2006 5.3L (LM7) PARALLEL HYBRID TRUCK
Powertrain Control Module (PCM)

ENGINE DIAGNOSTIC PARAMETERS

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SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
OUTSIDE AIR TEMPERATURE SENSOR (OATS) OUT OF CORRELATION WITH IATS	B0159	This DTC diagnoses if the OATS ambient temperature reading correlates with the ambient temperature predicted from the IATS.	Min_OAT – Max_IAT > 10C during Correlation Measurement Interval & OAT increases ≤ 10 C during False Failure Prevention Interval	Test Enable Criteria Following faults are not active: P0112-IAT Sensor Circuit Low Voltage P0113-IAT Sensor Circuit High Voltage P0502-VSS Circuit No Activity P0503-VSS Circuit Intermittent P2610-Control Module Ignition Off Timer Performance Powerup IAT ≥ -7C No HVAC Controller OATS out-of-range faults. No Loss of Communication with HVAC Controller. Ignition Off Soak Period ≥ 10 hours Correlation Measurement Interval 0 < Engine Run Time ≤ 10 seconds False Failure Prevention Interval Cumulative Time (with VSS ≥ 20 mph) ≤ 300 seconds	Non-continuous: 1 per trip Sample Rate: 1 sample / 1 sec	DTC type C
Rear Wheel Speed Signal	C003D	This diagnostic detects if the ABS is indicating a rear wheel speed signal fault for PCM skid signal	ABS controller sends a message to PCM indicating that a failure has occurred in the ABS module	When PCM and ABS are powered	Continuous	DTC Type C (DTC sets when P0856 is active)
Tire Diameter Mis-match	C0078	This diagnostic detects if the ABS is indicating a tire diameter mis-match condition for PCM skid signal	ABS controller sends a message to PCM indicating that a failure has occurred in the ABS module	When PCM and ABS are powered	Continuous	DTC Type C (DTC sets when P0856 is active)
ABS ECU Performance	C0550	This diagnostic detects if the ABS is indicating a performance fault for PCM skid condition	ABS controller sends a message to PCM indicating that a failure has occurred in the ABS module	When PCM and ABS are powered	Continuous	DTC Type C (DTC sets when P0856 is active)
(B1S1) HEATED OXYGEN SENSOR HEATER CONTROL CIRCUIT	P0030	This DTC checks the Heater Output Driver circuit for electrical integrity.	Output state shorted or open.	10 > Ignition Voltage > 18 Volts	5 failures out of 12 samples 500ms loop continuous	DTC Type B
(B1S2) HEATED OXYGEN SENSOR HEATER CONTROL CIRCUITB	P0036	This DTC checks the Heater Output Driver circuit for electrical integrity.	Output state shorted or open.	10 > Ignition Voltage > 18 Volts	5 failures out of 12 samples 500ms loop continuous	DTC Type B

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(B2S1) HEATED OXYGEN SENSOR HEATER CONTROL CIRCUIT	P0050	This DTC checks the Heater Output Driver circuit for electrical integrity.	Output state shorted or open.	10 > Ignition Voltage > 18 Volts	5 failures out of 12 samples 500ms loop continuous	DTC Type B
(B1S1) HEATED OXYGEN SENSOR HEATER RESISTANCE	P0053	Out-Of-Range (OOR) Resistance: Detects an oxygen sensor heater having an incorrect or (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
(B2S2) HEATED OXYGEN SENSOR HEATER CONTROL CIRCUIT	P0056	This DTC checks the Heater Output Driver circuit for electrical integrity.	Output state shorted or open.	10 > Ignition Voltage > 18 Volts	5 failures out of 12 samples 500ms loop continuous	DTC Type B
(B2S1) HEATED OXYGEN SENSOR HEATER RESISTANCE	P0059	Out-Of-Range (OOR) Resistance: Detects an oxygen sensor heater having an incorrect or (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

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(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 Crank sensor DTC's not active System voltage > 11V but < 18V Canister Purge DC ≤ 100% 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 Running Engine Speed ≥ 400 RPM System Voltage ≥ 8 volts The above must be present for a period of time greater than 1 seconds	*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

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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 Running Engine Speed ≥ 400 RPM System Voltage ≥ 8 volts The above must be present for a period of time greater than 1 seconds	*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 DTC's not active TP sensor DTC's not active IAC DTC's 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	TP sensor DTC's not active 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/100 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	Cold Start Run Time – Table value in seconds based on Powerup Coolant Temperature ***Run Test*** TP sensor DTC's not active Engine Running 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/100 ms	DTC Type B

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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 < 0.03515 Volts	ECT sensor DTC's not active VS 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	MAF sensor DTC's not active 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	ECT – IAT > 15°C	Soak time > 10 hours IAT > 15°C IAT drop <3°C Vehicle Speed >15mph for 400 seconds	Immediate when enable conditions are met	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 Engine run time < 10 seconds IAT < 50° C	45 test failures in a 50 test sample. 1 sample/500 ms	DTC Type B
ENGINE COOLANT TEMP SENSOR CIRCUIT HIGH (LOW TEMP)	P0118	Circuit Continuity This DTC detects a continuous short to high or open in the ECT signal circuit or the ECT sensor.	Low Resistance Pull-up Raw ECT > 4.94 Volts High Resistance pull-up Raw ECT > 4.96 Volts	Engine run time > 60 seconds Or Engine run time < 60 seconds IAT > 0° C	45 test failures in a 50 test sample. 1 sample/500 ms Continuous	DTC Type B

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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

