2005 6.0L (LQ4) *with* CNG *fuel* -or- CNG / gasoline *dual-fuel*

ENGINE DIAGNOSTIC PARAMETERS

2005file6_CNG.doc

SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUES	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUM. TYPE
ALT FUEL HIGH PRESSURE LOCKOFF (HPL)	**P0005**	This DTC detects an open sensor ground or continuous short to high in either the signal circuit of the High Pressure Fuel Shutoff Relay Control Circuit	Disconnected, Shorted To Ground, Or Shorted To Battery	Ign Volt > 6v And < 18v Engine Speed > 400 Rpm	1 Second Loop	DTC Type A (Bi-Fuel Switches To Gasoline)
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 RESISTANCE	**P0053**	Out-Of-Range (OOR) Resistance: Detects an oxygen sensor heater having an incorrect or (OOR) resistance value.	O2 Heater Resistance < 3.12 ohms OR O2 Heater Resistance > 9.81 ohms (O2 Heater Resistance is corrected to 20 degrees C)	Engine Soak Time > 10 Hours Coolant – IAT < 8ºC -30ºC < Coolant 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
(B1S2) HEATED OXYGEN SENSOR HEATER RESISTANCE	**P0054**	Out-Of-Range (OOR) Resistance: Detects an oxygen sensor heater having an incorrect or (OOR) resistance value.	O2 Heater Resistance < 3.12 ohms OR O2 Heater Resistance > 9.81 ohms (O2 Heater Resistance is corrected to 20 degrees C)	Engine Soak Time > 10 Hours Coolant – IAT < 8ºC -30ºC < Coolant 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

(B2S1) HEATED OXYGEN SENSOR HEATER RESISTANCE	**P0059**	Out-Of-Range (OOR) Resistance: Detects an oxygen sensor heater having an incorrect or (OOR) resistance value.	O2 Heater Resistance < 3.12 ohms OR O2 Heater Resistance > 9.81 ohms (O2 Heater Resistance is corrected to 20 degrees C)	Engine Soak Time > 10 Hours Coolant – IAT < 8ºC -30ºC < Coolant 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
(B2S2) HEATED OXYGEN SENSOR HEATER RESISTANCE	**P0060**	Out-Of-Range (OOR) Resistance: Detects an oxygen sensor heater having an incorrect or (OOR) resistance value.	O2 Heater Resistance < 3.12 ohms OR O2 Heater Resistance > 9.81 ohms (O2 Heater Resistance is corrected to 20 degrees C)	Engine Soak Time > 10 Hours Coolant – IAT < 8ºC -30ºC < Coolant 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
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
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
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.	Raw MAP < .04 volts (3 counts)	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	Raw MAP > 4.89 Volts (250 counts)	TP sensor DTC's not active Engine Running Engine Run Time based on power up coolant temperature: ≥ 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	Raw IAT < .244 Volts	VS sensor DTC's not active ECT sensor DTC's not active Vehicle speed ≥ 25 mph Engine run time > 45 seconds Coolant Temperature < 125°C	25 test failures in a 50test sample 1 sample/500 ms	DTC Type B
INTAKE AIR TEMP SENSOR CIRCUIT HIGH (LOW TEMP)	**P0113**	This DTC detects a continuous open or short to high in the IAT signal circuit or the IAT sensor	Raw IAT > 4.95 Volts	ECT sensor DTC's not active VS sensor DTC's not active Coolant Temperature ≥ 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 coolant temp 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 IAT > 4.93 Volts High Resistance pull-up Raw IAT > 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

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	<u>Stuck high test:</u> The last throttle position value is > predicted throttle position based on engine RPM. <u>Stuck low test:</u> The last throttle position value is < predicted throttle position based on engine RPM	<u>Test Enable:</u> Engine Coolant Temp ≥ 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 <u>Stuck high test:</u> MAP < 50 kPa <u>Stuck low test:</u> MAP > 65 kPa	<u>Stuck high test:</u> 150 test failures within a 200 test sample <u>Stuck low test:</u> 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 (7.6 counts)	None	90 test failures in a 100 test sample size. 1 sample/12.5ms	DTC Type B

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. (249.9 counts)	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 engine coolant temperature rises too slowly due to an ECT or cooling system fault	If actual accumulated airflow is > predicted accumulated airflow before engine coolant reaches 75 °C when IAT is > 10° C, and before engine coolant reaches 40°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 120 seconds ≤ Engine runtime ≤ 1370 seconds Fuel ethanol percent ≤ 85% ECT at startrun ≤ 70°C for IAT above 10°C; ECT at startrun ≤ 35°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 Frequency: 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 < 200 mV <OR> In PE Oxygen sensor voltage < 360 mV	No Throttle, IAT, Injector, Coolant, 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 No Throttle, IAT, Injector, Coolant, 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 Fuel Level ≥ 10% Ethanol % ≤ 90 Not in High RPM Fuel Cutoff Engine runtime > 30 sec Closed Loop Fueling Conditions are met In Power Enrichment All of the above met for at least 1 second	310 failures out of 330 samples. Sensor monitored for 5 sets of samples. After 5 sets of failures, related sensors checked for same failure. If related sensor also failing, then no action is taken. 100 ms/sample Continuous 95 failures out of 100 samples 100 ms/sample Continuous	DTC Type B

(B1S1) HEATED OXYGEN SENSOR CIRCUIT HIGH	**P0132**	Circuit Continuity Detects a HO2S voltage stationary rich (high signal voltage) condition.	Oxygen sensor voltage > 1050 mV <OR> In DFCO Oxygen sensor voltage > 540 mV	No Throttle, IAT, Injector, Coolant, 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 No Throttle, IAT, Injector, Coolant, 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 Decel Fuel Cut Off Active Fuel Level ≥ 10% Ethanol % ≤ 90 Engine runtime > 30 sec Above conditions met for 2 seconds	90 failures out of 96 samples. Sensor monitored for 5 sets of samples. After 5 sets of failures, related sensors checked for same failure. If related sensor also failing, then no action is taken. 100 ms/sample Continuous 45 failures out of 50 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, Coolant, 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
(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, Coolant, 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	570 failures out of 600 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, Coolant, 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 Coolant ≥ 50 ºC 3 g/s ≤ Airflow ≤ 40 g/s Engine runtime ≥ 120 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 <OR> In PE Oxygen sensor voltage < 420 mV	No Throttle, IAT, Injector, Coolant, 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 No Throttle, IAT, Injector, Coolant, 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 Fuel Level ≥ 10% Ethanol % ≤ 90 Not in High RPM Fuel Cutoff Engine runtime > 30 sec Closed Loop Fueling Conditions are met In Power Enrichment All of the above met for at least 2 seconds	380 failures out of 400 samples Sensor monitored for 5 sets of samples. After 5 sets of failures, related sensors checked for same failure. If related sensor also failing, then no action is taken. 100 ms/sample Continuous 95 failures out of 100 samples 100 ms/sample Continuous	DTC Type B

