for 30 seconds	runs continuously		DTC Type B
PRIMARY FUEL LEVEL STUCK HIGH	P0463	This DTC will detect a fuel sender stuck out of range high	Fuel level A/D counts more than 150 A/D counts for 30 seconds	runs continuously		DTC Type B
FUEL LEVEL SENSOR A CIRCUIT INTERMITTENT	P0464	This DTC will detect intermittent fuel level sensor signals that would have caused the engine-off natural vacuum small leak test to abort due to an apparent re-fueling event.	If a change in fuel level is detected the engine-off natural vacuum test is aborted due to an apparent refueling event. Subsequent to the abort, a refueling rationality test is executed to confirm that a refueling event occurred. If a refueling is confirmed, then the test sample is considered passing. Otherwise, the sample is considered failing indicating an intermittent signal problem. The refuel event is defined as a change of 10.0 % fuel level during the engine-off test. A refueling event is confirmed if the fuel level has a persistent change of 10.0 % for 30 seconds. The test will report a failure if 2 out of 3 samples are failures.	• This test will execute whenever the engine-off natural vacuum small leak test (P0442) executes	This test is executed during an engine-off natural vacuum small leak test. The test can only execute up to once per engine-off period. The length of the test is determined by the refueling rationality test which can take up to 600 seconds to complete.	DTC Type A

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
PRIMARY COOLING FAN RELAY CONTROL CIRCUIT MALF	P0480	This DTC checks the Primary Cooling Fan Relay Control Circuit for electrical integrity	Output state shorted or open.	Engine speed > 400 rpm. 6 V < System voltage < 18 V	10 failures out of 100 samples 500ms loop continuous	DTC Type B For use on vehicles with electric fan
SECONDARY COOLING FAN RELAY CONTROL CIRCUIT MAL	P0481	This DTC checks the Secondary Cooling Fan Relay Control Circuit for electrical integrity	Output state shorted or open.	Engine speed > 400 rpm. 6 V < System voltage < 18 V	10 failures out of 100 samples 500ms loop continuous	DTC Type B For use on vehicles with electric fan
EVAP SYSTEM FLOW DURING NON-PURGE	P0496	This DTC will determine if the purge solenoid is leaking to engine manifold vacuum.	Tank Vacuum > 2491 Pa for 5.00 sec BEFORE Test time > 60 seconds (cold start)	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 solenoid circuit DTC's • No EVAP Canister Vent Solenoid circuit DTC's • No Thermostat Rationality DTC's • 15 % ≤ Fuel Level ≤ 85. % • 11.00 V ≤ System Voltage ≤ 18.00 V • 4 °C ≤ IAT ≤ 30°C • ECT ≤ 35 °C • BARO ≥ 74.00 kPa (8000 ft)	Once per cold start. Cold start: max time is 1000 seconds	DTC Type B
VEHICLE SPEED SENSOR SYSTEM PERFORMANCE (MANUAL TRANS)	*P0500	This DTC detects a missing signal from the vehicle speed sensor in a manual transmission vehicle.	Vehicle speed = 0 when enable conditions met	No MAP DTC's set No TPS DTC's set No Crank Sensor DTC's set ECT ≥ 35 °. C Engine speed > 1000 rpm 5 % ≤ throttle position ≤ 100 % A/C off: 40 kPa ≤ MAP ≤ 100 kPa A/C on: 45 kPa ≤ MAP ≤ 100 kPa Above conditions met > 2 seconds to enable diagnostic	500 test failures in a 600 test sample 100 ms loop Continuous	DTC Type B Manual Transmission Only