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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 55°C when IAT is ≤ 10°C but ≥ -7°C.	No MAF, MAP, TP Sensor, IAT, ECT shorted or open, VSS, ECT High Sided Rationality, or Fuel Compensation faults active ECT shorted or open faults not failing IAT ≥ -7°C 90 seconds ≤ Engine runtime ≤ 1370 seconds Fuel ethanol percent ≤ 87% ECT at startrun ≤ 70°C for IAT above 10°C; ECT at startrun ≤ 50°C for IAT ≤ 10°C but ≥ -7°C Minimum Average Airflow ≥ 10 gps Vehicle speed ≥ 5 MPH for at least 1.50 miles Maximum airflow added to actual accumulated airflow limited to 75 gps Airflow added to actual accumulated airflow is considered 0 gps below an actual 20 gps.	30 failures to set DTC <u>Frequency:</u> Once per ignition cycle 1 second loop	DTC Type B
(B1S1) HEATED OXYGEN SENSOR CIRCUIT LOW	P0131	Circuit Continuity Detects a HO2S voltage stationary lean (low signal voltage) condition.	Oxygen sensor voltage < 200 mV <OR> In PE Oxygen sensor voltage < 360 mV	Closed Loop Fuel Control. TPS: 3-70% Fuel > 10% 10 V < System Voltage < 18 V Ethanol % < 90 Above conditions met for 2 sec No AIR, EGR, Throttle, MAT, Injector, Coolant, Air Flow, Purge Control, MAP, Fuel Composition or Engine Protect faults active. Power Enrichment active 1 sec Fuel > 10% Ethanol % < 90 10 V < System Voltage < 18V Engine runtime > 30 sec No AIR, EGR, Throttle, MAT, Injector, Coolant, Air Flow, Purge Control, Misfire, MAP, Fuel Composition or Engine Protect faults active.	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

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(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 > 75 mV	Closed Loop Fuel Control. TPS: 3-70% Fuel > 10% 10 V < System Voltage < 18V Ethanol % < 90 Above conditions met for 2 sec No AIR, EGR, Throttle, MAT, Injector, Coolant, Air Flow, Purge Control, MAP, Fuel Composition or Engine Protect faults active. Decel Fuel Cut Off active 8 sec Fuel > 10% 10 V < System Voltage < 18 V Ethanol % < 90 Engine runtime > 30 sec No AIR, EGR, Throttle, MAT, Injector, Coolant, Air Flow, Purge Control, MAP, Fuel Composition or Engine Protect faults active.	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 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	Closed Loop Fuel Control Engine runtime > 160 sec 1200 < RPM < 3000 20 < Air Flow < 55g/s. 10 V < System Voltage < 18V TPS > 5% Fuel > 10% ECT > 60 °C CCP > 0 Ethanol % < 90 -1280 ºC < Predicted Oxygen Sensor Temp < 1280 ºC Above conditions met for 1 sec DTC's P0131, P0132, P0134 and P0135 not set No AIR, EGR, Throttle, MAT, Injector, Coolant, Air Flow, Purge Control, MAP, Fuel Composition or Engine Protect faults active.	100 sec Once per trip.	DTC Type B

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(B1S1) HEATED OXYGEN SENSOR CIRCUIT NO ACTIVITY	P0134	Circuit Continuity Detects a HO2S circuit open.	350 mV < B1S1 voltage < 550 mV	Engine runtime > 300 sec 10 V < System Voltage < 18V Ethanol % < 90 No AIR, EGR, Throttle, MAT, Injector, Coolant, Air Flow, Purge Control, MAP, Engine Protection or Fuel Composition faults active.	570 failures out of 600 samples 100 ms/sample Continuous.	DTC Type B
(B1S1) HEATED OXYGEN SENSOR HEATER CIRCUIT	P0135	Detects a malfunctioning HO2S heater circuit by monitoring the current through the circuit	0.25 A < Heater Current < 3.125 A	10 V < System Voltage < 18 V Coolant > 50 ºC 3 g/s < Airflow < 40 g/s Device control not active Engine runtime > 120 sec 500 < RPM < 3000 Ethanol % < 90 No AIR, EGR, Throttle, MAT, Injector, Coolant, Air Flow, Purge Control, MAP, Engine Protect or Fuel Composition faults active. DTC P0053 not set.	8 failures out of 10 samples Frequency: 1 times per key cycle	DTC Type B
(B1S2) HEATED OXYGEN SENSOR POSD	P0136	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 25.4 seconds.	Stage1 – Passive Test: Engine runtime > 2 sec Stage2 – Intrusive Test: Closed Loop Fuel Control Engine runtime > 810 sec 5 < Airflow < 55 g/s 10 V < System Voltage < 18V 900 < Engine Speed < 5000 RPM 15 < Vehicle speed < 82 mph 0.90 < Short Term Integrator < 1.10 Above conditions met for 1 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 25.4 sec. Maximum of 12 Stage2 attempts (aborts). Once per trip	DTC Type B

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(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	Closed Loop Fuel Control. TPS: 3-70% Fuel > 10% 10 V < System Voltage < 18 V Ethanol % < 90 Above conditions met for 2 sec No AIR, EGR, Throttle, MAT, Injector, Coolant, Air Flow, Purge Control, MAP, Engine Protect or Fuel Composition faults active. Power Enrichment active 2 sec Fuel > 10% 10 V < System Voltage < 18V Ethanol % < 90 Engine runtime > 30 sec No AIR, EGR, Throttle, MAT, Injector, Coolant, Air Flow, Purge Control, MAP, Engine Protect or Fuel Composition faults active.	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 > 75 mV	Closed Loop Fuel Control. TPS: 3-70% Fuel > 10% 10 V < System Voltage < 18 V Ethanol % < 90 Above conditions met for 2 sec No AIR, EGR, Throttle, MAT, Injector, Coolant, Air Flow, Purge Control, MAP, Engine Protect or Fuel Composition faults active. Decel Fuel Cut Off active 8 sec Fuel > 10% Ethanol % < 90 10 V < System Voltage < 18 V Engine runtime > 30 sec No AIR, EGR, Throttle, MAT, Injector, Coolant, Air Flow, Purge Control, MAP, Engine Protect or Fuel Composition faults active.	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