(B1S2) HEATED OXYGEN SENSOR CIRCUIT HIGH	**P0138**	Circuit Continuity Detects a HO2S voltage stationary rich (high signal voltage) condition.	Oxygen sensor voltage > 950 mV <OR> In DFCO Oxygen sensor voltage > 480 mV	No Throttle, IAT, Injector, Coolant, 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 No Throttle, IAT, Injector, Coolant, 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 Decel Fuel Cut Off Active Fuel Level ≥ 10% Ethanol % ≤ 90 Engine runtime > 30 sec Above conditions met for 4 seconds	380 failures out of 400 samples. Sensor monitored for 5 sets of samples. After 5 sets of failures, related sensors checked for same failure. If related sensor also failing, then no action is taken. 100 ms/sample Continuous 45 failures out of 50 samples. 100 ms/samples 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, Coolant, 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, Coolant, 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
(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 < 3.125 A	No Throttle, IAT, Injector, Coolant, 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 Coolant ≥ 50 ºC 3 g/s ≤ Airflow ≤ 40 g/s Engine runtime ≥ 120 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

ALT FUEL INJECTOR DRIVER MODULE	**P0148**	Incorrect Fuel Mode	Modules Disagree. PCM Internal Status Disagrees with IDM Reported Status.	Ign Volt > 6V and < 18V Engine Speed > 1 RPM	2 second loop	DTC Type A Bi-Fuel ONLY (Bi-Fuel switches to gasoline)
(B2S1) HEATED OXYGEN SENSOR CIRCUIT LOW	**P0151**	Circuit Continuity Detects a HO2S voltage stationary lean (low signal voltage) condition.	Oxygen sensor voltage < 200 mV <OR> In PE Oxygen sensor voltage < 360 mV	No Throttle, IAT, Injector, Coolant, 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 No Throttle, IAT, Injector, Coolant, 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 Fuel Level ≥ 10% Ethanol % ≤ 90 Not in High RPM Fuel Cutoff Engine runtime > 30 sec Closed Loop Fueling Conditions are met In Power Enrichment All of the above met for at least 1 second	310 failures out of 330 samples. Sensor monitored for 5 sets of samples. After 5 sets of failures, related sensors checked for same failure. If related sensor also failing, then no action is taken. 100 ms/sample Continuous 95 failures out of 100 samples 100 ms/sample Continuous	DTC Type B

(B2S1) HEATED OXYGEN SENSOR CIRCUIT HIGH	**P0152**	Circuit Continuity Detects a HO2S voltage stationary rich (high signal voltage) condition.	Oxygen sensor voltage > 1050 mV <OR> In DFCO Oxygen sensor voltage > 540 mV	No Throttle, IAT, Injector, Coolant, 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 No Throttle, IAT, Injector, Coolant, 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 Decel Fuel Cut Off Active Fuel Level ≥ 10% Ethanol % ≤ 90 Engine runtime > 30 sec Above conditions met for 2 seconds	90 failures out of 96 samples. Sensor monitored for 5 sets of samples. After 5 sets of failures, related sensors checked for same failure. If related sensor also failing, then no action is taken. 100 ms/sample Continuous 45 failures out of 50 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, Coolant, 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
(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, Coolant, 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	570 failures out of 600 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, Coolant, 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 Coolant ≥ 50 ºC 3 g/s ≤ Airflow ≤ 40 g/s Engine runtime ≥ 120 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 <OR> In PE Oxygen sensor voltage < 420 mV	No Throttle, IAT, Injector, Coolant, 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 No Throttle, IAT, Injector, Coolant, 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 Fuel Level ≥ 10% Ethanol % ≤ 90 Not in High RPM Fuel Cutoff Engine runtime > 30 sec Closed Loop Fueling Conditions are met In Power Enrichment All of the above met for at least 2 seconds	380 failures out of 400 samples. Sensor monitored for 5 sets of samples. After 5 sets of failures, related sensors checked for same failure. If related sensor also failing, then no action is taken. 100 ms/sample Continuous 95 failures out of 100 samples. 100 ms/sample Continuous	DTC Type B For use on vehicles with 4 sensors

(B2S2) HEATED OXYGEN SENSOR CIRCUIT HIGH	**P0158**	Circuit Continuity Detects a HO2S voltage stationary rich (high signal voltage) condition.	Oxygen sensor voltage > 950 mV <OR> In DFCO Oxygen sensor voltage > 480 mV	No Throttle, IAT, Injector, Coolant, 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 No Throttle, IAT, Injector, Coolant, 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 Decel Fuel Cut Off Active Fuel Level ≥ 10% Ethanol % ≤ 90 Engine runtime > 30 sec Above conditions met for 4 seconds	380 failures out of 400 samples. Sensor monitored for 5 sets of samples. After 5 sets of failures, related sensors checked for same failure. If related sensor also failing, then no action is taken. 100 ms/sample Continuous 45 failures out of 50 samples. 100 ms/sample Continuous	DTC Type B For use on vehicles with 4 sensors

(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, Coolant, 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, Coolant, 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 For use on vehicles with 4 sensors
(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 < 3.125 A	No Throttle, IAT, Injector, Coolant, 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 Coolant ≥ 50 ºC 3 g/s ≤ Airflow ≤ 40 g/s Engine runtime ≥ 120 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 For use on vehicles with 4 sensors

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 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 > 10 % (must be <10% for at least 10 seconds to disable; default is to enable if fuel sender is broken)	100 ms loop Continuous	DTC Type B

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 ≤ 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 ≤ 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 ≥ 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	• No Misfire DTC's • No 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. Intrusive Enable Criteria • The EWMA of long term fuel trim (LTM) samples ≤ 0.825 • RPM > 375 • Mass Airflow > 3 g/s but < 250 g/s • MAP > 15 kpa but < 105 kpa 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

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 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 > 10 % (must be <10% for at least 10 seconds to disable; default is to enable if fuel sender is broken)	100 ms loop Continuous	DTC Type B

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 ≤ 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 ≤ 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 ≥ 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	• No Misfire DTC's • No 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. Intrusive Enable Criteria • The EWMA of long term fuel trim (LTM) samples ≤ 0.825 • RPM > 375 • Mass Airflow > 3 g/s but < 250 g/s • MAP > 15 kpa but < 105 kpa 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