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.	RPM < Desired RPM by an amount determined in a look up table based on ECT ECT value 56 -100 68 -100 80 -100 92 -100 104 -100 116 -100 128 -3200 140 -3200 152 -3200	No Throttle, Electronic Throttle Control, VS speed, ECT, Fuel System , MAF, MAP, IAT, CCP solenoid or valve stuck open, fuel injector or misfire faults active. ECT ≥ 60.00 °C System Voltage ≥ 9.00 V but ≤ 18.00 V IAT ≥ -10.00 °C Engine run time ≥ 60.00 seconds BARO ≥ 65.00 kPa TP Sensor ≤ 0. 0.3515625 % VSS ≤ 1.00 MPH Catalyst Diagnostic Intrusive Test = not active Post O2 Diagnostic Intrusive Test = not active Electronic Throttle Control not forcing limited idle No Parasitic load change Above met for a time ≥ 2 seconds to enable diagnostic.	5.00 seconds per test 1 test to fail; must leave enable criteria between each test Frequency: Continuous after enable 100ms loop	DTC Type B
IDLE SYSTEM - HIGH ENGINE SPEED	P0507	This DTC will determine if a high idle exists.	RPM > Desired RPM by an amount determined in a look up table based on ECT ECT value 56 200 68 200 80 200 92 200 104 200 116 200 128 3200 140 3200 152 3200	No Throttle, Electronic Throttle Control, VS speed, ECT, Fuel System , MAF, MAP, IAT, CCP solenoid or valve stuck open, fuel injector or misfire faults active. ECT ≥ 60.00 °C System Voltage ≥ 9.00 V but ≤ 18.00 V IAT ≥ -10.00 °C Engine run time ≥ 60.00 seconds BARO ≥ 65.00 kPa TP Sensor ≤ 0.3515625 % VSS ≤ 1.00 MPH Catalyst Diagnostic Intrusive Test = not active Post O2 Diagnostic Intrusive Test = not active Electronic Throttle Control not forcing limited idle No Parasitic load change Above met for a time ≥ 2 seconds to enable diagnostic.	5.00 seconds per test 1 test to fail; must leave enable criteria between each test Frequency: Continuous after enable 100ms loop	DTC Type B
PCM – FLASH EEPROM CHECKSUM ERROR	P0601	Indicates that PCM is unable to correctly read data from the flash memory.	Calculated checksum does not match expected checksum for the program.	Ignition in Run or Crank.	One occurrence. Check is performed at power-up and every 100 milliseconds thereafter.	DTC Type A

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
PCM – PROGRAMMING ERROR	P0602	Indicates that the PCM is not flashed.	PCM not flashed.	Ignition on. PCM is identified through calibration as a service pcm	1 test failure Check is performed at power-up and every 100 milliseconds thereafter.	DTC Type A
PCM RAM FAILURE	P0604	Indicates that PCM is unable to correctly write and read data to and from RAM	Data read does not match data written	Ignition in Run or Crank	One occurrence. Check is performed at power-up and every 100 milliseconds thereafter.	DTC Type A
PCM INTEGRITY	P0606	Indicates that the PCM has detected an ETC internal processor integrity fault	ETC has process sequencing error, dual path consistency error, clock error, or computer is not operating properly	Ignition in Run/Crank or during key-off	Fault sets within 200 msec Runs every 18.75 msec	DTC Type A
5 VOLT REFERENCE A CIRCUIT	P0641	Determines if the supply voltage for the 5 volt reference is within an acceptable limit.	Voltage state invalid (Voltage > 4.7 volts or voltage < 4.39 volts)	Engine is running	Condition present > 2 seconds 200 ms loop Continuous.	DTC Type B
MALFUNCTION INDICATOR LAMP CONTROL CIRCUIT MALF	P0650	This DTC checks the Malfunction Indicator Lamp Control Circuit for electrical integrity	Output state shorted or open.	Engine speed > 400 rpm. 6 V < System voltage < 18 V	10 failures out of 100 samples 500ms loop continuous	DTC Type B No MIL
5 VOLT REFERENCE B CIRCUIT	P0651	Determines if the supply voltage for the 5 volt reference is within an acceptable limit	Voltage state invalid (Voltage > 4.7 volts or voltage < 4.39 volts)	Engine is running	Condition present > 2 seconds 200 ms loop Continuous.	DTC Type B
TCM MIL REQUEST	*P0700	Monitors the TCM MIL request line to determine when the TCM has detected a MIL illuminating fault.	The TCM MIL request line is active for more than 1 second.	Ignition on time > 7 seconds Ignition voltage > 11V TCM MIL Request Control Circuit not Active	Continuous 100 msec	DTC Type A