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(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	Engine runtime > 300 sec Closed Loop Fuel Control. 10 V < System Voltage < 18 V Ethanol % < 90 5% Δ TPS within 1 sec, 6 times DTC P0141 not Active DTC P0054 not Active No AIR, EGR, Throttle, MAT, Injector, Coolant, Air Flow, Purge Control, MAP, Engine Protect or Fuel Composition faults active. 10 V < System Voltage < 18 V Ethanol % < 90 Engine runtime < 200 sec DTC P0141 not Active DTC P0054 not Active No AIR, EGR, Throttle, MAT, Injector, Coolant, Air Flow, Purge Control, MAP, Engine Protect or Fuel Composition faults 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	Detects a malfunctioning HO2S heater circuit by monitoring the current through the circuit	0.25 A < Heater Current < 3.125 A	10 V < System Voltage < 18 V. Coolant > 50 ºC 3 g/s < Airflow < 40 g/s Device control not active Engine runtime > 120 sec 500 < RPM < 3000 Ethanol % < 90 No AIR, EGR, Throttle, MAT, Injector, Coolant, Air Flow, Purge Control, MAP, Engine Protect or Fuel Composition faults active. DTC P0053 not set.	8 failures out of 10 samples Frequency: 1 times per key cycle	DTC Type B

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(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	Closed Loop Fuel Control. TPS: 3-70% Fuel > 10% 10 V < System Voltage < 18 V Ethanol % < 90 Above conditions met for 2 sec No AIR, EGR, No Throttle, MAT, Injector, Coolant, Air Flow, Purge Control, MAP, Engine Protect or Fuel Composition faults active. Power Enrichment active 1 sec Fuel > 10% Ethanol % < 90 10 V < System Voltage < 18 V Engine runtime > 30 sec No AIR, EGR, Throttle, MAT, Injector, Coolant, Air Flow, Purge Control, MAP, Fuel Composition or Engine Protect faults active.	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 > 75 mV	Closed Loop Fuel Control. TPS: 3-70% Fuel > 10% 10 V < System Voltage < 18 V Ethanol % < 90 Above conditions met for 2 sec No AIR, EGR, Throttle, MAT, Injector, Coolant, Air Flow,, Purge Control, MAP, Engine Protect or Fuel Composition faults active. Decel Fuel Cut Off active 8 sec Fuel > 10% 10 V < System Voltage < 18 V Ethanol % < 90 Engine runtime > 30 sec No AIR, EGR, Throttle, MAT, Injector, Coolant, Air Flow, Purge Control, MAP, Fuel Composition or Engine Protect faults active.	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 45 failures out of 50 samples 100 ms/sample Continuous	DTC Type B

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(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	Closed Loop Fuel Control Engine runtime > 160 sec 1200 < RPM <3000 20 < Air Flow < 55 g/s 10 V < System Voltage < 18 V TPS > 5% Fuel > 10% ECT > 60 °C CCP > 0 Ethanol % < 90 -1280 ºC < Predicted Oxygen Sensor Temp < 1280 ºC Above conditions met for 1 sec DTC's P0151, P0152, P0154 and P0155 not set No AIR, EGR, Throttle, MAT, Injector, Coolant, Air Flow, Purge Control, MAP, Engine Protect or Fuel Composition faults active.	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	Engine runtime > 300 sec 10 V < System Voltage < 18 V Ethanol % < 90 No AIR, EGR, Throttle, MAT, Injector, Coolant, Air Flow,, Purge Control, MAP, Engine Protect or Fuel Composition faults active.	570 failures out of 600 samples. 100 ms/sample Continuous	DTC Type B
(B2S1) HEATED OXYGEN SENSOR HEATER CIRCUIT	P0155	Detects a malfunctioning HO2S heater circuit by monitoring the current through the circuit	0.25 A < Heater Current < 3.125 A	10 V < System Voltage < 18 V Coolant > 50 ºC 3 g/s < Airflow < 40 g/s Device control not active Engine runtime > 120 sec 500 < RPM < 3000 Ethanol % < 90 No AIR, EGR, Throttle, MAT, Injector, Coolant, Air Flow,, Purge Control, MAP, Engine Protect or Fuel Composition faults active. DTC P0053 not set	8 failures out of 10 samples Frequency: 1 times per key cycle	DTC Type B

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SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
(B1S2) HEATED OXYGEN SENSOR POSD	P0156	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 25.4 seconds.	Stage1 – Passive Test: Engine runtime > 2 sec Stage2 – Intrusive Test: Closed Loop Fuel Control Engine runtime > 810 sec 5 < Airflow < 55 g/s 10 V < System Voltage < 18V 900 < Engine Speed < 5000 RPM 15 < Vehicle speed < 82 mph 0.90 < Short Term Integrator < 1.10 Above conditions met for 1 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 25.4 sec. Maximum of 12 Stage2 attempts (aborts). Once per trip	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	Closed Loop Fuel Control. TPS: 3-70% Fuel > 10% 10 V < System Voltage < 18 V Ethanol % < 90 Above conditions met for 2 sec No AIR, EGR, Throttle, MAT, Injector, Coolant, Air Flow, Purge Control, MAP, Engine Protect or Fuel Composition faults active. Power Enrichment active 2 sec Fuel > 10% Ethanol % < 90 10 V < System Voltage < 18 V Engine runtime > 30 sec No AIR, EGR, Throttle, MAT, Injector, Coolant, Air Flow, Purge Control, MAP, Engine Protect or Fuel Composition faults active.	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

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SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
(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 > 75 mV	Closed Loop Fuel Control. TPS: 3-70% Fuel > 10% Ethanol % < 90 10 V < System Voltage < 18 V Above conditions met for 2 sec No AIR, EGR, Throttle, MAT, Injector, Coolant, Air Flow, Purge Control, MAP, Engine Protect or Fuel Composition faults active. Decel Fuel Cut Off active 8 sec Fuel > 10% Ethanol % < 90 10 V < System Voltage < 18 V Engine runtime < 30 sec No AIR, EGR, Throttle, MAT, Injector, Coolant, Air Flow Purge Control, MAP, Engine Protect or Fuel Composition faults active.	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	Engine runtime > 300 sec Closed Loop Fuel Control. 10 V < System Voltage < 18 V Ethanol % < 90 5% Δ TPS within 1 sec, 6 times DTC P0161 not Active DTC P0060 not Active No AIR, EGR, Throttle, MAT, Injector, Coolant, Air Flow, Purge Control, MAP, Engine Protect or Fuel Composition faults active. 10 V < System Voltage < 18 V Ethanol % < 90 Engine runtime < 200 sec DTC P0161 not Active DTC P0060 not Active No AIR, EGR, Throttle, MAT, Injector, Coolant, Air Flow, Purge Control, MAP, Engine Protect or Fuel Composition faults 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