FUEL COMPOSITION SENSOR CIRCUIT LOW FAULT	***P0178**	Determines if the Fuel Composition Sensor is in an out of range low condition	Fuel composition sensor frequency is < 45 Hertz.	Engine runtime ≥ 30 seconds. 11 V ≤ System Voltage ≤ 18 V	360 failures out of 420 samples 1 sample/500 msec. Continuous check.	DTC Type B
FUEL COMPOSITION SENSOR CIRCUIT HIGH FAULT	***P0179**	Determines if the Fuel Composition Sensor is in an out of range high condition	Fuel composition sensor frequency is > 155 Hertz.	Engine runtime ≥ 30 seconds. 11 V ≤ System Voltage ≤ 18 V	100 failures out of 200 samples 1 sample/500 msec. Continuous check	DTC Type B
AFC Tank Temperature Circuit Low	**P0182 van only**	This diagnostic detects and then reports continuous short to low circuit conditions on the alternative fuel tank temperature sensor circuit.	Tank Temperature sensor output <0.15 Volts	None 6 Volts < Battery voltage < 18 Volts	20 failures out of 100 samples Continuous	DTC Type C
AFC Tank Temperature Circuit High	**P0183 van only**	This diagnostic detects the presence of a tank Temperature transducer signal that has shorted to Battery.	Tank Temperature sensor output >4.92 Volts	IAT > -7 C The following faults are not active: Induction Air Temp Low Fault, (P0112) Induction Air Temp High Fault, (P0113) 6 Volts < Battery voltage < 18 Volts Start up IAT > -7 C Minimum Soak Time > 36000 Sec.	20 failures out of 100 samples Continuous	DTC Type C

ALT FUEL RAIL TEMPERATURE RANGE /PERFORAMNCE	**P0186**	Determine Circuit Range/ Performance of the Rail Temperature Sensor	One of the following rationality tests must occur to fail the test: Stuck Sensor Rationality: * Start-up Rail Temp is <= 2 C different from present Rail Temp. * Start-up IAT > 10 C delta from present IAT (if above 20 C). Delta IAT scales from 40 C to 10 C when the present IAT is -10 C to 20 C. * -10 C > IAT > 120C * CTS > 85 C * Engine runtime > 800 sec Sensor Scaling Rationality: * Start-up Rail Temp is > 2 C different from present Rail Temp. * Start-up IAT > 10 C different from start-up Rail Temp. * Soak Time > 10 hours	* Ign Volt > 4 V * Rail Temp DTC's P0187, P0188 not set, * IAT DTC's P0111, P0112, P0113 not set, * ECT DTC's P0116, P0117, P0118 not set, * Analog PWM P1207 not set, * Initial Read Delay over = 1 sec, * No switch from gasoline to Alt fuel this key cycle. * Soak Time > 8 hours	2 s Once per trip	DTC Type B Default = IAT (Disable long term learn)
ALT FUEL TEMPERATURE SENSOR (RAIL) LOW FAULT	**P0187**	Determines if the Rail Temperature Sensor is in a low condition	Rail Temperature Sensor Voltage < 0.102 volts	* Ign Volt > 4 V * P1207 Not Active * Initial Read Delay over = 1 sec	5 second loop	DTC Type B Default = IAT (Disable long term learn)
ALT FUEL TEMPERATURE SENSOR (RAIL) HIGH FAULT	**P0188**	Determines if the Rail Temperature Sensor is in a high condition	Rail Temperature Sensor Voltage > 4.95 Volts	* Ign Volt > 4 V * IAT > -10 C * P0112, P0113, 1207 Not Active * Initial Read Delay over = 1 sec	5 second loop	DTC Type B Default = IAT (Disable long term learn)
ALT FUEL PRESSURE SENSOR PERFORMANCE (RAIL)	**P0191**	Determine Circuit Range/ Performance of the Rail Pressure Sensor	* Rail Pressure < 207 kPa to 276 kPa (30 to 40 psia), depending on MAF. * TankP >= 2068 kPa (300psia) * Rail Pressure Sensor Voltage > 0.102 volts OR * Rail Pressure > 620 kPa (90 psia) * Rail Pressure Sensor Voltage < 4.95 Volts	* Engine RPM >= 100 * P0005, P0192, P0193, P0336, P1207, P1209, P1431, P1432, P1433, P2665 Not Active * HPL, LPL Open * MAF <= 200 g/s * CTS >= 20 C	3 seconds Once per trip	DTC Type A (Bi-Fuel switches to gasoline)

ALT FUEL PRESSURE SENSOR (RAIL) LOW FAULT	**P0192**	Determines if the Rail Pressure Sensor is in a low condition	Rail Pressure Sensor Voltage < 0.102 volts	* Engine RPM > 100 * P0191 Not Active	2.5 second loop	DTC Type B Default = 45psig (Disable long term learn)
ALT FUEL PRESSURE SENSOR (RAIL) HIGH FAULT	**P0193**	Determines if the Rail Pressure Sensor is in a high condition	Rail Pressure Sensor Voltage > 4.95 Volts	* Engine RPM > 100 * P0191 Not Active	2.5 second loop	DTC Type B Default = 45psig (Disable long term learn)
INJECTOR CONTROL CIRCUIT	**P0200**	Circuit Continuity Control circuit voltage is monitored during operation. It should be low during operation and near B+ when “off”.	The PCM detects that the commanded state of the driver and the actual state of the control circuit do not match.	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**	Circuit Continuity Control circuit voltage is monitored during operation. It should be high during operation and near 0 volts when “off”.	The PCM detects that the commanded state of the driver and the actual state of the control circuit do not match.	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

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 = 1.75% 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, 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 < 5350 RPM. • 11 volts < System voltage < 18 volts. • + Throttle position delta < 50% per 100 ms. • - Throttle position delta < 50% per 100 ms. • 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. • 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. Frequency: 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 Frequency: 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
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 Coolant 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 Coolant 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.	Evaluated at crankshaft position synchronization.	Engine Running or Cranking	15 Failures out of 100 test samples 100 ms loop 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
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 (if applicable) and samples increment by 1 each time the diagnostic executes. If engine speed is ≥ 1500 RPM test failures (if applicable) and samples increment by 2 each time the diagnostic executes in order to report a failure faster		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 (if applicable) and samples increment by 1 each time the diagnostic executes. If engine speed is ≥ 1500 RPM test failures (if applicable) and samples increment by 2 each time the diagnostic executes in order to report a failure faster		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 (if applicable) and samples increment by 1 each time the diagnostic executes. If engine speed is ≥ 1500 RPM test failures (if applicable) and samples increment by 2 each time the diagnostic executes in order to report a failure faster		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 (if applicable) and samples increment by 1 each time the diagnostic executes. If engine speed is ≥ 1500 RPM test failures (if applicable) and samples increment by 2 each time the diagnostic executes in order to report a failure faster		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 (if applicable) and samples increment by 1 each time the diagnostic executes. If engine speed is ≥ 1500 RPM test failures (if applicable) and samples increment by 2 each time the diagnostic executes in order to report a failure faster		30 Failures out of 100 500 msec / test Continuous	DTC Type B
IGNITION CONTROL #6 CIRCUIT	**P0356**	Monitor EST channel F (Cylinder 6)	EST line is Stuck Low, is open, or is Stuck High. If engine speed is <≥ 1500 RPM test failures (if applicable) and samples increment by 1 each time the diagnostic executes. If engine speed is ≥ 1500 RPM test failures (if applicable) and samples increment by 2 each time the diagnostic executes in order to report a failure faster		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 (if applicable) and samples increment by 1 each time the diagnostic executes. If engine speed is ≥ 1500 RPM test failures (if applicable) and samples increment by 2 each time the diagnostic executes in order to report a failure faster		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 (if applicable) and samples increment by 1 each time the diagnostic executes. If engine speed is ≥ 1500 RPM test failures (if applicable) and samples increment by 2 each time the diagnostic executes in order to report a failure faster		30 Failures out of 100 500 msec / test Continuous	DTC Type B