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
PRNDL SWITCH	P0706	Check for PRNDL switch malfunction – stuck in park or neutral	PRNDL indicates Park or Neutral when engine conditions indicate it should not. Note that PRNDL defaults to PSM position or Drive 4, depending on trans, when P0706 is Active.	Ignition voltage ≥ 6 and < 18 V No Throttle, VSS or unknown ratio faults Engine runtime ≥ 60 seconds TP ≥ 5% VS ≥ 20 mph Engine torque ≥ 50 ft/lbs. Gear ≥ 3 Not in PTO	Stuck in PN for 100 samples out of 150 samples. 500 msec loop Continuous	DTC Type C
TCM MIL REQUEST CONTROL CIRCUIT	*P0802	Integrity check for the TCM MIL request line	TCM MIL request line is never active during integrity check.	Ignition on time < 7 seconds Ignition voltage > 11 V	Continuous 100 msec	DTC Type A
CLUTCH SWITCH CIRCUIT	*P0833	Clutch switch state is monitored during vehicle operation.	The PCM detects that a clutch switch state transition has not occurred when the vehicle speed has gone from 0 MPH above a threshold value and back to 0 MPH.	No VSS codes present VSS is currently at 0 mph. VSS was above 24mph before returning to 0 mph. One test sample taken every time the above conditions have been met.	7 test failures in a 8 test sample size 100ms Continuous	DTC Type B (Manual Only)
TRACTION CONTROL TORQUE REQUEST CIRCUIT	P0856	Monitors the Traction Control Torque Request Circuit for an open circuit or a short to ground or battery .	The PCM detects the torque request circuit is > 98% or < 2% OR The delta between the input period and the normal period > 29999999994 microseconds OR The input duty cycle cannot be computed	Engine is running Engine Runtime > 10 seconds	200 test failures in a 250 test sample size 12.5 millisecond loop Continuous	DTC Type B (Type B on L18 with Allison Transmission Only)
ACCELERATOR PEDAL POSITION SYSTEM	P1125	PCM determines a limp home mode of operation due to multiple accelerator pedal sensor faults.	This DTC is set when: 1) 2 or more APP sensors are out of range, OR 2) all 3 APP sensors disagree, OR 3) one APP sensor is out of range AND the other 2 APP sensors disagree.	Ignition in Run or Crank. Ignition voltage > 5.23 V. Valid TACM - PCM serial data. No TACM processor DTC.	One occurrence. Check runs every 18.75 ms.	DTC Type A For use on vehicles with ETC

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
(B1S1) HEATED OXYGEN SENSOR TOO FEW R/L OR L/R SWITCHES	P1133	Detects sensors that are initially slow to respond to changes in commanded A/F (but have normal transition times) by monitoring the number of R/L and L/R switches.	The oxygen sensor switches between 250 – 625 mV. Number of switches: L/R switches < 47 R/L switches < 47	No Throttle, IAT, Injector, ECT, Air Flow, Purge Control, MAP, Fuel Composition or Engine Protect faults Active. Catalyst Monitor Test not Intrusive Not in Device Control Post Oxygen Sensor Diagnostic not Intrusive 10 V ≤ System Voltage ≤ 18 V DTC's P0131, P0132, P0134 and P0135 not Active -1280 ºC < Predicted O2 Sensor Temp < 1280 ºC No Misfire Faults Active Fuel Level ≥ 10% Ethanol % ≤ 90 ECT > 60 °C Engine runtime > 160 sec CCP Duty Cycle ≥ 0% PRNDL in drive range Closed Loop Fuel Control 1200 ≤ RPM ≤ 3000 20 ≤ Air Flow ≤ 55g/s. TPS ≥ 5% Above conditions met for 1 sec	100 sec Once per trip.	DTC Type B

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
(B1S1) HEATED OXYGEN SENSOR TRANSITION TIME DIFFERENCE	P1134	Detects slow asymmetrical faults by monitoring the difference between R/L and L/R average response times.	The oxygen sensor transitions between 250 – 625 mV. HO2S sensor average transition time difference (R/L minus L/R): Max + 93 ms Min - 120 ms	No Throttle, IAT, Injector, ECT, Air Flow, Purge Control, MAP, Fuel Composition or Engine Protect faults Active. Catalyst Monitor Test not Intrusive Not in Device Control Post Oxygen Sensor Diagnostic not Intrusive 10 V ≤ System Voltage ≤ 18 V DTC's P0131, P0132, P0134 and P0135 not Active -1280 ºC < Predicted O2 Sensor Temp < 1280 ºC No Misfire Faults Active Fuel Level ≥ 10% Ethanol % ≤ 90 ECT > 60 °C Engine runtime > 160 sec CCP Duty Cycle ≥ 0% PRNDL in drive range Closed Loop Fuel Control 1200 ≤ RPM ≤ 3000 20 ≤ Air Flow ≤ 55g/s. TPS ≥ 5% Above conditions met for 1 sec	100 sec Once per trip.	DTC Type B

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
(B2S1) HEATED OXYGEN SENSOR TOO FEW R/L OR L/R SWITCHES	P1153	Detects sensors that are initially slow to respond to changes in commanded A/F (but have normal transition times) by monitoring the number of R/L and L/R switches.	The oxygen sensor switches between 250 – 625 mV. Number of switches: L/R switches < 47 R/L switches < 47	No Throttle, IAT, Injector, ECT, Air Flow, Purge Control, MAP, Fuel Composition or Engine Protect faults Active. Catalyst Monitor Test not Intrusive Not in Device Control Post Oxygen Sensor Diagnostic not Intrusive 10 V ≤ System Voltage ≤ 18 V DTC's P0131, P0132, P0134 and P0135 not Active -1280 ºC < Predicted O2 Sensor Temp < 1280 ºC No Misfire Faults Active Fuel Level ≥ 10% Ethanol % ≤ 90 ECT > 60 °C Engine runtime > 160 sec CCP Duty Cycle ≥ 0% PRNDL in drive range Closed Loop Fuel Control 1200 ≤ RPM ≤ 3000 20 ≤ Air Flow ≤ 55g/s. TPS ≥ 5% Above conditions met for 1 sec	100 sec Once per trip.	DTC Type B