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(B2S2) HEATED OXYGEN SENSOR HEATER CIRCUIT	P0161	Detects a malfunctioning HO2S heater circuit by monitoring the current through the circuit	0.25 A < Heater Current < 3.125 A	10 V < System Voltage < 18 V Coolant > 50 ºC 3 g/s < Airflow < 40 g/s Device control not active Engine runtime > 120 sec 500 < RPM < 3000 Ethanol % < 90 No AIR, EGR, Throttle, MAT, Injector, Coolant, Air Flow, Purge Control, MAP, Engine Protect or Fuel Composition faults active. DTC P0053 not set	8 failures out of 10 samples Frequency: 1 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 B1S1 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

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SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
BANK 1 FUEL TRIM SYSTEM RICH	P0172	Determines if the fuel control system is in a rich condition	The EWMA of long term fuel trim (LTM) samples $\leq$ 0.825 Once the above occurs, purge is ramped off to determine if excess purge is the cause. Therefore, the following must also occur to report a failure: The EWMA of LTM samples with purge off $\leq$ 0.83 for at least 2 seconds during each of 3 intrusive segments. General Notes: 1. At least 24 seconds of data must accumulate on each trip before the EWMA of LTM samples is considered usable and at least 15 seconds of data in the current fuel trim cell must accumulate on each trip before the LTM for that cell is considered usable in the EWMA calculation. Intrusive Notes: 1. Segments can last up to 16 seconds, and are separated by the smaller of a 30 second purge-on time or enough time to purge 18 grams of vapor. 2. A maximum of 5 completed segments are allowed for each intrusive test, and up to 20 intrusive attempts allowed per trip. 3. After an intrusive test report is completed, another intrusive test cannot occur for 300 seconds to allow sufficient time to purge excess vapors from the canister. During this period, fuel trim will pass if the EWMA of LTM samples $\geq$ 0.83 for at least 60 seconds, indicating that the canister has been purged. Performing intrusive tests too frequently may also affect EVAP and FTP emissions, and the	• No Misfire DTC's • No B1S1 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 $\leq$ 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

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SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
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 B2S1O2 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

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SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
BANK 2 FUEL TRIM SYSTEM RICH	P0175	Determines if the fuel control system is in a rich condition	The EWMA of long term fuel trim (LTM) samples $\leq$ 0.825 Once the above occurs, purge is ramped off to determine if excess purge is the cause. Therefore, the following must also occur to report a failure: The EWMA of LTM samples with purge off $\leq$ 0.83 for at least 2 seconds during each of 3 intrusive segments. General Notes: 1. At least 24 seconds of data must accumulate on each trip before the EWMA of LTM samples is considered usable and at least 15 seconds of data in the current fuel trim cell must accumulate on each trip before the LTM for that cell is considered usable in the EWMA calculation. Intrusive Notes: 3. Segments can last up to 16 seconds, and are separated by the smaller of a 30 second purge-on time or enough time to purge 18 grams of vapor. 4. A maximum of 5 completed segments are allowed for each intrusive test, and up to 20 intrusive attempts allowed per trip. 5. After an intrusive test report is completed, another intrusive test cannot occur for 300 seconds to allow sufficient time to purge excess vapors from the canister. During this period, fuel trim will pass if the EWMA of LTM samples $\geq$ 0.83 for at least 60 seconds, indicating that the canister has been purged. Performing intrusive tests too frequently may also affect EVAP and FTP emissions, and the execution frequency of other diagnostics.	• No Misfire DTC's • No B2S1 O2 Sensor DTC's • No EVAP DTC's • No Fuel Injector DTC's • No Fuel Composition DTC's • No IAC, MAF, or MAP DTC's • Engine speed > 400 rpm but < 6500 rpm • BARO > 70 kpa • ECT > -40°C but < 139°C • MAP > 15 kpa but < 105 kpa • IAT > -20 °C but < 152°C • Mass Airflow > 1.0 g/s but < 250 g/s • Vehicle speed < 82 mph • Long Term Fuel Trim Learning enabled • CCP DC ≤ 8% when canister vent is closed • Closed Loop Reset not active. Intrusive Enable Criteria 4. The EWMA of long term fuel trim (LTM) samples $\leq$ 0.825 5. RPM > 375 6. Mass Airflow > 3 g/s but < 250 g/s 7. 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

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SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
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

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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 = 2.125% 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, ETC, MAP, ECT, CMP, IAT and MAF sensors. • No engine protection faults. • P0315 (Crankshaft Position System Variation Not Learned) not active or engine speed < 1000 RPM. • Fuel cutoff not active. • Power management is not active. • Brake torque management not active. • Fuel level > 10% (disablement ends 500 after a low fuel level condition ceases, and fuel disable does not occur with a fuel sensor DTC). • -7°C < ECT < 130°C. • If ECT at startup < -7°C, then disable until ECT > 21°C. • 375 RPM < Engine speed < 5600 RPM. • 11 volts < System voltage < 18 volts. • + Throttle position delta < 50% per 100 ms. • - Throttle position delta < 50% per 100 ms. • Abnormal engine speed is not present. • ABS rough road not detected. • ABS is not active. • Positive and zero torque (except the CARB approved 3000 rpm to redline triangle). Positive and zero torque is detected when both is true: 1) engine load > zero torque cal (cal a function of engine speed and temperature), and 2) TPS > 1 or VSS < 30. • 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. <u>Frequency:</u> Continuous	DTC Type B (MIL Flashes with Catalyst Damaging Misfire)
CRANKSHAFT POSITION SYSTEM VARIATION NOT LEARNED	P0315	Monitor for valid crankshaft error compensation factors	Factors are considered NOT valid if the factor sum is greater than 4.001 or less than 3.999	OBD Manufacturer Enable Counter = 0	100 ms/test	DTC Type A