CATALYTIC CONVERTER LOW OXYGEN STORAGE	**P0420**	Oxygen Storage.	OSC Time Difference ≥ 0.185663 OSC Time Difference = OSC Worst Pass Thresh - OSC Compensation Factor * (Post Cat O2 Resp Time - Pre Cat O2 Resp Time) OSC Worst Pass Thresh = 2.052727sec	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 ≥ 750 rpm for minimum of 39 sec since end of last idle period Engine Speed < 750 rpm Vehicle Speed ≤ 2 mph Engine runtime ≥ 600 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 ≥ 572°C 0.9 < Short Term Fuel Trim < 1.1 Delta Increase in Short Term Fuel Trim ≤ 0.15 Electric fan hasn't changed state for at least 2 seconds 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 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 ≤ 20 steps Delta Load ≤ 2% Delta RPM ≤ 300 3 ≤ MAF ≤ 11 RPM – Desired RPM ≤ 200 Desired RPM – RPM ≤ 100 Predicted Catalyst Temperature ≤ 730°C Ethanol ≤ 87% Engine Fueling Criteria at Behinning of Idle Period Must be met from between 3.5 and 7 seconds after idle conditions have been met for at least 5 seconds Number of pre-O2 switches > 2	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 curent OSC time difference ≥ 0.606965sec 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 ≥ 620° 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

CATALYTIC CONVERTER LOW OXYGEN STORAGE	**P0430**	Oxygen Storage.	OSC Time Difference ≥ 0.185438 OSC Time Difference = OSC Worst Pass Thresh - OSC Compensation Factor * (Post Cat O2 Resp Time - Pre Cat O2 Resp Time) OSC Worst Pass Thresh = 1.86115 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 ≥ 750 rpm for minimum of 39 sec since end of last idle period Engine Speed < 750 rpm Vehicle Speed ≤ 2 mph Engine runtime ≥ 600 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 ≥ 520°C 0.9 < Short Term Fuel Trim < 1.1 Delta Increase in Short Term Fuel Trim ≤ 0.15 Electric fan hasn't changed state for at least 2 seconds 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 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 ≤ 20 steps Delta Load ≤ 2% Delta RPM ≤ 300 3 ≤ MAF ≤ 11 RPM – Desired RPM ≤ 200 Desired RPM – RPM ≤ 100 Predicted Catalyst Temperature ≤ 730°C Ethanol ≤ 87% Engine Fueling Criteria at Behinning of Idle Period Must be met from between 3.5 and 7 seconds after idle conditions have been met for at least 5 seconds Number of pre-O2 switches > 2	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 curent OSC time difference ≥ 0.606965sec 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 ≥ 620° 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

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 1.25 to 3.25" water). The normalized value is entered into EWMA (with 0= perfect pass and 1=perfect fail). Once EWMA exceeds the fail threshold, the DTC light is illuminated. The DTC light can be turned off if the EWMA falls below the re-pass threshold for 3 consecutive trips. Fail threshold = 0.50769 Re-Pass threshold = 0.315613	TEST ENABLE : No MAP DTC's No Thermostat Rationality DTC's VS Sensor DTC's not active No Fuel Tank Pressure Sensor DTC's No EVAP Canister Purge Solenoid DTC's No EVAP Canister Vent Solenoid DTC's No Fuel Level DTC's Coolant Sensor DTC's not active IAT Sensor DTC's not active EVAP Vacuum Sensor Performance DTC not active. EVAP CCP stuck open DTC not active. EVAP large leak DTC not active. Ignition off timer DTC not active. Fuel Level >15.0% but < 85.0% Drive time >= 600 seconds. Drive length >= 3 miles. Coolant >= 70°C. No fuel filling (fuel level increment >= 10%) During EONV test. BARO > 74.0kPa Estimated ambient temperature at end of drive > 2°C but < 32°C. Estimate of Ambient Air Temperature Valid Conditions to be valid 1. Cold Start Startup ECT < 30° C Startup IAT > 4°C but < 30° C 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 3 minutes and 3 miles)	Once per cold start, during hot soak (up to 2500 sec.). Time since last complete test >= 17 hours if EWMA is passing, or >= 10 hours if EWMA is failing. No more than 2 attempts per day.	DTC Type A EWMA Average run length: 9

EVAP CANISTER PURGE SOLENOID VALVE CIRCUIT	**P0443**	Circuit Continuity Control circuit voltage is monitored during operation. It should be low during operation and near B+ when "off".	The PCM detects that the commanded state of the driver and the actual state of the control circuit do not match.	Engine speed > 400 rpm. 6 V < System voltage < 18 V	10 failures out of 100 samples 500ms loop continuous	DTC Type B
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 > 12.00 “H2O for 5 seconds BEFORE Purge Volume > 10 liters OR Vented Vacuum < -2.5 in. H20 or Vented Vacuum > 5 in. H20 for 15 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 DTC’s • No Evap Canister Purge solenoid DTC’s • No EVAP Canister Vent Solenoid DTC’s • No Thermostat Rationality DTC’s • 15 % < Fuel Level < 85. % • 10.00 V < System Voltage < 18.00 V • 4 °C < IAT < 30°C • ECT < 30 °C • BARO > 74.00 kPa (8000 ft)	Once per trip Time is dependent on driving conditions Max. before test abort is 1000 seconds	DTC Type B
EVAP VENT SOLENOID CONTROL CIRCUIT	**P0449**	Circuit Continuity Control circuit voltage is monitored during operation. It should be low during operation and near B+ when “off”.	The PCM detects that the commanded state of the driver and the actual state of the control circuit do not match.	Engine speed > 400 rpm. 6 V < System voltage < 18 V	10 failures out of 100 samples 500ms loop continuous	DTC Type B

FUEL TANK PRESSURE (FTP) SENSOR CIRCUIT PERFORMANCE	**P0451**	The DTC will be set if the fuel tank vacuum sensor is out of range when it tries to re-zero prior to the phase-1 or phase-2 portions of the engine-off natural vacuum small leak test.	The tank vacuum sensor voltage is compared to a window about the nominal sensor voltage offset (~1.5 volts) 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 = 0.729981 Re-Pass threshold = 0.400024	This test will execute whenever the engine-off natural vacuum small leak test (P0442) executes	This test is executed during an engine-off natural vacuum small leak test. The number of times that it executes can range from zero to two per engine-off period. 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	<u>Frequency:</u> 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
EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR/SWITCH 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 of 1.0 “H2O 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 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