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
(B2S1) HEATED OXYGEN SENSOR TRANSITION TIME DIFFERENCE	P1154	Detects slow asymmetrical faults by monitoring the difference between R/L and L/R average response times	The oxygen sensor transitions between 250 – 625 mV. HO2S sensor average transition time difference (R/L minus L/R): Max + 97 ms Min -120 ms	No Throttle, IAT, Injector, ECT, Air Flow, Purge Control, MAP, Fuel Composition or Engine Protect faults Active. Catalyst Monitor Test not Intrusive Not in Device Control Post Oxygen Sensor Diagnostic not Intrusive 10 V ≤ System Voltage ≤ 18 V DTC's P0131, P0132, P0134 and P0135 not Active -1280 ºC < Predicted O2 Sensor Temp < 1280 ºC No Misfire Faults Active Fuel Level ≥ 10% Ethanol % ≤ 90 ECT > 60 °C Engine runtime > 160 sec CCP Duty Cycle ≥ 0% PRNDL in drive range Closed Loop Fuel Control 1200 ≤ RPM ≤ 3000 20 ≤ Air Flow ≤ 55g/s. TPS ≥ 5% Above conditions met for 1 sec	100 sec Once per trip.	DTC Type B
ENGINE PROTECTION MODE ACTIVE	P1258	Monitor for engine protection mode active.	ECT >= 129.4°C for more than 10 seconds.	No ECT sensor DTC's.	Set immediately upon engine protection mode active. 1 second loop continuous	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 ≤ 7000 Engine Load ≤ 60%	450 failures out of 500 samples 100 msec loop continuous	DTC Type C (DTC can only set when a P0300 Light Request is True)
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 ≤ 7000 Engine Load ≤ 60%	450 failures out of 500 samples 100 msec loop continuous	DTC Type C (DTC can only set when a P0300 Light Request is True)

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
COLD START EMISSIONS REDUCTION SYSTEM FAULT	P1400	Model based test computes exhaust thermal energy from idle speed and spark timing. Detects if the cold start emission reduction system has failed resulting in the delivered thermal energy being out of range.	-8.0 > (Average desired accumulated exhaust energy - Average estimated accumulated exhaust energy) > 0.5	Cold start emission reduction strategy is active. VS < 2 mph TP < 0.5 % Airflow per cylinder > 80 milligrams No DTC's set for the following systems: MAP, MAF, IAT, ECT, Misfire, Electronic Spark Timing, Crank sensor, Idle, Fuel Injection, TP sensor, VS sensor, 5 volt reference, ECM/PCM Memory	100ms loop Runs once per trip when the cold start emission reduction strategy is active. Test completes after 15 seconds of accumulated qualified data	DTC Type A
COMMAND vs ACTUAL THROTTLE PERF. (TAC MODULE)	P1516	Indicates that the TAC Module has detected a throttle positioning error OR Either Processor cannot determine throttle positioning OR Both TP Sensors are invalid	ABS (throttle error): a) ≥2 degrees for >200 ms with no change in error sign. OR b) ≥2 degrees for >500 ms for throttle command changes ≥ 2 degrees. OR c) ≥ 5 degrees for >200 ms for throttle command changes ≥ 5 degrees. OR d) ≥ 5 degrees for > 300 ms with no change in error sign. OR 2) PCM processor DTC's. OR 3) TACM processor DTC. OR 4) both TPS Circuit DTC's are set. OR 5) PCM-TACM Serial Data DTC w/ any APP Sensor DTC or TP Sensor DTC. [Throttle error = Measured throttle position - commanded throttle position]	Ignition in Run or Crank. Ignition voltage > 5.23 V. Valid TACM - PCM serial data. Not in battery saver mode.	One occurrence. Check runs every 3 ms.	DTC Type A For use on vehicles with ETC

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
SECONDARY FUEL LEVEL NO CHANGE, STUCK IN RANGE	*P2066	This DTC will detect a fuel sender stuck in range	For dual tank, if delta fuel volume change is less than 3 liters over accumulated 175 miles. OR If the secondary tank fuel volume remains > 73 liters when the transfer pump on time is ≥ 500 seconds If transfer pump is on and at idle delay for 90 seconds for slosh. Then If the secondary tank does not decrease by 3 liters when the primary tank did increase by > 3 liters for more than 410 seconds.	Secondary Fuel level greater than 11 liters		DTC Type B For use on vehicles with dual fuel tank
SECONDARY FUEL LEVEL STUCK LOW	*P2067	This DTC will detect a fuel sender stuck out of range low	Fuel level A/D counts less than 20 A/D counts for 30 seconds	runs continuously		DTC Type B For use on vehicles with dual fuel tank
SECONDARY FUEL LEVEL STUCK HIGH	*P2068	This DTC will detect a fuel sender stuck out of range high	Fuel level A/D counts more than 150 A/D counts for 30 seconds	runs continuously		DTC Type B For use on vehicles with dual fuel tank