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KNOCK SENSOR CIRCUIT	P0325	Check knock detector integrated circuit.	Instant noise level greater than a defined value or instantaneous knock signal greater than 254 counts for a defined time.	To run test: 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	To run test: No Coolant Sensor DTC's No TP sensor DTC's 1500 < engine rpm < 3000 Coolant temp > 60° C 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	To run test: No Coolant Sensor DTC's No TP sensor DTC's 1500 < engine rpm < 3000 Coolant temp > 60° C Engine run time > 10 sec Ignition voltage > 10 Volts	24 failed tests within 30 tests. Each test is 25 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 ≥ 0 No Cam Position Sensor DTC's No Airflow DTC's PCM state = READY or CRANK	7 test failures in a 10 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/test 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	15 Failures out of 100 100 ms/test 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	15 Failures out of 50 100 msec / test 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	15 Failures out of 50 100 msec / test Continuous	DTC Type B

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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	10 Volts < Ignition Voltage < 18 Volts	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	10 Volts < Ignition Voltage < 18 Volts	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	10 Volts < Ignition Voltage < 18 Volts	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	10 Volts < Ignition Voltage < 18 Volts	30 Failures out of 100 500 msec / test Continuous	DTC Type B

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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	10 Volts < Ignition Voltage < 18 Volts	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	10 Volts < Ignition Voltage < 18 Volts	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	10 Volts < Ignition Voltage < 18 Volts	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	10 Volts < Ignition Voltage < 18 Volts	30 Failures out of 100 500 msec / test Continuous	DTC Type B

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SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
CATALYTIC CONVERTER LOW OXYGEN STORAGE BANK 1 (B1)	P0420	Oxygen Storage Capacity (OSC) (Stored Oxygen Release Monitor)	OSC Mass EWMA ≤ B1 = 0.350098 grams Air OSC Period = HO2S2 Resp Time – HO2S1 Resp Time – Inert Catalyst Transport Delay. OSC Mass = ∫{ MAF(Bank,t) * [EquivalenceRatio(t)/FuelTrim LT – 1]}∂t, t=0 to OSC Period. Normalized OSC Mass = OSC Mass *Catalyst Temperature Compensation Factor. OSC Mass EWMA(n) = OSC Mass EWMA(n-1) + EWMAcoef* { Normalized OSC Mass(n) – OSC Mass EWMA(n-1)} OSC Worst Pass Thresh = B1 = 0.69902 grams Air	Trip Enable Criteria No VSS, Throttle, Purge control, Purge Circuit, Oxygen sensor, Misfire, MAT, MAP, Injector, ESC Control, Coolant, Crank sensor, Cam sensor, Air flow, IAC, or Fuel trim DTC's failing Test Enable Conditions 420 C ≤ Predicted Catalyst Temperature ≤ 680 C Min learn enable time for stable BLM & PLM ≥ 80 sec Barometric Pressure ≥ 74 kPa -7 ≤ IAT ≤ 85°C 75°C ≤ ECT ≤ 120°C Tests Attempted this trip < 55 Tests Attempted this DFCO period < 1 AC Clutch is stable during measurement Gear is stable during measurement Valid DFCO Period Criteria Trip & Test Enable Criteria Met DFCO Period ≥ 0.8 sec HO2S1 ≤ 100 mV (prior to DFCO exit) HO2S2 ≤ 100 mV for 1.6 sec (prior to DFCO exit) Valid DFCO Exit Period Criteria Trip & Test Enable Criteria Met Step-in TPS ≥ 3.008 % TPS travel < 20 % Equivalence Ratio ≥ 1.00 Test Completion Criteria HO2S1 ≥ 600 mV & HO2S2 ≥ 230 mV HO2S2 Resp Time – HO2S1 Resp Time ≤ 3.2 sec Fast Initial Response Criteria Test has not reported as Passed or Failed yet. Rapid Step Response (RSR) Enable Criteria Min OSC Change For RSR ≥ B1 = 0.199951 grams Normalized OSC Mass ≤ 0.648438 grams All 2004 applications for small block trucks – use material burnoff delay algorithm. Diagnostic will not enable until the next ignition cycle after the following has been met, predicted catalyst temperature ≥ 428° C for 0.5 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)	1 test attempted per exit from valid deceleration fuel cut-off (DFCO) period Minimum of 1 test per trip. Fast Initial Response(FIR) or Rapid Step Response(RSR) Maximum of 18 tests per trip. Maximum of 6 trips to detect failure when Rapid Step Response is enabled frequency: 12.5 ms continuous	DTC Type A

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CATALYTIC CONVERTER LOW OXYGEN STORAGE BANK 2 (B2)	P0430	Oxygen Storage Capacity (OSC) (Stored Oxygen Release Monitor)	OSC Mass EWMA ≤ B2 = 0.350098 grams Air OSC Period = HO2S2 Resp Time – HO2S1 Resp Time – Inert Catalyst Transport Delay. OSC Mass = ∫{ MAF(Bank,t) * [EquivalenceRatio(t)/FuelTrim LT – 1]}∂t, t=0 to OSC Period. Normalized OSC Mass = OSC Mass *Catalyst Temperature Compensation Factor. OSC Mass EWMA(n) = OSC Mass EWMA(n-1) + EWMAcoef* { Normalized OSC Mass(n) – OSC Mass EWMA(n-1)} OSC Worst Pass Thresh = B2 = 0.69902 grams Air	Trip Enable Criteria No VSS, Throttle, Purge control, Purge Circuit, Oxygen sensor, Misfire, MAT, MAP, Injector, ESC Control, Coolant, Crank sensor, Cam sensor, Air flow, IAC, or Fuel trim DTC's failing Test Enable Conditions 420 C ≤ Predicted Catalyst Temperature ≤ 680 C Min learn enable time for stable BLM & PLM ≥ 80 sec Barometric Pressure ≥ 74 kPa -7 ≤ IAT ≤ 85°C 75°C ≤ ECT ≤ 120°C Tests Attempted this trip < 55 Tests Attempted this DFCO period < 1 AC Clutch is stable during measurement Gear is stable during measurement Valid DFCO Period Criteria Trip & Test Enable Criteria Met DFCO Period ≥ 0.8 sec HO2S1 ≤ 100 mV (prior to DFCO exit) HO2S2 ≤ 100 mV for 1.6 sec (prior to DFCO exit) Valid DFCO Exit Period Criteria Trip & Test Enable Criteria Met Step-in TPS ≥ 3.008 % TPS travel < 20 % Equivalence Ratio ≥ 1.00 Test Completion Criteria HO2S1 ≥ 600 mV & HO2S2 ≥ 230 mV HO2S2 Resp Time – HO2S1 Resp Time ≤ 3.2 sec Fast Initial Response Criteria Test has not reported as Passed or Failed yet. Rapid Step Response (RSR) Enable Criteria Min OSC Change For RSR ≥ B2 = 0.19995 grams Normalized OSC Mass ≤ 0.648438 grams All 2004 applications for small block trucks – use material burnoff delay algorithm. Diagnostic will not enable until the next ignition cycle after the following has been met, predicted catalyst temperature ≥ 428° C for 0.5 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)	1 test attempted per exit from valid deceleration fuel cut-off (DFCO) period Minimum of 1 test per trip. Fast Initial Response(FIR) or Rapid Step Response(RSR) Maximum of 18 tests per trip. Maximum of 6 trips to detect failure when Rapid Step Response is enabled frequency: 12.5 ms continuous	DTC Type A