EVAP. EMISSION CONTROL SYSTEM MALFUNCTION	**P0455**	This DTC will detect a weak vacuum condition (large leak or purge blockage) in the Evap system.	Purge volume > 14.00 liters BEFORE Tank vacuum < 11 "H_2O 2 liters of fuel must be consumed after setting the DTC active the first time to set the DTC active the second time. Weak Vacuum Follow-up Test (fuel cap replacement test) Weak Vacuum Test failed previous trip and this trip. Passes if tank vacuum > 11 " H_2O. Note: Weak Vacuum Follow-up Test can only report a pass.	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 DTC's • No Evap Canister Purge solenoid DTC's • No EVAP Canister Vent Solenoid DTC's • No Thermostat Rationality DTC's • 15 % < Fuel Level < 85. % • 10.00 V < System Voltage < 18.00 V • 4 °C < IAT < 30°C • ECT < 30 °C • BARO > 74.00 kPa (8000 ft) 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 Weak Vacuum Follow-up Test On 2nd trip with large leak detected, the follow-up test is limited to 600 seconds. Once the MIL is on, the follow-up test runs indefinitely.	DTC Type B
FUEL LEVEL NO CHANGE, STUCK IN RANGE	**P0461**	This DTC will detect a fuel sender stuck in range .	For single tank, if delta fuel volume change is less than 3 liters over accumulated 150 miles. OR For dual tank, if transfer pump is on and at idle delay for 20 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 200 seconds. OR If primary tank is full and secondary tank is empty for > 175 miles.	runs continuously		DTC Type B
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

FUEL LEVEL STUCK HIGH	**P0463**	This DTC will detect a fuel sender stuck out of	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 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
PRIMARY COOLING FAN RELAY CONTROL CIRCUIT MALF	**P0480**	Control circuit voltage is monitored during operation. It should be low during operation and near B+ when “off”	The PCM detects that the commanded state of the driver and the actual state of the control circuit do not match	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**	Control circuit voltage is monitored during operation. It should be low during operation and near B+ when “off”.	The PCM detects that the commanded state of the driver and the actual state of the control circuit do not match	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 > 10 ”H2O 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 DTC’s • No EVAP canister purge valve solenoid DTC’s • No EVAP Canister Vent Solenoid DTC’s • No Thermostat Rationality DTC’s • 15 % < Fuel Level < 85. % • 10.00 V < System Voltage < 18.00 V • 4 °C < IAT < 30°C • ECT < 30 °C • BARO > 74.00 kPa (8000 ft) 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. 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 Coolant ≥ 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

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 engine coolant ECT value 56 -150 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 ≤ 0.742% 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 engine coolant ECT value 56 250 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 ≤ 0.742% 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

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
ALT FUEL INJECTOR DRIVER MODULE (COMM)	**P0611**	Determines if the Injector Driver Module is in an out of range high condition	Injector Driver Module frequency is out of range.	* Engine RPM >= 1 * P1207, P1209 Active	1 second loop	DTC Type A (Bi-Fuel switches to gasoline)
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**	Control circuit voltage is monitored during operation. It should be low during operation and near B+ when “off”.	The PCM detects that the commanded state of the driver and the actual state of the control circuit do not match.	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

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 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)
ALT FUEL INJECTOR DRIVER MODULE (INPUTS)	**P1020**	Monitor the Injector Control Circuit	Disconnected, shorted to ground, or shorted to battery	* Ign Volt > 6V and < 18V * P0148, P0611, P1209 Not Active * RPM > 0 * Fuel Cut-off Not Active	3.55 - 4.75 sec Continuous	DTC Type A (Bi-Fuel switches to gasoline)
ALT FUEL INJECTOR DRIVER MODULE (OUTPUT - CYLINDER 1)	**P1021 C/K truck only**	Auxiliary Injector 1 Control Circuit	Disconnected, shorted to ground, or shorted to battery	Ign Volt > 6V and < 18V RPM >= 1 CNG Mode Active	3.55 - 4.75 sec Continuous	DTC Type A (Bi-Fuel switches to gasoline)
ALT FUEL INJECTOR DRIVER MODULE (OUTPUT - CYLINDER 2)	**P1022 C/K truck only**	Auxiliary Injector 2 Control Circuit	Disconnected, shorted to ground, or shorted to battery	Ign Volt > 6V and < 18V RPM >= 1 CNG Mode Active	3.55 - 4.75 sec Continuous	DTC Type A (Bi-Fuel switches to gasoline)

ALT FUEL INJECTOR DRIVER MODULE (OUTPUT - CYLINDER 3)	**P1023 C/K truck only**	Auxiliary Injector 3 Control Circuit	Disconnected, shorted to ground, or shorted to battery	Ign Volt > 6V and < 18V RPM >= 1 CNG Mode Active	3.55 - 4.75 sec Continuous	DTC Type A (Bi-Fuel switches to gasoline)
ALT FUEL INJECTOR DRIVER MODULE (OUTPUT - CYLINDER 4)	**P1024 C/K truck only**	Auxiliary Injector 4 Control Circuit	Disconnected, shorted to ground, or shorted to battery	Ign Volt > 6V and < 18V RPM >= 1 CNG Mode Active	3.55 - 4.75 sec Continuous	DTC Type A (Bi-Fuel switches to gasoline)
ALT FUEL INJECTOR DRIVER MODULE (OUTPUT - CYLINDER 5)	**P1025 C/K truck only**	Auxiliary Injector 5 Control Circuit	Disconnected, shorted to ground, or shorted to battery	Ign Volt > 6V and < 18V RPM >= 1 CNG Mode Active	3.55 - 4.75 sec Continuous	DTC Type A (Bi-Fuel switches to gasoline)
ALT FUEL INJECTOR DRIVER MODULE (OUTPUT - CYLINDER 6)	**P1026 C/K truck only**	Auxiliary Injector 6 Control Circuit	Disconnected, shorted to ground, or shorted to battery	Ign Volt > 6V and < 18V RPM >= 1 CNG Mode Active	3.55 - 4.75 sec Continuous	DTC Type A (Bi-Fuel switches to gasoline)
ALT FUEL INJECTOR DRIVER MODULE (OUTPUT - CYLINDER 7)	**P1027 C/K truck only**	Auxiliary Injector 7 Control Circuit	Disconnected, shorted to ground, or shorted to battery	Ign Volt > 6V and < 18V RPM >= 1 CNG Mode Active	3.55 - 4.75 sec Continuous	DTC Type A (Bi-Fuel switches to gasoline)
ALT FUEL INJECTOR DRIVER MODULE (OUTPUT - CYLINDER 8)	**P1028 C/K truck only**	Auxiliary Injector 8 Control Circuit	Disconnected, shorted to ground, or shorted to battery	Ign Volt > 6V and < 18V RPM >= 1 CNG Mode Active	3.55 - 4.75 sec Continuous	DTC Type A (Bi-Fuel switches to gasoline)
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