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
COMMAND vs ACTUAL THROTTLE PERF. (PCM)	P2101	Indicates that the PCM has detected a throttle positioning error	ABS (throttle error) > 5%. [Throttle error = Measured throttle position - modeled throttle position]	Ignition in Run or Crank TACM determines PCM Desired Throttle Position is valid. Not in battery saver mode. No Airflow Actuation DTC. (Engine Running = true) OR (Ignition Voltage > 8.5 volts). No Throttle Actuation DTC. No PCM-TACM Serial Data DTC. Both TPS Circuit DTC's are not set. No PCM Processor DTC's. No TACM Processor DTC.	High counter increments by 2 for every throttle error > 5%; decrements by 1 if %<t.e.<5%; decrements by 5 if -5%<t.e.<0%; clears if t.e. < -5%. Check runs every 18.75 ms with TACM - PCM valid message received. Low counter increments by 2 for every throttle error < -5%; decrements by 1 if -5%<t.e.<0%; decrements by 5 if 0%<t.e.<5%; clears if t.e. > 5%. Check runs every 18.75 ms with TACM - PCM valid message received.	DTC Type A For use on vehicles with ETC

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
TAC MODULE PROCESSOR	P2108	Indicates that TAC Module is unable to correctly read data from the flash memory. Indicates that TAC Module is unable to correctly write and read data to and from RAM. Indicates that the TAC Module has detected an internal processor integrity fault.	1) Power-up test fails to read/write data OR 2) Max. allowed Running Resets exceeded OR 3) ROM checksum does not match expected checksum OR 4) RAM data read does not match data written OR 5) Failure of Interrupt process flag to match expected value. OR 6) Program is not executed in the proper order OR 7) Primary and Redundant RAM variables disagree OR 8) Primary and Redundant Indicated Pedal Position calculation difference = 0.0%. OR 9) Math/Logic test fails to equate to a predetermined value. OR 10) Internal Register data read does not match data written. OR 11) Internal Timer fails to increment OR 12) Watchdog Timer fails to increment OR 13) Failure of Processor Stack pointer to zero at Main Loop.	Ignition in Run or Crank. Ignition voltage > 5.23 V. Valid TACM - PCM serial data.	1) One occurrence Check runs at Reset initialization 2) 10 occurrences during ignition cycle Check runs at Reset initialization 3) One occurrence. Check runs at power up and every 60 seconds thereafter. 4) One occurrence. Check runs at power up and every 800 milliseconds thereafter 5) - 13) One occurrence. Check runs every 3 milliseconds. Second Watchdog timer runs in 10 millisecond loop.	DTC Type A For use on vehicles with ETC
APP SENSOR 1 CIRCUIT	P2120	1) TACM indicates a continuous or intermittent short or open in either the signal circuit or the APP sensor #1. OR 2) TACM indicates an invalid minimum mechanical position for the APP sensor #1. OR 3) TACM indicated reference voltage out of range.	1) Raw APP sensor signal < 0.235 V or > 4.487 V. OR 2) APP sensor minimum mechanical stop voltage < 0.235 V. OR 3) Vref out of range < 4.54 V or > 5.21 V.	'Ignition in Run or Crank. Ignition voltage > 5.23 V. Valid TACM - PCM serial data. No TACM processor DTC.	1) & 2) Counter increments by 4 for every error, decrements by 1 for every pass; threshold is 133. Check runs every 3 ms.	DTC Type A For use on vehicles with ETC