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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 DTC will also be set if the fuel tank vacuum sensor is out of range when it tries to re-zero prior to test phase-1 or test phase-2. The DTC will also be set if the refueling rationality test is failed.	***SMALL LEAK TEST FAIL:*** Engine Off Natural Vacuum 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 between 1.5" water and 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 Vacuum sensor out of range <1.3 volts or >1.7 volts. Vacuum sensor out of range is reported as a perfect fail to the EWMA.	***TEST ENABLE :*** VS Sensor DTC's not active Coolant Sensor DTC's not active IAT Sensor DTC's not active EVAP Vac 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% Valid Cold Start ECT > 3.75°C but < 30° C IAT > 3.75°C but < 30° C Cold Temp Δ°C(ECT-IAT) < 8.25°C if ECT > IAT BARO > 74.0 kPa Estimated ambient temperature at end of drive > 2^{o}C but < 32^{o}C. Drive time >= 10 minutes. Drive length >= 3 miles. Coolant >= 70^{o}C. No fuel filling (fuel level increment >= 10%).	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
EVAP CANISTER PURGE SOLENOID VALVE CIRCUIT (ODM)	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. Ignition voltage > 10.0 volts, but < 18 volts	5 seconds. (10 Test Failures out of 100 Test Samples) 1 Test Sample/500 ms continuous.	DTC Type B

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EVAP CANISTER VENT BLOCKED	P0446	This DTC will determine if a restriction is present in the vent solenoid, vent filter, vent hose or canister.	***EXCESS VACUUM TEST - STAGE I :*** Vent solenoid **commanded** OPEN Fuel Tank Vacuum ≥ 7 in. H_2O for 2 seconds(monitored during initial purge ramp) **OR** ***EXCESS VACUUM TEST - STAGE II :*** Vent solenoid **commanded** OPEN during normal purge. Fuel Tank Vacuum ≥ 9.0 in. H_2O for a time ≥ 23 seconds **OR** Vented Vacuum =< -2.5 in. H_2O or Vented Vacuum => 5.0 in H_20 For 3 seconds after cold-start key-up.	***TEST ENABLE :*** MAP DTC's not active Volt-DTC's not active TP Sensor DTC's not active VS Sensor DTC's not active Coolant Sensor DTC's not active O2 Sensor DTC's not active IAT Sensor DTC's not active Fuel Level >15.0% but < 85.0% PLM > .89 System Voltage > 10V but < 18V ***COLD START TEST:*** ECT > 3.75°C but < 30° C IAT > 3.75°C but < 30° C Cold Temp Δ°C(ECT - IAT)<8.25°C if ECT > IAT BARO > 74.0 kPa ***WEAK VACUUM TEST -Stage I***: Tank Vacuum ≥ 9 in. H_2O within a value 40 integral seconds.	***EXCESS VACUUM TEST - STAGE II :*** 180 seconds Once per cold start at: • Power-up • Excess Vac. Stage I • Excess Vac. Stage II Test must complete within 360, **420** ,460, 525, or 600 seconds from when purge is enabled, Depending on application	DTC Type A
EVAP VENT SOLENOID CONTROL CIRCUIT (ODM)	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. Ignition voltage > 10.0 volts, but < 18 volts	5 seconds Continuous.	DTC Type B
EVAP SYSTEM PRESSURE LOW	P0452	This DTC will detect a vacuum sensor stuck low	tank vacuum raw voltage < 0.1 volt for 5 seconds	***runs continuously after a 1 second delay for sensor warm-up***	Continuous 100ms loop	DTC Type B
EVAP SYSTEM PRESSURE HIGH	P0453	This DTC will detect a vacuum sensor stuck hi	tank vacuum raw voltage >4.90 volt for 5 seconds	***runs continuously after a 1 second delay for sensor warm-up***	Continuous 100ms loop	DTC Type B

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EVAP. Emission Control System Malfunction	P0455	This DTC will detect a weak vacuum condition (large leak or restriction) in the EVAP. system.	***WEAK VACUUM TEST- STAGE I (Cold Test):*** Tank Vacuum < 11 in. H_2O for a time greater than (30-80 integral seconds) depending on application. ***WEAK VACUUM TEST- STAGE II PASS CRITERIA(Warm Test):*** Stage I test failed previous trip and this trip. Passes if Tank Vac. > 11 in. H_2O Note: Stage II can only report a pass	***TEST ENABLE :*** MAP DTC's not active Volt-DTC's not active TP Sensor DTC's not active VS Sensor DTC's not active O2 Sensor DTC's not active Coolant Sensor DTC's not active IAT Sensor DTC's not active Fuel Level >15.0% but < 85.0% Power-up Vacuum Test Fail = False PLM > .89 System Voltage > 10V but < 18V ***COLD START TEST:*** ECT > 3.75°C but < 30° C IAT > 3.75°C but < 30° C Cold Temp Δ°C(ECT - IAT)<8.25°C if ECT > IAT BARO > 74.0 kPa	***WEAK VACUUM TEST- STAGE I (Cold Test):*** Fault present for an integral time ≥ 50, or 70sec. depending on application. Test must complete within 360, 420 ,460, 525, or 600 seconds from when purge is enabled, Depending on application ***WEAK VACUUM TEST- STAGE II (Warm Test):*** Fault present for a time ≥ 1400 sec. This is the maximum test time length. Once per cold start	DTC Type A (Behaves as a Type B)
Fuel Level No Change, Stuck in Range	P0461	This DTC will detect a fuel sender stuck in range .	IF Delta Fuel Volume change less than 3 liters over a accumulated 150 miles.	runs continuously		DTC Type C No Light
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	1 Test Sample/500ms	DTC Type C No Light
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	1 Test Sample/500ms	DTC Type C No Light
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