(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 < 60 R/L switches < 60	No Throttle, IAT, Injector, Coolant, 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

(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 +75 ms Min -185 ms	No Throttle, IAT, Injector, Coolant, 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

(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 < 60 R/L switches < 60	No Throttle, IAT, Injector, Coolant, 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

(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 +75 ms Min -185ms	No Throttle, IAT, Injector, Coolant, 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
ALT FUEL SYSTEM	**P1204**	Excessive Crank Time Using Alternative Fuel	Crank Time > 8 sec	* Ign Volt > 6V and < 18V * P0005, P0146, P0191, P0192, P0193, P0611, P1020 to P1028, P1209, P2146, P2665 Not Active * CNG Mode Active	> 8 sec crank time with no engine run on alternative fuel	DTC Type B Bi Fuel ONLY (Bi-Fuel switches to gasoline)
ALT FUEL INJECTOR DRIVER MODULE (ANALOG LINE)	**P1207**	Monitor Fuel Injector Analog Feedback Circuit	Inactive OR Out of Range PWM	Ign Volt >= 4 V	2 second loop	DTC Type B (Bi-Fuel switches to gasoline)
Fuel Injector Control Module Sensor Signal Circuit 2 (Fuel Rail Temperature)	**P1208 van only**	This diagnostic detects and then reports faults occurring on the Alt. Fuel analog PWM #2 circuit.	AFC T610 Analog PWM2 < 1.99% OR AFC T610 Analog PWM2 > 97.5%	Ignition_1_Is_On 6 Volts < Battery voltage < 18 Volts	20 failures out of 100 samples Continuous	DTC Type B

ALT FUEL INJECTOR DRIVER MODULE (DIAG. LINE)	**P1209**	Monitor Fuel Injector Diagnostic Feedback Circuit	Inactive OR Out of Range PWM	* Ign Volt > 6V and < 18V * Engine Speed >= 1 RPM	2 second loop	DTC Type A (Bi-Fuel switches to gasoline)
ENGINE PROTECTION MODE ACTIVE	**P1258**	Monitor for engine protection mode active.	Coolant temperature >= 129.4°C for more than 10 seconds.	No coolant sensor DTC's.	Set immediately upon engine protection mode active. 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 is Light Request is True)
ALT FUEL TANK PRESSURE NO CHANGE	**P1431**	Monitor for Tank Pressure Circuit Range/ Performance	The Tank Pressure must change 200 psi over 50 miles of driving on Alt Fuel to pass.	* Alt Fuel Operation * Alt Fuel engine runtime > 5 sec * Ignition Voltage > 5 V * Above conditions met for 1 sec * IAT DTC's P0111, P0112, P0113 not set, * Tank DTC's P1432, 1433 not set, * Analog PWM P1207 not set	2 sec Once per Trip	DTC Type A Default = 0psi (Bi-Fuel switches to gasoline)
ALT FUEL PRESSURE SENSOR (TANK) LOW INPUT	**P1432**	Monitor for Tank Pressure Sensor Circuit Low Input	Tank Pressure Sensor < 0.102 volts	* Ign Volt > 4 V * P1207 Not Active * Initial Read Delay over = 1 sec	2 second loop	DTC Type B Default = 0psi (Bi-Fuel switches to gasoline)

ALT FUEL PRESSURE SENSOR (TANK) HIGH INPUT	**P1433**	Monitor for Tank Pressure Sensor Circuit High Input	Tank Pressure Sensor > 4.95 Volts	* CNG Fuel Temp < 30°C * Analog PWM DTC (P1207) Not set * Ign Volt > 4 V * Initial Read Delay over = 1 sec * IAT DTC (P0111, P0112, P0113) Not set * Tank DTC's (P1431, P1432) Not set * IAT < 27C OR * IAT >= 27 C * Distance traveled this key cycle is > 20 Mi	2 second loop	DTC Type B Default = 0psi (Bi-Fuel switches to gasoline)
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

Fuel Level No Change, Stuck in Range Secondary Tank	***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(L18) or 200(LQ4) miles. OR If transfer pump is on and at idle delay for 20 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 200 seconds.	Fuel level greater than 30 liters		DTC Type B For use on vehicles with duel fuel tank
Fuel Level Stuck Low Secondary Tank	***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 duel fuel tank
Fuel Level Stuck High Secondary Tank	***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 duel fuel tank
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

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

APP SENSOR 1 PERFORMANCE	**P2121**	1) TACM indicates a continuous or intermittent correlation fault between APP sensors #1 and #2 AND #1 and #3. OR 2) TACM indicates an invalid minimum mechanical position correlation between APP sensor #1 and #2 AND #1 and #3. OR 3) PPS1 signal short to PPS2 signal, any reference, or ground.	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
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

APP SENSOR 2 PERFORMANCE	***P2126**	1) TACM indicates a continuous or intermittent correlation fault between APP sensors #1 and #2 AND #2 and #3. OR 2) TACM indicates an invalid minimum mechanical position correlation between APP sensor #1 and #2 AND #2 and #3.	ABS(5 V - raw APP sensor #2 voltage - raw APP sensor #1 voltage) > 0.20 V. AND ABS{5 V - [(raw APP sensor #3 voltage - 0.61 V) * 53 / 32] - (5 V - raw APP sensor #2 voltage)} > 0.26 V.	Ignition in Run or Crank. Ignition voltage > 5.23 V. Valid TACM - PCM serial data. No TACM processor DTC.	1) Counter increments by 1 for every error, decrements by 1 for every pass; threshold is 167. Check runs every 3 ms.	DTC Type A
APP SENSOR 3 CIRCUIT	***P2130**	1) TACM indicates a continuous or intermittent short or open in either the signal circuit or the APP sensor #3. OR 2) TACM indicates an invalid minimum mechanical position for the APP sensor #3.	1) Raw APP sensor signal < 1.63 V or > 4.38 V. OR 2) APP sensor minimum mechanical stop voltage > 4.28 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 106. Check runs every 3 ms.	DTC Type A
APP SENSOR 3 PERFORMANCE	***P2131**	1) TACM indicates a continuous or intermittent correlation fault between APP sensors #1 and #3 AND #2 and #3. OR 2) TACM indicates an invalid minimum mechanical position correlation between APP sensor #1 and #3 AND #2 and #3.	ABS{5 V - [(raw APP sensor #3 voltage - 0.61 V) * 53 / 32] - raw APP sensor #1 voltage} > 0.26 V. AND ABS{5 V - [(raw APP sensor #3 voltage - 0.61 V) * 53 / 32] - (5 V - raw APP sensor #2 voltage)} > 0.26 V.	Ignition in Run or Crank. Ignition voltage > 5.23 V. Valid TACM - PCM serial data. No TACM processor DTC.	1) Counter increments by 1 for every error, decrements by 1 for every pass; threshold is 167. Check runs every 3 ms.	DTC Type A