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
APP SENSOR 2 CIRCUIT	P2125	1) TACM indicates a continuous or intermittent short or open in either the signal circuit or the APP sensor #2. OR 2) TACM indicates an invalid minimum mechanical position for the APP sensor #2. OR 3) TACM indicated reference voltage out of range.	1) Raw APP sensor signal < 0.235 V or > 4.487 V. OR 2) APP sensor minimum mechanical stop voltage > 0.235 V. OR 3) Vref out of range < 4.54 V or > 5.21 V.	Ignition in Run or Crank. Ignition voltage > 5.23 V. Valid TACM - PCM serial data. No TACM processor DTC.	1) & 2) Counter increments by 4 for every error, decrements by 1 for every pass; threshold is 180. Check runs every 3 ms.	DTC Type A For use on vehicles with ETC
THROTTLE POSITION SENSOR 1, 2 RANGE/PERF.	P2135	1) TACM indicates a continuous or intermittent correlation fault between TP sensors #1 and #2. OR 2) TACM indicates an invalid minimum mechanical position correlation between TP sensor #1 and #2. OR 3) TPS1 signal short to TPS2 signal, Any reference, or ground.	1) ABS(TPS1 raw – TPS2 raw) < 6.0%. OR 2) TPS1 sig to TPS2 sig > 0.05V when TPS2 reference = 0.0 V.	Ignition in Run or Crank. Ignition voltage > 5.23 V. Valid TACM - PCM serial data. No TACM processor DTC.	1) Counter increments by 4 for every error, decrements by 1 for every pass; threshold is 180. Check runs every 3 ms. 2) One occurrence. Check runs at power-up 3) Counter increments by 4 for ever error, decrements by 1 for every pass: threshold is 1333 Check runs every 3ms..	DTC Type A For use on vehicles with ETC

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
APP SENSOR 1 AND 2 DISAGREE	P2138	1) TACM indicates a continuous or intermittent correlation fault between APP sensors #1 and #2 OR 2) TACM indicates an invalid minimum mechanical position correlation between APP sensor #1 and #2 OR 3) PPS1 signal short to PPS2 signal	1)ABS(raw APP sensor #2 voltage - raw APP sensor #1 voltage) > 0.269 V. OR 2) PPS1 to PPS2 > 0.05V when PPS2 reference is 0.0 V.	Ignition in Run or Crank. Ignition voltage > 5.23 V. Valid TACM - PCM serial data. No TACM processor DTC.	1) Counter increments by 4 for every error, decrements by 1 for every pass; threshold is 180 Check runs every 3 ms. 2) Counter increments by 4 for ever error, decrements by 1 for every pass: threshold is 1333 Check runs every 3ms..	DTC Type A For use on vehicles with ETC
SOAK TIMER (IGNITION OFF TIMER)	P2610	Monitor soak timer for proper increments in positive time at correct rate	1) Initial soak timer value is not between 0 to 5 seconds 2) After initial 4.0 second delay, the soak timer does not increase by 1 second increments 3) Each 1 second increment of the soak timer is not within 1.0 +/- 0.3 seconds 4) The soak timer value decrements by any amount	PCM is powered down DTC will be active on next key cycle if failure detected	Every key down 100 msec loop	DTC Type B

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
(B1S2) O2 SENSOR CIRCUIT RANGE/ PERFORMANCE	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 reduces and increases delivered fuel to achieve the required rich and lean threshold.	Post catalyst oxygen sensor can not achieve voltage ≥ 730 millivolts and voltage ≤ 200 millivolts	<u>System Enabling Criteria:</u> ▪ No Oxygen Sensor circuit, response, heater resistance, heater current DTC's active. ▪ No TPS, ETC, EVAP, MAF, ECT, MAP, IAT Fuel Injector, Fuel composition sensor circuit DTC's ▪ 10 volts ≤ System Voltage ≤ 18 volts ▪ Green Converter Delay = Not Active ▪ Oxygen sensor learned heater resistance is valid ▪ No FASD or Misfire DTC's active <u>Specific Enable Criteria :</u> ▪ Engine run time ≥ 300 seconds ▪ 0.96 ≤ Short Term Fueling Integrator ≤ 1.04 ▪ 500 rpm ≤ Engine Speed ≤ 5000 rpm ▪ 3 gps ≤ Engine Airflow ≤ 50 gps ▪ 5 mph ≤ Vehicle Speed ≤ 82 mph ▪ Post Cell Enabled ▪ Power take off is not active ▪ EVAP diagnostic is not in control of purge ▪ Ethanol Estimation is not in progress ▪ Fuel state is closed loop ▪ Fuel level ≥ 15% All the above enable criteria met for 1second Then Purge Duty Cycle = 0% for 5 seconds	Up to : 550 grams of accumulated air flow for the lean test and 550 grams of accumulated air flow for the rich test <u>Frequency:</u> Once per trip <u>Green Converter Delay Criteria</u> Diagnostic will not enable until the following has been met: predicted catalyst temperature ≥ 590° C for 1 hour (non-continuously).	DTC Type B