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SECONDARY COOLING FAN RELAY CONTROL CIRCUIT MALF	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.	***PURGE VALVE LEAK TEST:*** Purge Valve closed TP > 0% but < 100% Engine Vacuum ≥ 25 kPa Tank Vacuum ≥ 12 in. H_2O for2 sec within ≤ 37.5 seconds after 30 second delay.	***TEST ENABLE :*** MAP DTC's not active Volt-DTC's not active TP Sensor DTC's not active VS Sensor DTC's not active O2 Sensor DTC's not active Coolant Sensor DTC's not active IAT Sensor DTC's not active Fuel Level >15.0% but < 85.0% PLM > .89 System Voltage > 10V but < 18V ***COLD START TEST:*** ECT > 3.75°C but < 30° C IAT > 3.75°C but < 30° C Cold Temp Δ°C(ECT - IAT)<8.25°C if ECT > IAT BARO >74.0 kPa ***EXCESS VACUUM TEST -STAGE I :*** Vent solenoid **commanded** OPEN Fuel Tank Vacuum < 7 in. H_2O ***WEAK VACUUM TEST -Stage I*** : Throttle position < 75% Vehicle speed < 75 mph Tank Vacuum ≥ 9 in. H_2O within a value 40 integral seconds…	***PURGE VALVE LEAK TEST:*** 180 seconds Max. Once per cold start	DTC Type B

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IDLE SYSTEM - LOW ENGINE SPEED	P0506	Determines if a low idle is a result of an engine mechanical problem. Low RPM is 100 RPM below desired	Idle > 100 RPM low from desired	**Passive:** No MAF, MAP, IAT, ECT, TP, Injector, Fuel System, Misfire, EGR, VSS or Purge DTC Engine Run > 60 sec. ECT ≥ 60 ° C BARO > 65 kPa IGN. voltage > 9 & < 18 volts IAT > -10 ° C TP < 0.74% VS ≤ 1 MPH Time > 5 seconds to fail. > 8 seconds to pass	**Passive:** Must be outside the fail criteria continuously for 5 seconds. Must be within pass criteria for 8 seconds continuously.	DTC Type B
IDLE SYSTEM - HIGH ENGINE SPEED	P0507	Determines if a high idle is a result of an engine mechanical problem. High RPM is 200 RPM above desired	Idle > 200 RPM high from desired	No MAF, MAP, IAT, ECT, TP, Injector, Fuel System, Misfire, EGR, VSS or Purge DTC Engine Run > 60 sec. ECT ≥ 60 ° C BARO > 65 kPa IGN. voltage > 9 & < 18 volts IAT > -10 ° C TP < 0.74% VS ≤ 1 MPH Time > 5 seconds to fail. > 8 seconds to pass	Must be outside the fail criteria continuously for 5 seconds. Must be within pass criteria for 8 seconds continuously.	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 100milliseconds thereafter.	DTC Type A
PCM – PROGRAMMING ERROR	P0602	Indicates that the PCM is not flashed.	PCM not flashed.	Ignition on.	1 test failure 100 ms after PCM powered-up	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 ms thereafter.	DTC Type A

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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	Check is performed at power-up.	DTC Type A
5 VOLT REFERENCE A CIRCUIT	P0641	Determines if the supply voltage for the 5 volt reference is within an acceptable limit.	Compares the ratio of the 5 volt reference circuit voltage to the 5 volt supply voltage.	5 volt reference circuit voltage differs from 5 volt supply voltage by plus or minus approximately .01 volt. PCM is powered up	Condition present > 2 seconds Continuous.	DTC Type B
Malfunction Indicator Lamp Control Circuit MALF (ODM)	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 greater than 400 rpm. Ignition voltage > 10.0 volts, but < 18 volts	5 seconds. 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
PRNDL SWITCH	P0706	Check for PRNDL switch malfunction	Start run is achieved if reverse or drive is indicated; or if in park or neutral if: TPS > 5% Torque > 50 ftlbs VSS > 20 mph Failcounts: 100/150 samples	Ignition voltage >6 and < 18 V Gear ≥ 3rd Gear	Stuck in drive immediately upon start Stuck in PN 10 seconds Continuous Monitor	DTC Type C

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PCM skid signal	P0856	This DTC diagnoses the PWM skid signal received from the ABS unit. When the duty cycle is high, low or invalid a fault will be indicated. In addition, when the expected transmission period varies from the expected period by a certain amount, a fault will be reported.	1. PWM Fault ranges Low Skid PWM <2.0% Invalid Low 5% < Skid PWM <20% Invalid Intermediate 26% < Skid PWM < 88% High Skid PWM > 94% 2.Absolute value of (Skid PWM Period – expected period) > 1 mS	1. When PCM and ABS are powered 2. Engine_Run_Time() > 10 seconds	1. 125 fails from 125 samples 1 sample/ 12.5ms 2. Every 12.5ms	DTC type B
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