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
ALT FUEL INJECTOR RELAY	**P2146**	Injector Positive Voltage Relay Control Circuit	Alt Fuel Injector Relay Disconnected, shorted to ground, or shorted to battery	* Ign Volt > 6V and < 18V * Engine Speed >= 400 RPM	2 second loop	DTC Type A (Bi-Fuel switches to gasoline)
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
ALT FUEL LOW PRESSURE LOCKOFF (LPL)	**P2665**	This DTC detects an open sensor ground or continuous short to high in either the signal circuit of the Low Pressure Fuel Shutoff Relay Control Circuit	Disconnected, Shorted To Ground, Or Shorted To Battery	Ign Volt > 6v And < 18v Engine Speed > 400 Rpm	1 Second Loop	DTC Type A (Bi-Fuel Switches To Gasoline)

Fuel Mode Indicator Lamp Control Circuit	**P2668 van only**	This diagnostic detects if the PCM output driver module detects the state of the line is in an unexpected state	Driver line determined to be in unexpected state. Open circuit, Short to Battery.	6 Volts < Battery voltage < 18 Volts	100 failures out of 150 samples Continuous	DTC Type C
(B1S2) HEATED OXYGEN SENSOR POSD	**P2A01**	Detects post sensors that are stuck in range, outside of the open or shorted regions.	Stage1 - Passive Test: During the ignition cycle the O2 signal must exceed the upper bound of the post O2 PID control window set at 710mV, and also drop below 349mV, which is the minimum lean voltage used by the Idle Catalyst diagnostic. Stage2 - Intrusive Test: If the Stage1 test has not reported a pass during the first 810 seconds, then an 8% lean and/or rich fueling change will be commanded to force the signal to cross the appropriate threshold as described above. The DTC will set if the sensor has not responded to the intrusive rich or lean test after 60.0 seconds.	Stage1 – Passive Test: Engine runtime > 2 sec Stage2 – Intrusive Test: Closed Loop Fuel Control Engine runtime > 810 sec 5 < Airflow < 100 g/s 10 V < System Voltage < 18V 900 < Engine Speed < 5000 RPM 15 < Vehicle speed < 82 mph 0.965 < Short Term Integrator < 1.035 Above conditions met for 3 sec Lean test: Pre sensors must drop below 300mV Rich test: Pre sensors must exceed 600mV Stage2 test order: Lean then Rich	DTC will set if Stage2 test length exceeds 60 sec. Maximum of 100 Stage2 attempts (aborts). Once per trip	DTC Type B

(B1S2) HEATED OXYGEN SENSOR POSD	**P2A04**	Detects post sensors that are stuck in range, outside of the open or shorted regions.	Stage1 - Passive Test: During the ignition cycle the O2 signal must exceed the upper bound of the post O2 PID control window set at 710mV, and also drop below 349mV, which is the minimum lean voltage used by the Idle Catalyst diagnostic. Stage2 - Intrusive Test: If the Stage1 test has not reported a pass during the first 810 seconds, then an 8% lean and/or rich fueling change will be commanded to force the signal to cross the appropriate threshold as described above. The DTC will set if the sensor has not responded to the intrusive rich or lean test after 60.0 seconds.	Stage1 – Passive Test: Engine runtime > 2 sec Stage2 – Intrusive Test: Closed Loop Fuel Control Engine runtime > 810 sec 5 < Airflow < 100 g/s 10 V < System Voltage < 18V 900 < Engine Speed < 5000 RPM 15 < Vehicle speed < 82 mph 0.965 < Short Term Integrator < 1.035 Above conditions met for 3 sec Lean test: Pre sensors must drop below 300mV Rich test: Pre sensors must exceed 600mV Stage2 test order: Lean then Rich	DTC will set if Stage2 test length exceeds 60 sec. Maximum of 100 Stage2 attempts (aborts). Once per trip	DTC Type B

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
ISB Incorrect Type	**U0306 van only**	This diagnostic is used to report a fault when the wrong type of ISB is installed on the vehicle. Example: ISB with bi-fuel capabilities on a dedicated CNG vehicle or vice versa.	Powertrain Control Module (PCM) expects to see a 37.5% and a 50% duty cycle PWM associated with a dedicated ISB and a bi-fuel ISB respectively. Fail if +-3% of target duty cycle	The following fault is not active: AFC Diagnostic PWM Circuit Fault	Continuous	DTC Type A

LOOK UP TABLES

P0101: (Calculated Flow – Measured Flow) Lookup Table

Calculated Airflow	Airflow Delta
Grams_Air_0	6.34
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

LOOK UP TABLES

P0106 – Predicted MAP Maximum Look Up Table

	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 Minimum Look Up Table

	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

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:

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

LOOK UP TABLES

LOOK UP TABLES --- CNG C/K series Truck

(CNG fulsize G-van lookup tables follow CNG C/K series truck lookup tables)

P0300: Emission Failure Misfire Percentages as a Function of Engine Speed and Load Table: 6.0L (LQ4) **CNG / gasoline dual-fuel**

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	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
10 Load_In_Percent	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
20 Load_In_Percent	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
30 Load_In_Percent	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
40 Load_In_Percent	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
50 Load_In_Percent	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
60 Load_In_Percent	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
70 Load_In_Percent	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
80 Load_In_Percent	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
90 Load_In_Percent	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
100 Load_In_Percent	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5

LOOK UP TABLES

LOOK UP TABLES --- CNG C/K series Truck

(CNG fulsize G-van lookup tables follow CNG C/K series truck lookup tables)

P0300: Emission Failure Misfire Percentages as a Function of Engine Speed and Load Table: 6.0L (LQ4) **Dedicated CNG-only fuel**

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	2.5	1.125	1.125	1.125	1.125	1.125	1.125	1.125	1.125
10 Load_In_Percent	2.5	1.125	1.125	1.125	1.125	1.125	1.125	1.125	1.125
20 Load_In_Percent	2.5	1.125	1.125	1.125	1.125	1.125	1.125	1.125	1.125
30 Load_In_Percent	2.5	1.125	1.125	1.125	1.125	1.125	1.125	1.125	1.125
40 Load_In_Percent	2.5	1.125	1.125	1.125	1.125	1.125	1.125	1.125	1.125
50 Load_In_Percent	1.125	1.125	1.125	1.125	1.125	1.125	1.125	1.125	1.125
60 Load_In_Percent	1.125	1.125	1.125	1.125	1.125	1.125	1.125	1.125	1.125
70 Load_In_Percent	1.125	1.125	1.125	1.125	1.125	1.125	1.125	1.125	1.125
80 Load_In_Percent	1.125	1.125	1.125	1.125	1.125	1.125	1.125	1.125	1.125
90 Load_In_Percent	1.125	1.125	1.125	1.125	1.125	1.125	1.125	1.125	1.125
100 Load_In_Percent	1.125	1.125	1.125	1.125	1.125	1.125	1.125	1.125	1.125