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
(B1S2) O2 SENSOR CIRCUIT RANGE/ PERFORMANCE	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 reduces and increases delivered fuel to achieve the required rich and lean threshold.	Post catalyst oxygen sensor can not achieve voltage ≥ 730 millivolts and voltage ≤ 200 millivolts	<u>System Enabling Criteria:</u> ▪ No Oxygen Sensor circuit, response, heater resistance, heater current DTC's active. ▪ No TPS, ETC, EVAP, MAF, ECT, MAP, IAT Fuel Injector, Fuel composition sensor circuit DTC's ▪ 10 volts ≤ System Voltage ≤ 18 volts ▪ Green Converter Delay = Not Active ▪ Oxygen sensor learned heater resistance is valid ▪ No FASD or Misfire DTC's active <u>Specific Enable Criteria :</u> ▪ Engine run time ≥ 300 seconds ▪ 0.96 ≤ Short Term Fueling Integrator ≤ 1.04 ▪ 500 rpm ≤ Engine Speed ≤ 5000 rpm ▪ 3 gps ≤ Engine Airflow ≤ 50 gps ▪ 5 mph ≤ Vehicle Speed ≤ 82 mph ▪ Post Cell Enabled ▪ Power take off is not active ▪ EVAP diagnostic is not in control of purge ▪ Ethanol Estimation is not in progress ▪ Fuel state is closed loop ▪ Fuel level ≥ 15% All the above enable criteria met for 1second Then Purge Duty Cycle = 0% for 5 seconds	Up to : 550 grams of accumulated air flow for the lean test and 550 grams of accumulated air flow for the rich test <u>Frequency:</u> Once per trip <u>Green Converter Delay Criteria</u> Diagnostic will not enable until the following has been met: predicted catalyst temperature ≥ 590° C for 1 hour (non-continuously).	DTC Type B

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
PCM TO TAC MODULE SERIAL DATA CIRCUIT	U0107	Indicates that the serial data line between the PCM and TACM has intermittently or continuously failed.	PCM: No message for 18.75 ms. Corrupted data in the message. Invalid message protocol. PCM processor DTC's. TACM processor DTC. TAC Module: No message for 25 ms. Corrupted data in the message. Invalid message protocol. PCM processor DTC's. TACM processor DTC. Throttle Authority Limit Exceeded.	(Ignition in Run or Crank) AND engine not in crank state. Time since power-up > 0. Ignition in Run or Crank. Ignition voltage > 5.23 V. Valid TACM - PCM serial data.	PCM and TACM continuous No valid message received for 500 ms. PCM Intermittent: Invalid or missing message increments counter by 10; valid message received decrements counter by 1; threshold is 254. TACM Intermittent: Invalid or missing message increments counter by 6; valid message received decrements counter by 1; threshold is 200. Check for invalid messages runs every 18.75 ms. Check for missing messages runs every 25 ms. Throttle Authority Limit Exceeded > 300 ms	DTC Type A For use on vehicles with ETC

2007 SMALL BLOCK LIGHT DUTY ENGINE DIAGNOSTIC PARAMETERS

Engine Family: **7GMXT06.2382** Certification Standard: **BIN8/LEV2**

OBD Group: **07OBDG15**

LOOK UP TABLES

Calculated Airflow	Airflow Delta
Grams_Air_0	6.36
Grams_Air_40	10.11
Grams_Air_80	13.67
Grams_Air_120	21.76
Grams_Air_160	25.61
Grams_Air_200	29.62
Grams_Air_240	33.78
Grams_Air_280	38.10
Grams_Air_320	42.58
Grams_Air_360	47.21
Grams_Air_400	52

2007 SMALL BLOCK LIGHT DUTY ENGINE DIAGNOSTIC PARAMETERS

Engine Family: **7GMXT06.2382** Certification Standard: **BIN8/LEV2**

OBD Group: **07OBDG15**

LOOK UP TABLES

P0106 – Predicted MAP Max Look Up Table; 6.0L LQ9

	0 %	10 %	20 %	30 %	40 %	50 %	60 %	70 %	80 %	90 %	100 %
0 RPM	105	105	105	105	105	105	105	105	105	105	105
800 RPM	70	88.99902	102.998	105	105	105	105	105	105	105	105
1600 RPM	53.99902	75	92.00195	105	105	105	105	105	105	105	105
2400 RPM	47.99805	63.99902	77.99805	97.99805	105	105	105	105	105	105	105
3200 RPM	42.00195	55	62.00195	87.00195	102.002	105	105	105	105	105	105
4000 RPM	36.00098	43.99902	47.99805	72.00195	100	105	105	105	105	105	105
4800 RPM	32.00195	32.99805	43.99902	61.00098	88.99902	100	105	105	105	105	105
5600 RPM	30	31.00098	40	57.99805	82.00195	95	105	105	105	105	105