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HO2S SYSTEM - TOO FEW R/L OR L/R SWITCHES (B1S1)	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 < 25 R/L switches < 25	Closed Loop Fuel Control Engine runtime > 160 sec 1200 < RPM < 3000 20 < Air Flow < 55 g/s. TPS > 5% 10 V < System Voltage < 18 V Fuel > 10% ECT > 60 °C CCP > 0 Ethanol % < 90 -1280 ºC < Predicted Oxygen Sensor Temp < 1280 ºC Above conditions met for 1 sec DTC's P0131, P0132, P0134 and P0135 not set No AIR, EGR, Throttle, MAT, Injector, Coolant, Air Flow, Purge Control, MAP, Engine Protect or Fuel Composition faults active.	100 sec Once per trip.	DTC Type B
HO2S TRANSITION TIME DIFFERENCE (B1S1)	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 +155 ms Min -120 ms	Closed Loop Fuel Control Engine runtime > 160 sec 1200 < RPM < 3000 20 < Air Flow < 55 g/s. TPS > 5% 10 V < System Voltage < 18 V Fuel > 10% ECT > 60 °C CCP > 0 Ethanol % < 90 -1280 ºC < Predicted Oxygen Sensor Temp < 1280 ºC Above conditions met for 1 sec DTC's P0131, P0132, P0134 and P0135 not set No AIR, EGR, Throttle, MAT, Injector, Coolant, Air Flow, Purge Control, MAP, Engine Protect or Fuel Composition faults active.	100 sec Once per trip.	DTC Type B

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HO2S SYSTEM - TOO FEW R/L AND L/R SWITCHES (B2S1)	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 < 25 R/L switches < 25	Closed Loop Fuel Control Engine runtime > 160 sec 1200 < RPM < 3000 18 < Air Flow < 55 g/s. 10 V < System Voltage < 18 V TPS > 5% Fuel > 10% ECT > 60 °C CCP > 0 Ethanol % < 90 -1280 ºC < Predicted Oxygen Sensor Temp < 1280 ºC Above conditions met for 1 sec DTC's P0151, P0152, P0154 and P0155 not set No AIR, EGR, Throttle, MAT, Injector, Coolant, Air Flow, Purge Control, MAP, Engine Protect or Fuel Composition faults active.	100 sec Once per trip.	DTC Type B
HO2S TRANSITION TIME DIFFERENCE (B2S1)	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 +155 ms Min -120ms	Closed Loop Fuel Control Engine runtime > 160 sec 1200 < RPM < 3000 20 < Air Flow < 55 g/s. TPS > 5% 10 V < System Voltage < 18 V Fuel > 10% ECT > 60 °C CCP > 0 Ethanol % < 90 -1280 ºC < Predicted Oxygen Sensor Temp < 1280 ºC Above conditions met for 1 sec DTC's P0131, P0132, P0134 and P0135 not set No AIR, EGR, Throttle, MAT, Injector, Coolant, Air Flow, Purge Control, MAP, Engine Protect or Fuel Composition faults active.	100 sec Once per trip.	DTC Type B
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.	DTC Type A
ABS Rough Road Malfunction	P1380	This diagnostic detects if the ABS controller is indicating a fault. When this occurs, misfire will STILL 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	DTC Type C (DTC sets when a P0300 is active)

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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 STILL run.	Serial data messages are lost	VS ≥ 5mph RPM ≤ 7000 Engine Load ≤ 60%	450 failures out of 500 samples	DTC Type C (DTC sets when a P0300 is active)
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

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SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
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

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SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
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

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SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL ILLUMINATION TYPE
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 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

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

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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
CAN fault ESCM module	U0111	This DTC detects that either the rolling counter from this module has frozen. It also detects if any of the CAN messages from this module has timed out.	1.Change in rolling counter = 0 2.An individual message has not been received for at least 2.5 expected message transmission intervals Message 1 – 125ms timeout Message 2 – 250ms timeout	Test enable criteria CAN network is alive Ignition voltage > 6V	1. 100 fails from 200 samples 1 sample/50ms 2. 400 fails from 800 samples 1 sample/12.5ms	DTC Type C
CAN fault SGCM module	U0120	This DTC detects that either the rolling counter from this module has frozen. It also detects if any of the CAN messages from this module has timed out.	1.Change in rolling counter = 0 2.An individual message has not been received for at least 2.5 expected message transmission intervals Message 1 – 250ms timeout Message 2 – 62.5ms timeout	Test enable criteria CAN network is alive Ignition voltage > 6V	1. 200 fails from 400 samples 1 sample/25ms 2. 400 fails from 800 samples 1 sample/12.5ms	DTC Type B
CAN fault EHPS module	U0131	This DTC detects that either the rolling counter from this module has frozen. It also detects if any of the CAN messages from this module has timed out.	1.Change in rolling counter = 0 2.An individual message has not been received for at least 2.5 expected message transmission intervals Message 1 – 62.5ms timeout	Test enable criteria CAN network is alive Ignition voltage > 6V	1. 200 fails from 400 samples 1 sample/25ms 2. 400 fails from 800 samples 1 sample/12.5ms	DTC Type C

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CAN fault HCM module	U0293	This DTC detects that either the rolling counter from this module has frozen. It also detects if any of the CAN messages from this module has timed out.	1.Change in rolling counter = 0 2.An individual message has not been received for at least 2.5 expected message transmission intervals Message 1 – 125ms timeout Message 2 – 62.5ms timeout	Test enable criteria CAN network is alive Ignition voltage > 6V	1. 100 fails from 200 samples 1 sample/50ms 2. 400 fails from 800 samples 1 sample/12.5ms	DTC Type B
Invalid Data from ABS ECU for Front Wheel Speed Sensors	U0415	This diagnostic detects if the ABS is receiving invalid front wheel speed data for PCM skid condition	ABS controller sends a message to PCM indicating that a failure has occurred in the ABS module	When PCM and ABS are powered	Continuous	DTC Type C (DTC sets when P0856 is active)
Lost Communications With Climate Control Panel	U1153	This DTC detects if the State of Health Class 2 message from the HVAC controller has timed out.	No State of Health Message from HVAC controller for > 5 seconds	No Class 2 Communication Short Faults PCM State = Ready, Run, or Idle Engine Off	Continuous	DTC Type C
Class 2 Comm. Fault - Short to ground	U1300	This DTC detects if the PCM Class 2 signal is shorted to a low voltage	Class 2 line shorted to ~ 0 V for > 3 seconds	PCM State = Ready, Run, or Idle Engine Off	Continuous (100 ms rate)	DTC Type C
Class 2 Comm. Fault - Short to high	U1301	This DTC detects if the PCM Class 2 signal is shorted to a high voltage	Class 2 line shorted to ~ 12 V for > 3 seconds	PCM State = Ready, Run, or Idle Engine Off	Continuous (100 ms rate)	DTC Type C