LOOK UP TABLES

LOOK UP TABLES --- CNG C/K series Truck

(CNG fulsize G-van lookup tables follow CNG C/K series truck lookup tables)

P0300: Emission Failure Misfire Percentages as a Function of Engine Speed and Load Table: 6.0L (LQ4) Heavy Duty

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	2.5	1	1	1	1	1	1	1	1
10 Load_In_Percent	2.5	1	1	1	1	1	1	1	1
20 Load_In_Percent	2.5	1	1	1	1	1	1	1	1
30 Load_In_Percent	2.5	1	1	1	1	1	1	1	1
40 Load_In_Percent	2.5	1	1	1	1	1	1	1	1
50 Load_In_Percent	1	1	1	1	1	1	1	1	1
60 Load_In_Percent	1	1	1	1	1	1	1	1	1
70 Load_In_Percent	1	1	1	1	1	1	1	1	1
80 Load_In_Percent	1	1	1	1	1	1	1	1	1
90 Load_In_Percent	1	1	1	1	1	1	1	1	1
100 Load_In_Percent	1	1	1	1	1	1	1	1	1

LOOK UP TABLES

LOOK UP TABLES --- CNG C/K series Truck

(CNG fulsize G-van lookup tables follow CNG C/K series truck \ lookup tables)

P0420: Average Base Pulse Width Maximum Allowed Value as a Function of Airflow Table

Airflow in gps	Average BPW in milliseconds
0	6.5
1	6.5
2	6.5
3	6.5
4	6.5
5	6.5
6	6.5
7	6.5
8	6.5
9	6.5
10	6.5
11	6.5
12	6.5
13	6.5
14	6.5
15	6.5
16	6.5

LOOK UP TABLES

LOOK UP TABLES --- CNG C/K series Truck

(CNG fulsize G-van lookup tables follow CNG C/K series truck lookup tables)

P0430: Average Base Pulse Width Maximum Allowed Value as a Function of Airflow Table

Airflow in gps	Average BPW in milliseconds
0	6.5
1	6.5
2	6.5
3	6.5
4	6.5
5	6.5
6	6.5
7	6.5
8	6.5
9	6.5
10	6.5
11	6.5
12	6.5
13	6.5
14	6.5
15	6.5
16	6.5

LOOK UP TABLES

LOOK UP TABLES --- CNG full size Van

(CNG G-van lookup tables

P0101: (Calculated Flow – Measured Flow) Lookup Table

Calculated Airflow	Airflow Delta
Grams_Air_0	6.828125
Grams_Air_40	10.55469
Grams_Air_80	20.46094
Grams_Air_120	24.26563
Grams_Air_160	27.98438
Grams_Air_200	31.61719
Grams_Air_240	35.15625
Grams_Air_280	38.61719
Grams_Air_320	41.98438
Grams_Air_360	45.27344
Grams_Air_400	48.46875

LOOK UP TABLES --- CNG full size Van

(CNG G-van lookup tables

P0106 – Predicted MAP Maximum Look Up Table

	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	72.09961	88.99902	102.998	105	105	105	105	105	105	105	105
1600 RPM	60	75	92.00195	102.998	105	105	105	105	105	105	105
2400 RPM	50	63.99902	77.99805	97.99805	103.999	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	92.99805	102.002	105	105	105	105	105
4800 RPM	32.00195	32.99805	42.99805	57.00195	82.99805	98.99902	102.4023	105	105	105	105
5600 RPM	30	31.00098	38.99902	55	77.99805	95	101.001	105	105	105	105

P0106 – Predicted MAP Minimum Look Up Table

	0 %	10 %	20 %	30 %	40 %	50 %	60 %	70 %	80 %	90 %	100 %
0 RPM	7.998047	10	12.00195	25	43.99902	46.00098	47.00195	47.99805	45	45	40
800 RPM	7.998047	10	12.00195	25	44.70215	46.00098	47.00195	48.19824	45	45	40
1600 RPM	7.998047	10	10	23.99902	43.99902	45.2002	47.00195	48.19824	45	45	40
2400 RPM	7.998047	10	10	19.39941	41.00098	45	45	48.39844	45	45	40
3200 RPM	7.998047	7.998047	7.998047	15	32.99805	42.99805	45	47.99805	45	45	40
4000 RPM	7.998047	7.998047	7.998047	11.00098	26.00098	38.90137	43.99902	45.2002	45	45	40
4800 RPM	7.998047	7.001953	7.001953	10	22.99805	35	42.00195	43.99902	45	45	40
5600 RPM	7.998047	7.001953	7.001953	10	21.69922	32.99805	40	43.99902	45	45	40

LOOK UP TABLES --- CNG full size Van

(CNG G-van lookup tables

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

Eng. Load ↓ / Eng. RPM →	0 RPM	1000 RPM	2000 RPM	3000 RPM	4000 RPM	5000 RPM	6000 RPM	7000 RPM	8000 RPM
0 Load_In_Percent	10.625	10.625	10.625	10.625	10.625	10.625	10.625	10.625	10.625
10 Load_In_Percent	10.625	10.625	10.625	10.625	10.625	10.625	10.625	10.625	10.625
20 Load_In_Percent	10.625	10.625	10.625	10.625	10.625	10.625	10.625	10.625	10.625
30 Load_In_Percent	10.625	10.625	10.625	10.625	9.75	10.625	10.625	10.625	10.625
40 Load_In_Percent	10.625	10.625	10.625	10.625	8.5	10.625	10.625	10.625	10.625
50 Load_In_Percent	10.625	10.625	10.625	10.625	8.5	9.125	9.125	9.125	9.125
60 Load_In_Percent	10.625	10.625	10.625	10.625	8.5	6.5	6.5	6.5	6.5
70 Load_In_Percent	10.625	10.625	10.625	10.625	7	5	5	5	5
80 Load_In_Percent	10.625	10.625	10.625	10.625	5.625	5	5	5	5
90 Load_In_Percent	10.625	10.625	10.625	10.125	5	5	5	5	5
100 Load_In_Percent	10.625	10.625	10.625	9.25	5	5	5	5	5

LOOK UP TABLES --- CNG full size Van

(CNG G-van lookup tables

P0420: Average Base Pulse Width Maximum Allowed Value as a Function of Airflow Table

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

LOOK UP TABLES --- CNG full size Van

(CNG G-van lookup tables

P0420: Average Base Pulse Width Minimum Allowed Value as a Function of Airflow Table

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 --- CNG full size Van

(CNG G-van lookup tables

P0430: Average Base Pulse Width Maximum Allowed Value as a Function of Airflow Table

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

LOOK UP TABLES --- CNG full size Van

(CNG G-van lookup tables

P0430: Average Base Pulse Width Minimum Allowed Value as a Function of Airflow Table

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