P0106 – Predicted MAP Min Look Up Table; 6.0L LQ9

	0 %	10 %	20 %	30 %	40 %	50 %	60 %	70 %	80 %	90 %	100 %
0 RPM	10	10	12.00195	25	43.99902	46.00098	47.00195	47.99805	45	45	40
800 RPM	10	10	12.00195	25	43.99902	46.00098	47.00195	47.99805	45	45	40
1600 RPM	10	10	10	23.99902	43.99902	45	47.00195	47.99805	45	45	40
2400 RPM	10	10	10	18.99902	32.00195	45	45	47.99805	45	45	40
3200 RPM	10	10	10	15	26.00098	42.99805	45	47.99805	45	45	40
4000 RPM	10	10	10	11.00098	22.99805	37.00195	43.99902	45	45	45	40
4800 RPM	10	10	10	10	17.99805	28.99902	42.00195	43.99902	45	45	40
5600 RPM	10	10	10	10	16.00098	27.99805	40	43.99902	45	45	40

LOOK UP TABLES

P0121: Stuck High TP Sensor Lookup Table: 4.3L (LU3) GMT800 (LQ9 does not support this Pcode as it has Electronic Throttle Control, not analog TP sensor)

Engine RPM	Max TP Sensor Value
RPM 400	28.00781
RPM 800	31.99219
RPM 1200	35.99609
RPM 1600	39.86328
RPM 2000	44.14063
RPM 2400	48.00781
RPM 2800	51.99219
RPM 3200	56.21094
RPM 3600	59.00391
RPM 4000	61.99219
RPM 4400	64.49219
RPM 4800	67.46094
RPM 5200	69.375
RPM 5600	69.375
RPM 6000	69.375
RPM 6400	69.375

LOOK UP TABLES

P0121: Stuck Low TP Sensor Lookup Table: 4.3L (LU3) GMT800 (LQ9 does not support this Pcode as it has Electronic Throttle Control, not analog TP sensor)

Engine RPM	Min TP Sensor Value
RPM 400	0
RPM 800	0
RPM 1200	0.996094
RPM 1600	3.300781
RPM 2000	7.5
RPM 2400	12.07031
RPM 2800	18.75
RPM 3200	24.00391
RPM 3600	28.00781
RPM 4000	31.73828
RPM 4400	33.49609
RPM 4800	33.63281
RPM 5200	33.80859
RPM 5600	33.80859
RPM 6000	33.80859
RPM 6400	33.80859

2007 SMALL BLOCK LIGHT DUTY ENGINE DIAGNOSTIC PARAMETERS

Engine Family: **7GMXT06.2382** Certification Standard: **BIN8/LEV2**

OBD Group: **07OBDG15**

LOOK UP TABLES

P0300: Catalyst Damaging Misfire Percentages as a Function of Engine Speed and Load Table: 6.0L (LQ9)

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%	7.125%	5%	5%	5%	5%	5%
10 Load_In_Percent	10.625%	10.625%	10 %	7.125%	5%	5%	5%	5%	5%
20 Load_In_Percent	10.625%	10.625%	10 %	5%	5%	5%	5%	5%	5%
30 Load_In_Percent	10.625%	10.625%	8.375%	5%	5%	5%	5%	5%	5%
40 Load_In_Percent	10.625%	10%	6.25%	5%	5%	5%	5%	5%	5%
50 Load_In_Percent	10%	8.3725%	6.25%	5%	5%	5%	5%	5%	5%
60 Load_In_Percent	8.375%	6.25%	5%	5%	5%	5%	5%	5%	5%
70 Load_In_Percent	6.25%	5%	5%	5%	5%	5%	5%	5%	5%
80 Load_In_Percent	5%	5%	5%	5%	5%	5%	5%	5%	5%
90 Load_In_Percent	5%	5%	5%	5%	5%	5%	5%	5%	5%
100 Load_In_Percent	5%	5%	5%	5%	5%	5%	5%	5%	5%

LOOK UP TABLES

P0420: Average Base Pulse Width Maximum Allowed Value as a Function of Airflow Table: 6.0L (LQ9)

Airflow in gps	Average BPW in milliseconds
0	99
1	99
2	99
3	99
4	99
5	99
6	99
7	99
8	99
9	99
10	99
11	99
12	99
13	99
14	99
15	99
16	99

P0420: Average Base Pulse Width Minimum Allowed Value as a Function of Airflow Table: 6.0L (LQ9)

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

LOOK UP TABLES

P0430: Average Base Pulse Width Maximum Allowed Value as a Function of Airflow Table: 6.0L (LQ9)

Airflow in gps	Average BPW in milliseconds
0	99
1	99
2	99
3	99
4	99
5	99
6	99
7	99
8	99
9	99
10	99
11	99
12	99
13	99
14	99
15	99
16	99

P0420: Average Base Pulse Width Minimum Allowed Value as a Function of Airflow Table: 6.0L (LQ9)

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

LOOK UP TABLES